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# Knowledge and Perceptions Regarding Medical Termination of Pregnancy among Medical and Non-medical Students

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## ABSTRACT

Abortion is legal in India, under certain conditions and with prescribed regulations as regards to the personnel and place where it can be performed. The medical fraternity has to strictly adhere to these guidelines. The present study aimed to ascertain the level of knowledge regarding abortion practices and laws among educated sections of the society namely medical and non medical students. We observed that though medical students are more aware as compared to non medical students, the level of knowledge still needs to increase at the undergraduate level as well as awareness among the general public as regards to safe abortion practices must be increased.

**Keywords:** Abortion, MTP Act, Medical Students

## INTRODUCTION

The actual worldwide incidence of abortion is not known. Estimates range from 30-55 million a year or about 40-70 per 1000 women of reproductive age, with an abortion ratio of 260-450 per 1000 live births. In India it has been computed that about 6 million abortions take place every year of which four million are induced and two million spontaneous<sup>(1,2)</sup>. There are a set of guidelines that are mandated to enforced in all places where medical termination of pregnancy are to take place and these are kept under strict vigilance. <sup>(3)</sup> It was reported widely in Indian and World media that developing countries report a higher incidence of maternal mortality and one of the contributing factors for the same include the practice of unsafe abortions done in unlicensed centre's or by unqualified individuals<sup>(4)</sup>. One of the reasons may be due to the fact that women are either unaware or ill informed about the availability of safe abortion techniques at various centers or do not possess

an idea about the need for a safe abortion. Knowledge about MTP Act is limited to either doctors or lawyers, with the general public still being in the dark. There is a need to assess whether the non medically educated individuals possess knowledge about MTP and safe abortion practices as compared to Medical students so that appropriate health education may be conducted. Another aspect in opting for unsafe practices lies in the fact that perceptions and attitude of the society as a whole towards abortion is generally skewed. This is also an important aspect to be covered. The objective behind this study was to understand the level of knowledge of non medical students as compared to medical students regarding the basic features of abortions, to compare the attitudes and perceptions that a medical and non medical student has towards abortions as a whole so as to formulate a common plan for providing education regarding safe abortion practices and remove any false knowledge.

## METHODOLOGY

The study was a cross sectional, non randomized, questionnaire based study on Health education and Forensic Medicine which was conducted in a tertiary Hospital and Medical College in Bareilly, Uttar Pradesh. The study was conducted over a period of 2 months comprising of individuals who are students

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of undergraduate or postgraduate programmes in educational institutions and are comfortable in reading and writing English. The subjects include both genders and all age groups. Written informed consent was obtained in the prescribed format prior to inclusion in study. The data was collected as per questionnaire sheet. Age and gender of the individual were needed for preparing analytical charts and results. No other identifying data was recorded or needed to be disclosed. A distinction was made between medical and non medical students by means of a check box on the questionnaire sheet. The sample size was estimated as 200, with 100 each from both the genders and an attempt was made to include equal students from medical and non medical fields. The data was compiled and analysed using SPSS software and in consultation with a statistician.

### OBSERVATIONS

A total of 186 students submitted completed questionnaires comprising of 88 males and 98 females in total. The medical and non medical students comprised of a total of 93 students each having a distribution of 49 females and 44 males (Table 01). Regarding the prevalence and problem of unsafe abortions, 99% of males and females were aware that the problem exists in the country among both study groups; however 3 % males and 2% females were unaware of the situation among non medical study group (table 02).

Upon being asked whether the consent from husband was required for conducting an abortion, 73% males and 74 % females gave correct replies. Among the incorrect entries, the non medical students ranked higher than medical students, and among the non medical students, males gave more incorrect replies as compared to females (table 03). In reference to the maximum permissible limit of foetal age for abortions, only 64% male and 60% females answered correctly. Medical Students were ahead in correct entries with males giving more correct replies among them.(table 04)

The enquiries regarding if there are specific rules and regulations for hospitals and doctors conducting abortions, a very low number of non medical students (34%) gave correct replies, while medical students surprisingly gave only 64% correct replies.(table 05)

The results show that many medical students are still unaware regarding the provisions of MTP act and

its ramifications towards the community and medical professionals. It also shows that non medical individuals still are in the dark regarding the safe abortion practices and community outreach is needed in this case.

**Table 1: Students Distribution (n=186)**

Students	Male	Female
Medical	44	49
Non Medical	44	49
Total	88	98

**Table 2: Regarding Prevalence of Unsafe Abortions**

Students	Male	Female
Medical	44(100%)	49(100%)
Non Medical	43(97%)	48(98%)
Total	87(99%)	97(99%)

**Table 3: Regarding Consent of Husband**

Students	Male	Female
Medical	38(86%)	40(82%)
Non Medical	26(59%)	32(65%)
Total	64(73%)	72(74%)

**Table 4: Regarding Maximum age of foetus**

Students	Male	Female
Medical	34(77%)	36(73%)
Non Medical	22(50%)	23(47%)
Total	56(64%)	59(60%)

**Table 5: Regarding Institutions and Personnel performing abortions**

Students	Male	Female
Medical	31(70%)	28(58%)
Non Medical	15(34%)	19(39%)
Total	46(53%)	47(48%)

### DISCUSSION

The present study was conducted at Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly having a total of 186 students, comprising 93 each from medical and non medical fields of study. We found that a large number of non medical students and all medical students were aware of the problem of unsafe practices of abortion among the quacks in the country. This finding is in agreement with studies by Kumar et

al and Hogmark S et al, who also stated that medical students are by and large aware of the problem statement regarding unsafe abortions<sup>(5,6)</sup>. A study by Palo LB et al from Puducherry also had the same finding, wherein all medical students under study had knowledge of the unsafe abortion practices.<sup>(7)</sup>

In the present study, among all of the students, both male and female, from medical and non medical backgrounds, only half (50%), were aware of the MTP Act. Among medical students, 64% were aware while in non medical group, 36% were aware of the presence of an ACT. Whereas, in a study done by Herald and Linda among 457 final year medical students at the University of Argentina, found that 92.6% knew that abortion is not punishable under some circumstances. But, the majority did not know the exact abortion laws in Argentina.<sup>(8)</sup> Similarly the findings of a study done by Geleto et al have shown that fewer than half, 35.7% of the respondents had good awareness about legal background of safe abortion in Ethiopia.<sup>(9)</sup> This is a dire scenario and warrants the need to have outreach programmes designed to educate the general population as regards to the presence of abortion laws and regulations that are present to prevent unsafe abortions and to educate the masses that registered medical professionals with requisite qualifications can only perform such procedures.

27 % males and 26 % females in our study reported that the consent from husband is a mandatory requirement for a woman to undergo a abortion. This is in conflict with a study by Palo LB et al, who reported that 64 % of respondents were under this impression. <sup>(7)</sup>

### CONCLUSION

A study estimated that approximately 60% of the world's population lives in countries where abortion is officially legal but there are considerable barriers to access an abortion, despite high demand.<sup>(10)</sup> The findings in the present study correlate the above opinion with similar studies done in India and abroad. The knowledge regarding MTP Act was poor among medical undergraduate students. This leads us to conclude that insufficient knowledge and training among health care providers presents an obstacle to women seeking abortions as well as increasing incidence of unsafe abortions which further leads to increased morbidity and mortality.

There is a need for medical students as well as the general public to receive better understanding and knowledge regarding safe abortion practices to improve sexual and reproductive health services and abortion services in future.

**Conflict of Interest:** Nil

**Source of Funding:** Self

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# A Comparative Study on Cephalic and Facial Indices among Students from Southern Parts of India

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## ABSTRACT

**Background:** Craniofacial anthropometry deals with the dimensions of head and face. Based on these measurements race and sex can be determined.

**Objective:** To correlate the concurrence of the head and facial type, and to determine the predominant head and facial type in males and females from southern parts of India.

**Materials and Method:** A cross-sectional study was conducted among medical students in a Medical College Puducherry, India. A total of 195 subjects (105 males and 90 females), above 18 years were studied. Cephalic and facial indices of all the subjects were analyzed based on Martin & Saller method.

**Results:** There is no correlation between head types and facial types. However, Mesocephalic/medium head type was predominant in both males (44.76%) and females(48.89%) type. In the case of facial types, leptoprosopic/ narrow face (30.48%) in males and hyper leptoprosopic/ very narrow face (35.56%) was the most predominant in females.

**Conclusion:** This study not only appreciated the prevalence of the cephalic and facial phenotypes but also found the concurrence of both these phenotypes in males.

**Keywords:** cephalic index; facial index; head types; facial types; southern parts of India

## INTRODUCTION

Anthropometric measurements play a very important role, in studying the differences among the human population based on geographical, racial, sex, age and nutritional factors.<sup>1</sup> Cephalometry is a branch of anthropology, in which the dimensions of head and face are noted.<sup>2</sup> Based on the craniofacial measurements cephalic indices and facial indices are calculated, which helps in ascertaining the variation between different race, ethnic groups and sex.<sup>3</sup>

Cephalic index (CI) is also known as a cranial index or Index of breadth.<sup>4</sup> Cephalic index is the ratio of the

maximum breadth of the head to the maximum length of the head. On the basis of the cephalic index, head shapes are grouped into dolichocephalic, brachycephalic, mesocephalic, and hyperbrachycephalic. It is one of the important parameters for identification and also to differentiate between different human races.<sup>5</sup> It also gives an idea of how genetic characters are transmitted between offspring and siblings.<sup>6</sup>

The Facial index (FI) is the ratio of the length of the face to the maximum width between zygomatic prominences, based on which face shapes are classified into hypereuryprosopic, euryprosopic, mesoprosopic, hyperleptoprosopic and leptoprosopic.<sup>7</sup> Facial index need not limit with identification but could be extended to the planning and prognosis of orthodontic treatments.<sup>8</sup>

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Indian population can't be classified as a pure Caucasian, Mongoloid or Negroid because of racial

mixing and hence it's basically Caucasian with a few Negroid characters.<sup>9</sup> Some authors state that North Indians and North West Indians are Caucasians, East Indians and North East Indians are more of Mongoloid while South Indians belong to Negroid race.<sup>10,11</sup>

Taking all these into consideration, this study is designed not only to appreciate the prevalence of the cephalic and facial indices among students from southern parts of India. But also to find the concurrence of both these indices in a person, belonging to southern parts of India.

**MATERIAL AND METHOD**

A cross-sectional study was conducted from June 2017 – December 2017 in the Department of Forensic Medicine, of Aarupadaiveedu Medical College and Hospital, Puducherry, among the medical students after obtaining approval from institutional ethical committee. A total of apparently healthy 195 subjects (105 males and 90 females) belonging to Southern parts of India (Tamil Nadu, Puducherry, Andhra Pradesh, Telangana, Kerala and Karnataka) above the age of 18 years, with valid consent are included for the study. Subject belonging to other parts of India, and those having congenital craniofacial anomaly, trauma, reconstructive surgery, and deformities were excluded from the study.

The head of the subject was allowed to rest in eye-ear plane or Frankfurt plane. Subjects were made to sit on low raise stool and instructed not to change his/her position while taking measurements. To reduce technical error of the measurements, each measurement was taken by the same person to eliminate the discrepancies.<sup>6</sup> All the physical measurements were taken using the spreading calliper with rounded ends. The anatomical landmarks are defined as follows:-

Glabella (g): A point above the nasal root between the eyebrows and intersected by mid-sagittal plane.

Opisthocranium (op): It is the most posterior point on the posterior protuberance of the head in the mid sagittal plane.

Euryon (eu): It is the most laterally placed point on the sides of the head.

Gnathion (gn): It is the lowest point on the lower margin of the lower jaw intersected by the mid-sagittal plane.

Nasion (n): It is the point on the nasal root intersected by mid sagittal plane

Zygion (zy): It is the most lateral placed point on the zygomatic arch.

The maximum head length (glabella to opisthocranium) and maximum head width (maximum transverse diameter between euryon to euryon) will be measure with Spreading Caliper with rounded ends. Facial length (distance from nasion to gnathion) and facial width (distance between two zygomatic landmarks) are also measured using the Spreading Caliper with rounded ends. The above mentioned measurements will be used to derive the cephalic index (CI) and facial index (FI) according to Martin & Saller with following formulae:<sup>12</sup>

$$CI = (\text{maximum head breadth} / \text{maximum head length}) \times 100$$

Depending on these indices the types of head and face shapes will be classified according to Martin & Saller (1957) method.<sup>12</sup>

**Table 1: Classification of Head types**

Head type	Range of Index	
	Male	Female
Dolicocephalic	71.0-75.9	72.0-76.9
Mesocephalic	76.0-80.9	77.0-81.9
Brachycephalic	81.0-85.9	82.0-86.4
Hyperbrachycephalic	86.0-90.9	86.5-91.9
Ultrabrachycephalic	91.0- above	91.0- above

**Table 2: Classification of Facial types**

Facial type	Range of Index	
	Male	Female
Hypereuryprosopic	78.9 & below	76.9 & below
Euryprosopic	79.0-83.9	77.0-80.9
Mesoprosopic	84.0-87.9	81.0-84.9
Leptoprosopic	88.0-92.9	85.0-89.9
Hyperleptoprosopic	93.0- above	90.0- above

The obtained data was subjected to appropriate

statistical analysis. Data were entered in MS Excel 2007 and Pearson’s correlation was used to test the association between head and facial types using statistical package SPSS version 16 for windows.

### RESULTS

**Table 3: Distribution of head types in males & females**

Head types	Male		Female		Both	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Dolicocephalic	30	28.57%	29	32.22%	59	30.26%
Mesocephalic	47	44.76%	44	48.89%	91	46.67%
Brachycephalic	26	24.77%	14	15.56%	40	20.51%
Hyperbrachycephalic	02	1.90%	03	3.33%	05	2.56%
Total	105	100%	90	100%	195	100%

**Table 4: Distribution of facial types in males & females**

Facial types	Male		Female		Both	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Hypereuryprosopic	02	1.90%	0	0	02	1.02%
Euryprosopic	16	15.24%	06	6.67%	22	11.28%
Mesoprosopic	31	29.52%	21	23.33%	52	26.67%
Leptoprosopic	32	30.48%	31	34.44%	63	32.31%
Hyperleptoprosopic	24	22.86%	32	35.56%	56	28.72%
<b>Total</b>	<b>105</b>	<b>100%</b>	<b>90</b>	<b>100%</b>	<b>195</b>	<b>100%</b>

**Table 5: Cross-tabulation of head types with facial types in males**

Sex	Head Types	Facial Types					
		Hypereuryprosopic	Euryprosopic	Mesoprosopic	Leptoprosopic	Hyperleptoprosopic	Total
Male	Dolicocephalic	0	05	05	10	10	30
		0	4.76%	4.76%	9.52%	9.52%	28.57%
	Mesocephalic	02	06	12	16	11	47
		1.90%	5.71%	11.43%	15.24%	10.48%	44.76%
	Brachycephalic	0	05	14	05	02	26
		0	4.76%	13.34%	4.76%	1.91%	24.77%
	Hyperbrachycephalic	0	0	0	01	01	02
		0	0	0	0.95%	0.95%	1.90%
<b>Total</b>		02	16	31	32	24	105
		1.90%	29.52%	30.47%	22.85%	100%	

**Table 6: Cross-tabulation of head types with facial types in females**

Sex	Head Types	Facial Types					Total
		Hypereury prosopic	Eury prosopic	Meso prosopic	Lepto prosopic	Hyperlepto prosopic	
Female	Dolicocephalic	0	01	04	13	11	29
		0	1.11%	4.44%	14.44%	12.22%	32.22%
	Mesocephalic	0	03	13	13	15	44
		0	3.33%	14.44%	14.44%	16.67%	48.89%
	Brachycephalic	0	02	03	04	05	14
		0	2.22%	3.33%	4.44%	5.56%	15.56%
	Hyperbrachycephalic	0	0	01	01	01	03
0		0	1.11%	1.11%	1.11%	3.33%	
Total 0		0	06	21	31	32	90
		6.66%	23.32%	34.43%	35.56%	100%	

**Table 7: Correlation of head types with facial types**

Correlation	Numbers	Correlation coefficient (r)	P value	Confidence interval
Male	105	-0.2703	0.0053	-0.4392 to -0.08286
Female	90	-0.1169	0.2724	-0.0924 to -0.3164
Both	195	-0.0964	0.1796	-0.2339 to 0.04466

**DISCUSSION**

In the present study (Table 3), the predominant head type in males from southern parts of India was mesocephalic/medium headed (44.76%) followed by dolicocephalic/long headed (28.57%) and brachycephalic/short headed (24.77%). In females, the dominant head types were mesocephalic (48.89%) followed by dolicocephalic (32.22%) and brachycephalic (15.56%). Which was consistent with other Indian studies by Salve VM et al.,<sup>13</sup> in Andhra region, Shah & Jadhav,<sup>14</sup> in Gujarathi population, Shrikanthan G et al.,<sup>15</sup> in Indians belonging to the southern region and Anitha MR et al.,<sup>16</sup> in Indians belonging to the northern region. On the contrary, Brachy-cephalic phenotype was predominantly noted in Punjabi students by Mahajan A et al.,<sup>17</sup> in population belonging to eastern parts of India by Vijayanath V et al.,<sup>18</sup> and in Manipal by Yagain VK et al.<sup>19</sup>

In the present study (Table 4), the predominant facial type in males from southern parts of India was leptoprosopic/ narrow face (30.48%) followed by mesoprosopic/ medium face (29.52%) and hyperleptoprosopic/ very narrow face (22.86%). In females, the dominant face types were hyperleptoprosopic (35.56%) followed by leptoprosopic (34.44%) and mesoprosopic (23.33%). The studies conducted in different regions of India showed, mesoprosopic as common facial type notes in North Indians by Deepu SK et al.,<sup>20</sup> and in Haryanvi adults by Mahesh Kumar et al.<sup>21</sup> A study done in South Indians by Praveen KD et al.,<sup>22</sup> and by Ranjana G et al.,<sup>23</sup> in Chattisgarh showed hyperleptoprosopic as dominant facial type.

In furtherance, a cross tabulation (Table 5), was done for checking the most probable facial form in a specific head type in the population. On analyzing in males, it was identified that persons with dolicocephalic head type predominantly had a leptoprosopic facial type (9.52%).

Whereas Mesocephalic head type had a predominantly leptoprosopic facial type (15.24%) and brachycephalic head type predominantly had a mesoprosopic facial type (13.33%).

Analyzing cross tabulation (Table 6), for females, it was identified that persons with dolicocephalic head type predominantly had a leptoprosopic facial type (14.44%). Whereas mesocephalic head type predominantly had a hyperleptoprosopic facial type (16.67%) and brachycephalic head type predominantly had a hyperleptoprosopic facial type (5.56%).

Further, it is inferred that in males, the most probable combination is the medium head with a narrow face and in females; it is the medium head with a very narrow face.

However, in (Table 7) statistical correlation between head and facial types shows that only in males there is statistical significance ( $p=0.0053$ ). In females and combination of both the sexes there is no statistical significance.

### CONCLUSION

From the present study, we found that in Southern parts of India males predominantly have mesocephalic/medium head type and leptoprosopic/narrow facial type. Whereas, females predominantly have mesocephalic/medium head type and hyper leptoprosopic/very narrow facial type.

There exists a significant correlation between the head and facial types only in males from southern parts of India. However, considering the limitations of our study and the absence of previous studies regarding the correlation of the head and facial types, this may be considered for further studies using large population group. The same study can be done in other parts of India.

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**Conflict of Interest:** Nil

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# Correlation of Attributes of Homicide Cases with its Severity based on Homicide Injury Scale

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## ABSTRACT

Homicide Injury Scale (HIS) was developed so that there is more specificity and accuracy for the victims' injuries analysis. It has a scoring range of 1 to 6 where score 1 represents a single cause of death with no external injuries and score 6 was given when there were multiple causes of death with multiple external injuries amounting to overkill. In this study the fatal injuries found in homicide cases were categorised according to the Homicide injury scale and was correlated with various factors like types of fatal injuries, anatomical distribution of fatal injuries and type of weapon used. This study showed that as the severity of injuries increased on the scale, the cause of fatal trauma in majority of cases changed from blunt force to sharp force. It also showed a unique pattern of conglomeration of fatal injuries over the head and neck area throughout all categories of homicide cases.

**Keywords:** *homicide, homicide injury scale, weapon of offence*

## INTRODUCTION

In this fast-paced stressful world, it is not surprising that the single biggest threat to a human life is another human being. A recent study published by United Nations office on Drugs and Crime reported a global average of intentional homicide rate of 6.2 per 100,000 population. <sup>(1)</sup> Even though scientific breakthroughs have simplified investigative processes and subsequent incarceration of the assailants, it has not deterred man from committing the most ancient and heinous of all crimes. Several research papers have been published which analyses homicide cases where the profile typically included total number of cases, gender variation, cause of death, type of weapon used and relationship between offender and the victim. <sup>(2-5)</sup> However there are very few literatures which have done an extensive study on the severity

of injuries in a homicide case based on a standardised scale. <sup>(6,7)</sup>

Classifying injuries based on their severity has always been considered as a vital tool by trauma surgeons all over the world. Several scoring systems are still in vogue and newer systems are formulated every year to categorise injuries by their severity and thereby aiding in effective triage and treatment of trauma patients. A paper published by Fredrik et al in which 7 injury scoring systems were compared, concluded that Sum of all AIS (SAIS) score is the closest to a gold standard for injury severity scoring in homicide victims. <sup>(8)</sup> The authors also concluded that if their proposed definition of overkill is used then Homicide Injury Scale (HIS) can be used as a valid alternative method for SAIS while quantifying injuries in a homicide victim.

Homicide Injury Scale (HIS) was first formulated by Safarik and Jarvis in 2005 using injury data from medical examiner's report. <sup>(9)</sup> This scale was developed so that there is more specificity and accuracy for the victims' injuries analysis. It is particularly useful to compare injuries in a large sample of cases where there are different and multiple causes of death with or without related injuries. HIS quantifies only those injuries

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which are directly related to the cause of death. It has a scoring range of 1 to 6 where score 1 represents a single cause of death with no external injuries and score 6 was given when there were multiple causes of death with multiple external injuries amounting to overkill [Table 1.] Safarik and Jarvis referred to Crime Classification Manual for the definition of overkill. According to 2006 edition of the manual, overkill is defined as excessive trauma beyond that which is necessary to cause death.<sup>(10)</sup>

### AIM

To classify the homicide cases according to the Homicide injury scale and to correlate various attributes of homicide with Homicide Injury Scale.

### MATERIALS AND METHOD

This is a retrospective study which includes all homicide cases which were autopsied at a private medical college in Pondicherry from 2004 to 2016. The data for this study was obtained from post-mortem report and police inquest report of the cases. In each of the case, the injuries were studied and categorised according to the Homicide injury scale. Various attributes like types of fatal injuries, anatomical distribution of fatal injuries and type of weapon used were noted in all cases. Each attribute was correlated with the homicide injury scale using IBM SPSS Statistics software version 22.0.

#### Inclusion criteria:

All homicidal cases autopsied in the hospital from 2004-2016

#### Exclusion criteria:

Homicidal cases which showed advanced decomposition changes obliterating the injuries

Homicidal cases where the cause of death could not be ascertained

### RESULTS

A total of 1994 cases were autopsied during the specified study period out of which 85 cases were homicide cases. Based on injuries mentioned in the autopsy report, these 85 cases were categorised according to homicide injury scale. Out of 85 cases none of them fell under category of HIS 1. For each other categories, the total number of cases, types of fatal injuries, regional distribution of fatal injuries and type of weapon used are

tabulated and represented pictographically. (fig 1- 4)

#### Homicidal injury scale and type of fatal injury:

In the category of HIS score 6 and 5, where the fatal injuries were excessive (overkill), all cases (100%) had sharp force injuries as fatal injuries. HIS scale 4, which included cases with multiple causes of death with no excessive or overkill injuries, showed 20 % of cases (3 cases) had sharp force fatal injuries, while 73% had fatal injuries due to blunt force trauma and 66% of cases had fatal injuries leading to mechanical asphyxia. In cases categorized under HIS scale 3, where there was a single cause of death with no excessive or overkill injuries, 16 % of cases had fatal sharp force injuries, 77 % of cases had fatal blunt force injuries and 6.4% of cases had fatal thermal burns. Cases with single cause of death with internal injury and with related minor external injuries were categorised under HIS 2 and all of these cases had only fatal injuries causing mechanical asphyxia. It was noted that as the homicidal injury score decreases, the number of cases with fatality due to sharp force trauma had significantly reduced while the number of cases with fatal blunt force trauma and injuries resulting in asphyxia was significantly high in cases categorized under lower HIS scores (p value <0.0001).

#### HIS and Anatomical distribution of fatal injuries:

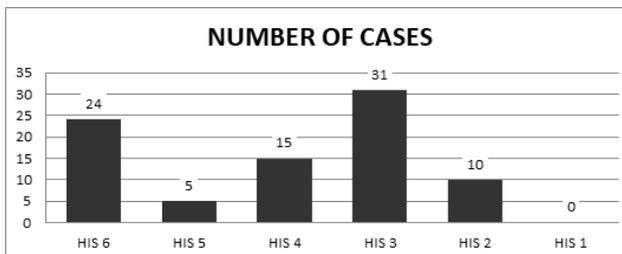
Out of the 10 cases which were categorized under HIS 2, 90% of cases had fatal injury over neck and in the remaining 10% of cases the fatal injury was over the face. Majority of the cases under HIS 3 category had fatal injuries on the head (52%) while in HIS 4 category most of fatal injuries were noted over the neck (67%) followed by face (53%) and then head (47%). Cases under HIS 5 and 6 also showed a preponderance of fatal injuries being located over the head, face and neck.

#### HIS and weapon of offence:

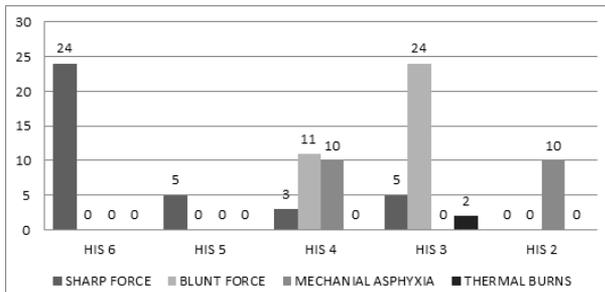
In HIS 2 category cases the weapon of offence was either a ligature material (90%) or the offender's hand (10%). In both HIS 3 (73%) and HIS 4 (77%) category cases blunt weapons were noted to be used more frequently than other type of weapons. It was noted, that in all cases of HIS 5 and 6 category sharp cutting weapons were most common offending weapon. As the severity score increased, the weapon of choice also changed significantly from blunt weapons to sharp weapon (p value <0.0001).

**Table 1: The Homicide Injury Scale (HIS)**

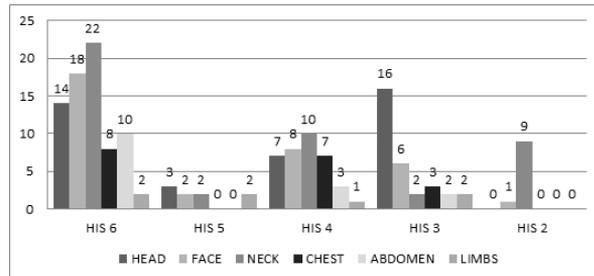
HIS score	Definition
HIS 1	Single cause of death only: internal injuries only with no visible related external injuries (e.g., smothering, strangulation, ruptured organs resulting from blunt force trauma)
HIS 2	Single cause of death only: internal injuries only with minor related external injuries (e.g., smothered with related abrasions and/or contusions of mouth and face, strangled with related abrasions or ligature marks)
HIS 3	Single cause of death only: related external moderate to serious injuries not identified as either excessive or overkill
HIS 4	Two or more causes of death: related internal and/or external injuries not identified as either excessive or overkill
HIS 5	Single cause of death only: related external injuries identified as either excessive or overkill
HIS 6	Two or more causes of death: related internal and/or external injuries in at least one of the causes of death identified as either excessive or overkill



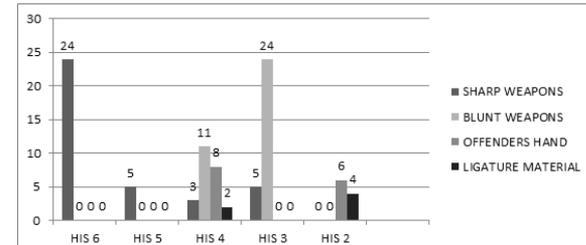
**Figure 1: NUMBER OF CASES IN HOMICIDAL INJURY SCALE**



**Figure 2: TYPE OF FATAL INJURY**



**Figure 3: ANATOMICAL DISTRIBUTION OF FATAL INJURIES**



**Figure 4: TYPE OF WEAPON USED**

**DISCUSSION**

Though HIS has long been formulated and used by FBI as a tool for differentiating offender variables, there are very few researches which has correlated HIS with various attributes of homicide cases.<sup>(8,9,11,12)</sup> HIS was formulated by taking into consideration whether there was a single or multiple cause of death with or without overkill injuries. In a study conducted by Carol.E.J, et al homicide injury scale was found to be an effective tool in assessing the severity of injury.<sup>(11)</sup> In this study we have attempted to correlate HIS with various attributes of homicide like types of fatal injuries, regional distribution of fatal injuries and type of weapon used.

In our study it was found that majority of cases had sharp force fatal injuries followed by blunt force trauma and fatal injuries resulting in asphyxia. These findings were consistent with the studies by various other authors, where sharp force fatal injuries were seen in majority of cases followed by blunt force injuries.<sup>(13-15)</sup> In the present study, categories with highest severity (HIS 6,5), showed a preponderance of sharp force injuries being the commonest type of fatal injuries while, in the category of moderate severity (HIS 4,3), the type of fatal injuries were predominately blunt force injuries. The category of least severity (HIS 2) showed fatal injuries to be predominately those injuries that had resulted in mechanical asphyxia.

Site of fatal injury many a times has a direct bearing with the cause of death. It was noted that in all categories of Homicidal Injury Score, fatal injuries were predominantly noted over head, face and neck. This observation is consistent with another study conducted on homicide victims in South India.<sup>(15)</sup> This might

be because of a common knowledge shared among offenders about vital structures of human body which are present in this area and the ease with which these structures can be damaged resulting in certain death of their victims.

Weapon of offence depends on the modus operandi of the offender. Similar to type of fatal injuries, majority of cases which fell under the categories with highest severity (HIS 6,5) the choice of weapon were heavy and light sharp cutting weapons while, in the category with moderate severity (HIS4,3), it was found that the choice of weapon was significantly blunt force weapon and in the category of least severity (HIS 2), weapon of offence was ligature material in most of the cases.

### CONCLUSION

Analysing the various attributes of homicide cases with a standardised scale like homicide injury scale shows that these attributes changes significantly in accordance with the severity of the homicide case. The type of fatal injuries inflicted by the offender and the weapon chosen by the offender for the act significantly varies with the increasing severity of the homicide case. This is a rare study where a large number of homicide cases has been categorised based on a standardised scale to project a significant pattern of correlation between severity of injury and various factors of homicide cases. However it has to be noted that one aspect of homicide which might be an important facet in determining the severity of injuries caused in a homicide is the offender himself. Further studies in the current line of research, where severity of injuries if compared with other attributes of offenders like motive of offence, number of offenders involved, previous criminal profile of offenders may lead to better solving of homicidal cases in future.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** the study has been approved by the institution research committee and since the study does not involve any live human beings it was also cleared by the institute ethical committee.

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# Study of Pattern of Skull Fractures in the Victims of Unnatural Deaths Due to Head Injury Caused by Road Traffic Accidents (RTA) at Kanpur, India

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## ABSTRACT

**Background:** Head is one of the most venerable part of body to get injured in the road traffic accident. Head may get serious injuries in the terms of morbidity and mortality.

**Method:** This study was conducted for the period of one year from January to December 2015 at the postmortem house of G.S.V.M. medical college and LLR hospital Kanpur U.P. 808 cases of skull fracture in head injury caused by fatal road traffic accident were evaluated.

**Results and Conclusion:** Linear fracture of skull is most common seen in 132(16.34%) cases. Parietal bone is single most commonly involved bone comprising 117 (14.48%) case. Most commonly involved age group is 21-30 year contributed 230 (28.47%) cases.

**Keywords:** head injury, fatal road traffic accident, linear fracture.

## INTRODUCTION

Among all the regional injuries, injuries to the head and neck are most common and significant in medico-legal practice. Their different causes are road traffic accident, fall from height, assault, train accident etc. head injury is an important cause of mortality and morbidity, throughout the world. Head is supposed to be the most venerable part of body, involved in fatal road traffic accident. India accounts for about 10% of road accident fatalities worldwide.<sup>1</sup>

By the national advisory neurological disease and stroke council; Head injury has been defined as “a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of skull,

produced by mechanical forces”. It has also been defined as physical damage to the scalp, skull or brain produced by an external force which needs not be applied directly to the head.<sup>2</sup>

Road Traffic Accidents (RTA) are the major causes of death worldwide. Head injury is the single most common cause of mortality in road traffic accidents; head being the most vulnerable part of the body.<sup>3</sup>

India being one of the fastest developing nations in the world with a huge population density, the road traffic density is also increasing. In India, for individuals older than four years of age, more life years are lost due to traffic accidents than cardiovascular diseases.<sup>4</sup> India accounts for about 10% of road accident fatalities worldwide.<sup>5</sup> WHO defined the accident as, “an unexpected, unplanned occurrence that may involve injury”.<sup>6</sup>

Head injury has been defined as, “a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and or the contents of the skull, produced by mechanical forces”.<sup>7</sup> Depending upon whether or

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not the dura matter was torn, the head injury may be termed as open or closed type.<sup>8</sup> The extent and degree of injury to the skull and its content is not necessarily proportional to the quantum of force applied to the head. According to Munro, any type of cranio-cerebral injury is possible with any kind of blow on any sort of head.<sup>9</sup>

The head being the most vulnerable part of the body is involved frequently and lead to morbidity and mortality in road traffic accidents. In this present study, patterns of head injury in road traffic accidents with regards to age, sex, frequency of occurrence, anatomical sites involved is analyzed and presented.

Road traffic accidents (RTA) have been the bane of the modern civilization accounting for considerable loss to the nation. Head injuries are leading causes of death from vehicle crashes with many death occurring despite optimal use of the available treatment facilities.<sup>10</sup> Accident represents a major epidemic of non communicable disease in the present century. World health organization (WHO) has defined accidents as “an unpremeditated event resulting in recognizable damage”.<sup>11</sup>

Moreover fatalities due to road traffic injuries in India are projected to increase by 150% by the year 2020, with the majority of this increase being among users of motor vehicles.<sup>12</sup> A road traffic injury is a fatal or non fatal injury in occurred as a result of a collision on a public road involving at least one moving vehicle. India has experienced rapid growth in motorization in the last decade, with concomitant increases in road traffic injury (RTI) related mortality.<sup>13</sup> In many countries, motor vehicle accidents rank first among all fatal accidents. Every year almost 1.3 million people die from road accidents in the world.<sup>14</sup> In India data from Ministry of home at alone shows, over. 105,700 people died and 452,900 were injured due to road traffic injuries with vehicular users accounting for 17.8% of the fatali.<sup>15</sup>

**METHOD AND MATERIALS**

Present study was carried out at the mortuary of GSVM medical college Kanpur UP India, which is a tertiary care teaching hospital of a metropolitan city. This is a comprehensive study of one year extending from 1 January 2015 to 31 December 2015.

The material for the study comprises detailed and complete findings of medico legal autopsies conducted

at postmortem house of GSVM medical college Kanpur.

During study period of one year, total 1281 cases of fatal head injury in RTA were considered as per the different **Inclusion and Exclusion criteria**. Among them, skull fracture were observed in 808 cases.

A detailed history from the police & the relatives regarding age, sex, socio economical status, marital status, habits, illness etc. were taken. Detailed history from police regarding scene of crime, position of body, photography etc. were also taken. Irrespective of information collected, both external and internal post mortem findings were observed meticulously. Institutional ethical approval was taken. Data was collected and analysed by using Microsoft office excel 2010.

**Inclusion criteria:**

1. All age groups.
2. All cases of skull fracture due to road traffic accidents reported to the mortuary of GSVM Medical College Kanpur during the study period.
3. Either of the genders.

**Exclusion criteria:**

1. Decomposed cases.
2. Skull Fracture due to Homicidal head Injuries,
3. Skull Fracture due to railways accident.

**OBSERVATION AND RESULTS**

**Table 1 autopsy profile**

	<b>Autopsy</b>
Total autopsy	3730
Fatal head injury in RTA	1281
Skull fracture in fatal head injury in RTA	808
Other	1641

During study period, total 1281 cases of fatal head injury due to road traffic accident were reported

Out of them skull fracture were observed in 808 cases.

The age group between 21-30 years covers the

maximum no of incidences (n= 230; 15.12%) cases.

**Table -2 age wise distribution**

Age	No. of autopsy	Percentage (%)
0-10	21	2.6
11-20	67	8.29
21-30	230	28.47
31-40	203	25.12
41-50	163	20.17
51-60	74	9.16
61-70	29	3.59
>70	21	2.60

In the present study males (n=156, 78.0%) outnumbered females (n=44, 22.0 %) significantly with male to female ratio of nearly 3.54:1. (Table 2)

**Table 3 : Sex wise distribution**

Sex	No. of autopsy	Percentage (%)
Male	637	78.84
Female	171	21.16
<b>Total</b>	<b>808</b>	<b>100</b>

Most common area involved in fracture is temporo-parital region (n=183; 22.65%) cases.

**Table 4 : Anatomical location of skull fracture.**

Site of skull fracture	No. of autopsy	Percentage (%)
Frontal	89	11.01
Temporal	56	6.93
Parietal	117	14.98
Occipital	48	5.94
T + P	183	22.65
F + P	81	10.02
F + T	18	2.23
T + O	15	1.86
P + O	13	1.62
F+ P+O	9	1.11
F+T+O	8	0.99
F+T+P	160	19.80
F+T+P+O	11	1.36

Most common type of skull fracture observed in our study was linear fracture vertex+ basal fracture comprising 199(24.63%) cases.

**Table 5: Distribution according to type of skull fracture**

Types of skull fracture	No. of autopsy	Percentage (%)
LN # Vertex only	132	16.34
DP # Vertex only	122	15.10
Communitated fracture vertex only	128	15.84
Basal fracture only	121	14.98
LN fracture vertex + basal fracture	199	24.63
DP fracture vertex + basal fracture	61	7.55
Communitated fracture vertex + basal fracture	32	3.96
LN + Communitated fracture vertex	7	0.86
Communitated + DP fracture vertex	6	0.74

## DISCUSSION

Road traffic accidents have been the bane of modern civilization accounting for considerable loss to nation. Head injuries are leading cause of death from vehicle crashes.

In present study, conducted for a period of 1 year since 1 January 2015 to 31 December 2015 total 1281 cases of fatal head injury due to road traffic accident were reported. Among them skull fracture was present in 808 cases.

The most common age group, involved was 21-30 years comprising 230 (28.47%) cases. Followed by 31-40 years age of group comprising 203 (25.12%) incidence. Least number of involvement in RTA seen in extreme ages 0-10 year and >70 years having 21 (2.60%) cases.

Similar result were also seen in the study of Dr. Swati Sonawane et al (2015); 20-30years 31%, 31-40 years 27% and Ranjeet M Tandle et al (2011); 20-30years 28.34%, 31-40 years 25.13%.

We found predominantly male involvement in RTA. In present study, Male victims are 637 (78.84%) and females are 171 (21.16%). This is also similar to other studies. In the study of Dr. Swati Sonawane et al (2015) male are 89%, female are 11%. In the study of Arvind Kumar et al (2008) male are 88.22% and female are 11.77%.

In the present study of fatal head injury in road traffic accident skull bone fracture found in 808 cases of fatal head injury in road traffic accident. Parietal bone is single most commonly involve bone comprising 117 (14.48%) in combination most commonly involve in skull fracture is temporal and parietal bone comprising 183 (22.65%) followed by frontal, parietal and temporal bone comprising 160 (19.80%). In our study, parietal bone was most commonly fracture single bone of skull.

Similar trend seen in the study, of Ranjeet M Tandle et al (2011) parietal bone 13.75%, frontal bone 10%, parietal + frontal bone 20%. Anand Menon et al (2005) Parietal bone 17.35%, frontal bone 11.30%, parietal + frontal bone 21.23%. Akhilesh Pathak et al (2006) parietal bone 12.28%, frontal bone 11.05%, parietal + frontal bone 19.27%.

In the present study linear fracture of skull is most common type seen in 132 (16.34%) cases, followed by comminuted fracture vertex only in 128 (15.84%) depressed fracture vertex only in 122 (15.10%) cases. Least common type fracture seen in, basal fracture in 121 cases 14.98%.

Similar trend seen in the study of author Ranjeet M Tandle et al (2011) linear fracture 16.84%, depressed fracture 14.74%, LN+vertex + basal 24.12%. Anand Menon et al (2005) Linear fracture 17.94%, depressed 13.24%, LN+ vertex + basal 22.92%. Akhilesh Pathak et al (2006) linear fracture 19.21%, combination of linear + basal fracture + vertex 26.21%.

In the present study, a combination of multiple head injuries in the form of scalp injury, skull fracture, intracranial hemorrhage and injury to brain was predominantly seen in 430 (53.22%) cases, followed by combination of scalp injury, skull fracture and intracranial haemorrhage comprising 312 (38.61%) cases.

Present study, finding correlate with other researcher Anand Menon et al (2005) scalp injury in 84.41%

intracranial haemorrhage 78.28% cases skull fracture in 62.84% cases, brain injury in 38.08% cases. Sangeet Dillon et al 2007 scalp injury 91.31%, intracranial haemorrhage 80.92% cases. Ranjeet M Tandle et al (2011) scalp injury 93.48% cases intracranial haemorrhage 81.88% cases, Skull fracture 58.1% cases, brain injury 36.95%.

## RECOMMENDATIONS

Road Traffic Accident (RTA) constitutes a complex phenomenon of multiple causation. Increase in their number may be due to several factors, like carelessness of the drivers and pedestrians, tiredness, fatigue of the drivers, poor

Visibility due to lack of street lights, Population explosion, urbanization and tremendous growth in road transport

Congested roads, speeding, inadequate traffic planning, low use of helmets, consumption of alcohol and violation of the traffic rules have contributed much of the occurrences of RTA.

Present study signifies that head injury is a major cause of death in RTA which necessitates the establishment of

Trauma centers with inclusion of neurology, radiology and orthopedic departments to reduce morbidity and mortality. As mostly young population is affected; saving a bread winner in the family will help directly the family and indirectly the country. Such incidences can be reduced with following measures:

- The roads should be properly planned and maintained.
- For pedestrians and slow moving vehicles and bullock-carts, complete segregation from the highways should be done.
- The vehicles should be properly maintained and inspected regularly.
- safety measure like use of seat belts and helmets should be made compulsory.
- The drivers of the vehicles should be educated and properly trained by authorized centers.
- The driving licenses should be issued only after strict testing of driving skills, medical fitness and knowledge of traffic rules.

- There is an urgent requirement of enforcement of traffic safety laws and regulations and campaign for firm and swift punishment for traffic offenders.

### CONCLUSION

Distribution and causes of head Injuries in present study are fairly similar to the pattern found in most of the other studies. This similarity is seen in approximately all parameters used in this study.

Most fatal head injuries are caused by road traffic accidents. Maximum victims were young males who were the backbones of their family. Certain changes may minimize mortality, disability, and costs to the community. Public should be made aware and encouraged to follow traffic rules and safety precaution. We need to eradicate causative factors for RTAs to curtail the high Their high fatality rate in this region.

**Conflict of Interest:** None

**Ethical Clearance:** Taken from the Ethical Committee from the Institute.

**Source of Support:** Nil

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# Detection and Estimation of Arsenic and Lead in Coconut Water - A Kerala Study

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## ABSTRACT

Coconut is a popular food ingredient in many parts of the world and the water it contains is believed to be the purest form of natural drink available. The water is rich in potassium, sodium, chloride and many vitamins, and hence is considered the beverage of choice. In medical practice, coconut water is recommended as the preferred oral rehydration fluid in cases of severe dehydration due to diarrhoea.

Chronic heavy metal poisoning has been shown to occur from plant products. However there is scanty research work relating to coconuts and heavy metal contamination. Among the various metals, lead is said to be the commonest metal involved. Arsenic is only second to lead in the incidence of chronic toxicity. When plants are exposed to heavy metals, mostly through contaminated water (irrigation), or contaminated soil, they accumulate in edible parts such as the fruits.

This study was undertaken to detect the presence of two of the commonest heavy metals - arsenic and lead – in coconut water present in coconuts sold in different parts of Ernakulam district of Kerala state, and to quantitatively assess their levels. It was also decided to detect the differences in the levels of the metals between tender and mature coconut water, and also to detect inter-zonal variations within Ernakulam district in the levels of the two heavy metals, in tender and mature coconut water.

**Keywords:** Coconut; Coconut water; Heavy metal; Lead; Arsenic.

## INTRODUCTION

Coconut is a ubiquitous food ingredient in many South Indian dishes. Coconut water is assumed to be safe as it is believed to be the purest form of natural drink. The water is rich in potassium, sodium, chloride and the full range of B vitamins (except B6 and B12), and hence is considered the beverage of choice in some countries of the world.<sup>1,2</sup>

In medical practice, coconut water is recommended as the preferred oral rehydration fluid to replenish fluid

losses in cases of severe dehydration due to diarrhoea.<sup>3,4</sup> It has even been tried with some success as an IV infusion (close to the nature of human blood).<sup>5</sup>

In severe physical exercise, production of reactive oxygen species can occur. The antioxidant properties of coconut water can help in neutralising the effects of these by-products of exercise.<sup>6,7</sup> Tender coconut water (as compared to mature coconut water) has minerals such as calcium (for bones), magnesium (for heart) and potassium (for muscles) in high levels. In addition to these benefits, sports nutrition medicine experts claim that coconut water provides hydrating effects similar to those of carbohydrate-electrolyte sports drinks.<sup>8,9</sup>

Chronic heavy metal poisoning is unfortunately not uncommon in India and it has been proven that even vegetables can be contaminated with heavy metals.<sup>10,11</sup>

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However it was noted that there has been scanty research work done on coconuts for estimation of heavy metal contamination.<sup>2</sup> The problem of environmental pollution due to toxic metals has long been a major cause for concern in many parts of the world including India. Lead is said to be the commonest metal involved in chronic poisoning and is abundant in soil. Arsenic is only second to lead in the incidence of chronic toxicity.<sup>11</sup> Lead is widely used for domestic, industrial, and other purposes. Similarly, arsenic poisoning occurs as a result of industrial exposure or consumption of contaminated water/food. Children are more susceptible to heavy metal poisoning because of the increased absorption from gastrointestinal tract as compared to the adult.<sup>12,13</sup> Chronic arsenic poisoning in India is said to occur from consumption of contaminated well water because of the high levels of arsenic in the soil in many parts of the country.<sup>14</sup>

When plants are exposed to heavy metals, mostly through contaminated water used for irrigation, or contaminated soil in which they are grown, they accumulate in edible parts such as the fruits.<sup>15,16</sup> Soil contamination with heavy metals due to rapid growth in industrialization is becoming a major problem on a global scale.<sup>17,18</sup>

Metals have a tendency to accumulate in the soil to hazardous levels due to their non-degradable nature, and this happens when soils get contaminated due to long term application of industrial waste water.<sup>19</sup> Such waste water is composed of effluents containing heavy metals and other toxicants. The solubility of heavy metal salts in water is the reason why they can be very toxic.

This study was undertaken with three objectives in mind. The first objective was to detect the presence of two of the commonest heavy metals - arsenic and lead – in coconut water present in coconuts sold in different parts of Ernakulam district of Kerala state, and to quantitatively assess their levels. The second objective was to detect the differences in the levels of the metals between tender and mature coconut water. The third objective was to detect inter-zonal variations within Ernakulam district in the levels of the two heavy metals, in tender and mature coconut water.

## MATERIALS AND METHOD

Tender and mature coconuts (eight each) were purchased from vendors (from four different zones of

Ernakulam District) twice every month. The four zones from where coconuts were purchased were – Chittoor (Zone 1), Cheranallloor (Zone 2), Edappally (Zone 3) and Kothad (Zone 4). This is a pilot work as no previous literature is available with regard to contamination of coconuts/coconut water with heavy metals. The sample size was therefore kept relatively low - 176 coconuts (88 tender and 88 mature coconuts). Spoiled coconuts were excluded from this study. Five tender coconuts and 28 mature coconuts were purchased from Zone 1. From Zone 2, twenty tender coconuts and 19 mature coconuts were obtained. Thirty six tender coconuts and 19 mature coconuts were bought from Zone 3, and from Zone 4, twenty seven tender coconuts and 22 mature coconuts were purchased. The coconuts were cut open using a chemically treated stainless steel knife to avoid any artificial contamination with metals. The coconut water was then collected and digested using nitric acid. Subsequently, the samples were subjected to heavy metal estimation using ICP-AES (Inductively Coupled Plasma Atomic Emission Spectrometry). ICP-AES is generally considered to be among the best methods for heavy metal analysis.<sup>20</sup>

This is a prospective cross-sectional study. The statistical analysis was done using IBM SPSS v. 20. The mean and standard deviation of the quantitatively assessed levels of heavy metals (arsenic and lead) were computed for each of the four zones separately. There was high variation and non-normal distribution of the values of the variables. To test the statistical significance of the difference in the mean values amongst the four zones, Kruskal Wallis One Way Anova was applied. Since it was non-significant, the data from all the four zones were pooled. The statistical significance of the levels of arsenic and lead between the tender and mature coconut water was tested using Wilcoxon's Rank sum test. A p value of <0.05 was considered to be statistically significant.

## RESULTS

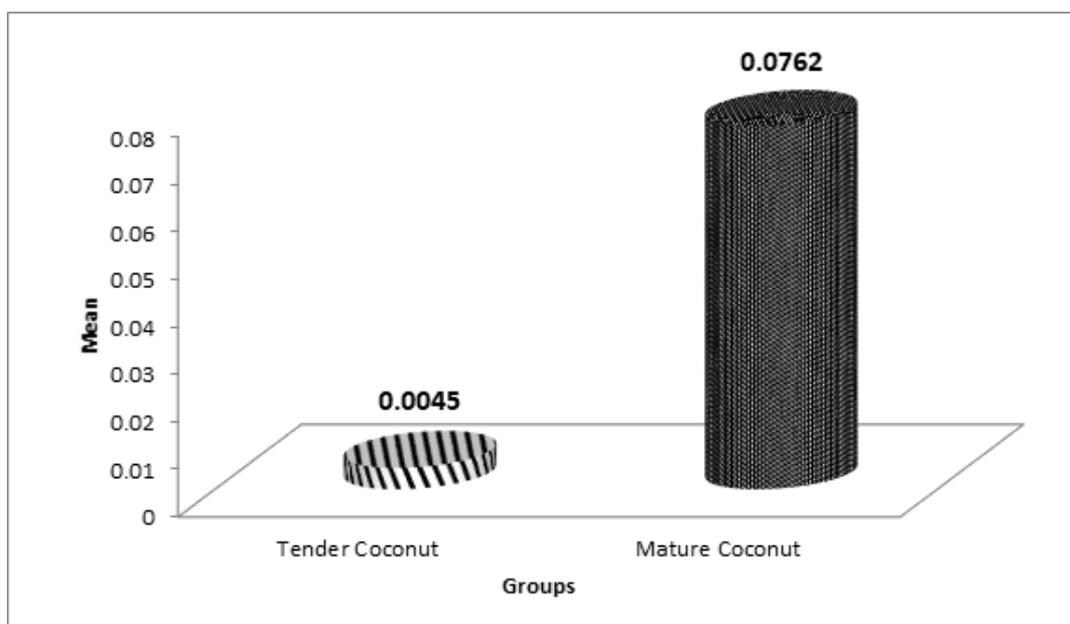
Arsenic was not detected in any of the samples (mature or tender coconut water). Out of the total 176 samples, lead was detected in 19.31% of the samples (34 samples). Among tender coconut water samples, lead was detected in 6 of the water samples, the majority being from Zone 2. In case of mature coconut water, lead was detected in 28 samples; the majority belonging to Zone 4 (**Table 1**).

**Table 1: Distribution of Heavy Metal Lead in Coconut Water Samples**

Zone	Tender Coconut		Mature Coconut	
	Frequency	Percentage	Frequency	Percentage
Zone 1 - Chittoor	1	16.7	5	17.9
Zone 2 - Cheranalloor	3	50.0	5	17.9
Zone 3 - Edappally	1	16.7	7	25.0
Zone 4 - Kothad	1	16.7	11	39.3
<b>Total</b>	<b>6</b>	<b>100.0</b>	<b>28</b>	<b>100.0</b>

The highest value detected was 1.22ppm (parts per million) which was that of a sample of mature coconut water from Zone 2. The lowest value detected was 0.01ppm from a sample of tender coconut water belonging to Zone 1.

The variation of the lead levels between tender and mature coconut water samples was analysed next after taking the mean and the S.D. of the lead levels (**Fig 1**).



**Fig 1: Comparison of Mean Lead Values between Tender and Mature Coconut Water Samples**

The mean value of the levels of lead in mature coconut water was higher (0.0762ppm) when compared to that of 0.0045ppm in tender coconut water. On analysis this variation between the tender and mature coconut water samples was found to be highly statistically significant (p value < 0.001)

The inter-zonal variations in the levels of lead were statistically analysed next (**Table 2**).

**Table 2: Comparison of Mean Lead Values between the Four Zones**

Zone	n	Mean	S D	p Value
Zone 1 - Chittoor	33	0.087	0.259	0.452
Zone 2 - Cheranalloor	39	0.044	0.196	
Zone 3 - Edappally	55	0.009	0.025	
Zone 4 - Kothad	49	0.041	0.079	

The mean value of the levels of lead was highest in Zone 1 (Chittoor – 0.087) and was lowest in Zone 3 (Edappally – 0.009). Statistically these variations between the zones were not significant.

Finally all the zones and the groups (tender and mature coconut water samples) were pooled and the mean values were statistically analysed (Fig 2). It was not significant.

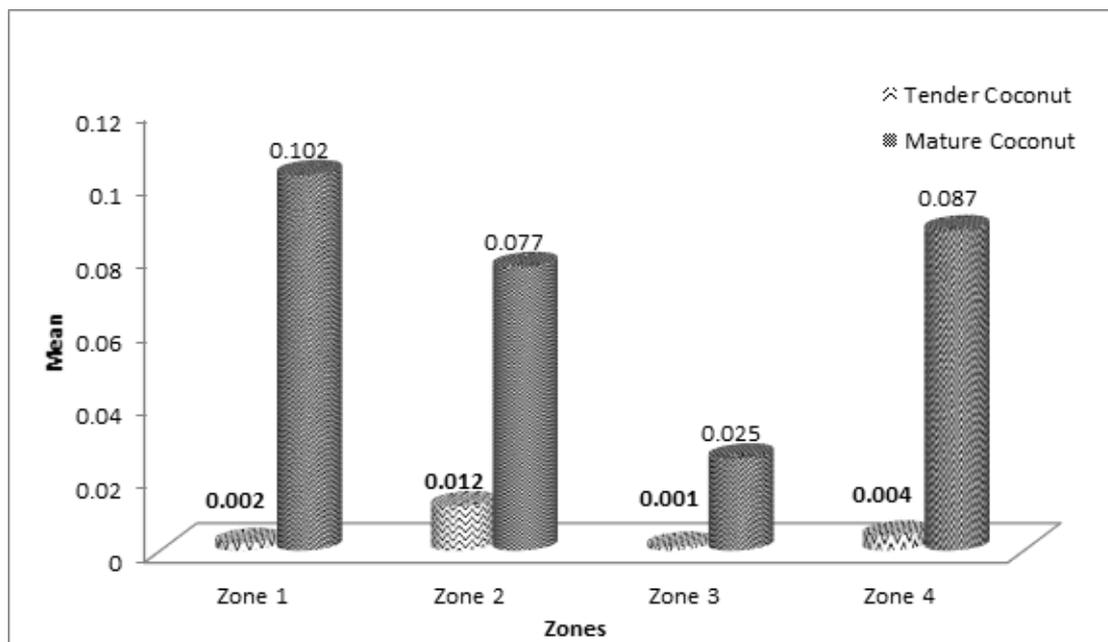


Fig 2: Comparison of Mean Lead Values between the Four Zones in Both Groups

## DISCUSSION & CONCLUSION

It is evident that most of the studies in the existing literature focus on estimation of the levels of lead in vegetables or fruits. The literature on estimation of arsenic is limited and in one such study<sup>21</sup> the level of arsenic was found to be highest in green leafy vegetables (spinach). However in the current study arsenic was not even detected in any of the samples. This may be because the soil in this part of the country is not contaminated with significant levels of arsenic, though this cannot be stated with certainty unless soil analysis or analysis of the water used for irrigation is tested for the presence or absence of arsenic.

The presence of lead however has been recorded in a wide range of research publications. One of the studies is related to lead contamination of deciduous fruits.<sup>22</sup> It was seen that 97.5% of the fruit samples were contaminated within the maximum permissible limits with different heavy metals. Only 0.4% of these were contaminated with lead. On the other hand, in a study concerning heavy metal contamination of vegetables, cauliflower and onion showed high amounts of lead.<sup>23</sup> However, even this was within the permissible limits

of human consumption. An interesting research work showed that school going children (from school vegetable gardens) were exposed to heavy metal contamination in vegetables.<sup>24</sup> Elevated concentrations of lead were seen in the school vegetable samples; but they were found to be again within permissible limits.

The only work remotely similar to the current work is the research done on various parts of coconut palms.<sup>2</sup> In this study, heavy metal estimation of soil, water, coconut leaf, coconut root and coconut water samples was undertaken. The heavy metals analysed included Fe, Zn, Cr, Cu, Pb, Ni and Cd. It was concluded that the heavy metal contamination in coconut water was under permissible limits of drinking water. It was further opined that the coconut plants probably possess the ability to control the presence of heavy metals in coconut water, whatever be the amounts of these heavy metals in the contaminated irrigation water. In the current study, arsenic was not detected at all in any of the coconut water samples.

Lead was detected in 34 samples (19.31%). It was detected in 28 of the mature coconut water samples, and 6 of the tender coconut water samples. The highest

value of 1.22ppm was seen in one of the mature coconut water samples. When the variations of the levels of lead were analysed between tender and mature coconut water samples, the mature water samples showed higher lead value of 0.0762ppm (mean). The mean value in the case of tender coconut water was only 0.0045ppm. According to the revised Indian Standards for drinking water (IS 10500:2012) the acceptable limit of lead in drinking water is 0.01ppm or mg/L.<sup>25</sup> This means that the amount of lead in mature coconut water is marginally higher than acceptable limits, while in tender coconut water it is far below (safer) the acceptable limits. Statistically this variation of lead levels between mature and tender coconut water samples was found to be highly statistically significant (p value <0.001).

Further, the inter-zonal variations were analysed and the water samples of mature coconut from Zones 1, 2 and 3 were found to be having marginally higher amounts of lead levels (Zone 1 being maximum – 0.087ppm).

Lastly, a comparison was made pooling data from all the zones, and both the groups for over-all statistical significance. This was found to be statistically not significant.

However, this study has a small limitation as far as the low sample size is concerned. Further studies are recommended considering multiple zones all over the state of Kerala, so that the results for a larger population can be made available. Heavy metal contamination of the coconut meat portion can also be included in future studies. This work was done only as a pilot study in order to assess whether there is a need for a larger study, perhaps utilising greater resources/more samples.

In closing, it can be concluded that coconut water from mature coconuts is not as safe as tender coconut water with regard to heavy metal contamination, especially lead, in the location of the study.

**Conflict of Interest:** There are no conflicts of interest in this research work

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**Ethical Clearance:** Ethical Clearance was not required in this research work.

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# The Presence of Diatoms in Liver Tissue in Non Drowning Cases: An Autopsy based Study

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## ABSTRACT

**Background:** Diatom test is routinely used by forensic pathologists in cases of bodies recovered from water, to identify the cause of death and the site of drowning. Studies have shown the presence of diatoms in organs of non drowning deaths as well.

**Aim:** This study was done to study identify the presence of diatoms in the liver of non drowning deaths.

**Materials and Method:** A total of 75 non drowning cases autopsied at a teaching hospital and a non teaching hospital in central Kerala between July, 2011 and September, 2012 with known causes of death were included in the study. The sample comprised of 62 males (82.7%) and 13 females (17.3%). Variables such as age, sex, diet preference and source of drinking water were collected. The liver was subjected to acid digestion and the presence of diatoms in the liver as well as the type was recorded.

**Analysis:** This is a descriptive cross sectional study. Statistical analysis was done using the software IBM SPSS version 20.

**Results:** Diatoms were found in the liver in 49 cases (65.4%). There was no statistically significant relation between the presence and absence of diatoms and the sex, age, dietary habits or drinking water source. One significant observation was that the pennates were significantly larger than the centrales (p 0.001). The mere presence of diatoms in the liver cannot be taken as evidence of drowning.

**Keywords:** acid digestion technique, central, contaminant diatoms, diatom test, liver, non drowning deaths, pennate

## INTRODUCTION

Drowning or the process of experiencing respiratory impairment from submersion / immersion in a liquid<sup>1</sup> is the second most common cause of death worldwide.<sup>2</sup> There are no pathognomonic findings to indicate death by of drowning. Conclusion is arrived at based on circumstantial evidences along with a few autopsy findings which generally exclude other causes of death.<sup>3</sup>

Ancillary investigations,<sup>3,4</sup> like toxicological screening to rule out poisoning, histology of various tissues to rule out other causes like myocardial infarction, head injury etc. are integral parts of the diagnosis.<sup>3,5</sup> Differences in the blood sodium, chloride and potassium ion concentrations between the right and left chambers of the heart and blood strontium levels are investigations which are sometimes used.<sup>6</sup>

The 'diatom test' is one such ancillary investigation. The microscopic unicellular algae called diatoms present in water bodies, soil, damp places etc and are the most common types of phytoplankton. The organism may be circular (centric kinds- class centrale) or oblong (pennate kinds- class pennate). The centrales are radially symmetrical and circular or triangular in shape whereas

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the pennates are bilaterally symmetrical. The pennate diatoms may be wedge-shaped, boat-shaped or keel-like in appearance. Their size ranges from 2 to 200 microns<sup>7</sup> and they are encased within a tough silica coating called the frustule.

When a person drowns in water containing diatoms, a few diatoms will penetrate the walls of the alveolar capillaries (this has been proved using Transmission Electron Microscope and Scanning Electron Microscopy<sup>8</sup>) and thereby enter the bloodstream which will carry the diatoms to be lodged in distant organs. This is unlikely in post-mortem immersion. The demonstration of the presence of diatom frustules in the internal organs of drowned victims, by 'diatom test' is used by forensic experts to help in the diagnosis of drowning.<sup>9</sup>

While some experts contend that the identification of diatoms in human organs is a proof of drowning, others dispute it saying that it is not possible to come to this conclusion because of its widespread distribution.<sup>10,11</sup> There are three possible ways by which diatom frustules can enter the bodies of individuals other than by drowning,<sup>3</sup> a) inhalation of airborne diatoms, b) ingestion of materials containing diatoms, and c) aspiration of water containing diatoms. Raw fruits, vegetables, fish, meat and molluscs are all sources of diatoms.<sup>5,12,13,14,15</sup> The possibility of entry of diatoms from the gastro-intestinal tract via the portal vein or lymphatics has also been pointed out.<sup>12</sup> Knight<sup>5</sup> has also mentioned that there seems to be no reason for the diatoms to not to penetrate the intestinal lining and gain access to the bloodstream or body tissues. It is also possible that a diatom analysis may have been compromised by contaminated glassware and reagents.

### OBJECTIVES

The primary objective is to estimate the percentage of diatoms present in the liver in non drowning deaths. The secondary objective is to determine the genera, size and the number of diatoms, if any, detected in such cases.

### MATERIALS AND METHOD

Study material consisted of tissue samples from the organs of cadavers brought for autopsy in Amrita Institute of Medical Sciences, Kochi and Ernakulam General Hospital. With 95% confidence and 20% relative

precision, the minimum sample size was calculated as 64.54. A total of 75 non drowning cases with known causes of death were included in the study.

The details of the deceased collected were the age, sex, occupation, dietary habits (whether vegetarian/non-vegetarian/consumes fish or meat) and the primary source of drinking water (corporation/ municipality/well/purified water). The type of purification methods used (reverse osmosis filter or Ultra Violet filter) was also included. Cases where the details required for statistical analysis were not available were excluded. The cases brought for autopsy in Amrita Institute of Medical Sciences, Kochi and General Hospital, Ernakulam, which fulfilled the above criteria, were included. The study spanned from July, 2011 to September, 2012.

### The equipments:

1. Sterile surgical blades attached to Bard Parker Handle
2. Curved scissors
3. Toothed forceps
4. Conical flask 100 mL capacity (Borosil)
5. Sterile culture bottles made of plastic
6. Glass funnel (Borosil) of medium size
7. Glass rods
8. Concentrated nitric acid (Nice Chemicals)
9. Glass pipettes (Borosil) -10 mL
10. Double distilled water (items 1 to 4 were washed in double distilled water before use)
11. Measuring Cylinder (Borosil) -10 ml, graduated
12. Water Bath (Beston) (0-110°C)
13. Centrifuge Tubes 15 mL, made of plastic
14. Centrifuge Apparatus with a capacity to hold four tubes. The speed could be adjusted from 1000 rpm to 7000 rpm.
15. Glass slides (Bluestar) -75mm X 25mm
16. Cover slips (Bluestar) -22mm, 10gms, square shaped

17. D.P.X mountant (Nice Chemicals)

18. Nikon H600L Phase Contrast Microscope with Nikon DS Qi1Mc camera attachment (1.3 megapixels).

19. Image J software version 1.47 developed at the National Institutes of Health, Maryland, USA.

Approximately 50g of liver tissue was collected during autopsy using a sterile blade and the exact measurement was taken in the lab before digestion.<sup>16,17</sup> The tissue was stored in deep freezer if immediate digestion was not possible. Preservatives were not used.

10 mL of concentrated nitric acid was added to the conical flasks containing the minced tissue and mixed well using separate glass rods.<sup>18,17</sup> Glass funnels were used to cover the mouth of the conical flasks to avoid large amounts of nitric acid fumes emanating from the

solution and the conical flasks were placed in a water bath set to a temperature of 65°C.<sup>19</sup> (Fig. 1) The liver tissue was completely digested in about 4 hours. The solution was then cooled to room temperature and five millilitres of double distilled water was added. The solution was transferred to a centrifuge tube (separate tubes were used for each specimen). The samples were then centrifuged for 20 minutes at 3000 rpm.<sup>20</sup>

The supernatant fluid was discarded and the residue was washed twice with double distilled water.<sup>12,21,22</sup> The resultant pellet was mixed in one millilitre of double distilled water ensuring a uniform distribution of the sediments. A drop of this mixture was then taken using a fresh glass pipette and transferred to a glass slide, air dried, covered with a cover slip and DPX mountant was added along the sides.<sup>12</sup>



Fig. 1: The steps in acid digestion. A. Adding concentrated nitric acid to the conical flask containing minced tissues. B. The digested material after addition addition of double distilled water. C. Adding the digested liquid into centrifuge tube. D. The samples for centrifugation in the centrifuge apparatus. E. Preparation of the slide

All the slides were examined using 1000x magnification using oil immersion objective. Counting was done by the strip technique; starting from the top left end of the cover slip and ending at the bottom right.<sup>12</sup> The diatoms found in the slides were counted and pictures of each taken using the attached camera. The number of centrales and pennates observed were counted and recorded from all the slides. The lengths of the diatoms were later measured using the image J software which measures the length of the diatom in relation to the already provided standard length.<sup>14</sup> Diatoms were identified based on their morphological features which included the bilateral or radial symmetry of the frustules and the serrations.

This is a descriptive cross sectional study. The presence of diatoms was correlated with factors like sex, age, diet, and drinking water source, and its statistical significance was analysed applying Chi-Square test (Fisher's Exact Probability Test and the Freeman-Halton extension of it was used when appropriate). The lengths of the order of diatoms (centrales and pennates) were compared using independent sample t test and Mann-Whitney U test. Statistical analysis was done using the software IBM SPSS version 20.

## OBSERVATIONS

In this study, there were a total of 62 males (82.7%) and 13 females (17.3%), N = 75. Diatoms were found in the liver in 49 cases (65.4%). Of these, 41 cases (83.6%)

had pennate type of diatoms and eight cases (16.4%) had centrales (see **Table 1**).

**Table 1: The type of diatoms.**

Specimen	Pennate	Centrale	Both centrale and pennate	No diatoms
Liver	41 (54.6%)	8 (10.6%)	0	26 (34.8)

N = 75

Diatoms were detected in 40 males (64.5%) and 9 females (69.2%). There was no statistically significant difference between the two sexes (p 0.507).

The cases were divided into four age groups (Table 2). In those under 30 years (n =14), diatoms were detected in 8 (57.1%). In those aged between 31 and 45 years (n =16), 11 (68.8%) and in those aged between 46 and 60 years (n =21), 17 (68%) had diatoms in the liver tissue. In those aged above 60 years (n =20), 13 (65%) had the presence of diatoms.

There were 70 (93.3%) non vegetarians (who consumed both fish and meat) and five (6.7%) vegetarians in the study group. 46 (65.7%) non vegetarians and 3 (60%) vegetarians had diatoms in the liver tissue. No significant association was detected between the dietary habits and the presence of diatoms in the liver (p 0.795).

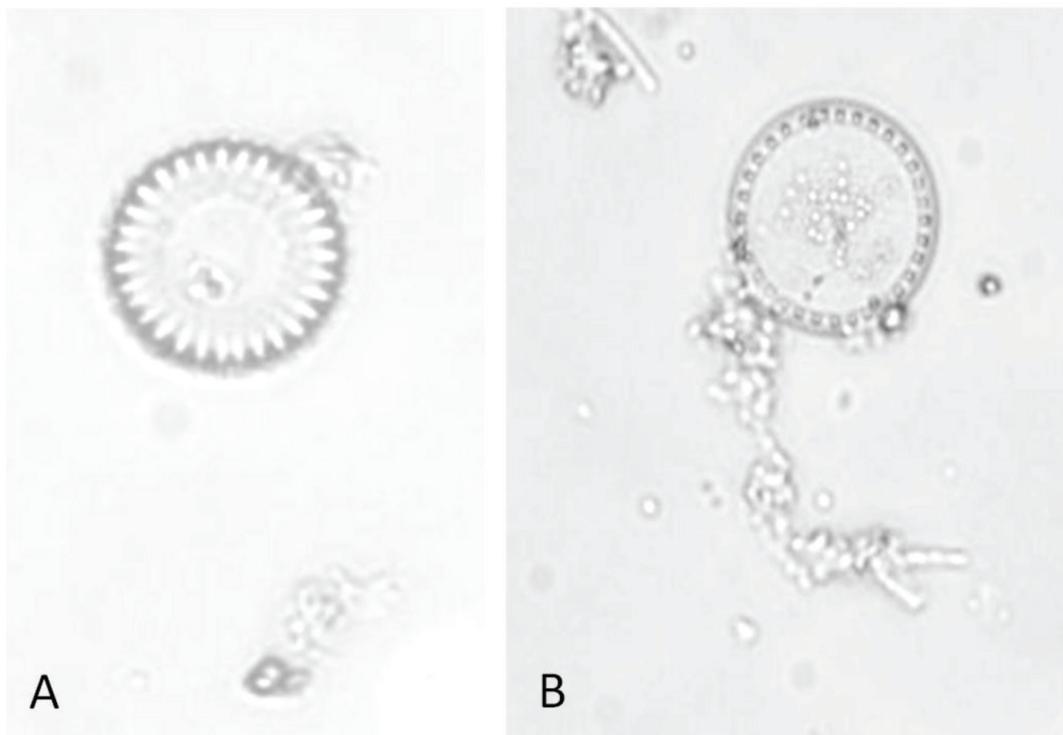
**Table 2 Pattern of distribution of diatoms in liver.**

LIVER		Diatoms absent		Diatoms present		P value
n		%	n	%		
Sex	Male n 62	22	35.5%	40	64.5%	0.507
	Female n 13	4	30.8%	9	69.2%	
Age	< 30 years n 14	6	42.9%	8	57.1%	0.902
	31-45 years n 16	5	31.2%	11	68.8%	
	46-60 years n 25	8	32%	17	68%	
	> 60 years n 20	7	35%	13	65%	

**Cont... Table 2 Pattern of distribution of diatoms in liver.**

Dietary habits	Vegetarian <i>n</i> 5	2	40%	3	60%	<b>0.795</b>
	Non vegetarian <i>n</i> 70	24	34.3%	46	65.7%	
Drinking water source	Pipe water <i>n</i> 24	6	25%	18	75%	<b>0.568</b>
	Well water <i>n</i> 5	2	40%	3	60%	
	Both pipe and well water <i>n</i> 45	17	37.8%	28	62.2%	
	Purified tap water <i>n</i> 1	1	100%	0	0%	

In those who used piped corporation/municipality water as their only drinking water source (*n* =24), 18 had diatoms in the liver tissue. In those who used only well water(*n* =5), 3 had diatoms. The largest group (*n* =45), however used both these sources, in whom 28 had diatoms in their liver tissue. This did not show any statistical significance (p 0.568). In the single case where purified drinking water was used for drinking, there were no diatoms in any of the tissues. (**Table 1**)



**Fig 2: The diatoms detected in liver tissue. A – Genus Cyclotella -length 7.8 microns (1000X). B - Genus Stephanodiscus -length 12.5 microns (1000X).**

Out of the 55 diatoms detected in the 49 cases, the smallest diatom was of size 7.887 microns and the largest measured 33.339 microns. The average length of the diatoms found in the body was 18.78 microns. The average size of diatoms in liver, was 18.54 microns. (**Table 3**)

**Table 3: Table showing the average lengths of the types of diatoms**

Type	Length of smallest diatom ( $\mu$ )*	Length of largest diatom ( $\mu$ )	Mean	Median	SD	p-value
All diatoms n 55	7.887	33.339	18.54	18.61	5.008	
Pennate n 47	9.554	33.339	19.408	19.096	4.813	0.001
Centrale n 8	7.887	16.014	13.458	14.713	2.588	

\*micron

In liver, the average length of pennates was 19.408 and that of centrales was 13.458 microns. The difference in the size of the pennates and centrales was statistically significant ( $p < 0.001$ ). (Table 3) In the 49 cases containing diatoms, it was noted that except two cases, all the cases had only one diatom per slide analysed. In one case, there were six diatoms and in another, there were two diatoms in a single slide.

The most common varieties of diatoms noted belonged to the genera *Navicula* (in the order Pennate) and *Cyclotella* (belonging to order Centrale). The other varieties of pennates seen belonged to the genera *Diatoma*, *Cocconeis*, *Nitzschia*, *Pinnularia* (a rare genus), and *Surirella*. Apart from *Cyclotella* (Fig 2), *Stephanodiscus*, which is a relatively rare genus (Fig 2) was the only other type of centrale seen. Most diatoms in liver belonged to the genus *Navicula*.

## RESULTS

There was no statistically significant relation between the presence and absence of diatoms and the sex, age or drinking water source (as long as purified water was not used). This finding corroborated earlier studies<sup>17</sup> Similarly, no statistically significant association was detected between the presence of diatoms and dietary habits. There was, however a statistically significant difference between the length of centrales and the pennates (the pennates were larger) in the liver tissue. Both the types were not seen together in any case.

In the single case in our sample where purified drinking water was used for drinking, there were no diatoms in the liver tissue, but the statistical significance of this finding could not be tested. Another interesting finding was that the centrales were less common than the pennate type.

This study establishes the fact that liver tissue is not best suited for the 'diatom test'. It also needs to be emphasised that the mere presence of diatoms in tissue should not be taken as a positive diatom test. Further studies are required to describe the most common types of diatoms seen in drowning associated deaths, the sizes and the relative proportion in which they enter the tissues and the type of water in which drowning occurs.

**Ethics Approval:** Obtained from the Institutional Ethics Committee of Amrita Institute of Medical Sciences and the General Hospital, Ernakulam.

**Source of Funding:** The study was self funded.

**Conflict of Interest:** The authors declare that they have no conflict of interest.

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# A Study on Deaths by Suicidal Hanging in Bengaluru

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## ABSTRACT

Suicide by hanging is the most common method used in our country. A study was conducted in fatal hanging cases done at the department of Forensic medicine and Toxicology, Vydehi Institute of Medical Sciences and Research centre, Bengaluru from January 2015-June 2016. The main objectives of this study is to study the age, sex distribution, methods used & motives, in all autopsy cases of death due to hanging. A total of 110 cases of suicides were studied out of which hanging constituted 75.45% of the cases. Males were the predominant group. The maximum cases were noticed between the age ranges of 21-30 years. The youngest age seen was 15year, and oldest age was 70years. Family problems constituted the main method for hanging.

**Keywords** – Suicide, Hanging, Deliberate self-harm, Family Problems.

## INTRODUCTION

Suicide in *Latin suicidium* is an act of killing one self or self-murder<sup>1</sup>. World health organization defined suicide has the following steps from thinking of a plan to commit suicide and the will to do so and arranging the necessary things to kill one self and successfully carrying out the act<sup>2</sup>. According to NCRB, Suicide is defined as “Deliberate termination of life” The essential ingredients of a suicide are:

1. It should be an un-natural death.
2. The desire to die should originate within him/her.
3. There should be a reason for ending the life<sup>3</sup>.

Frequently encountered methods of suicide which we meet regularly in medico-legal practices are broadly categorized into physical methods (Hanging) and chemical methods (poisoning). In general single method

is used but in some instances combination of methods is also used. The current study is aimed to Analyse Suicides by Hanging and to know Motives behind the Suicides.

## MATERIALS & METHODOLOGY

Data was collected from the cases of alleged suicide by hanging at the Department of Forensic Medicine & Toxicology, VIMS & RC, Bengaluru, during the period of Jan 2015 to June 2016. Information was collected from the inquest forms 146(i) and 146(ii). Documents were studied and taken for the study. All cases of autopsies where cause of death was suicidal hanging were included in the study. The cases where cause of death was not finalized and clear history details were not available were excluded from the study.

## OBSERVATIONS & RESULTS

Total suicides were 110 cases of which death due to hanging were 83 cases.

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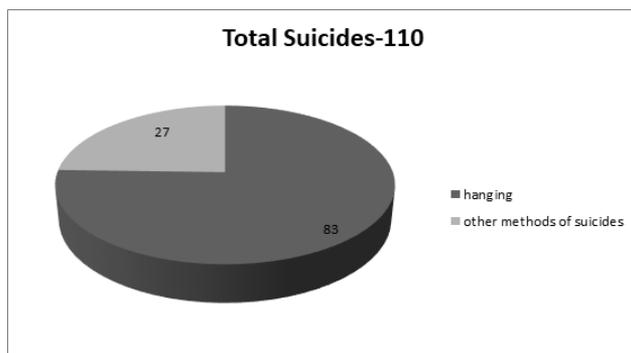


Figure-1: Incidence of hanging in suicide

Table-1: Age and Sex Distribution

Age (In Years)	Male	Female	Total
0-10	0	0	0
11-20	4	10	14
21-30	25	17	42
31-40	11	4	15
41-50	6	0	6
51-60	5	0	5
More than 60	1	0	1
<b>Total</b>	<b>52 (62.7%)</b>	<b>31 (37.4%)</b>	<b>83</b>

The 21-30 years age group was most commonly involved with more than half of the cases and males were the predominant group in the ration of 1.67:1.

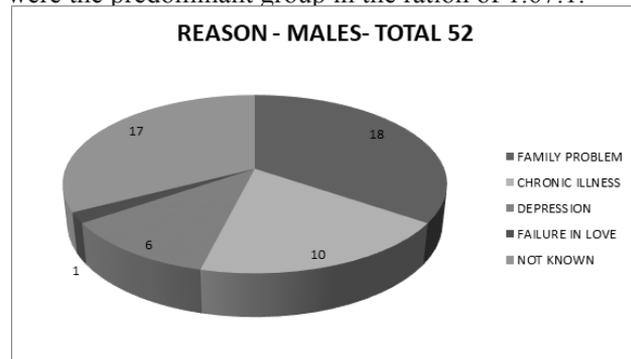


FIGURE-2: REASON FOR SUICIDE IN MALES

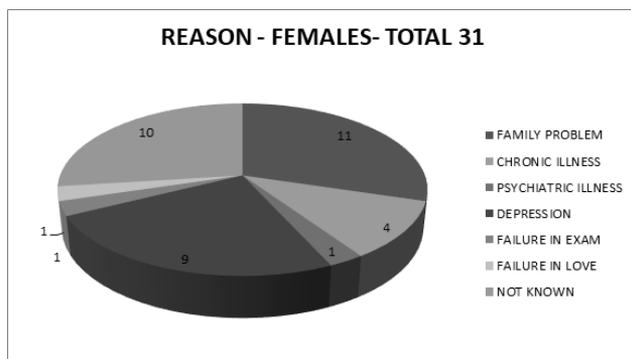


FIGURE-3: REASON FOR SUICIDE IN FEMALES

## DISCUSSION

The methods employed in these 110 cases were hanging-83(75.45%) followed by others like Poisoning, Falling from height, Cut throat & Drowning. It was observed in the study of Lalwani et al in suicidal deaths that methods to be Hanging were 52.99% followed by poisoning (37.65%), burns (6.68%), fall from height (1.37%) and firearms (1.24%)<sup>4</sup>. Chaudhari observed in a study in 2012 that the methods used were hanging in 45.07% followed by poisoning (26.65%)<sup>5</sup>. Sukhadev in a study done during May 2013 to October 2014, also reported the common suicidal methods were hanging (43.31%) and poisoning (30.57%)<sup>6</sup>. Singh Kh P in a study conducted during 1993 – 2002, indicate the method commonly chosen was hanging (52.03%) followed by poisoning (23.98%),<sup>7</sup>. Karthik S K in a study on females during November 2009 to October 2011, also showed the most common method as hanging methods to be chosen were hanging-61%, burns-13%, poisoning-11%,<sup>8</sup>.

The highest number of cases was found between 21-30 years, followed by 31-40 years and 11-20 years respectively. Only one case was reported in the age group >60 years and no cases were reported below 11 years. The findings are consistent with the previous studies<sup>4-8</sup>. Regarding the reason for Suicide in this study, the most common was family problems, followed by chronic illness, depression, failure in love, failure in exams, psychiatric illness, and harassment. When the reasons were not known constituted the second highest group with in 27 cases. This could be due to the fact that suicide is considered as a social taboo and the family members do not divulge all the details and the reasons of suicide to the police officer particularly when the suicide note is not recovered by the police. Palimer in a study, during the period 2005 to 2009, reported the reasons for the suicidal act being disgust in life, failure in exams and failure in love, physical illness, mental illness and not known<sup>9</sup>. Shetty C K in a study during January 1992 to December 2012, stated the most common motive was, despair with life successively followed by chronic physical illness, mental illness combination of physical illness and mental illness<sup>10</sup>. Similar findings were reported by Sukhadev <sup>6</sup> and Karthik et al<sup>8</sup>.

## CONCLUSION

The individuals in this young age group are more

exposed to harsh realities of the world like career problems, higher studies, marriage, financial issues, failure of love affairs etc.

**Ethical Clearance:** Institute Ethics Committee.

**Conflict of Interests:** Nil

**Source of Funding:** Self Funding.

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# Vitamin C as a Potential Indicator of Post-Mortem Interval: A Biochemical Analysis

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## ABSTRACT

Accurate estimates of postmortem interval (PMI) are crucial for successful investigation of death especially during un-witnessed death examinations, thus continues to be one of the most strenuous variable to be determined correctly. There are numerous ways to estimate postmortem interval (PMI), or time since death, including body temperature, rigor mortis, insect activity and decomposition. Individually, however, many of these indicators are prone to inaccuracy due to the influence of the external environment upon them. Furthermore, various metabolites have also been identified that change post mortem, but lack of accuracy and reproducibility probably did not let their extensive utilization as a PMI indicator, warranting a simple yet precise marker and easy technique for PMI evaluation. Therefore, present study proposes that vitamin C could be used for precise determination of PMI using simple, easy and rapid biochemical analysis. Vitamin C was estimated at 37°C and 4°C in liver, spleen, kidneys and blood over a time period of 24 hours. Results revealed a gradual change in ascorbic acid levels in the spleen, liver, kidneys and blood from time of death till 24 hours after death indicating its potential to accurately measure time since death.

**Keywords:** Vitamin C, Post mortem interval, time since death

## INTRODUCTION

Postmortem interval (PMI), or time since death, is a matter of critical importance in any death investigation however its accurate determination is difficult as postmortem onset and further changes are multifactorially affected which complicate the exact death time estimation. Many physical and chemical changes start taking place immediately after death and progress till complete body decomposition<sup>[1]</sup> and any physical or biological change that is a function of time since death provides a potentially useful clue in determining PMI<sup>[1, 2]</sup>. Initially, the most reliable PMI indicators are usually the predictable physical and chemical consequences of death<sup>[3]</sup>. Also are to be

considered additional factors including events which occurred prior to death: existence of injury; relationship of injury and death; interval between injury and death; cause, mode, and manner of death; musculature activity of the deceased prior to injury or death; and health of the person before death<sup>[4]</sup>. Because of the dependence of PMI on so many above listed factors, its exact estimation is susceptible to a range of errors and requires accurate indicator(s). Most techniques look for various biomarkers including protein fractions, urea, creatinine, glucose, iron, potassium, calcium, enzymes, insulin, myo-albumin fraction, strontium 90 etc.<sup>[5-13]</sup> however, none have been found to be completely reliable and specific. Studies employing the use of vitamins by biochemical estimation as a mean of assessing PMI are lacking and hence the focus of the present study.

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Vitamin C, a major antioxidant of the body is known to be readily oxidized, an investigation of the influence of time/ temperature upon the vitamin C content of postmortem tissues thus seems to be of immense forensic importance. Hence present study intends to determine

whether vitamin C can be used as an accurate indicator of PMI. In order to explore possibility of exploiting vitamin C to carry out time since death studies, we investigated vitamin C stability in liver, kidneys, spleen and blood for varying period after death.

## MATERIALS AND METHOD

### Animals

In this study, female LACA mice weighing between 20-25 grams were obtained from the Central animal house, Panjab University. Animal experiments were performed in accordance with national guidelines for the use and care of laboratory animals approved by the local animal ethics committee of Panjab University, Chandigarh.

### Experimental procedure- Blood and Liver, spleen, kidney tissue extraction

Mice were divided into four subgroups ( $n = 3$ ), decapitated and blood and tissues viz. Liver, spleen and kidney were extracted, homogenized, centrifuged and kept at  $-80^{\circ}\text{C}$  until vitamin C estimation at intervals of 0, 6, 12 and 24 hours

### Vitamin C estimation

Vitamin C was estimated by the method of Jagota and Dani<sup>[14]</sup>. Estimation was based on the colorimetric analysis using Folin phenol reagent. The absorption maximum of the color developed by the interaction of ascorbic acid with Folin reagent is 760 nm. Briefly, to 0.2 ml of tissue homogenate, 0.8 ml of 10% trichloroacetic acid was added. After vigorous shaking the tubes were kept in an ice bath for 5 min and centrifuged at 3000 rpm for another 5 min. For the estimation of Vitamin C, 0.2-0.5 ml of the above extract was used. The extract was diluted to 2.0 ml using double-distilled water, and after 0.2 ml of diluted Folin reagent was added to the extract, the tubes were vigorously shaken. After 10 min the absorbance of the blue color developed was measured and results were expressed as  $\mu\text{g/ml}$  sample.

### Statistical Analysis

Data analysis was performed by using SPSS for Windows. All data was analyzed by two-way ANOVA using the Sidak's multiple comparisons test. The significance was declared at  $p < 0.05$ . Results are expressed as means  $\pm$  SEM.

## FINDINGS

Present study estimated vitamin C content in liver, kidney, spleen and blood samples of decapitated mice at 0, 6, 12, 24 hours. These estimations were carried out at  $37^{\circ}\text{C}$  and  $4^{\circ}\text{C}$ . Figure 1-4 depicts the levels of analyzed vitamin C of various tissues. With regard to liver tissue (figure 1), it was found that there was increase in vitamin C at 6 hours, followed by a slight dip at 12 hours. Surprisingly, at 24 hours it again increased significantly at  $37^{\circ}\text{C}$ . These observations revealed that with respect to control i.e. zero hours there was percentage change (elevation) of 7.6 % at 6 hours and 19 % at 24 hours at  $37^{\circ}\text{C}$  while at  $4^{\circ}\text{C}$ , a decrease of 17.6 % and 16.3 % was observed at 6 hours and 24 hours respectively. A similar trend of vitamin C was followed in case of spleen tissue (Figure 2) though the changes at 6 hours (24.4 %) and 12 hours (11.8 %) were less. However, there was incredible increase (approximately four fold) at 24 hours. On the other hand, vitamin C kept on increasing in kidney (Figure 3) and blood (Figure 4). Initially the elevations in vitamin C levels were slight at 6 hours, but considerably significant at 12 hours ( $P < 0.001$ ) and 24 hours ( $P < 0.001$ ) in kidney tissue while in blood there was considerable increase at 6 hours (10 %) and 12 hours (18.2 %). The observed pattern of change in ascorbic acid over the time frame of 24 hours was not linear with a pattern of increase-decrease, followed by increase at 24 hours. However, the overall trend of vitamin C in liver, spleen, blood at  $4^{\circ}\text{C}$  was found to decline after 12 hours and at 24 hours it was almost similar to that at zero hours. In kidney, there was continuous increase in the levels of vitamin C at  $4^{\circ}\text{C}$  though marginal and at 24 hours the levels were almost similar to that of zero hours.

In the present study, the results revealed, a gradual change in ascorbic acid in the spleen, liver, kidneys and blood from time of death till 24 hours after death with an overall increase in vitamin C levels at  $37^{\circ}\text{C}$  in the levels of ascorbic acid suggesting that it can be exploited for estimating time since death.

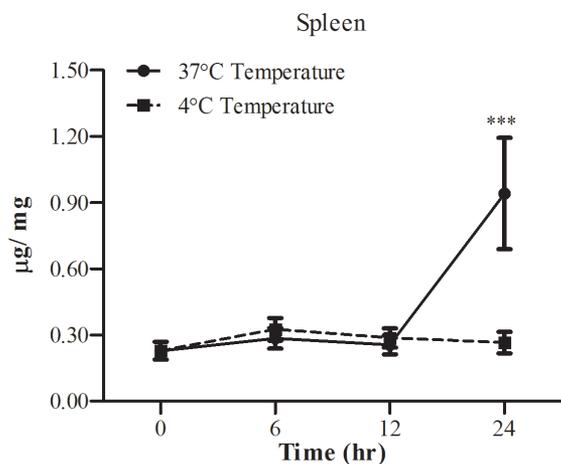


Figure 1. Levels of Ascorbic acid in liver at different time intervals after death. Values are expressed as mean ± SEM, n = 3.

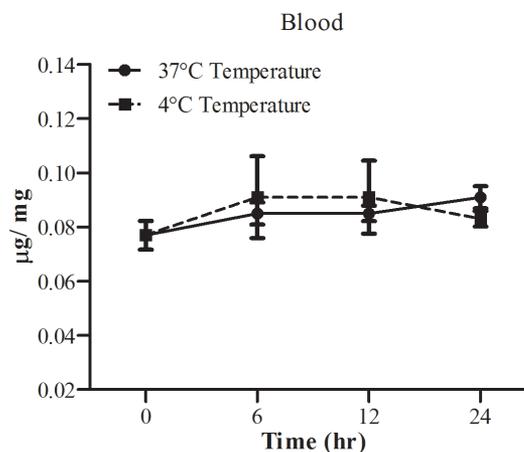


Figure 4. Levels of Ascorbic acid in blood at different time intervals after death. Values are expressed as mean ± SEM, n = 3.

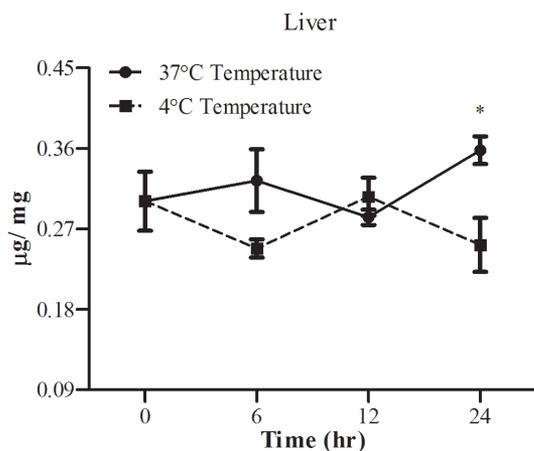


Figure 2. Levels of Ascorbic acid in spleen at different time intervals after death. Values are expressed as mean ± SEM, n = 3.

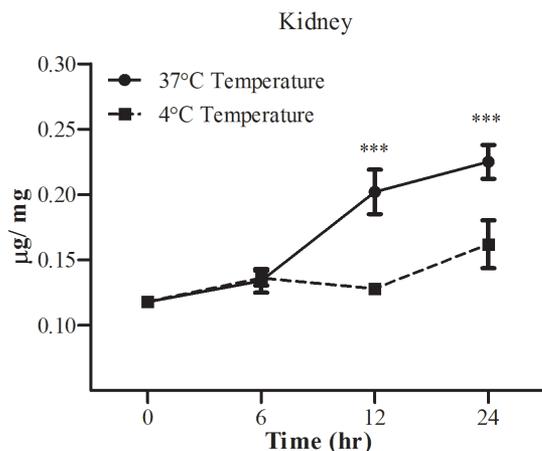


Figure 3. Levels of Ascorbic acid in kidney at different time intervals after death. Values are expressed as mean ± SEM, n = 3.

### DISCUSSION

Present study examined liver, spleen, kidney and blood samples of mice in an attempt to find a correlation between levels of ascorbic acid, which is also an antioxidant and PMI (0–24 hours). Antioxidants maintain redox state of body by removing free radicals in live tissues<sup>[15]</sup>, however in injured/diseased tissues, antioxidants decrease and oxidants increase disrupting physiological equilibrium<sup>[16]</sup>. Therefore oxidant/antioxidant balance is an indicative of tissue damage and repair<sup>[17]</sup>.

There was a significant increase in vitamin C from 0-6 hours in liver, spleen, kidneys and blood at 37°C and this was in favour of antioxidants. After 6 hours to 12 hours there was decline in ascorbic acid levels though not enormous. A study by Abo El-Noor et al (2016), on rat heart and kidney, also demonstrated that levels of antioxidants begun to fall after 3-4 hours in heart and 5-6 hours in kidney<sup>[18]</sup>. Identical studies carried out by Sener et al (2012) and Ozturk et al (2013) also lend support to observations of present study where similar trend of antioxidants was followed. However, no study was found which analyzed these parameters for 24 hours<sup>[17,19]</sup>.

In the present study ascorbic acid increased from 12-24 hours in liver, spleen, kidneys and blood and this increase was tremendous. Nevertheless it can't be related to the antioxidant role of ascorbic acid as oxidants tend to increase after death though after some time. Hence some other attributing factor(s) might be playing a role. The dehydro form of ascorbic acid could

be one of the key players as it is liable to increase under oxidant environment however necessitates additional studies to prove its exact role. On the contrary the decline with respect to 37 °C in the levels of ascorbic acid at 4°C is a suggestive of seize of cellular functions at this temperature.

This study presents a new biomarker for estimating postmortem interval which depicts a non-linear relationship between ascorbic acid in different tissues with death interval. By far, no published paper depicting significant relationship between ascorbic acid levels and time since death was found. The present study attempts to draw a relationship between changes in level of ascorbic acid concentration with early post-mortem interval which can help in producing an easy, reliable and accurate method for time since death estimation though warrants additional studies using larger time periods (beyond 24 hours) to provide an exact correlation between ascorbic acid concentration and time interval since death. Furthermore, extending this work to human autopsy samples using larger time periods will further add to the usage of vitamin C as an indicator of postmortem interval.

### CONCLUSION

There still occur lacunae in the present knowledge. As estimation of post-mortem interval employing vitamins has not been carried out so more studies are needed in this subject.

**Conflict of Interest:** Authors show no conflict of interest.

**Ethical Clearance-** Taken from the local animal ethics committee of Panjab University, Chandigarh with ethics approval no: PU/IAEC/S/16/42.

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# Age Determination of Prostitute Women by Radiological Investigation

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## ABSTRACT

Prostitution is an act or practice of engaging in promiscuous sexual relations especially for money. Investigating officer raided brothel house and captured 23 women and brought for age determination. By using standard procedure of Forensic Radiology, examining of ossification centers of all major bones such as clavicle, humers, radius-ulna, pelvis and femur, age of all the 23 women were determined. All of these 23 women were found to be more than 18 years old and among 2 of them were more than 24 to 27 years old.

**Keywords:** Prostitution, age determination, brothel, forensic radiology, and ossification centers.

## INTRODUCTION

Prostitution is an act or practice of engaging in promiscuous sexual relations especially for money. <sup>[1]</sup>Prostitution is the business or practice of engaging in sexual activity in exchange for payment or some other benefit. <sup>[2]</sup>Prostitution has been called the world's oldest "profession." Prostitution of women is a particularly lethal form of violence against women and a violation of a woman's most basic human rights.

A new definition has been coined for the word "prostitution" in the government of India's "Prevention of immoral Traffic Act" (enacted since January 1987); which now means "sexual exploitation or abuse of person for commercial purpose." However prostitution is not by choice. Survivors of prostitution have described it as "the choice made by those who have no choice" <sup>[3]</sup>Women are forced into prostitution by gender discrimination, race discrimination, poverty, abandonment, debilitating sexual and verbal abuse, lack of formal education, or a job that does not pay a living wage.

Prostitution is not an offence, practicing it in a brothel or within 200m of any public place is illegal <sup>[4]</sup> and this leads police to raid on such brothel to arrest women practicing prostitution.

On February 2017, Police from Shindkheda police station, a rural area from Dist Dhule, North Maharashtra, caught 23 women in raid & brought for age determination to Shri Bhau Saheb Hire Government Medical College Dhule. And this is how the role of Forensic expert came in picture to determine their scientific age to call them as major or minor.

To determine the age of an individual by scientific method we adopted well accepted method in medical field i.e. Forensic Radiology.

Forensic radiology comprises of the performance, interpretation, and reportage of those radiological examinations and procedures that have to do with court and law. <sup>[5]</sup>

In view point of justice, court accepts the common practice of doctors to determine age of an individual by scientific method and well accepted fact in the field of medical and legal professions i.e. study of appearance and fusion of ossification centers of bones.

According to best of my knowledge this was the 1<sup>st</sup> prospective study in North Maharashtra region to determine the age of an individual prostitute by using

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Forensic Radiology.

### AIMS AND OBJECTIVES

To determine age of prostitute women in Medico-legal cases.

To know variation if any & exception of appearance & fusion of centers of ossification.

### MATERIAL AND METHOD

The study was carried out in Shri Bhau Saheb Hire Government Medical College & General Hospital, Dhule, Maharashtra. The medical college serves as a tertiary care hospital catering four districts of North Maharashtra including remote and tribal areas from these four districts. Ethical clearance was taken from the institutional ethical committee and written consent was taken from all the women brought by police. All 23 cases were included for this study as no individual having malnourished, bony deformity, congenital malformation, suffering from any pathological or endocrinal disorder or with any developmental abnormality or not on any drugs such as steroid thus affecting the skeletal growth. During the study period of two and half years, we came across 23 cases of prostitute women brought by police for age determination.

Pro-forma for age was prepared and filled up with details like consent, educational status, birth date details, height, weight, chest and abdominal circumference, teeth, scalp, axillary & pubic hairs along with x-rays. After taking brief history, it came to know that all 23 women were brought from north, east and west regions of India for the prostitution. All of them were uneducated & don't have birth certificates. While evaluating their past history, we came to know that they were sold out by their families due to poverty to some persons and later on they were involved in prostitution. X-rays were taken at department of Radiology and following epiphyses of bones were examined: 1) clavicle: medial end 2) shoulder joint: head of humerus, greater & lesser tubercles 3) elbow joint: medial & lateral epicondyles of humerus, upper ends of radius & ulna 4) wrist joint: the lower ends of radius & ulna & 5) pelvis: iliac crest, ischial tuberosity & head of femur bone.

In our study, the designations of stages used by Mckern & Stewart (1957) were adopted to produce the staging method as outlined below<sup>[6]</sup>.

F0- Non- Union

F1- Active Union

F2- Complete Union

### RESULT & OBSERVATION

**Table no 1: Result of ossification centers of all 23 cases.**

Sr No	Bones	Appeared	Non- union	Active union	Complete union
2.	Sternal end of clavicle (24 to 27yrs F)		Not fused in 21 cases		Fused in 02 case
3.	Humerus- upper end fuses with shaft (18 to 19yrs F)				Fused in 23 cases
4.	Elbow joint				
	Medial epicondyle	Appeared			Fused in 23 cases
	Lateral epicondyle	Appeared			
	Trochlea	Appeared			
	Capitulum	Appeared			
	Lower end of humerus fused with shaft (16 to 17yrs F)				Fused in 23 cases
	Upper end of radius (16 to 17yrs F)				Fused in 23 cases
	Upper end of ulna (16 to 17yrs F)				Fused in 23 cases
5.	Wrist joint				
	Lower end of radius (18 to 19yrs F)			In process in 03 cases	Fused in 20 cases

**Cont... Table no 1: Result of ossification centers of all 23 cases.**

	Lower end of ulna (17 to 18yrs)			In process in 03 cases	Fused in 20 cases
	Carpal bones (pisiform bone 11 to 12yrs A)	Appeared in 23 cases			
6.	Pelvis				
	Iliac crest (20 to 21yrs F)		Not fused in 01 case	In process in 06 cases	Fused in 16 cases
	Ischial tuberosity (20 to 21yrs F)		Not fused in 01 case	In process in 06 cases	Fused in 16 cases
	Upper end of femur fuses with Gr & Lr Trochanter (17 to 18yrs F)				Fused in 23 cases

(A- Appearance of ossification center, F-Fusion or complete union of ossification center.) Total number of cases:23.

### DISCUSSION

In this study we compared our findings with other studies. All other researchers have compared their findings of different age groups with birth certificates of samples they took and determined age. During age determination of these 23 women, valid and legal documentary proofs of the women could not be made available to us by the investigating police authorities as they didn't had them.

Sternal or medial end of clavicle is the long bone epiphysis, last to fuse in body and therefore is useful for estimating age of an individual in the post-pubertal period.<sup>[7]</sup>In our study complete union of sternal end of clavicle observed in 02 cases at the age of 24 to 27 years and non union in 21 cases. This is similar to study of Szilvassy, 1980; Webb and Suchey 1985; McLaughlin, 1990; Black and Scheuer, 1996, Abdul et al and contrary to study of S.S. Bhise et al.

In our study upper end of humerus bone fuses with shaft in all 23 cases at the age of 18 to 19 years. Our findings similar with study of Erol et al have showed results of age of fusion of more than 18 years, which is contrary to studies by Anil Agarwal, Memon et al and Dr Kundan Porwar. Study of Dr. Saini et al had shown complete fusion (100%) of head of humerus in females

at the age of 17 to 18 years and on-wards, which is similar or near to findings of our study.

In our study, we found bones of elbow joint fused in all cases at the age of 14 to 17yrs which is similar to study of Hepworth SM et al, Lall R and Nat BS et al and Dr William Bilkey Ch. Sangma et al.

In our study, lower end of radius and ulna fused with their shaft in 20 cases and in 03 cases it's in process of fusion at the age of 17 to 19 yrs. Our findings similar with study of Dr William Bilkey Ch. Sangma et al, Kothari DR et al and contrary to study of Prasad RS et al, Sahni D et al showing age of fusion earlier to our findings.

In our study, iliac crest and ischial tuberosity fused in 16 cases, in process of fusion in 6 cases and not fused in 01 case at the age of 20 to 21yrs. Our findings similar with study of Hollinshead WH et al, Sankhyan S et al and contrary to study of Bennet KA et al showing age of fusion at 23 to 24yrs of age.

In our study, upper end of femur i.e. greater and lesser trochanter fuses with each other and with shaft in all 23 cases at the age of 17 to 18yrs of age which is similar with findings mentioned in text book of forensic medicine of Reddy KSN and text book of Rao Nageshkumar.

**Table no 2: Table showing variation of results with different researchers.**

Sr No	Other researcher	Sternal end of clavicle (24 to 27yrs F)	Humerus- upper end fuses with shaft (18 to 19yrs F)	Elbow joint (14 to 17 Yrs)
1	Bassed RB <sup>[7]</sup> , 2011	Similar		
2	Szilvassy <sup>[8]</sup> , 1980	Similar		
3	Webb and Suchey <sup>[9]</sup> 1985	Similar		
4	S. Balasubramanian, K. Priyatharsini <sup>[10]</sup> , 2016	Similar		
5	Black and Scheuer <sup>[11]</sup> , 1996	Similar		
6	S.S. Bhise et al <sup>[12]</sup> , 2012	Contrary at 21 to 22yrs		
7	Dr B. Tirpude, Dr V Surwade et al <sup>[13]</sup> , 2014		similar	
8	Anil Agarwal et al <sup>[14]</sup> , 2006		Similar or near to our findings	
9	Dr Pimpale et al 2013		Similar or near to our findings	
10	Dr. Saini O P et al 2005		Similar or near to our findings	
11	Krogman 1960		Similar	
12	Hepworth SM <sup>[15]</sup> , 1929			Conjoint epiphysis fused at 15yrs
13	Lall R and Nat BS <sup>[16]</sup> , 1934			Similar
14	Dr William Bilkey Ch. Sangma et al <sup>[17]</sup> , 2007			Similar

**Table no 3: Table showing variation of results with different researchers.**

Sr No	Other researcher	Lower end of Radius & Ulna (17 to 19 yrs)	Iliac crest & ischial tuberosity (20 to 21yrs)	Upper end of Femur with Gr & Lr trochanter (17 to 18 yrs)
15	Dr William Bilkey Ch. Sangma et al <sup>[18]</sup> , 2007	Similar		
16	Kothari DR <sup>[19]</sup> , 1974	Similar		
17	Prasad RS et al <sup>[20]</sup> , 1979	Contrary, earlier to this study 16yrs		
18	Sahni D <sup>[21]</sup> , 1995	Contrary, earlier to this study 16yrs		
19	Hollinshead WH <sup>[22]</sup> , 1969		Similar	
20	Sankhyan S et al <sup>[23]</sup> , 1993		Similar	
21	Bennet KA <sup>[24]</sup> , 1993		Contrary to our findings (23 to 24yrs)	
22	Yogesh Sharma, Akhilesh Sharma, Bhavesh Bohra			Similar
23	Reddy KSN <sup>[25]</sup>			Similar
24	Rao Nageshkumar			Similar

## CONCLUSION

By investigating and examining ossification centers of all 23 women, it was observed that all of them were more than age of 18 years. Two women out of the 23 were more than 24 to 27 years old as they were having complete ossification of Sternal end of clavicle. Other researcher has compared their findings of ossification centers of different age group with birth certificates of all samples and put their findings. Due to non-availability of age certificates of the women examined, we compared our findings with observations of other researchers and standard text books.

**Limitation:** i) Small amount of data to compare. ii) Regional and racial variations with respect to variable age of ossification of centers of bones.

**Ethical Clearance:** Obtained.

**Conflict of Interest:** Nil.

**Source of Funding:** Nil.

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# Study of Estimation of Stature from Head Height

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## ABSTRACT

Stature is an important anthropometric measurement for establishing the identification in both living as well as dead. Present study aims to estimate the stature from head height and aims to find whether there is any significant co-relation between the stature of an individual and the head height in different age groups of males and females and to derive a formula between head height and total height of an individual. The study participants were healthy Haryanvi population in the age group of 20 to 60 years including 100 males and 100 females. The subjects were selected from different socio economics backgrounds. All the subjects were measured for stature and head height. Head height was measured using Spreading caliper. Regression equation was derived for estimating stature from head height. Mean age of males was 36.63 11.31 and that of females was 35.53 9.99. Mean stature of males was 166.37±7.75 and that of females was 159.81±6.40. Mean±S.D. of head height in males was 9.53 0.93 and in females was 8.94 0.66. Correlation coefficient between stature and head height was found as 0.554 in general population and 0.512 for males and 0.429 for females. Regression equation was derived as  $Y = 116.41 + 5.04x$  for general population and  $Y = 120.88 + 3.99x$  for males and  $Y = 137.64 + 1.52x$  for females (Y is stature and x is head height). There is a positive correlation between stature and Head height. Race and gender specific Regression equation are needed which can be used with fair degree of accuracy for the stature estimation.

**Keywords:** Stature, Head Height, Spreading caliper

## INTRODUCTION

Identification or identity means establishment of individuality of a person. In living persons, it is necessary to identify in different cases such as criminal cases to identify the person accused of assault, murder or rape. In the civil cases identification is important in cases pertaining to marriage, passport/license, inheritance, insurance claim, missing person, disputed sex and many other different cases.

In dead person it is important to identify the person in cases of decomposed, mutilated or fragmentary

remains of body which are usually recovered in cases of air crash, fire, building collapse, bomb explosion, railway accident, or bodies recovered from Sea Rivers, canals, wells, or in mutilated bodies. Identification thus means to determine the individuality of a person on the basis of certain physical characteristics. It can be either Complete/Absolute or Incomplete/Partial.

Complete (absolute)- Absolute fixation of the individuality of a person

Partial (incomplete) – Ascertainment of some facts such as race, sex, age, or stature of a person<sup>1</sup>.

Forensic Anthropology is the examination of human skeletal remains to determine the identity of unidentified bodies and it is of immense use for law enforcement agencies. Anthropometry (Bertillon system) involves the registration of the characters under three headings<sup>2</sup>i.e,

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**Descriptive data:** This relates to the color of hair and iris, complexion of skin and shape of nose, ears, chin etc.

**Bodily marks:** Includes scars, moles or tattoo marks on skin

**Body measurements:** These pertain to certain body parts and are eleven in number.

The word 'Anthropometry' has been derived from the Greek word "anthropos" means man and "metron" is measure and thus it means measurement of man<sup>3</sup>. All the human beings belong to the same species i.e, Homo Sapiens<sup>4</sup>. It is a universal fact that no two persons show same measurements in all respects, not even siblings and thus this is the underlying principle for identification of an individual.

Interesting differences in bodily form and proportion are frequently seen in the persons living under different conditions and members of different ethnic groups. Anthropometry is thus the means of giving quantitative expression to the variations which different individuals with different traits exhibit<sup>5</sup>. Stature is one of the important and useful anthropometric parameter that helps in determining the physical identity of an individual<sup>1</sup>. The height of a person in the upright posture is referred to as Stature<sup>6</sup>. An individual attains maximum height by the age of 21 years i.e, when all the long bones get ossified. It is an important parameter for personal identification<sup>7</sup>. Stature is important for identification is underlined by the fact that one can calculate the stature both in the living individuals as well as in the skeleton even long after a person has died<sup>8</sup>.

Throughout the middle age it remains constant and then starts decreasing with the old age. There are studies which show diurnal and positional variation of stature in an individual<sup>9</sup>. In a living person, the stature decreases by approximately 2 cm every day from the time a person wakes up in the morning and then carries out the routine day to day activities in the whole day and till the time that an individual goes back to sleep at night. In dead body soon after death due to primary relaxation of the muscles, the body length may be more by 2-2.5cm. Later when rigor mortis develops it may be shortened<sup>10</sup>.

## MATERIAL AND METHOD

The study was conducted in the department of Forensic Medicine MMIMSR, Mullana. The study

participants were healthy Haryanvi population in the age group of 20 to 60 years including 100 males and 100 females. The subjects were selected from different socio-economics backgrounds. All the subjects were measured for stature and head height.

**Stature (S):** It is the vertical distance between standing surface and the vertex (highest point on head) when the subject is standing in the anatomical position.

**Head Height:** It is the projective distance between tragus and the vertex with the subject in sitting position and looking forward. It was measured with spreading caliper.

The measurements were taken at fixed time of the day i.e, between 2 to 5 p.m. to avoid diurnal variations. All the measurements were recorded by same person to minimize the errors in methodology. Head height was recorded from right and left side and three measurements were taken on each side separately and the mean of three readings was taken for analysis.

### *Inclusion criteria:-*

Healthy adult males and females belonging to Haryana

Chronological age of 20 to 60 years

### *Exclusion criteria:-*

- 1.) Subjects with physical abnormalities
- 2.) Visibly malnourished & obese subjects
- 3.) Chronological age less than 20 or more than 60

Informed and written consent was taken from the each participant before conducting the study. Statistical analysis was conducted on this study population with data split gender wise as well as combined. Analysis included descriptive statistics, correlation between stature and head height and derivation of regression formulae for stature from head height. The regression was performed with stature as dependent variable and head height as independent variable. Regression formula obtained was of  $Y=A+B(X)$  where Y is stature, X is Head height (an independent variable), A is regression constant and B is regression coefficient. Data was analyzed using SPSS software.

## OBSERVATIONS AND RESULTS

Table 1 depicts the descriptive statistics of the total population studied. Mean  $\pm$  SD of stature was 163.06  $\pm$  7.81 cm. Mean  $\pm$  SD of head height was 9.24  $\pm$  0.86 cm. Mean  $\pm$  SD of age was 36.08  $\pm$  10.66 years. Sex wise distribution of stature. In males Mean  $\pm$  SD was 166.37  $\pm$  7.75 cms and in females Mean  $\pm$  SD was 159.81  $\pm$  6.40 cms. The descriptive statistics related to head height in the population studied. The Mean  $\pm$  S.D. head height in males was 9.53  $\pm$  0.93 cm. Similarly Mean  $\pm$  S.D head height in females was 8.94  $\pm$  0.66 cm.

Mean  $\pm$  SD of males in age group of 20- 29 is 168.39  $\pm$  9.43 cm and in females it is 160.51  $\pm$  6.27 cm. In age group of 30-39 for males it is 165.89  $\pm$  6.01 and for females it is 160.83  $\pm$  6.36. In 40-49 age group males Mean  $\pm$  S.D. is 164.55  $\pm$  6.64 and in females it is 159.44  $\pm$  6.43. In those aged  $\geq$ 50 for males Mean  $\pm$  S.D. of stature is 163.87  $\pm$  7.15 and in females it is 157.06  $\pm$  6.49. All the values are statistically significant (p value < 0.05).

Mean  $\pm$  S.D of head height in males aged 20-29 it is 9.50  $\pm$  1.04 cm and in females it is 8.70  $\pm$  0.55 cm and is statistically significant (p < 0.001). In 30-39 age group, for males it is 9.70  $\pm$  0.91 cm and for females 9.01  $\pm$  0.55 cm and it is statistically significant (p is 0.001).

In 40-49 age group, for males it is 9.40  $\pm$  0.86 and for females it is 9.18  $\pm$  0.72 cm and it is not statistically significant (p 0.418). In  $\geq$ 50 aged males Head height Mean  $\pm$  S.D for males it is 9.33  $\pm$  0.69 cm and for females it is 8.83  $\pm$  0.83 cm and is statistically insignificant (p = 0.087).

Table 2 shown that Age wise correlation of stature with head height in the population sample. Correlation coefficient (r) of stature and head height in age group 20-29 was 0.662 which is highly positively correlated and it is statistically significant (p < 0.001). Similarly in 30-39 age group it is 0.473 i.e, it is moderately positively correlated and is statistically significant (p < 0.001). In 40-49 'r' is 0.425 and is statistically significant (p is 0.008). In those aged  $\geq$  50, stature and head height are highly positively correlated 'r' is 0.651 and is statistically significant (p < 0.001).

Table 3 depicts the correlation between stature and head height in males and females. Coefficient of correlation for general population is 0.554 i.e, highly positively correlated. Correlation coefficient 'r' in males is 0.512 that shows high positive correlation and 'r' is 0.429 in females showing moderately positive correlation. All the values are statistically significant (p < 0.001).

**Table 1 : Distribution of study participants according to stature, head height and age**

Parameter	N	Range	Minimum	Maximum	Mean $\pm$ S.D.
Stature	200	42	147	189	163.06 $\pm$ 7.81
Head height	200	5	7	12	9.24 $\pm$ 0.86
Age	200	40	20	60	36.08 $\pm$ 10.66

**Table 2: Correlation between stature and head height with respect to age**

Age	N	Parameters	Correlation Coefficient(r)	P Value
20-29	66	Stature & Head ht	0.662	<0.001
30-39	66	Stature & Head ht	0.473	<0.001
40-49	38	Stature & Head ht	0.425	0.008
$\geq$ 50	30	Stature & Head ht	0.651	<0.001

**Table 3: Correlation between stature and head height in males and females.**

Population	N	Correlation coefficient	P value
General	200	0.554	<0.001
Male	100	0.512	<0.001
Female	100	0.429	<0.001

**Table 4: Comparison of Stature reported from different related studies and present study**

Author Population	Stature Mean ± S.D.	Range (in cm)	Population	Age gp
Krishan K (2008) <sup>15</sup>	172.31± 6.83	151.2-186.4	North Indian Gujar	18-30
Seema& Mahajan(2011) <sup>11</sup>	166.93± 8.94	141.5-177.1	Punjab	18-23
Mohammed Habeebuddin(2012) <sup>14</sup>	162.5± 7.67	142.7-193.2	Hyderabad	20-60
Rajani Singh(2013) <sup>12</sup>				
Males	167.2± 7.8	144.5-174.4	U.P.	17-26
Females	157.0 ± 6.0	151-189.6		
Twisha Shah et al (2015) <sup>13</sup>				
Males	164.3 ± 7.55	150.56- 170	Gujarat	21-50
Females	150.56± 7.11			
Present study (2017)	163.06 ± 7.81	147-189		
Males	166.37 ± 7.75		Haryana	20-60
Females	159.81± 6.40			

**Table 5: Comparison of head height and correlation between head height and stature reported from different studies with the present study**

Author	Population	Head Height Mean± S.D.	correlation coefficient 'r'
Ilayperuma <sup>16</sup>			
Males	Sri Lanka	14.10 ± 9.0	0.514
Females		13.53 ± 12.16	1.478
Mohammed Habeebuddin(2012) <sup>14</sup>			
Males	Hyderabad	12.02± 0.81	0.56
Females			0.688

**Cont... Table 5: Comparison of head height and correlation between head height and stature reported from different studies with the present study**

<b>Rajani Singh(2013)<sup>12</sup></b>			
<b>Males</b>	U.P.	10.2± 0.9	0.58
<b>Females</b>		10.1± 0.9	0.76
<b>Present study (2017)Total</b>		9.24± 0.86	0.554
<b>Males</b>	Haryana	9.53 ± 0.93	0.512
<b>Females</b>		8.94 ± 0.66	0.429

## DISCUSSION

Many studies have been done till date to estimate the height or stature from various bones. It is generally stated that skull is the best bone for defining the racial differences. Thus the cranial parameters are one of the important parameters used to define racial characteristics. Cranial dimensions used for estimating stature consists of head length, head breadth, head circumference, and head height. Very few studies have been done for estimating stature from head height. This study was done in the Haryanvi population to estimate the stature from one of the cranial parameter that is, head height.

This study was done among 200 Haryanvi adults including 100 Males and 100 females aged 20- 60 years to estimate stature from head height. All the measurements were recorded at fixed time in the day to avoid diurnal variation in the readings. In our study population, stature was found to be ranging from 147-189 cms. Mean stature in males came out to be 166.37 cm and in females it was 159.81 cm. The mean stature obtained in our study correlates with the study by Seema and Mahajan<sup>11</sup> (2011) found the mean stature in Punjabi student population as 166.93.

Our findings also correlate with another study by Rajanisingh<sup>12</sup>(2013 ) who found the mean stature of 167.2 cm in males and 157 cm in females. In a study by Twisha Shah et al<sup>13</sup> mean stature was obtained as 164.3 cm in Gujarati males and 150.56 cm in females which is less than that obtained in our study. Also stature obtained by Mohammad Habeebuddin Shaji<sup>14</sup> (2012) in a study in Hyderabad city, Stature in the population of 20- 60 yrs ranged from 141.5-177.1 cm and the mean

stature obtained was 162.5 cm. Krishan K<sup>15</sup> (2008) found mean stature to be 172.31 cms in North Indian Gujjar population which is higher than that obtained in our study. This difference could be because of the fact that healthy young males aged 18-30 years were taken in their study whereas in our study the age group was quite wide ranging from 20-60 years. Other factors that influence stature includes the nutritional factors, hereditary influences and regional differences as well.

In this study, the head height ranged from 7-12 cm and mean was obtained as 9.24± 0.86 cm for total population. For males head height was 9.53± 0.93 cm and for females it was 8.94± 0.66cm. Comparison of the head height from other studies. Ilayperuma (2010)<sup>16</sup> in his study found the mean head height in males as 14.10± 9.0 cm and in females it was 13.53± 12.16 cm. This is quite high in comparison to our study. This difference can be explained by the racial differences as his population consisted of Sri Lankan population. In another study by Mohammed Habeebuddin<sup>14</sup> (2012) in Hyderabad, the mean head height was found to be 12.02± 0.81 cm. This difference compared with our finding can be because of the fact that his sample size was small, consisting of only 100 adults aged 20-60 years and the percent of males and females are also not defined properly in his study. Rajani Singh<sup>12</sup> (2013) in her study in U.P. students aged 17-26 years calculated mean head height as 10.2± 0.9 cm in males and 10.1± 0.9 cm in females. This is roughly corresponding with our study.

Correlation coefficient 'r' of head height with stature in our study was obtained as 0.554 in general population and 'r' was 0.512 in males showing high

positively correlated and it was 0.429 in females showing moderate positive correlation. Ilayperuma<sup>15</sup> (2010) found 'r' of 0.514 in males and 1.478 in females. Rajanisingh (2013)<sup>12</sup> found 'r' of 0.58 in males and 0.76 in females. Similarly Moh Habeebuddin<sup>14</sup> calculated 'r' as 0.63 for general population and 0.56 in males and 0.688 in females. Correlation coefficient 'r' obtained for females in other studies is high as compared to our study. This could be explained by the different age groups in our study population that 'r' is high in females in age group of 20-29 and 50 and above.

### CONCLUSION

There is a positive correlation between stature and head height. In males, stature and head height have a high positive correlation whereas females show a moderate positive correlation. Regression formulae derived can be used for stature prediction with a fair degree of accuracy.

**Conflict of Interest:** None Declared

**Source of Funding:** Self

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# Medico-legal Evaluation of Death due to Poisoning

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## ABSTRACT

Fast growth in science and technology and rapid development in farming and manufacturing sector has led to boost in the occurrence of poisoning, taking away a lot of precious human life. The chemical substances developed to protect the agriculture products from rodents and pests, to save the human beings from starvation, are themselves becoming a threat for the human life. Trends of poisoning had been continuously changing throughout the world with advent of new agents. The objective of this study was to find out the incidences and pattern of poisoning in this area. The study included all the cases of suspected poisoning brought to GSVM Medical College and LLR & associated hospital's mortuary, Kanpur (U.P) from July 2015 to June 2017. A total of 7648 medico legal post mortems were performed during the study period. Among (7.6%) cases were death due to poisoning. Male victims (63.1%) outnumbered females (36.9%) and maximum numbers of cases (32.2%) were in the age group 21-30 years. Majority of the poisoning cases belong to the urban area (57.1%) and most of the victims were married (71%). Maximum number of poisoning death have been reported in the month of June (14.4%) followed by March (13.5%). Organophosphorus compounds were the most common agent responsible for poisoning with (24%) followed by organochlorine compounds with (18%).

**Keywords:** Medico-legal aspect, Autopsy, Poisoning.

## INTRODUCTION

Every unnatural death whether suicidal, accidental or homicidal, represents a tragic waste of precious human life and resources<sup>1</sup>. Death due to poisoning is no exception. India is not only a developing country but also an agrarian country where population is mostly dependant on agriculture. Pesticides act as a common agent for suicidal purpose after trivial family problems in developing countries kill around 3 00,000 people each year<sup>2-4</sup>. Suicidal deaths in industrialized countries are also caused by pesticide ingestion<sup>5, 6</sup>. Poisoning cases can also occur accidentally and rarely as homicidal purpose. Accidental poisoning occurs in manufacturers, users, children of users, packers, sprayers and due to

contamination of food grains mixed with insecticides preserved for seedling purposes. Poisoning also occurs from fruits and vegetables<sup>7</sup>. Homicidal poisoning by insecticides is usually rare, because of the stink and also due to alarming signs and symptoms which appear rather early. Regrettably death by poisoning is seldom included as a priority for health research in our country. The aim of this study was to determine the epidemiological profile and medico-legal assessment of death due to poisoning in this part of the world which is useful for widening the horizon of knowledge of clinician and those who are concerned with planning of successful preventive measures against them.

## MATERIALS AND METHOD

This prospective study was conducted among victims of poisoning at the GSVM Medical College and LLR & associated hospital's mortuary, Kanpur (U.P) from July 2015 to June 2017. Various identification data of the study subjects were noted from the inquest report accompanying the dead bodies, information from the victim's attendants and post mortem reports of the

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victim. Specific identification of poisons was made from Chemical Examiner’s report. Thereafter all the details were analyzed & presented in graph, chart and tabular form.

### FINDINGS

A total of 7648 medico legal post mortems were performed during this study period. Among these 582 cases (7.6%) were due to poisoning. Out of these cases specific poisons were identified in 243 (42%) cases. Among the detected poisoning cases Organophosphorus was the commonest agent 139 (24%) followed by organochlorous (18%). In 339 (58%) cases no poison was detected in chemical analysis. Out of 582 victims 367 (63.1%) were male and 215 (36.9%) were female. Highest incidence of poisoning was observed in 21-30 years age group 187 (32.2%) followed by age group of 31-40 years 128 (21.9%). Maximum number of poisoning death have been reported in the month of June (14.4%) followed by March (13.5%). Most of the victims were unemployed 302 (52.7%) and 413 (71%) were married. On external examination of the deceased

characteristic odor was present in 175 cases, frothing at mouth and nose was present in 162 cases and cyanosis of extremities was present in 145 cases. On internal autopsy examination congestion of GIT with sub mucous petechial hemorrhage and generalized visceral congestion was present in all cases and pulmonary and cerebral edema was present in 395 cases. Considering manner of death (90.8%) victims committed suicide by poisoning and (5.3%) were accidental in (3.9%) cases manner of death was not determined.

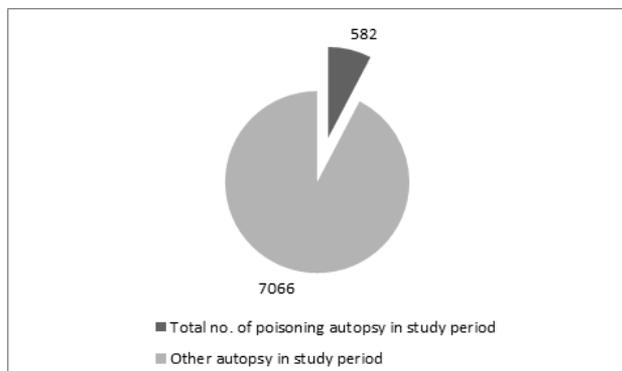


Figure 1: Incidences of death due to poisoning among all unnatural deaths

Table 1: Incidences of death due to poisoning among all unnatural deaths

Total no. of poisoning autopsy in study period	Other autopsy in study period	Total no. of autopsy in study period
582	7066	7648

Table 2: Age and sex wise distribution of poisoning cases

Sl.no.	AGE (in yrs.)	Male	%	Female	%	Total	%
1	0-20	72	12.6	32	5.2	104	17.8
2	21-30	133	22.8	54	9.4	187	32.2
3	31-40	87	14.9	41	7.3	128	21.9
4	41-50	52	8.9	46	7.9	98	16.8
5	51-60	17	2.9	31	5.5	48	8.4
6	ABOVE 60	6	1	11	1.9	17	2.9
	<b>Total</b>	<b>367</b>	<b>63.1</b>	<b>215</b>	<b>36.9</b>	<b>582</b>	<b>100</b>

**Table 3: Marital status of the poisoning victims**

Marital status	Male	%	Female	%	Total	%
Married	257	70	159	74	416	71.
Unmarried	96	26	45	21	141	25
Not known	14	04	11	5	25	4
<b>Total</b>	<b>367</b>	<b>100</b>	<b>215</b>	<b>100</b>	<b>582</b>	<b>100</b>

## DISCUSSION

In the present study, incidence of poisoning found to be (7.6%). Male victim 367 (63.1%) outnumbered female 215 (36.9%) as males lead a more stressful life than female due to family responsibilities.<sup>1-17</sup> Maximum numbers of cases (32.2%) were in the age group 21-30 years due to the fact that at this period they are by nature more emotional, aggressive, intolerant and irrational.<sup>9,10,14,16</sup> Married outnumbered 413 (71%) single 142 (25%), because after marriage economic problem of family results in frequent quarrels and familial disharmony leading to increased stress.<sup>1-17</sup> Maximum numbers (27.6%) of victims were educated up to high school level. In our study maximum number of poisoning death have been reported in the month of June (14.4%) followed by March (13.5%).

In our study it Reveals that on external examination of the deceased characteristic odor was present in 175 cases frothing at mouth and nose was present in 162 cases and cyanosis of extremities was present in 145 cases on internal autopsy examination congestion of GIT with sub mucous petechial hemorrhage and generalized visceral congestion was present in all cases and pulmonary and cerebral edema was present in 395 cases. The observation may be explained that it is possible that a person may die from the effects of poison, and yet none may be found in the body after death if the whole of the poison has disappeared from the lungs by evaporation, or has been removed from the stomach and intestines by vomiting and purging, and after absorption has been detoxified, conjugated and eliminated from the system by the kidneys and other channels. Certain vegetables poisons may not been detected in the viscera, and they do not have any reliable tests, while organic poisons, especially the alkaloids and glycosides, may,

by oxidation during life or putrefication after death, and split up into other substances, which have no characteristic reactions sufficient for their identification. Modi saw cases in which there were definite signs of death from poisoning, although the chemical examiner failed to detect the poison in the viscera preserved for chemical analysis. It has, therefore been widely held by that in case where a poison has not been detected on chemical analysis, the judge, is deciding a charge of poisoning, should weigh in evidence the symptom, post mortem appearances and the moral evidence.<sup>18</sup> In the present study (90.8%) cases of poisoning were suicidal and (5.3%) were accidental. No case of homicidal poisoning was found during study period. The suicidal cases were more than the accidental cases in both the sexes.

The present study findings are similar with most of the studies done in this field<sup>9,10,12,14,15,17</sup> but few studies have some variation is also noted.<sup>1,8,11,16</sup> The incidence of death due to poisoning among all unnatural death shows marked variation, the lack of uniformity may be depends on variety of factors such as urban or rural area, some part of our country where the farmer used very toxic pesticides shows marked mortality, availability of good medical facility, awareness and strict regulation on sale of poisonous substance also play a important role. As we seen in the Comparison table the incidence of death due to poisoning ranges between less than (4%)<sup>1</sup> to some study particularly in Punjab region as high as (26%)<sup>8</sup> and this type of trends not only common in our country but also seen in south Asian countries.

**Table 4: Comparison of incidence of poisoning death of present study with various studies<sup>1, 8, 9, 12-17</sup>**

Name of the Author	Year	% of poisoning autopsy in study period
Dhattarwal SK et al <sup>8</sup>	2001	26.6
Kapila P et al <sup>9</sup>	2003	14.0
Gupta BD et al <sup>12</sup>	2005	16.0
Kanchan T et al <sup>13</sup>	2008	18.0
Haloi M et al <sup>1</sup>	2013	3.9
Ahmad M et al <sup>14</sup>	2014	5.8
Kumar A. et al <sup>15</sup>	2014	8.7
Koulapur V et al <sup>16</sup>	2015	24.4
Chakrabarty P. et al <sup>17</sup>	2015	11.1
Present study	2017	7.6

**Table 5: Evaluation of male & female victim of present study with different studies.<sup>1, 9-17</sup>**

Name of the Author	Year	% of Male victim	% of Female Victim
Kapila P et al <sup>9</sup>	2003	66.0	34.0
Nigam M et al <sup>10</sup>	2004	66.0	34.0
Dash SK et al <sup>11</sup>	2005	53.0	47.0
Gupta BD et al <sup>12</sup>	2005	62.1	37.9
Kanchan T et al <sup>13</sup>	2008	73.3	26.7
Haloi M et al <sup>1</sup>	2013	62.5	37.5
Ahmad M et al <sup>14</sup>	2014	58.0	42.0
Kumar A. et al <sup>15</sup>	2014	71.5	28.4
Koulapur V et al <sup>16</sup>	2015	72.3	27.6
Chakrabarty P. et al <sup>17</sup>	2015	64.2	35.7
Present study	2017	63.1	36.9

**Table 6: Association of the most common age group of the victims of death due to poisoning of the present study compare with other studies.<sup>1, 9-12, 14, 16, 17</sup>**

Name of the Author	Year	Most common age group	% of victim
Kapila P et al <sup>9</sup>	2003	21-30 Years	52.3
Nigam M et al <sup>10</sup>	2004	21-30 Years	32.4
Dash SK et al <sup>11</sup>	2005	11- 20 Years	32.3
Gupta BD et al <sup>12</sup>	2005	21-30 Years	43.1
Haloi M et al <sup>1</sup>	2013	20-29 Years	33.3
Ahmad M et al <sup>14</sup>	2014	21-30 Years	39.0
Koulapur V et al <sup>16</sup>	2015	21-30 Years	38.1
Chakrabarty P. et al <sup>17</sup>	2015	40-49 Years	20.0
Present study	2017	21-30 Years	32.2

### CONCLUSION

Poisoning by agrochemical compounds is an important problem in this country. Proper emphasis should be given for safe use of pesticides. Consciousness should be created among the population about poisonous compounds.<sup>1, 3, 5</sup> Preventive measure can play huge role as all the unnatural deaths seemed avoidable. It is customary to emphasize the role of psychiatrist/psychologist in most of the background situations most important to death from poisoning,<sup>17</sup> the establishment of specialized toxicological units for detection and management of poisoning cases at all hospitals and primary health care centers could considerably minimize the morbidity and mortality due to poisoning.<sup>16</sup>

**Ethical Clearance-** Taken from GSVM Medical College Ethical committee.

**Source of Funding-** Self

**Conflict of Interest -** Nil

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# Study of Knowledge among the Resident Doctors Regarding Various Aspects of Medicolegal Cases at a Tertiary Care Teaching Hospital of North India

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## ABSTRACT

Medico-legal knowledge is an essence for a medical professional, irrespective of their specialty. One year prospective study from 1<sup>st</sup> September, 2014 to 30<sup>th</sup> September, 2015 was carried out in Emergency Medicine department of SKIMS to study the knowledge of resident doctors regarding various aspects of medicolegal issues. The study revealed that the knowledge score of medico-legal issues was higher in male resident doctors as compared to their female counterparts. Duration of medical training plus years of experience lead to higher mean knowledge scores. Senior resident doctors and also the resident doctors having experience greater than five years had significantly higher knowledge scores.

**Keywords:** Medico-Legal Case, Knowledge, Resident doctors

## INTRODUCTION

Article 21 of the constitution guarantees protection of life and liberty to every citizen as well as non citizens. Right to health care and medical assistance is integral to the right of life and state has a constitutional obligation to provide health facilities.<sup>1</sup>

A medicolegal case is a case of injury or illness where the attending doctor, after eliciting history and examining the patient, thinks that some investigation by law enforcement agencies is essential to establish and fix responsibility for the case in accordance with the law of the land.<sup>2</sup> In simple language it is a medical case with legal implications for the attending doctor where the attending doctor, after eliciting history and examining the patient, thinks that some investigation by law enforcement agencies is essential.<sup>3,4</sup>

Medicolegal cases are an integral part of medical practice that is frequently encountered by medical officers/doctors. Proper handling and accurate

documentation of these cases is of prime importance to avoid legal complications and to ensure that the next of kin receive the entitled benefits. All doctors in hospitals/ non medical units encounter medicolegal issues which should be handled in accordance with the law of the land. Since law and order is a state subject, there are differences in the legal procedures being followed by different states, medical professionals should acquaint themselves with medico legal procedures that are in vogue in the state in which they are serving.<sup>5</sup>

Ignorance of law is no excuse for violating it. It is the duty of everyone to know the law which concerns him or her. Nowadays practicing medicine is hazardous & risky. For implementation of high quality of healthcare practice in the world of latest medical and technological advances a good knowledge of legal responsibilities is a necessity. The way in which medico-legal issues are handled has a profound impact on the public image of the hospitals. Usually all the big hospitals and the teaching institutions have an institutional medico-legal manual which gives, in a step-wise detail, the correct procedure of dealing with the various kinds of MLCs. Even if such manuals are not available, these cases pose no problem if one uses proper caution and due care and attention, while dealing with them. Proper documentation, timely

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information, a methodical and thorough examination – including all relevant investigations, referrals etc are all that are necessary to see such cases through successfully.<sup>5</sup>

### OBJECTIVES

1. To study the knowledge of resident doctors regarding various aspects of medicolegal cases.
2. To study the factors affecting the knowledge of resident doctors regarding various aspects of medicolegal issues.

### METHOD

A prospective study was conducted over a period of one year from 1<sup>st</sup> September 2014 to 30<sup>th</sup> September 2015. The study population consisted of all the residents working in Emergency Medicine department of SKIMS.

The questionnaire related to the various aspects of medicolegal cases (like registration and reception, informed consent and record keeping) was devised and pretested and distributed among the resident doctors. Oral informed consent was taken from each respondent. Confidentiality was maintained.

### OBSERVATIONS

A total of 120 questionnaires were distributed among the resident doctors working in the Emergency medicine department of SKIMS out of which 105 questionnaires were returned duly filled yielding a response rate of 87.5 %.

Each correct answer was given a score of one while as incorrect answer was given a score of zero. The knowledge score of each respondent was calculated by adding the correct responses.

**Table 1: Showing Working Profile of the Resident doctors**

		Frequency	Percentage (%)
<b>Gender</b>	Male	87	82.9%
	Female	18	17.1%
<b>Department</b>	Medicine	54	51.4%
	Surgery	44	41.9%
	Pediatrics	7	6.7%
<b>Designation</b>	Junior resident	30	28.57%
	Post graduate resident	47	44.76%
	Senior resident	28	26.67%
<b>Years of experience</b>	< 2 years	49	46.67%
	2-5 years	32	30.47%
	>5 years	24	22.86%

**Table 2: Showing Knowledge about Medicolegal issues according to Gender**

Sex	Mean knowledge score	p-value
Male	13.91	0.0001
Female	12.07	

The study revealed that the male residents had higher (13.91) mean knowledge score than the female residents (12.07). The difference between the two groups was found to be statistically significant. (Table 2)

**Table 3: Showing Knowledge about Medicolegal Issues According to Department**

Department	Mean knowledge score	p- value
Medicine	12.78	0.743
Surgery	12.97	
Pediatrics	12.68	

The study found that the resident doctors of surgery department had slighter higher mean knowledge score than the resident doctors of medicine and pediatrics. The difference between the two groups was found to be statistically insignificant. (Table 3)

**Table 4: Showing Knowledge about Medicolegal Issues According to Designation**

Designation	Mean knowledge score	p-value
Junior resident	11.51	0.0001
Post graduate Resident	13.21	
Senior resident	14.22	

The study revealed that the mean knowledge score of senior residents was highest followed by post graduate residents. The junior residents had lowest mean knowledge score .The difference between the two groups was found to be statistically significant. (Table 4)

**Table 5: Showing Knowledge about Medicolegal Issues According to Years of Experience**

Years of experience	Mean knowledge score	p- value
0-2 years	11.92	0.0001
2-5	13.30	
>5	14.58	

The study found that the resident doctors having more than 5 years of experience had highest mean knowledge score (14.58) while as the resident doctors having less than 2 years experience had the least knowledge score.(11.92) The difference between the two groups was found to be statistically significant. (Table 5)

**Table 6: Showing Frequency and Percentage of the Correct Responses**

Question	Frequency of Correct Responses(n=105)	Percentage of Correct Responses
Can a doctor attend a medicolegal case before arrival of police and other legal formalities?	82	78.09%
Is attending doctor duty bound to inform police regarding medicolegal cases?	88	83.80%
A case may be recorded as a medicolegal if it is brought within what hours?	78	74.28%
No fresh injury report is to be made if MLC has already been made in other hospital?	86	81.90%
Can indoor treating doctors label a case, as medicolegal if foul play is suspected later?	69	65.71%
Is Hospital is legally bound to maintain records?	92	87.61%
Medical records of a patient are the property of?	85	80.95%
How long we have to keep records of patient if it is a medico-legal case?	79	75.23%
What are the factors taken into consideration when consent is given?	94	89.52%

**Cont... Table 6: Showing Frequency and Percentage of the Correct Responses**

Children should not be treated (except in emergency) without the consent of parent or guardian.	98	93.33%
What is the minimum age at which a person can give consent for medical examination or treatment?	62	59.04%
Can a doctor treat a patient in case of medical/surgical emergency when patient is not available to give consent nor relatives/ guardians are available?	87	82.85%
When a medicolegal dies, dead body must be handed over to?	83	79.04%
Usually dying declaration has to be recorded by?	89	84.76%
A doctor is justified to disclose the professional secret (privileged communication) to?	93	88.57%
If doctor causes death of a patient due to medical negligence the case is judged in consumer court.	69	65.71%

### DISCUSSION

A questionnaire study involving all the resident doctors of Emergency medicine department was undertaken over a period of one year to study the knowledge of resident doctors regarding various aspects of medicolegal cases. Out of 120 questionnaires distributed 105 questionnaires were returned yielding a response rate of 87.5%.

The study revealed that the senior doctors have better level of knowledge than juniors. Similar results were found by Jasuma J Rai et al.<sup>6</sup> and Anil Haripaya et al.<sup>7</sup> This can be explained by the fact that senior residents have more medical training than postgraduate residents and the junior residents. Also with increase in the years of experience there is increase in exposure to medicolegal cases hence awareness also increases.

The study revealed that male resident doctors had more knowledge regarding medicolegal aspects. This is in consistence with findings of Anil Haripaya et al.<sup>7</sup> It may be attributed to the fact that comparatively males devote more time to routine practice and more frequently face these cases than their female counter parts.

The study also found that resident doctors working

in surgery department had higher mean knowledge score. The similar results were found by Anil Haripaya et al.<sup>7</sup> It may be explained by the fact that surgery department receives more medicolegal cases than any other speciality. Hence by more exposure increased awareness is obtained by the residents working in the surgical department.

The study revealed that 78.09 % resident doctors knew that they can attend a medicolegal case before arrival of the police and other legal formalities 83.30% of the resident doctors knew that the attending doctor is duty bound to inform police regarding medicolegal cases. In the casualty, while attending to an emergency, the doctor should understand that his first priority is to save the life of the patient. He should do everything possible to resuscitate the patient and ensure that he is out of danger. All legal formalities stand suspended till this is achieved.<sup>8</sup> This has been clearly exemplified by the Hon'ble Supreme Court of India in Parmananda Katara Vs Union of India.

The study revealed that 74.28% of the resident doctors knew that there is no time limit for a case to be recorded as medicolegal, 81.90 % of the resident doctors knew that no fresh injury report is to be made if

MLC has already been made in other hospital while as that 65.71% of the residents knew that indoor treating doctors can also label a case as medicolegal if foul play is suspected later. Any case that is in the list of medicolegal cases has to be registered as medicolegal even if several days have passed. At this period opinion regarding the case is to be given according to the present condition of the patient.<sup>8</sup>

Around 87.1% of the residents knew that the hospital is legally bound to maintain records as 80.95 % of the residents had the knowledge that medical records of the patient are property of the hospital while as 75.23 % of the resident doctors knew that medical records are of a medicolegal cases are to be preserved permanently. The hospital medical record is neither property of the clinicians nor of the patients. It is the sole property of the hospital. The patient has no claim over the medical records but with the promulgation of right to information act (RTI), the patient can ask for the details of the report in the respect of the treatment instituted to the patient. The period for which medical records can be retained in the hospital vary from hospital to hospital, depending upon the teaching and training or research facilities available. In general periodicity is: OPD records 5 years, Inpatient records 10 years, medicolegal records permanently. Written records including medical history, chart, notes, radiographs and photographs must be meticulous and it necessary for the documents to be signed and dated. Legally, physician written records carry more weight than patient's recollections. Under article 51 A(h) of constitution of India, there is moral obligation on the doctor and a legal duty to maintain and preserve medical, medicolegal and legal documents in the best interest of social and professional justice.<sup>8</sup>

The study revealed that 89.52 % of the residents had the knowledge that age and mental status of the patient are important factors to be considered when informed consent is to be taken. Around 59.04% of the residents had knowledge that 12 was the minimum age at which a person can give consent for examination and treatment .The factors taken into the consideration for a valid consent are age and mental status. Informed consent requires the patient fully understand the information given but if the patient is debilitated due to a serious mental illness/mental condition, a suitable surrogate should make decision which are in the best interest of the patient.<sup>8</sup>

## SUMMARY AND CONCLUSION

The study revealed that the knowledge of medico-legal issues was higher in male resident doctors as compared to female resident doctors. Resident doctors working in Surgery department had overall high mean knowledge score. Duration of medical training plus years of experience lead to higher mean knowledge scores. Senior resident doctors and also the resident doctors having experience greater than five years had significantly higher knowledge scores.

### Various recommendations' that can be suggested include:

1. The doctors who are involved in treatment of such medico-legal cases need to be more trained in this field. Also due to increase in accidents and violence cases, hospitals have the need for round the clock availability of such medico-legal experts in sufficient number to deal effectively with such cases to better serve laws of land.

2. The periodical CME programmes specially by involving forensic medicine and integrated reorientation programmes should be made compulsory for all doctors in dealing with medicolegal cases.

3. There is a need to increase awareness on the role of clinicians with respect to their ethical responsibilities as providers. There is also a need to formulate standard operating procedure (SOP) in the context of doctors, nurses and police and their respective medicolegal roles.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Sex Determination using Mental Foramen in Chennai Population

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## ABSTRACT

The most challenging task in forensics is the determination of sex from unknown human skeletal remains. Such identification is made easier by the use of radiographs. Determination of sex by using radiographic landmarks such as the mental foramen in dental panoramic radiographs of Chennai population is the purpose of this study. The mental foramen was identified in panoramic radiographs and traced. Superior and Inferior tangents were drawn to the mental foramen. Perpendiculars from the tangents were drawn to the Lower border of the mandible and their lengths are measured (SL and IL). Two sets of measurements were made on each radiograph. The data was obtained, tabulated and compared using statistical analyses. The mean values of SL and IL were significantly higher in males when compared to females. There was no significant difference between the measurements of right and left sides of both males and females. Hence mental foramen can be used as a marker for sexual dimorphism.

**Keywords:** sex determination, mental foramen, panoramic radiographs, forensic anthropology

## INTRODUCTION

Forensic anthropology is a well-established discipline within forensics. It involves the identification of individuals with only their bones when all physical features used for identification are no longer present. Anthropologists help identify victims in mass disasters, genocides and in mass graves. They use differences in the human skeleton to distinguish the sex of the individual. When only a part of the skull is found, mandibular morphological features are taken into consideration. Mandible, being the strongest bone with a dense layer of compact bone is one of the well-preserved bones of the facial skeleton<sup>(1)</sup>. The mental foramen is frequently used as an anatomical landmark in the mandible in forensic radiology. Its bilateral symmetrical presentation in panoramic radiographs is always consistent making it a marker for identification of sex of the individual<sup>(2)</sup>. Morphological features of mental foramen are easily identifiable in panoramic radiographs and can be measured.

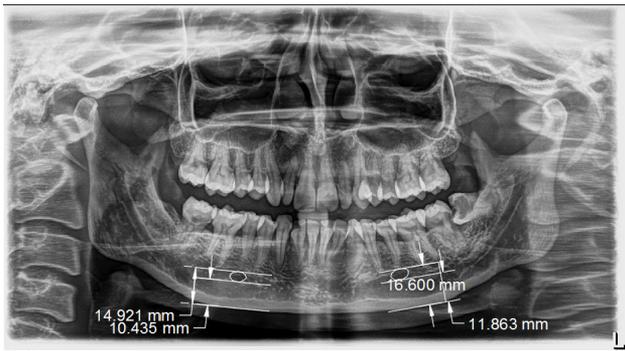
## MATERIALS AND METHOD

A total of 100 panoramic radiographs, consisting of 50 males and 50 females, were examined and selected

retrospectively. 200 mental foramina were analyzed for the study. The inclusion criteria was distinct mental foramen free of any radiographic artifact. The exclusion criteria were distorted images, unidentifiable mental foramen and the presence of artifacts.

200 mental foramina were located in the panoramic radiographs and traced using AutoCAD 2015. Two tangents – one superiorly and one inferiorly were drawn to the traced mental foramen. Similarly, the lower border of the mandible was traced. Perpendiculars from the tangents were drawn to the lower border and the distances (in mm) between them were measured (SL and IL) in both right and left sides. The measured distances were tabulated and analyzed.

Statistical analysis of the data was done using unpaired t – test and the mean and standard deviation of the measured values in males and females on both right and left sides were tabulated.



**RESULTS**

Superior tangent to the Lower border of the mandible (SL):

The mean and standard deviation in males was 18.0782 ± 3.61098 on the right side and 18.0049 ± 3.98981 on the left side [Table 1]. The mean and the standard deviation in females was 15.03170 ± 2.00086 on the right side and 15.49336 ± 2.109762 on the left side [Table 2]. There was no significant change in the SL measurements between right and left side of both males and females.

**Table 1: COMPARISON OF SL BETWEEN RIGHT AND LEFT SIDES IN MALES (mm)**

Sides	RIGHT	LEFT
Number of samples	50	50
Mean	18.0782	18.0049
Standard deviation	3.61098	3.98981
Standard error	0.51067	0.56424
Confidence limits : upper	19.10445	19.13879
Confidence limits : lower	17.05199	16.87101

**Table 2: COMPARISON OF SL BETWEEN RIGHT AND LEFT SIDES IN FEMALES (mm)**

Sides	RIGHT	LEFT
Number of samples	50	50
Mean	15.03170	15.49336
Standard deviation	2.000866	2.109762
Standard error	0.282965	0.298365
Confidence limits : upper	15.60034	16.09295
Confidence limits : lower	14.46306	14.89377

Inferior tangent to the Lower border of the mandible (IL):

The mean and standard deviation in males was 14.86436 ± 2.651171 on the right side and 14.66866 ± 3.502321 on the left side [Table 3]. The mean and the standard deviation in females was 12.11836 ± 1.777334 on the right side and 12.33984 ± 1.859179 on the left side [Table 4]. There was no significant change in the IL measurements between right and left side of both males and females.

**Table 3: COMPARISON OF IL BETWEEN RIGHT AND LEFT SIDES IN MALES (mm)**

Sides	RIGHT	LEFT
Number of samples	50	50
Mean	14.86436	14.66866
Standard deviation	2.651171	3.502321
Standard error	0.417359	0.495303
Confidence limits : upper	15.70307	15.66401
Confidence limits : lower	14.02565	13.67331

**Table 4: COMPARISON OF IL BETWEEN RIGHT AND LEFT SIDES IN FEMALES (mm)**

Sides	RIGHT	LEFT
Number of samples	50	50
Mean	12.11836	12.33984
Standard deviation	1.777334	1.859179
Standard error	0.251353	0.185918
Confidence limits : upper	12.62347	12.70874
Confidence limits : lower	11.61325	11.97094

Comparison of SL and IL measurements in males and females:

Comparison of SL measurements in males and females showed highly significant difference (p<

0.001) [Table 5]. Similar difference was observed in IL measurements of males and females [Table6].

**Table 5: COMPARISON OF SL MEASUREMENTS IN MALES AND FEMALES**

SIDE	t – VALUE	P VALUE	SIGNIFICANCE
RIGHT	5.218	0.000002 (<0.001)	Highly significant
LEFT	3.935	0.000185 (<0.001)	Highly significant

**Table 6: COMPARISON OF IL MEASUREMENTS IN MALES AND FEMALES**

SIDE	t – VALUE	P VALUE	SIGNIFICANCE
RIGHT	5.636	0.00000 (<0.001)	Highly significant
LEFT	3.726	0.000371 (<0.001)	Highly significant

Comparison of SL and IL measurements between the right and left sides in males revealed non - significant differences [Table 7]. Identical results were observed on comparison of SL and IL measurements between the right and left sides in females [Table 8].

**Table 7: COMPARISON OF SL AND IL MEASUREMENTS IN MALES**

SIDE	t – VALUE	P VALUE	SIGNIFICANCE
RIGHT	0.96	0.923	Non - significant
LEFT	0.302	0.763	Non - significant

**Table 8: COMPARISON OF SL AND IL MEASUREMENTS IN FEMALES**

SIDE	t – VALUE	P VALUE	SIGNIFICANCE
RIGHT	1.123	0.264	Non - significant
LEFT	1.194	0.235	Non – significant

## DISCUSSION

Sex determination using the morphometric features of skull and mandible is a frequently researched topic in forensic odontology. Williams and Rogers in 2006 achieved 96% success in determining the sex using different features of the Skull and the mandible. They also attained a 94% accuracy by using constant six traits such as mastoid, supraorbital ridge, size and architecture of skull, zygomatic extension, nasal aperture, and mandibular gonial angle. This indicates that by use of craniofacial morphology the sex of skeletal remains can be determined with a high accuracy<sup>(3)</sup>.

It has been reported that the contour of the lower border of the mandible was the characteristic feature that best permitted the sexes to be distinguished out of 13 nonmetric items of the mandible<sup>(4)</sup>.

Lindh et al. in 1995 and Guler et al. in 2005 suggested that the stability of lower border of mandible does not depend on resorption of alveolar process above the mental foramen. And thus the vertical measurements in panoramic radiography are clinically applicable. Because of the stability of the basal bone and mental foramen, these landmarks were selected as a point of reference for our study<sup>(5)(6) (7)</sup>separated, diffuse, or unidentified type. In a sample of 297 patients, the most frequent appearance was separated (43%).

A study done by Sina Haghanifar et al. on Radiographic evaluation of the mental foramen in a selected Iranian population revealed that the most common locations of the mental foramen are between the two premolars and in line with the second premolar (below and/or mesial to the second premolar).The mental foramina are usually symmetrically located on both sides<sup>(8)</sup>. This results were confirmed by the study of radiographic localization of mental foramen in selected Indian population by Anshuman Suresh Jamdade et al in 2013.<sup>(2)</sup>

In this study, the distances (SL and IL) for the right and left sides of an individual showed that the values were almost similar, with a non-significant difference, and this is applicable for both the male and the female groups. This is similar to the study of Akhilesh et al. Therefore, the distances from any of the sides can be used as a representative for sex determination<sup>(9) (10) (11)</sup>. The distances SL and IL were found to be significantly higher in males than in females. This is similar to

the study of Mamta Malik et al's, Suragimath et al in Maharashtra population and Dr. Priya Shani et al in Gujarat population<sup>(10)(11)(12)</sup>.

### CONCLUSION

From this study it can be concluded that,

Mental foramen can be used as a marker of sexual dimorphism in humans.

The distances between the superior tangent and the lower border of the mandible and the inferior tangent and the lower border of mandible were significantly higher in males when compared to females.

**Conflict of Interests:** The authors declare no conflict of interests.

**Source of Funding:** Self-funding

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# Trends of Death due to Poisoning among Females at a Tertiary Care Centre in North Karnataka

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## ABSTRACT

The present study evaluated the trends of death due to Poisoning among females in Northern Karnataka region for a period of one year, from January 2014 - December 2014 in the Department of Forensic Medicine and Toxicology at Karnataka Institute of Medical Sciences, Hubballi, Karnataka.

There were a total of 60 female cases died due to Poisoning. The highest incidence (36.7%) was seen in victims aged between 11-20 years. 88.3 % were from rural origin and most of the victims were literates and completed High School (50%). Majority of victims (71.7%) belonged to upper lower (Class IV) socioeconomic class and majority of the victims were home maker (68.3%) by occupation. Most common type of poison consumed or used was Organophosphorus Insecticide (68.3%), followed by Carbamates (15%) and Organochlorines (1.7%). Suicidal poisoning (93.3%) was most common among the victims.

**Keywords:** *Poisoning, Insecticides, Pesticides, Suicide, Accidental.*

## INTRODUCTION

Poison is any substance that causes damage or injury to the body and endangers one's life due to its exposure by means of ingestion, inhalation, or contact.<sup>1</sup> Poisoning, self infliction with fire and hanging are the major modes of suicides in India. A poison is a lethal tool in the hands and has been found to be one of the most common methods to end life due to their easy availability and painless death.<sup>2</sup>

In India according to National Crime Records Bureau 2014, more than one lakh persons (1,31,666)

lost their lives by committing suicide. Out of these 26% of the suicides were reported due to poisoning. The highest incidents of 16,307 (12.4%) suicides were reported in Maharashtra followed by 16,122 (12.2%) suicides in Tamil Nadu and 14,310 (10.9%) suicides in West Bengal. In Karnataka 10,945 (8.3%) persons committed suicides during the above mentioned period.<sup>3</sup>

In the Indian scenario, women in particular are expected to make more compromises and adjustments in life as compared to males that sometimes leads to a wide range of emotions such as anxiety, grief, fear and anger. When these emotions cross the acceptable limits, they may result in catastrophic consequences like in ending one's or someone else's life.<sup>4</sup>

These finding necessitates more research into the epidemiology of poisoning in the female gender.

## MATERIALS AND METHOD

The present research was a prospective study

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covering all female cases died due to poisoning which were autopsied over a period of 1 year (January 2014 to December 2014) in the Department of Forensic Medicine and Toxicology at Karnataka Institute of Medical Sciences, Hubballi, Karnataka.

In our study all female cases of unnatural deaths due to suspected poisoning occurred in course of treatment at Karnataka Institute of Medical Sciences, Hubballi and other hospitals in and around Hubballi which were subjected to medico-legal autopsy during the study period were included in this study. Relevant data including age, marital status, religion, type of poison used, was gathered from the relatives of the deceased, autopsy files maintained in the department of Forensic Medicine and Toxicology, Police inquest reports, Forensic Science Laboratory reports and Hospital case records (if available). The manner of death was constructed as suicide or otherwise based on inquest reports of investigating officer.

	Number of Cases	Percentage (%)
Males	119	66.5
Females	60	33.5
<b>Total</b>	<b>179</b>	<b>100</b>

Age group	Cases	%
< 10 Years	0	0
11-20 Years	22	36.7 %
21-30 Years	17	28.3 %
31-40 Years	13	21.7 %
41-50 Years	4	6.7 %
51-60 Years	2	3.3 %
>60 Years	2	3.3 %
<b>Total</b>	<b>60</b>	<b>100 %</b>

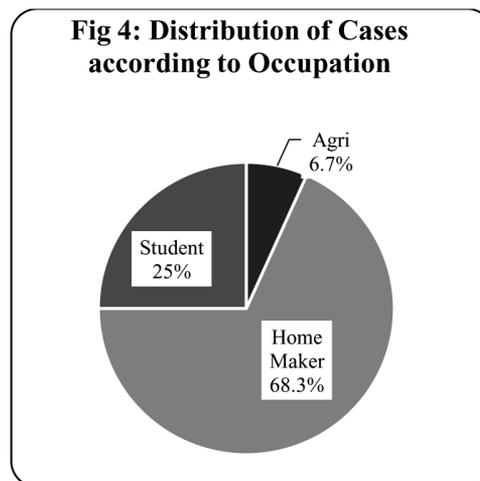
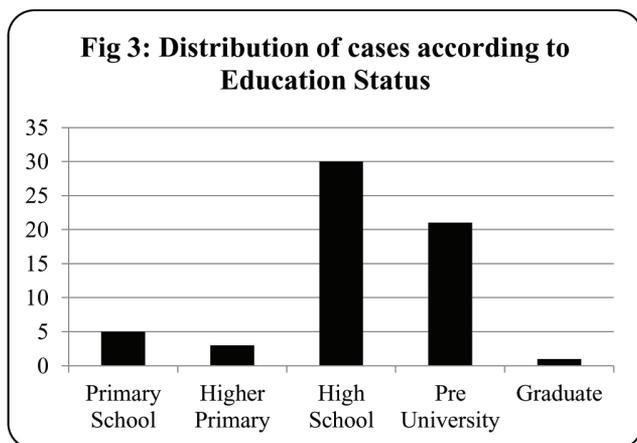
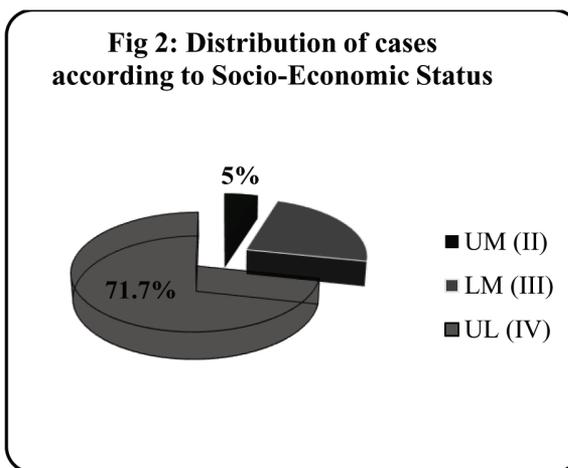
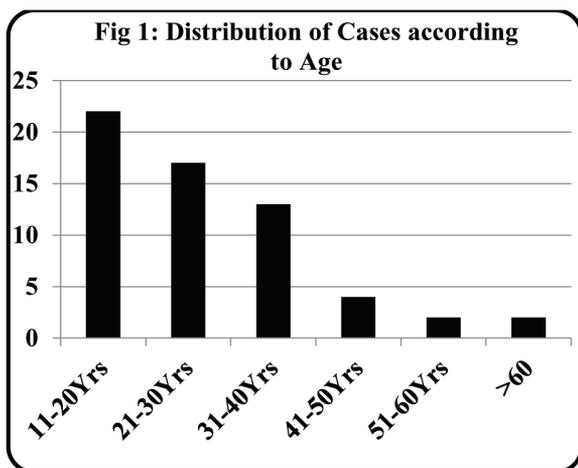
	Marital Status		Residence		Religion		
	Married	Unmarried	Rural	Urban	Hindu	Muslim	Christian
	41 (68.3%)	19 (31.7%)	53 (88.3%)	7 (11.7%)	54 (90.0%)	6 (10.0%)	0 (0.0%)

Type of Poison	Cases	%
Organophosphorus compounds	41	68.3
Organochlorine compounds	1	1.7
Carbamate	9	15
Sedatives	2	3.3
Phosphides	2	3.3
Corrosives (HCl)	1	1.7
Imidacloprid	1	1.7
Paraquit	2	3.3
Pyrethroids	1	1.7
<b>Total</b>	<b>60</b>	<b>100</b>

Duration of Stay	Number of Cases	Percentage (%)
Brought dead	11	18.3
< 24 hours	21	35
2 days	10	16.7
3 days	10	16.7
4 days	3	5
> 4 days	5	8.3
<b>Total</b>	<b>60</b>	<b>100</b>

**Table 6: Distribution of cases according to manner of Poisoning**

Manner	Cases	Percentage (%)
Accidental	4	6.7
Suicidal	56	93.3
Homicidal	0	0
<b>Total</b>	<b>60</b>	<b>100</b>



**RESULTS AND DISCUSSION**

A total of 1244 medico legal cases were autopsied in the department of Forensic Medicine and Toxicology, Karnataka Institute of Medical Sciences, Hubballi during the study period, out of which 179 cases of deaths due to poisoning was observed constituting 14.39% of total cases.

In our study out of 179 cases, 99 were males (constituting 66.5% of total cases), and 60 were females (constituting 33.5% of total cases) with a male to female

ratio of 1.65:1. (Table 1). This scenario is similar to the study done by Abubakar S et al, where there were 59.4% males and 40.6% females and the M:F ratio was 1.46:1.<sup>5</sup> Whereas a much higher M:F ratio of 3:1 and 6.1: 1 was observed by Ramesha KH et al<sup>6</sup> in a tertiary care centre in Karnataka and Guntheti BK and Singh UP<sup>7</sup> respectively. Lesser involvement of the females as compared to males is probably because of lesser involvement in outdoor activities and lesser exposure to hazardous substances, possibly because of their working habits and lifestyle as compared to males.

Overall the majority (36.7%) of poisoning deaths were in the age group of 11-20 years, followed by 21-30 years (28.3%) and 31-40 years (21.7%). The least commonly affected were 51-60 years and more than 60 years age group (3.3% each). (Table 2) The findings of the present study are in accordance with Gupta et al<sup>8</sup>, Gargi et al<sup>9</sup> and Palimer<sup>10</sup>. The reason of age group 21 to 30 years being more involved as this age group are the working population of the society, they have to undergo both physically as well as mental stress hence more prone during life. Conversely, the lesser involvement of 50 years and above is probably because of lesser responsibilities/stresses of life and comparatively harmonious time period of one's life.

Majority of the victims in our study were followers of Hindu religion (90%) as compared to followers of Islam religion (10%), majority of the victims were married (68.3%) and most of the victims were from rural back ground (53%). (Table 3). These are consistent with the authors.<sup>11,12</sup> Hindu predominance may be due to the fact that major population is of Hindu religion in our region. Most of the victims were from rural region as majority of the patients to the hospital are from rural area. Great incidence of poisoning cases among the married women can possibly be explained by the fact that after marriage a person has to bear more responsibilities especially women as they have to adjust in a new family.

According to B G Prasad's socioeconomic scale – 2014,<sup>13</sup> in our study highest number of cases (71.7%) belonged to upper lower (Class IV), followed by lower middle (Class III) (23.3%) socioeconomic class. (Fig 2). These are consistent with the authors<sup>14,15</sup> and it is contradictory to the study carried by Kumar S et al in which middle class victims are common followed by lower class.<sup>16</sup> Low socioeconomic group are more vulnerable which may be due to they are under continuous financial stress or other stress during their life.

Most of the victims were literates, of which 5 (8.3%) discontinued after primary and 3 (5%) after higher primary education, 30(50%) completed High school, 21(35%) studied up to pre-university and 1(1.7%) completed graduation. (Fig 3). Majority of the victims were Home makers (68.3%) and students (25%). (Fig 4). Men are the working population who work outside and women will be doing house hold things, this factor might have bearing of the greater involvement of Home

makers.

Regarding the type of poison consumed or used, overall a large number of cases were due to organophosphorus compounds i.e. 41 cases (68.3%). The next most common type of poison used was carbamates 9 cases (15%) and Sedatives, Phosphides, Paraquit 2 cases each. (Table 4). These are consistent with the authors<sup>17,18,19</sup> who conducted studies in Southern part of India. As agriculture is the main occupation of the people and Organophosphorus compounds were commonly used pesticides in this locality and their easy availability and improper storage in the house made it most common type of poison.

The duration of hospital stay preceding the death were lesser than 24 hours in 21 cases (35 %), while 11 cases (18.3 %) were brought dead, followed by 10 cases (16.7%) each who survived 2 and 3 days. (Table 5)

As regards to the manner of poisoning, an overwhelming number of cases were suicidal in nature 56 cases (93.3%). A small percentage of cases 4 cases (6.7%) were accidental in nature. (Table 6). These are consistent with Maharani et al, Mrinal et al, Kumar et al, Gargi et al.<sup>20,21,22</sup>

## CONCLUSION

The problem of poisoning in females is a major health issue that should be considered seriously from all aspects. The occurrence of suicidal attempts by females with poison has highlighted this issue again. Adding further to the problem is the easy access of poisons like organophosphorus insecticides that are easily available in the market and lack of knowledge regarding their proper use and taking safety measures in storing them will add up to the problem. The public are to be educated in managing the stress of their life. Sincere efforts should be made to educate the rural population and address their problems so as to bring harmony in their lives and prevent the loss of lives.

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# A Systematic Analysis of Medicolegal Radiological Investigations and Quantification of the Burden of Court Evidences on Radiology Department of a Tertiary Level Teaching Institute of North India

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## ABSTRACT

**Objective:** To systematically study the pattern of medico-legal cases (MLC) undergoing radiological investigations and to quantify the burden of MLC's.

**Materials and method:** In this retrospective study carried out in our institution between January 2009 and May 2017, all the MLC's details regarding nature of investigation, date, time, age, part examined, pattern of injury etc were manually collected and studied. Data was also collected for the time consumed by radiologists in carrying out MLC related activity.

**Results:** The total of 1629 Medico legal radiological investigations (MLRI) were done. Age range of MLCs was 1 to 90 years (mean 35 years, S.D 15 years) with males accounting for 71.5% and females for 28.5% cases. Radiographs comprised bulk of investigations (N=1301, 79.8 %), followed by CT (N=272, 16.7 %) and Ultrasound (MLU) (N=56, 3.4%). Fracture was the most common abnormality (N=251, 83.6%). Total time spent in delivering court evidences by radiologists in the study duration was 757 days.

**Conclusions:** Health institutions deal with substantial number of radiological MLC's with average of approximately MLRI 192 per year. Vast majority of the abnormal investigations are Radiographs and fracture is commonest abnormality detected. The average number of days devoted to MLC work by radiologists is 90 per year.

**Keywords:** Medico-legal evidence, Radiology evidence, court evidence

## INTRODUCTION

Government health institutions in India deal with large number of MLCs. Majority of these undergo radiological investigations like X Rays, CT scan or Ultrasound. There is no study till date which systematically analyses the pattern of injuries reported

in such Radiological evidences. Furthermore it has never been attempted to quantify the burden of these MLRIs on the health care system in terms of Radiologist's working time lost in attending and travelling to courts. The present study is the first of its kind in literature which seeks to answer these questions.

## MATERIALS AND METHOD

This is a retrospective study carried in department of Radiodiagnosis of our institute after approval by institutional scientific committee. The MLC registers were studied in detail for patient records between January 2009 and May 2017 and all relevant details were recorded and analysed. Inclusion criterion was: all

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medicolegal radiological investigations (MLRI) in the above time period. Exclusion criteria were- Post mortem MLRI, cases with incomplete/illegible data; cases with imaging done outside our institute. Out of a total of 1184 MLC's entered, 44 cases not fulfilling the exclusion criteria were rejected and 1140 cases were ultimately included in the study. Data was collected separately from the attendance registers for the number of days spent by radiologists in attending court evidences and travel associated with these evidences.

### RESULTS

During the time duration of our study, 1140 MLCs presenting to our department underwent a total of 1629 MLRIs. The age of cases ranged from 1 yr - 90 yrs (mean age- 35 years; S.D- 15). Maximum cases were

in the age group of 31-40 years (N= 319,27.98 %), followed by 21-30 years (N=308, 27.01%). The least number of cases were in the extreme age groups of >80 years (N=5, 0.44%) and 0-10 years (N=32, 2.81%). The male: female ratio in our study was 2.5:1.

Medicolegal radiographs (MLR) comprised the bulk of investigations (N=1301, 79.8 %), followed by medicolegal CT (MLCT) (N=272, 16.7 %) and medicolegal Ultrasound (MLU) (N=56 %, 3.4%).

Fracture was the most common abnormality (N=251) comprising 83.6% of all abnormal MLR and MLCT (N=300).

The region wise distribution and pattern of various findings encountered are summarized from Tables 1 to 6 given below:

**Table 1: Distribution and pattern of findings in MLRs of Head Neck region**

X Ray type	Total			No of Abnormal X rays	Distribution of fractures		Other findings	
Skull	224	AP and Lat views	170	11	Frontal and Parietal bones	2 each	Sclerotic mastoiditis	1
		Specialized views	54		Other bones *	6		
Other views	12	Orbits(PA) & STN (lateral)	6 each	1	orbital wall	1	-----	
Nasal bone	51 (All lateral)			12	Fracture nasal bone-12		-----	
Mandible	21(AP and oblique)			7	Rami		5	
			Angle & Body		1 each			

\*parietal, temporal, occipital, maxilla

**Table 2: Distribution and pattern of findings in MLRs of spine/pelvis region**

X Ray		Total X Rays	Abnormal X Rays	Distribution of fractures		Other findings
Spine (AP& Lat)	Cervical Spine	21	Nil	Nil		Nil
	Dorsal Spine/D-L soine	26	6	D11 and D12 bodies		
	Lumbosacral Spine	37	5	L1,L2 bodies, L1 - L5 transverse processes		Anterolisthesis L5 upon S1
	Sacrococcygeal	2	1	Coccyx		----
Pelvis (AP)		30	6	Ischiopubic ramus, Hemipelvis, Hip	1 each	Multiple shotgun pellets in soft tissues-1
				Neck femur	2	

**Table 3: Distribution of MLRs and pattern of findings in Chest and Abdomen**

X Ray	Total		Abnormal X Rays	Distribution of fractures	Other findings			
	PAV	151						
CXR	184	Other views (Lateral, AP, Oblique)	33	24	Rib fractures	14	Pleural effusion	5
							Lung collapse	1
					Clavicle	4	Lung consolidation	2
							Subcutaneous emphysema	1
				Scapula	1			
Clavicle	4 (All AP)		Nil	-----		-----		
Abdomen	4 (Erect and Supine)		1	-----		Pneumoperitoneum with small bowel obstruction- 1		

**Table 4: Distribution of MLRs and pattern of findings in upper extremities**

X Ray Body part	Total Xrays	Abnormal X Rays	Fractures		Other abnormal findings	
Hands (PA and oblique)	131	36	5 <sup>th</sup> Metacarpal (commonest)	9	Amputation of phalanx	1
			Other bones*	25	Injury (thumb epiphysis)	1
Wrist or wrist with distal forearm (PA and lateral)	59	18	Distal Radius	13	-----	
			Distal ulna	2		
			Metacarpals	3		
Forearm/ Forearm with elbow (AP and lateral)	97	15	Distal shaft radius	4	Radio-Ulnar dislocations- 2	
			Mid shaft ulna; both bones	2 each		
			Other forearm bony parts**	5		
Humerus (AP and Lateral)	19	2	Mid shaft humerus-2			
Shoulder/Shoulder with proximal Humerus (AP and lateral)	72	12	clavicle	6	Dislocation, Sprengels deformity (1 each)	
			scapula	3		
			Neck of humerus	1		

\*Distal Radius, Phalanges, 1<sup>st</sup>-4<sup>th</sup> metacarpals, Carpal bones

\*\*Radius head, olecranon, proximal ulna, ulnar styloid, unicortical ulnar,

**Table 5: Distribution of MLRs and pattern of findings in lower extremities**

X Ray	Total	Abnormal X Rays	Distribution of fractures		Other findings
Foot/ankle	50 (AP and Lateral)	6	Bimalleolar, Calcaneum & Metatarsal	1 each	Infective arthropathy-1
			First Phalanx	2	
Leg with ankle	72 (AP &Lateral)	34	Tibia & Fibula	17	-----
			Distal Fibula	10	
			Distal Tibia	7	
Knee/Knee with thigh or leg	65 (AP and Lateral)	12	Condyles	9 (Tibial 7, Femoral 2)	-----
			Upper fibula	1	
			Patella	2	
Femur/Femur with knee	34(AP and lateral)	11	Femur	9 (mid-6, prox2,distal1)	-----
			Tibial condyle, Pubic rami	1 each	
Hip joints	30(AP)	5	Proximal femur	2	Hip dislocation-1
			Femur neck, iliac bone	1 each	

**Table 6: Distribution and pattern of findings in MLRCT Head**

Total	Abn	Distribution of Abnormal findings								
		Traumatic				Non traumatic findings				
		Fractures		Other traumatic injuries						
251	63*	35	Calvarial bones	Frontal7,Parietal 6, temporal 4,Ocipital 2	34	Contusions	14	14	Lacunar infarcts	1
						Subdural hematoma	4		Cerebral atrophy	6
						Subarachnoid hemorrhage	2		Hydrocephalus	1
						EDH, DAI, Cerebral edema,Pneumocephalos	1 each		Basal ganglia Calcifications	3
						Scalp hematomas	10		Calcified granulomas	3
			Multiple bones	6						
			Orbit,maxilla	2 each						
			Nasal bone	6						

\*Some patients had multiple findings

During the time duration of 8 years and 5 months of our study, total number of days spent in delivering court evidences by radiologists was 757; equivalent to 7-8 days per month or 90 days per year.

**DISCUSSION**

Medicolegal evidences are an important, albeit

less acclaimed part of workload in all Radiology departments in Government sector. The potential for use of Radiological investigations in jurisprudence was realized soon after invention of X rays. Within weeks after their discovery, X rays helped in convicting a murderer by demonstrating bullet fragments lodged in the victim’s leg. <sup>[1,2]</sup>

Legal legitimization of X Ray film as a piece of credible evidence was an important milestone.<sup>[3]</sup> Imaging technology has progressed tremendously since then and application of modern imaging techniques in forensic medicine led to development of disciplines like Forensic Radiology. The main applications of this field are in establishing identity; cause of death; age determination; virtual autopsy; identifying injuries, foreign bodies (pellets, shrapnel, smuggled goods etc.)<sup>[4]</sup>

Although most of forensic radiography evidences are used in post mortem scenario<sup>[5,6]</sup>, clinical radiology also has proved useful in providing evidences in cases of non fatal injuries arising from assault, road side accidents, medical malpractice etc.<sup>[6,7]</sup>

Since a grievous hurt is defined under section 320 of Indian penal Code (IPC) as a fracture/dislocation of bone or tooth<sup>[8]</sup>; its radiological demonstration is of paramount importance. The primary role of clinical radiology in such cases is to document the presence or absence of fracture.<sup>[4]</sup> The bulk of MLC work in a Radiology department is therefore constituted in acquiring and reporting the Medico-legal radiographs for presence or absence fracture. Another important aspect is determination of biological age from radiographs.<sup>[9]</sup>

Advanced modalities like CT scan are increasing being used in jurisprudence to establish injuries to visceral organs or detection of occult fractures. Neuroimaging techniques like CT head, MRI and PET are now being used to support expert testimony for mental health or to support insanity defences.<sup>[10]</sup>

Currently there is no available literature on the radiological profile of MLC's or on the quantification of time duration spent by radiologists in attending court duties to give evidence in such cases. This study is designed to answer both these queries.

A total of 1629 MLRIs done during the study duration were analysed. Out of these, 1301 were X Rays; 272 were CT and 56 were USG. X Rays were thus by far the commonest MLRI, constituting 79.8% of total, followed by CT (16.7 %) and USG (3.4 %).

A wide age range was observed for the MLCs ranging from 1 year (youngest) to 90 years (eldest) with mean age of 35 years.

Vast majority of cases in the study were adults (N=1097, 96.2%) and children/adolescents (age <18

years) accounted for just 3.8% (N=43) cases. In this study, males outnumbered the females by a ratio of 2.5:1 (Males= 815, Females= 325)

Further discussion is detailed under the following headings:

#### **MEDICO LEGAL RADIOGRAPHS:** (Tables 1 to 5)

Skull (AP and/or True lateral) was the most frequently done X Ray (N= 208, 15.9%), followed by CXR (N=184, 14.1%). X rays of Sacrococcygeal spine, abdomen, orbit, and STN (soft tissue neck) were among the least common constituting just 0.15%, 0.3%, 0.38% and 0.46% of total X rays.

#### **Skull and facial bones**

The number of positive cases on skull X rays was quite less (N=11, 5%). In fact low positive yield of Skull X rays is a well known limitation.<sup>[11]</sup> This is due to greater number of head injuries being of trivial nature and partly due to nondetection of some fractures in anatomically complex areas of skull like skull base. Among the skull X Rays which showed fractures; frontal and parietal bone involvement was most common (18% each).

Among facial bones; fractures of nasal bone and mandible accounted for the bulk of findings, comprising 23 % and 33 % of these radiographs respectively. This is in keeping with other studies in literature.<sup>[12,13]</sup>

#### **Spine and pelvis:**

X ray of Lumbosacral spine was the commonest (31.8%) and sacrococcygeal spine the least common MLR (1.7%). The dorso-lumbar junction was most common site for spinal injuries with fractures of D11 to L2 constituting approx 66 % of total spinal injuries in our study. This is because the region between D9 and L2 is a transition zone between a rigid kyphotic thoracic spine and the flexible lordotic lumbar spine and is a commonly injured.<sup>[14]</sup>

#### **Upper extremities**

X rays of hands accounted for a large majority (43.3%) and fracture of 5<sup>th</sup> metacarpal was the commonest hand injury (N=9, 26%). Existing literature also lists metacarpal fractures the commonest hand fractures.<sup>[15]</sup> Fractures of carpal bone; digit amputation

and epiphyseal injury were the least common injuries (N=1, 3% each) noted.

In the wrist/forearm region, fractures of distal radius expectedly accounted for a majority of injuries (N=11, 57.8% in wrist X rays; N=4, 26.6% in distal forearm X Rays) as fracture of this area is known to be common injury with FOOSH (fall onto an outstretched hand) being the underlying cause.<sup>[16]</sup>

#### **Chest and Abdomen:**

CXR was the second most common MLR done after skull (N=184, 13.4%) and PAV was the commonest view (N=151, 82% of all CXRs). Specialized views like Right/left oblique were infrequent (1.6% and 1.1% respectively). Rib fractures was the commonest injury (N=14, 58.3%).

X rays of abdomen were among the least requested MLRs (N=4) and only one showed abnormality in form of pneumoperitoneum.

#### **Lower Extremities:**

MLRs of lower extremities comprised 19.3% of total MLRs (N=251) with X rays of leg with ankle being the commonest (N=72, 28.7%) followed by knee/knee with lower thigh (N=65, 25.9%). Abnormal radiographs constituted 27.1% of all lower extremity X rays (N=68) with most prevalent being fracture injuries of both tibia and fibula 25 % (N=17).

#### **CT SCAN (Table 6)**

A total of 272 MLCTs were done in our study with non-contrast CT head accounting for 92.3%.

The percentage of abnormal CT heads were 25.1% (N=63) with many cases showing multiple findings. Most common finding was fracture of skull and/or facial bones seen in 35 cases (55.5% of abnormal). Frontal; parietal and nasal bones were the most commonly fractured bones (20% and 17.1%). Occipital bone, orbit and maxilla were relatively less commonly fractured (N=2, 5.7% each).

Other traumatic intracranial injuries were also seen like- hemorrhagic contusions (N=14, 41.2%); SDH (N=4, 11.8%) and SAH (N=2, 5.9%).

A total of only 21 extra cranial MLCT's were also done for miscellaneous body parts, with CT spine being

the most frequent (N=7, 2.5%).

#### **Ultrasound**

USG was the least frequently done MLRI with abdomen being the most frequent USG (N=31, 55.3%), followed by antenatal (N=12, 21.4%) and USG Pelvic organs (N=11, 19.6%). Findings were diverse and ranged from urolithiasis (N=2), Horseshoe kidney (N=1), cystitis (N=1), fibroid uterus (N=2), epididymo-orchitis (N=1) etc.

#### **TIME CONSUMED IN COURT DUTIES**

During the period of 8 years and 5 months (101 months) constituting our study interval, a total of 757 days were spent for court evidence related activity by all radiologists (consultants/senior residents). This is equivalent to 7-8 days per month or 90 days (3 months per year).

A substantial time of senior radiologists was thus consumed in deliverance of court evidences which could have been utilized for patient care if evidences were conducted through telemedicine linkage with the courts (video-conferencing) instead of a physical appearance of radiologist in the court premises. Greater effort in this direction needs to be done by the department of Information and technology, ministry of health and family welfare to promote tele-evidence by integration of telemedicine and telejustice. Encouraging results have been achieved by PGIMER Chandigarh by using tele-evidence to attend court summons. The need of the hour is to fully integrate tele-medicine with tele-justice in all medical colleges and district level hospitals on pan India basis and completely replace physical deliverance of evidences of radiologists by tele-evidence. This will result in optimum utilization of radiologist's time for patient care; delivering speedy justice and also minimise the financial liabilities of government in the long run.

#### **CONCLUSION**

Radiology departments of health institutions do a variety of medico-legal investigations which besides putting additional workload, consumes a considerable time of radiologists in attending subsequent testimonies in courts. Implementation of tele-evidence can be immensely useful in saving quality time of radiologists which can be better utilized in patient care.

**Conflicts of Interest:** NIL

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# A Profile of Electrocution Deaths

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## ABSTRACT

Electricity is essential for modern human life and is extensively used for domestic and occupational purposes both in developed and developing countries. Electrical injuries are becoming an emerging health problem in low-income countries due to extensive usage of electricity by general public and less awareness of safety issues among them. The present study is a retrospective study undertaken in the Department of Forensic Medicine and Toxicology, Karnataka Institute of Medical Sciences, Hubballi, to determine the electrocution deaths brought for autopsy during the period of January 2015 to December 2017. Total 34 cases were studied and it was observed that all electrocution-related deaths are accidental in nature, common in males between age group of 21-30 years. Workplace and household surroundings are commonest place of accidents, and electric cable wires are the commonest agent. The most common sites of electrical contact wound were the upper extremities, abrasions and contusions were the most common non fatal mechanical injuries in electrocution deaths. In conclusion, death due to electrocution should be investigated properly for the purpose of compensation and safety measures as it is one of the preventable causes of death.

**Keywords:** *Electricity, accidental, electrical contact wound, safety measures, preventable.*

## INTRODUCTION

Electricity is essential for modern human life and is extensively used for domestic and occupational purposes both in developed and developing countries<sup>1</sup>. It has become an important part of our day to day activities and exists wherever we work, live or play. Interestingly, electricity is not a human invention, as it is observed in nature in the form of lightning<sup>2</sup>. Human body conducts electricity and if any part of the body comes into contact with any unprotected electrical source, the electricity will flow through the tissues with little obstruction often leading to fatal outcome<sup>3</sup>. Electrical injuries are becoming an emerging health problem in low-income countries due to extensive usage of electricity by general public and less awareness of safety issues among them<sup>4</sup>. Almost all fatalities by electrocution are accidental,

while homicides and suicides from electricity are rare or uncommon<sup>5</sup>.

Deaths due to electrocution involves both low- and high-voltage currents, however most deaths are due to low- voltage currents used in houses, and minor industrial settings<sup>6</sup>. India uses 220-240 V, 50 Hz alternating current<sup>5,1</sup>. The first case of electrical fatality with alternating current (AC) of 250 volts was recorded in France in 1879<sup>5</sup>.

It is often wrongly assumed that a 1000volts shock would be more deadly than 100 volts shock. There is also a misconception that normal household current and power lines are not lethal since they are insulated<sup>7</sup>. Hence, it is the amount of current (amperes) forced through the body, and not the voltage which causes electrocution<sup>8</sup>. Electrocutions may result from a source which is usually considered as nonlethal such as a faulty overhead power line or an open socket<sup>9,10</sup>.

Data on accidental deaths and suicides in India (2012) have reported that 8945 and 8750 individuals were electrocuted in 2011 and 2012 respectively. Therefore, electrocutions contributed to 2.2% of total

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accidental deaths during those two years<sup>11</sup>. It was reported that accidental deaths are highest from Pondicherry compared to the Indian national average<sup>11</sup>. Electricity is a ubiquitous energy agent and people in different daily activities deal with it. Many people know that the principal danger from electricity is that of electrocution, but very few really understand how minute quantity of electrical energy is required for electrocution. It is hoped that this study will serve as a valuable resource for concerned authorities to implement some safety measures to prevent electrocution deaths.

## MATERIAL AND METHOD

This study was performed in department of Forensic Medicine & Toxicology at KIMS, Hubballi. The data was collected retrospectively from the police inquest and autopsy reports from January 2015 to December 2017. Finally, the obtained data were tabulated and analyzed.

## DATA ANALYSIS

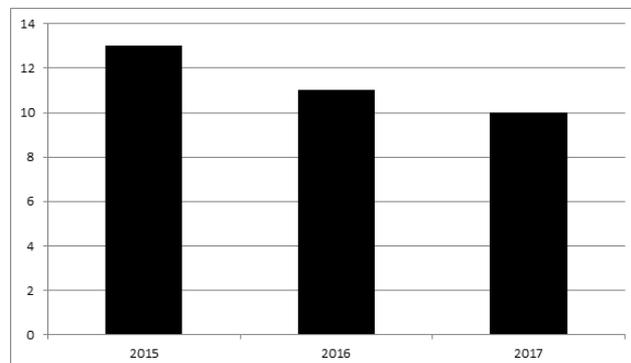
Data analysis was performed by SPSS (version 22), and results were presented as frequency and percentage in figures and tables.

### Ethics:

Confidentiality of patient's information was maintained when data were obtained from the medical records. All guidelines of the declaration of Helsinki were observed in all stages of the study.

## RESULTS

Overall, 34 electrocution deaths occurred from January 2015 to December 2017.



**Fig:1 - Frequency of electrocutions by the year of death**

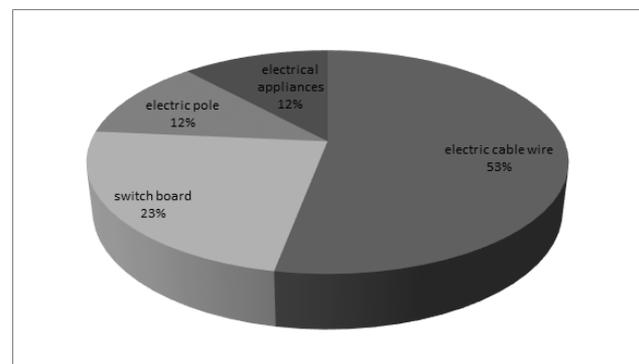
Majority of the victims were males 26 (76.47%) and 08 (23.53%) females. Most of the victims belonged to the age group of 21-30 years 19 (55.88%), followed

by 11-20 years 06 (17.64%), 04 (11.76%) belonged to 31-40 years, 03 (8.82%) between 51-60 years and one case each between 41- 50 years and above 60 years respectively.

The incidents were higher in urban areas 20 (58.82%) when compared to rural areas 14 (41.17%) and the presentation was higher during rainy season 13 cases (38.23%) and winter seasons 12 cases (35.29%) between 6am to 6pm.

In our study all cases were accidental in nature and majority were brought dead to KIMS, Causality, Hubballi and only 03 cases out of 34 were hospitalized and survived for less than 72hours. The place of occurrence was highest at workplace and household surroundings 14 cases (41.17%) each and 3 cases (8.82%) occurred roadside associated with fatal accidents.

The type of object or material causing electrocution was electric cable wire in 18 cases (52.94%), switch board contact in 08 cases (23.52%), electric pole in 04 cases (11.76%) and electric appliances such as water heating coils and water pumping motors in 04 cases (11.76%).



**Fig:2 - Type of object or material causing electrocution**

Electric contact wound was present in 31 cases (91.17%), no external injuries were noted in 03 cases (8.82%). Mechanical injuries such as abrasions and contusions were present in 11 cases (32.35%), skull fracture associated intracranial hemorrhage was noted in 01 case.

Fourth and fifth degree burns with cooking and charring was noted in 02 cases (5.88%), and infected burns were present in 02 cases (5.88%).

**Table no: 1- Distribution of electric contact wound on the body**

S.NO	AREA OF INVOLVEMENT	NO.OF CASES	%
01.	Upper extremities only	12	38.70
02.	Lower extremities only	04	12.90
03.	Chest only	01	03.22
04.	Upper and lower extremities	06	19.35
05.	Chest and extremities	04	12.90
06.	Whole body involvement	04	12.90

### DISCUSSION

In our study, details such as the age, gender, place of incidence, seasonal variation, entry mark and manner of death were recorded in all cases of electrocution deaths. These findings were tabulated and then compared with similar studies conducted around the world.

According to studies done in India electrocution deaths are mainly caused by contact with low voltage domestic supply, but the fatalities due to contact with high voltage supply has been lately on the rise.

Poor educational status, difference in weather conditions, accessibility of electricity, and negligent handling of electrical appliances/utensils are the main factors responsible. Marked variations in public awareness about electrical hazards, precautions, and safety measures have also contributed to variable incidence of electrocution.

In our study the incidence of fatal electrocution was 2.72% which was close to Gupta et al<sup>12</sup> (2.02%) and Rajit et al<sup>7</sup> (1.98%) study results done in India. Majority of the victims were males (76.47%) which are consistent with findings of most other authors<sup>(6, 13, 14)</sup> perhaps due to more exposure of men to electric hazards compared to females. According to our data, the vulnerable age for electrocution related deaths is between 21-30 years (55.88%) which is consistent with the study done by Reddy et al<sup>13</sup> and least number of cases were reported in extremes of ages. When compared with other studies only few have narrowed their age range like our study,

between 21-30 years<sup>5,15</sup>, but most of them categorized under wider age range either between 21-40 years<sup>7</sup> or between 20 and 50 years<sup>10, 16</sup>. Regarding the seasonal and diurnal variations, higher incidences were recorded in the rainy season (38.23%) and majority of incidences happened during day time (38.23%), which is consistent with the observations made by Gupta et al<sup>12</sup> and Kumar et al<sup>14</sup>; however Saha KK and Joe<sup>5</sup> and Sheikazadi<sup>17</sup> found higher incidences in summer season.

It was noted that all the electrocuted deaths were accidental in nature and the findings of our study are consistent with study by Reddy et al<sup>13</sup>. Majority of the cases were found dead at the scene of accident or were declared as brought dead on arrival to the hospital (91.17%) and similar findings are noted in studies done by Ragui et al<sup>15</sup>, Sheikazadi et al<sup>16</sup>. While studying the place of occurrence, equal number of accidents was noted at workplace and household surroundings (41.17%), which is in contrast with the study done by Kumar S<sup>14</sup>, where the place of occurrence was highest at workplace followed by household accidents.

Considering the contact details, deaths were caused most frequently by touching electrical wire cables (52.94%), followed by switch board contact (23.52%) similar to the study by Kumar S<sup>14</sup>, but in study done by Biradar G et al<sup>6</sup> electric pole was the main source of contact.

Electric contact mark was majorly seen over the upper extremities (38.70%), specifically on palms and fingers similar to most of the other studies<sup>6,7,15,1</sup>. This is because most of the times people handle electrical appliances with bare hands and work without using any insulating materials of footwear. No electric contact wound was present in three cases and still death was declared due to electrocution; based on history, circumstantial evidences, associated injuries, histopathological findings and investigations. It was noted that two cases showed extreme burns with cooking and charring with whole body involvement and 32.35% of the cases showed electrocution with associated mechanical injuries.

Strength of our study lies in the fact that no such study has been conducted so far in and around Hubballi area on this subject.

This study has certain limitations, it is a retrospective study, so finer details of electrocution

from eyewitnesses (family members, autopsy surgeons) and resource persons were not available; a prospective study would have been ideal for uncommon events like electrocution-related fatalities. Small sample size was another drawback; hence it was not sufficient to make any generalization.

### CONCLUSION

All electrocution-related deaths are accidental in nature, common in males between age group of 21-30 years. Workplace and household surroundings are commonest place of accidents, and electric cable wires are the commonest agent. The most common sites of electrical contact wound were the upper extremities, abrasions and contusions were the most common non fatal mechanical injuries in electrocution deaths.

In conclusion, death due to electrocution should be investigated properly for the purpose of compensation and safety measures, but autopsy diagnosis of electrocution as a cause of death is a great challenge for autopsy surgeon, since only 50%-60% of cases have definitive entry and exit marks, in some case the suspected marks have to be confirmed by histopathology or by electron microscopy. In some cases, the examination of the scene, clothing, shoes, gloves and headgear gives us some information. Hence in all cases of suspected electrocution, detailed examination of crime scene and autopsy may help us determine the manner and cause of death.

### Safety:

Regulations and safety campaigns have to be progressively implemented aimed at minimizing unintentional deaths from electrocution, whether in the workplace or at home. Parents and other adults need to be alert to possible electric dangers in the home. Damaged electric appliances, wiring cords and plugs should be repaired or replaced. Electrical repairs should be attempted only by people with the proper training. Electrical appliances should not be brought in contact with water or should not be touched with wet hands. Young children need to be kept away from electric appliances and should be taught about the dangers of electricity as soon as they are old enough. Electric outlets should require safety covers in homes with young children.

### Conflict of Interest: Nil

### Source of Funding: Self

**Ethical Clearance:** Taken from the intuition Ethical Clearance Committee.

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# Tobacco Addiction: A Survey of a Group of Students

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## ABSTRACT

**Objective:** Tobacco use is one of the most serious threats to global public health. The objective of our survey was to study the addictive behavior of tobacco among pharmacy students of the Faculty of Medicine and Pharmacy, Rabat, Morocco.

**Method:** The evaluation of nicotine addiction was carried out by the “Fagerström Questionnaire”. Our study targeted 431 students from the first and second year at the faculty of pharmacy. The statistical analysis was performed by the SPSS V19 software. The significance threshold was determined by chi-square test, a value of  $p < 0.005$  was considered statistically significant.

**Result:** The occurrence of smoking was 8.89%. Tobacco dependence was seen in more than half of our tobacco consumers, 30.3% of the subjects were weakly dependent on nicotine, 21.2% were moderately addicted and 6.1% of the students were heavily addicted.

**Conclusion:** The surroundings, the male sex, and an association of alcohol, cannabis, and other drugs are the major factors behind the increased use of tobacco.

**Keywords:** *Smoking, Fagerström, nicotine addiction, students of pharmacy, smoking prevalence*

## INTRODUCTION

Tobacco consumption is one of the most serious threats to global public health. More than 6 million people die each year as a result of smoking, this number could reach 7.5 million, or 10% of all deaths in 2020<sup>[1]</sup>. In Morocco, according to several studies on the prevalence of smoking, the rate differs according to socio-professional categories: It varies from 24% in school environments and 33.8% in university settings, to 52% in the workplace and 50% for doctors<sup>[2]</sup>. Health sector professional body represents an example for patients; this professional body should be the main actor in the fight against smoking.

The harmful effects of smoking are increasingly well known. The toxic products of tobacco smoke, gaseous compounds, and micro-particles carried by the blood exert their harmful effects on the arteries and on all the other organs<sup>[3]</sup>. Tobacco is a major risk factor in cardiovascular and chronic pulmonary diseases. It also

increases the risk of lung cancer and has an impact on the reproductive life of women<sup>[4]</sup>. Giving up smoking at an early age may not only decrease the risk of lung cancer but also reduce cancer mortality<sup>[5]</sup>.

The role today of any health professional, and especially those in direct contact with tobacco smokers, is to raise awareness and inform about this scourge. The objective of our survey was to study the addictive behavior of tobacco among pharmacy students of the Faculty of Medicine and Pharmacy, Rabat. Tobacco use among pharmacy students remains little studied, however. It is a population (pharmacy students) that should be at the forefront of the fight against smoking.

### Population Studied and Method

This is a cross-sectional descriptive study that targeted 431 students in the first and second year of pharmacy. The survey was conducted at the Faculty of Medicine and Pharmacy of Rabat in Morocco.

The data was collected through a self-questionnaire consisting of 40 questions for students. Anonymity was ensured at the time of the collection of the answers by ensuring the confidentiality of the data. The consent and free choice of students have been respected. The questionnaire is composed of two parts: The first part provided information on the general data of the students, the consumption beginning age, the frequentations and the surrounding. The second part focused on the evaluation of the nicotine chemical dependence “Fagerström Questionnaire” [6]. A score of 0 to 2, 3 to 4, 5 to 6 and 7 to 10 respectively indicated that the subject was not dependent, weakly dependent, moderately dependent and strongly or very strongly dependent on nicotine.

The statistical analysis was performed by the SPSS V19 software. The significance threshold was determined by chi-square test, a value of  $p < 0.005$  was considered statistically significant.

## RESULTS

### 1- Sociodemographic Data

The participation rate in the survey was 86.1% (n = 371), with a predominance of females at a sex ratio (male / female) of 0.4. The average age was  $21 \pm 1$  years old. Repetition rate was above 11% (n = 41). The practice of extracurricular activity was present in only 27% (n = 100) of students and 40% (n = 148) of students living far from home. The general characteristics of the studied population are summarized in Table 1.

**Table 1: General Characteristics of the Studied Population**

	Frequency	Number
Rate of participation in the survey		
Male	40%	148
Female	60%	223
Repeaters	11%	41
Practical extracurricular Activity	27%	100
Residence only	40%	148

### 2- Smoking Prevalence

The occurrence of tobacco consumption was 8.89%

(1.08% (n = 4) for women and 7.82% (n = 29) for men). The average age the beginning of consumption was 15 (Min 10 and Max 23). It is noticed that 41.2% of student consumers were influenced by their environment followed by the desire to try smoking with an occurrence percentage of 32.4%.

### 3- Smoking addiction

Pharmacological dependence was studied by Fagerström’s nicotine dependence test. Dependence was noted in 57.6% of students who use tobacco, of whom 6.1% were very addicted (Table 2).

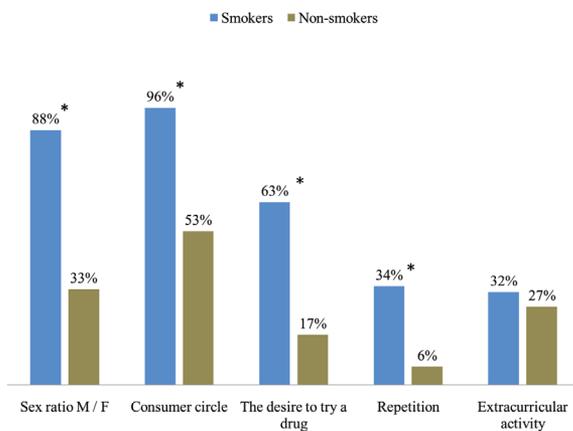
**Table 2: Fagerström test results in students**

Dependency Degree	Fagerström questionnaire Score	Freq- uency	Percen- tage (%)
Strongly or very strongly dependent subject	from 7 to 10	2	6,1
Average/moderately dependent subject	from 5 to 6	7	21,2
Slightly dependent subject	from 3 to 4	10	30,3
Non-dependent subject	from 0 to 2	14	42,4

The number of cigarettes that smokers consumed varied from 1 to 20 cigarettes per day. Smokers with 15 to 20 cigarettes per day did not exceed 5% of all regular tobacco smokers.

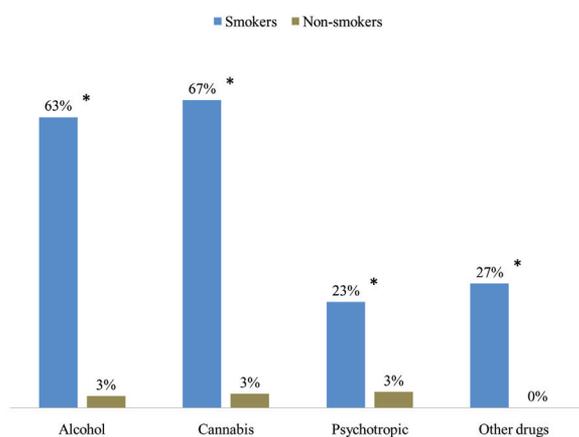
### 4- Comparison of smoking and non-smoking profiles

After a comparison of the profiles and characteristics of smokers and non-smokers of tobacco (Figure 1), it was found that the repetition rate was multiplied by 5 in smokers compared to non smokers with a prevalence of 34%; the test Chi-square was highly significant. Tobacco smokers have an entourage that consumes 95.5% of drugs, while in non-smokers the rate of presence of an entourage drug users was 53% ( $p < 0.001$ ). Trying new drugs increased 3.7 times among tobacco smokers ( $p < 0.001$ ).



**Figure 1: Comparison of profiles and characteristics of smokers and non-smokers of tobacco; \*  $p < 0.0001$ .**

Tobacco smokers consume cannabis, alcohol, psychotropic drugs and other drugs more than non-smokers. The prevalence of this consumption was respectively multiplied by 25, 22 and 6 compared to non-smokers; the chi-square test was highly significant (Figure 2).



**Figure 2: Comparison of the prevalence of drug use between smokers and non-smokers of tobacco; \*  $p < 0.0001$ .**

## DISCUSSION

The overall response rate was 86.1%. Participation in this epidemiological study can be considered as very satisfactory. Indeed, a broad awareness of teachers and students had achieved this strong participation.

Smoking prevalence in our study was 8.89%; it remains low compared to other studies, this was due to the low prevalence of female smokers (1.08%), who represented the majority of the studied population (60%). The low prevalence of female smoking is primarily due to sociocultural or religious considerations that may protect them from this scourge. According to a survey

conducted by the Moroccan ministry of health in 2013, the number of smokers was 34.5% of the male population aged 20 years and over [7]. According to Cuperjani et al. [8], the prevalence of students studying medicine who have ever smoked was 53.2%. Zaghba et al. [9] reported a decrease in prevalence in 2010 among students of medicine, which was 7.9% compared to 34% in 1982. Siemińska et al. [10] compared smoking prevalence among students of medicine in 1<sup>st</sup> and 6<sup>th</sup> year (medicine grades). They were 21% and 13%, respectively.

For our survey, the most common age to start tobacco consumption was at 15. This is explained by the fact that the teenager is endowed with a natural curiosity and aspires to more freedom and autonomy. The school offers him the opportunity to escape the parents and it is a meeting place where the student will try to identify with a group, to belong to it. Hence the use or consumption of tobacco and other drugs becomes a means of socialization and integration [11, 12].

In our study, dependence was noted in more than half of our workforce, but it remains inversely proportional to severity since only 6.1% of students who use tobacco were highly addicted to nicotine. According to Zaghba et al. [9], 70% of their students at the Faculty of Medicine and Pharmacy of Casablanca, were either *lightly* nicotine-dependent or *not* dependent at all, and 11% were highly dependent. Ndiaye et al. [13] found a moderate dependency in 59.3%, strong in 14% and very strong in 4.7% of students of the Faculty of Medicine and Pharmacy of Dakar. In a study conducted among students from Sakarya University in Turkey, in the 2012-2013 academic year, 50.8% of cases were non-dependent, 27.3% slightly dependent, 7.2% moderately dependent, 11, 4% highly dependent and 3.4% very strongly dependent [14]. The Fagerström addiction test characterizes pharmacological dependence as a continuous variable; it proposes thresholds' limits to differentiate smokers according to the intensity of their pharmacological dependence. In addition, it aims to specify the degree of dependence taking into account the usual smoking behavior as it also aims to identify the smokers who are likely to benefit the most from nicotine treatment [15]. Physical dependence is based on the important addictive properties of nicotine and other tobacco alkaloids [16]. Nicotine inhaled with the smoke reaches the brain very quickly, causing a peak or shoot in the blood and brain [17]. It binds to the nicotinic receptors of the brain reward system or dopaminergic

meso-cortico-limbic system thus releasing dopamine, which gives the brain pleasure and reward [18].

In addition to the biochemical cerebral determinants of addiction, several addiction sensitivity factors are added. Examples of these factors are genetic substratum which is still poorly known but very likely, cultural phenomena, the role of education, environmental, social, family, and professional constraints [19]. This is how our study found that repetition rates and the drug-consuming settings were high among smokers compared to non-smokers ( $p < 0.001$ ). Smoking results from an encounter between a psychoactive substance and a predisposed individual evolving in a favorable sociocultural environment [15].

The risk of poly-use is even higher among smokers, the testing of new drugs was higher compared to non-smokers ( $p < 0.001$ ): alcohol, cannabis, and psychotropic medications were more prevalent for smokers than non-smokers ( $p < 0.001$ ). The addictogenic potential is multiplied by joining tobacco with other drugs. Thus, long-term complications will be increased [20]. There is clear evidence that tobacco dependence is only a small part of an even more severe drug addiction phenomenon, and that all necessary steps and measures must be taken to deal with it.

This study concluded that close relationships, males, and an association of alcohol, cannabis, and other drug use could be factors that are strongly associated with increased tobacco use. The reduction of these risks should be associated with weaning as a therapeutic goal. Tobacco control is not limited to simple nicotine replacement [21], but involves all intervenors, health professionals and institutions. For that, it is necessary to intensify the campaign of fight against tobacco, to prohibit any form of smoking inside the faculty and especially to improve students' knowledge by a change in the formation process regarding addiction to nicotine.

### CONCLUSION

The present study provides information on epidemiological and behavioral aspects of tobacco use in the Faculty of Medicine and Pharmacy of Rabat, and which also provides awareness for students. Tracking student tobacco use over time is an essential part of developing policies and programs to protect our future pharmacists and combat this scourge.

**Ethical Clearance:** Compliance with Ethical Standards

**Source of Funding:** Self

**Conflict of Interest:** We declare that we have no conflict of interest.

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# Profile of Cases of Alleged Medical Negligence at Tertiary Care Centre:- A Retrospective Study

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## ABSTRACT

The concept of medical negligence is not new in India. It is there for a long time but since the last 2 decades, medical negligence and legal aspects of medicine have acquired great significance. Today the number of cases of medical litigation is increasing and already it has become a great problem especially for surgeons, anesthetists, obstetricians and gynecologists. The threat of litigation has increased to a great extent after the inclusion of medical services under the preview of Consumer Protection Act 1986 and 2002. The present study is an attempt to discover the ground realisms and basic drawbacks in the service of the healthcare which gives a boost to allegations against the medical practitioners. In this study we have taken into consideration the cases of alleged medical negligence that are referred for expert opinion to the Government medical college, Aurangabad in the period of 2011 to 2015. In the present study Large no. of allegations cases were related to the age group 21-30 years (35.94 %). Females in the reproductive age-group (21-40) years had the most frequent no. of cases (54.71%) of allegations. Large no. of cases (78.13%) were related to urban population as against rural population (21.88%). Cases related to allegations against the private hospitals scored more (71.88%) than against government hospitals. 47 % of cases were related to surgical specialties which was more than the medicinal aspect.

**Keywords:** Medical negligence, allegation, expert opinion, board of doctors.

## INTRODUCTION

The problem of medical negligence often resurrects as a cause of action against the doctors. It is extremely difficult for the doctors to live up to their patients expectations. In everyday usage, the word negligence means absence or lack of care that a reasonable person should have taken in the circumstances of the case. Negligence as a tort is “breach of legal duty to take care which results in damage undesired by the defendant to the plaintiff<sup>1</sup>.

Medical negligence defined as “the act of omission which a reasonably competent medical practitioner, guided by such medical knowledge and practice as is commonly known at the time and at the place where he practices and further guided by such other considerations which ordinarily regulate the conduct of a reasonably competent medical practitioners, would do, or doing something which a reasonably competent medical practitioners would not do<sup>2</sup>.”

The essential components of medical negligence include:-

A) Duty of care towards patient

B) De-reliction of duty of care.

C) Damage that results to the patient must be reasonably foreseeable,

D) Direct causation (direct relation between the breach in duty of care and the damage.)

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### **Types of negligence:-**

An act of medical negligence might amount to either or both the following:-

Civil negligence

Criminal negligence.

The difference between civil and criminal negligence is based on the degree of negligence and kind of negligence.

**Criminal negligence** :- in cases of criminal negligence, gross negligence of a kind that shows utter disregard for life and safety of others must be proved beyond reasonable doubt. The trial would be conducted in such cases in a manner that would be similar to any other trial under criminal law. Hence, the degree as well as the kind of negligence is examined to prove whether the act constitutes a crime under section 304(A), IPC.

**Civil negligence**:- in this negligence the kind as well as the degree of negligence is such that it gives a right for compensation. In order to establish civil negligence it is not necessary to prove that there was gross negligence.

### **Negligence Per Se:**

Black's Law Dictionary has defined negligence per se' as

Conduct, whether of action or omission, which may be declared and treated as negligence without any argument or proof as to the particular surrounding circumstances, either because it is in violation of a statute or valid municipal ordinance, or because it is so palpably opposed to the dictates of common prudence that it can be said without hesitation or doubt that no careful person would have been guilty of it. As a general rule, the violation of a public duty, enjoined by law for the protection of person or property, so constitutes<sup>5</sup>.

### **FORENSIC ROLE IN CASES IN NEGLIGENCE**

Alleged cases of negligence pose unique technical and ethical challenges to a forensic medical expert. It is always difficult to maintain objectivity in cases of this nature. Considering the consequences both for the practitioner involved as well as the reputation of the medical profession, due care and circumspection

must be exercised in handling such cases that come for forensic opinion.

Allegations of medical negligence are usually made in cases where the outcome has been fatal. Relatives often equate the duty of care and reasonable skill and care with cure or recovery or successful outcome in a case, especially of surgery.

Failure of treatment or death due to complications does not constitute dereliction of the duty of care, nor does it reflect failure to provide reasonable skill and care. While the possibility of negligence may be borne in mind, to exclude all other possibilities without a complete and thorough investigation is not only ethically incorrect, it also amounts to a miscarriage of justice.

Observation and analysis of the medical documentation:- all clinical notes pertaining to treatment administered should be obtained and studied. Involvement of an impartial expert in the same specialty as that of the practitioner against whom the allegation is made, should be done so as to clarify the complications occurring normally out of the treatment administered and also the foreseeability of the fatal outcome.

Study of the inquest papers and interview of the witnesses where possible, may help in understanding the findings available on the body of the deceased better and eventually understand the correct sequence of events.

Post-mortem examination should ideally involve a board of doctors with experts from the specialty concerned to death of the deceased to obtain expert opinion on the autopsy findings. Co-relation of the clinical papers with these findings and coupled with additional investigations like histo-pathological studies aid to the formation of opinion as to decide the role of negligent act of the practitioner in causing fatal outcome<sup>10</sup>.

**Board of doctors**:- An opinion that is the result of observation and deliberation by a board of competent experts has great evidentiary value, apart from scientific sanctity. The composition of board is such that no questions should be sustainable about either its competence or its impartiality and objectivity. A subsequent expert opinion is warranted where all relevant facts pertaining to a case which leads to uncover the truth<sup>10</sup>.

The studies emphasizing the factors necessary to challenge civil and criminal problems encountered by doctors are not much on record as on date. Hence for ensuring professional safety and satisfaction of doctors working in both private and government hospitals and also to address needs and legitimate rights of patients, the parameters necessary for preventing these occurrences need to be studied in a comprehensive manner.

It is a matter of concern that only a few studies in this regard of alleged medical negligence were available to correlate all the aspects of this study as far as the title and scope of this study is concerned.

This study is conducted with the hopefulness that the spirit and results as well as the recommendations will be appreciated on the background of above mentioned facts. This study deals to give the overview of the matters pertaining to the alleged medical negligence with an attempt to recommend preventive measures so as to minimize the allegations of negligence and suggest ways to improve the value of the health care system and medical fraternity.

#### **MATERIAL AND METHOD**

The present study is done with an objective to study the cases of alleged medical negligence referred to the Government Medical College, Aurangabad for expert medical opinion. The study was done with a primary focus on studying the causes of the allegations of medical negligence. The study is also aimed to find out preventive measures to minimize allegations of negligence.

The study was conducted during December 2013 to November 2016.

##### **Inclusion criteria:-**

Available data of cases of alleged medical negligence referred for expert medical opinion by the police or consumer court (including antemortem and postmortem cases)

##### **Exclusion criteria:-**

Cases of alleged medical negligence complained only by relatives (without any referral from police or court) were not included in the study.

Cases which were referred but sufficient data was not available for study.

The cases thus selected were studied in respect to presenting complaints by the patients or relatives at the time of admission, the investigations and the treatment details, complications leading to damage or death. The data was collected by filling details of every case in the predetermined proforma. The data was later arranged and analyzed and compared with the results of other studies.

#### **DISCUSSION**

The study revealed the following findings which will be elaborated in detail for discussion. Of the 64 cases studied, 37 (57.81%) cases consisted of females and 27 (42.19%) consisted of males. The highest number of cases belonged to the age group 21-30 (35.94%) which consisted majority of number of females (18 out of 23 in this particular age group). This observation suggest the fact that a female, who is in her reproductive age (21-40 years), is precious for a family and her loss due to some medical mishap, will be a big setback for them.

The observation of female dominance over male in the overall age group, coincides with the studies conducted by G. D. Niturkar<sup>6</sup>, and S.Janani et al<sup>7</sup>, so also the dominance of age group 21-30 years coincides with the study of S.Janani<sup>7</sup> (2009).

It was found that the majority (78.13%) of the cases of alleged negligence came from the urban region as compared to rural region (21.88%). The more number of cases from the urban region indicates that the degree of awareness of their rights as also the knowledge of related facts of treatment given by the doctor and medical negligence on his part, is more than that from the rural area. This observation of dominance of urban over the rural area coincides with the study done by S.Janani et al<sup>7</sup>.

The study has revealed that the allegations against the private hospitals are more than the government hospitals. Out of the 64 cases, the number of cases (46) from the private hospitals outnumbered the cases against the government hospitals (17).

Reason for this low number of Government Hospitals could be following:

Free services/services at negligible price provided by Government Hospitals and whenever there is not expected outcome from treatment/procedure/intervention it causes less hurt to them as there is at least

less financial damage.

Number of Government Hospitals is less as compared to private hospitals (including individual clinics) i.e. why private hospitals are more prone to case of medical negligence. Perception among consumers that Government Hospitals are not covered under the Consumer Protection Act, 1986.

The study further highlights on the specialty wise distribution of the cases, where the allegations against different branches of medical field are analyzed with consideration to the gender and age distribution. Of the 64 total cases, it was observed that allegations related to Obstetrics & Gynaecology (29.69 %) outnumbered the other specialties, which obviously remarks the female preponderance. The allegations against surgical aspect of medical practice (47%) were dominant over the medicinal aspect (39 %) in this study. A few cases related to psychiatry (1), ENT (1), pathology (2) and blood bank(1), dentistry(1) were also observed.

The result in this study about the dominance of allegation against the branch of Obstetrics & Gynaecology were similar to the observations made by S.Janani et al<sup>7</sup>, Anand P Rayamane et al<sup>9</sup> and Mukesh Yadav<sup>8</sup> in their respective studies. This study again confirms with the other studies carried out in different parts of the world. Professional liability survey conducted by the American college of Obstetricians and Gynaecologists in 1993 revealed that 78 percent of Obstetricians and Gynaecologists in USA have been sued at least once and 37 percent have been sued thrice or more<sup>11</sup>. The survey also revealed that 62 percent of American obstetricians have stopped their practice before the age of 55yrs<sup>11</sup>. In UK 85 percent of consultant obstetricians have been sued at least once<sup>3</sup>. Considering the fact that most number of deaths (26) in females occurring in the reproductive age group (21-40 years) were suggestive about the allegations against this branch of surgical aspect of medical practice most commonly dealing with the delivery and gynaecological ailments. So this part of the study is discussed with special consideration with a spirit to recommend some guidelines to create a medico-legal barrier against the various litigations.

Why the obstetricians are more vulnerable to litigations?:-

Obstetricians deal with two lives at a time-

mother and her developing foetus. Out of which one is seen clinically, i.e. mother and they have to predict the physiology and well-being of another i.e. foetus depending on the electronic gadgets, such as CTG, Doppler, Ultrasound. Thus there is an obvious inherent potential for error or inability to diagnose certain foeto-maternal disorders.

Follow-up of an obstetric case lasts up to 46 weeks(i.e. 40 weeks of gestation plus 6 weeks of postpartum phase)- within such a prolonged duration with rapidly changing physiology, any pathological condition can arise resulting in poor outcome.

In other branches of medicine, usually doctors handle pathological conditions, which often have a known course and the patient and relatives are mentally prepared to face adverse outcomes, while pregnancy and childbirth are perceived as physiological processes. Even though, some women may face an unpredictable or variable cause and outcome, patient and their relatives are usually not willing or able to understand the situation.

Obstetric patients are usually young and healthy or free from obvious disease hence relatives find it difficult to accept mishaps due to emotional attachment. Mental or psychological distress is more in such situations. Life can become totally disturbed on all fronts for such families if an unfortunate maternal mortality occurs<sup>4</sup>

In the present study, surgical aspect of the medical profession was reviewed as the percentage (47%) of the surgical cases involving surgery and super-specialties, anesthesia, obstetrics & gynaecology, ophthalmology, ENT, and even dentistry was more than the medicinal aspect. Similar observation of dominance of allegations against surgical aspect were found in the study of S.Janani et al<sup>7</sup>, Anand P Rayamane et al<sup>9</sup> and Mukesh Yadav<sup>8</sup>.

#### **Distribution of cases according to various allegations:-**

Of the 64 cases studied, maximum number of allegations (15) were related to negligence in the surgery performed, while allegations related to wrong diagnosis/ treatment ranked second (14). In the study, there were 7 cases of consent related complaints which included lack of informed consent, consent taken in fear of death of the patient, consent lacking vernacular

explanation. Miscellaneous allegations included insensitive and irresponsible nature of the doctor, lack of skillful staff in the hospital, over costing of the hospital bill by repetitive investigations, misinterpretation of the reports, communication gap between two treating doctors leading to misjudgment or delayed treatment.

### CONCLUSION

It is only the lack of good counselling efforts and we find that, physicians spend most of his time in treating the patients rather than counselling and hence the physical part of the disease may get cured, but the psychological or emotional aspect of the disease remains as it is. This results in dissatisfaction and is a cause of increase in allegations of medical negligence in the recent times.

An another important aspect of defense for doctors in case of allegation, is good documentation of the treatment and other important notes related to patient, along with preservation of medical records.

A detailed written and valid consent should be always be the unforgettable aspect of any invasive treatment. This will always prevent victimization of the doctor to an allegation of medical negligence.

**Conflict of Interest:-** The authors declare that there is no conflict of interest in this study.

**Source of Funding:-** Self

**Ethical Clearance:-** this study was cleared by the institutional ethical committee prior to MD dissertation thesis at Maharashtra University of Health Sciences, Nashik

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# Knowledge and Perception among Medical Students towards People with HIV and AIDS

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## ABSTRACT

Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) has become one of the significant public health problems in the world. Health Professionals are at an increased risk of exposure to viral agents as compared to the general populations. There are ethical and legal implications involved in treating a patient with HIV as well as aspect of ending discrimination and apathy in attitudes of healthcare providers towards such afflicted individuals. The implications must be made aware to medical students as they enter into patient contact at the start of their second academic year. The present study was aimed at ascertaining the knowledge and attitudes of various levels of medical students towards the disease and the Patients with a view to understand what can be done to improve the present scenario. The study concluded that there is in fact a difference on what knowledge requirement is and what is actually practiced. We concluded that medical students must be better trained with bedside requirements and attitude changes that must be brought about when dealing with HIV Patients.

**Keywords:** HIV, Medical Students, Knowledge, Discrimination

## INTRODUCTION

HIV/AIDS has been a global pandemic for the last 30 years, and its spread has yet to be contained. However, due to the availability of antiretroviral therapy, today HIV is becoming a chronic disease, which means that more physicians from every medical field will encounter HIV-infected individuals throughout their medical careers.(1) Knowledge regarding patient confidentiality and HIV/ AIDS health protocols is highly important for all those who work in the medical system. It is crucial that this information be taught and discussed at length throughout medical school so that students, whether starting their clinical studies or beginning their work as interns and residents, are well prepared, and know their rights and their duties. A better understanding of the students' prior knowledge and attitudes towards HIV/ AIDS will serve as a tool to create better educational

programs dealing with stigma and encouraging empathy towards patients.(2,3). The present study was thus conducted to gauge the level of knowledge among medical students regarding patient confidentiality and their attitudes towards patients with HIV and AIDS.

## MATERIAL AND METHOD

The study was carried out in Government Medical College in Gondia District, Maharashtra for a period of 3 months. Institutional Ethical committee clearance was obtained and documented prior to start of data collection. The individuals selected as subjects were asked to submit a filled questionnaire copy. The

Questionnaire was anonymous in nature. The subjects were asked to fill details such as age, sex and the academic semester in which they are at the present moment.

Sample size for data collection was 98 students. No identification data such as name, enrollment number, roll number etc. was to be written on the submitted questionnaire. Any other data apart from that which is requested in the questionnaire were grounds for

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exclusion from study.

The questionnaires once all completed were filed. The details of the answers were uploaded to a

Excel data sheet. The data analysis was conducted in consultation with institutional statistician.

### **OBSERVATIONS**

A total of 98 medical students were participants in the study. The males comprised 49 subjects while females constituted 49 subjects. The participants were from second year of M.B.B.S course.

In terms of Knowledge regarding the transmission of the virus through various routes 88% (n=86) of the subjects were able to correctly identify the routes of transmission with a marginal incline in favor of the females who accounted for a higher percentage i.e. 89.5% as compared to male candidates who accounted for 86.8% of all correct entries regarding transmission of the virus. 5 male subjects and 3 female subjects gave one or more incorrect answers regarding transmission. The incorrect answers were mostly in terms of whether breast feeding and kissing causes transmission of the virus.

In terms of diagnostic tests that were employed in detecting HIV and the confirmatory tests employed for the same, the knowledge of students was higher with a score of 100% students giving correct entries.

When asked about option of treating a HIV infected individual 22 students reported that they wanted to refuse treatment and to transfer the patient as compared to 76 students who wished to treat them. Among the 22 students who wanted to avoid treating HIV patients, 10 were males while 12 were females.

On being asked whether the students would be uncomfortable if they were asked to treat a individual with HIV and AIDS, with access to all Universal precautions, 40 % students (n=39) reported that they would be uncomfortable, with 18 males and 11 females.

In terms of whether there should be a bold warning on the beds of HIV infected patients disclosing the serological status of the patient, 66% (n=67) of the entire students in the study reportedly agreed to it being present. There were no significant differences between the males and females in this respect. As far as the

knowledge and attitude towards high risk groups is concerned, it was found that all students were aware of the high risk groups.

Upon being asked whether they would share details of patients serological status with other individuals even if the patient does not permit, the majority of students stated that they would disclose the status (60%, n =59), with 30 males and 29 females reporting it.

Students were asked whether India has a dedicated legislation regarding Individuals living with HIV and AIDS. A majority of students (52%) could not answer correctly, while some refrained from answering (11.22 %). Among the correct entries (36.78%), majority were females students (n=21) as compared to males (n =15).

### **DISCUSSION**

In a study conducted among medical students in a medical college in Karnataka stated that though the overall knowledge among the students was good, few minorities of the students held some misconceptions. There is a strong need for imparting HIV related education right from the beginning of medical curriculum so as to demystify misconceptions among students. Another area that needs to be addressed is the attitude of students towards people living with HIV. There is a need for medical colleges to foster an environment that is conducive to the development of appropriate student attitude towards HIV. Further such studies must be conducted involving all branches of health care so as to prepare health science students to handle HIV/AIDS patients better and also contribute to health education in society.<sup>(5)</sup>

A study among medical students from different years of medical school conducted by Baytner-Zamir et al concluded that there is an increase in Knowledge among medical graduates as they progress from pre clinical stage of learning to clinical stage, however there is still a need to introduce measures so as to improve doctor-patient relationship as far as HIV and AIDS is concerned. There are still prejudiced views among medical students and many times views expressed were contrary to anti discriminatory practices and confidentiality rules regarding the disease.<sup>(1)</sup>

A study among Nursing graduate students in Pondicherry revealed that a number of misconceptions with discriminatory attitudes among few participants

cannot be ignored. These findings were of great concern, because there is an urgent need to improve the level of knowledge and attitudes among nursing students toward HIV/AIDS as they have a key role in prevention, care and treatment in their future career as nurses. Further, continuous educational programs also are needed to improve their knowledge and competence in providing culturally sensitive rights-based approach care to HIV/AIDS patients.<sup>(6)</sup>

The authors are finding similar features in our study also and state that there must be education of the medical graduates from the second year itself in how to treat and address the patients from these disease spheres.

### CONCLUSIONS

There is a need to address the student community as towards the attitude that is to be displayed with patients suffering from HIV. The knowledge of the disease as well as steps to prevent it are well known but misconceptions or notions need to be rectified and health education in both a formal and informal tone are needed for the job to be done.

The limitation of this study lies in the fact that a small subset of students was included and this may not be a true representative sample of the medical fraternity. Further studies on the subject matter need to be conducted to realize the true problem.

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# Estimation of Femur Length from Fragments- A Study on Adult Femora

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## ABSTRACT

**Background:** Stature estimation from skeletal remains of long bones is important in identifying unknown bodies. This study was conducted in long bones of human skeleton to identify the total length of long bones from its fragments. This is helpful in order to estimate stature from the length of lone bone and also in orthopedic procedures to find the length of the implant that may be required. The regression formulae has been derived for the local population.

**Objective:** To find the proportion of each fragment to the length of femur and to derive at a regression formula to estimate the length of femur from its fragments. Secondly to compare the regression formula obtained with that of other studies.

**Material and Method:** 50 fully ossified, dry, adult femora were randomly selected from the departments of anatomy and forensic medicine. Five landmarks on the surface of femur was identified. The total length of femur and length of 4 segments namely, from most proximal point on the head to midpoint of lesser trochanter (segment 1), from the midpoint lesser trochanter to most proximal extension of the popliteal surface at point where the medial and lateral supracondylar lines become parallel below the linea aspera (segment 2), from the most proximal extension of the popliteal surface at point where the medial and lateral supracondylar lines become parallel below the linea aspera to most proximal point on the intercondylar fossa (segment 3), from most proximal point on the intercondylar fossa to most distal point on medial condyle (segment 4) were measured using the osteometric board and scale. From this regression formulae were derived for each bone fragment using anova, correlation and regression analysis.

**Results :** The proportion of all four segments to the total length was calculated and the regression formulae for the estimation of femur length was as follows. Total length of femur

$$= 25 F1+2.58 \quad = 26.58 F2+0.88 \quad = 35.23 F3+0.58 \quad = 20.43F4+6.07$$

**Conclusion:** The study helps to calculate the total length of femur from its segmental length by which stature can be estimated. This can be applied in crime investigation to establish identity, when only fragmentary remains of long bones are available and also in orthopedic surgery when it is helpful to make prosthesis.

**Keywords:** Femur, fragmentary remains, regression formulae

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## INTRODUCTION

The stature analysis and gender identification of skeletal remains plays a pivotal role in medico-legal cases. The identification of skeletal remains is a challenging task when the bones are mutilated and fragmented with destroyed epiphyses. Any definite clue

in this direction can provide substantial evidence in the court of law .

The lower limb bones directly contribute to the stature analysis. Femur provides the best univariate result for equations to estimate stature from long bones<sup>1</sup>

**AIM**

This study aims to estimate the total length of femur from its fragmentary segments. It is an attempt to obtain regression formulae to find out the total length of femur in relation to the segmental fragments by morphometric analysis.

**MATERIAL AND METHOD**

50 intact adult femora of both sexes were randomly selected from departments of Anatomy and forensic medicine. The measurements were taken using Osteometric board and Sliding vernier calipers

Each femur was carefully measured for maximum length of femur, and length of various segments of femur as follows

The total length measured from the highest point of the head to the distal point of medial condyle of femur in its oblique position as per the Geneva agreement.

The fragments were divided with the main points of division being

- 1) The proximal point of head and the midpoint of lesser trochanter.
- 2) Upper limit of popliteal surface where medial and lateral supracondylar lines are diverging from linea aspera.
- 3) Upper limit of intercondylar fossa.
- 4) Most distal point on the medial condyle.

Linear regression formulae is derived for each segment by plotting each segmental length of 50 bones against their total lengths. The correlation coefficients of each segment is also derived

SPSS Version 21, Anova, correlation and regression analysis were used to derive the formulae

**RESULT**

It was found that the total length of femur showed significant correlation with the length of 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> fragments. Among the 50 femora examined the average length of femur was 43.21cm. The mean length of fragments is shown in table 1. Its proportion to total length of femur is depicted in Table 2. The correlation between total length of femur and each fragment is shown in Table 3

**Table 1: Showing the mean lengths of four fragments of the femora (N=50) along with the standard Deviation, ‘F’ and ‘p’ values.**

Fragment	Mean length (cm)	SD	Minimum	Maximum	F value	P value
F1	7.05	0.823	5.5	8.5	1079.592	<0.001
F2	18.87	2.250	15.0	23.3		
F3	13.54	1.598	10.3	17.8		
F4	3.75	0.36	3.1	4.5		

**Table 2: Showing the proportion between the Mean length of Femur and the femoral fragments along with the standard Deviation, ‘F’ and ‘p’ values of the fragments of femur.**

Fragment	Mean % of Total length (cm)	SD	Minimum	Maximum	F value	P value
F1	16.3023	1.35667	13.59	20.15	1633.511	<0.001
F2	43.6383	3.83713	35.56	49.41		
F3	31.3870	3.59737	24.24	39.56		
F4	8.6724	0.55196	7.54	9.82		

**Table 3: Showing the variable x (fragment length), constant (a), multiplication factor(b), correlation coefficient(r) of all four fragments of femur**

Variable x	a(constant)	b	Correlation Coefficient (r)	r <sup>2</sup>	P value
F1	25	2.58	0.72	0.53	<0.001
F2	26.58	0.88	0.68	0.46	<0.001
F3	35.23	0.58	0.32	0.10	0.02
F4	20.43	6.07	0.75	0.56	<0.001

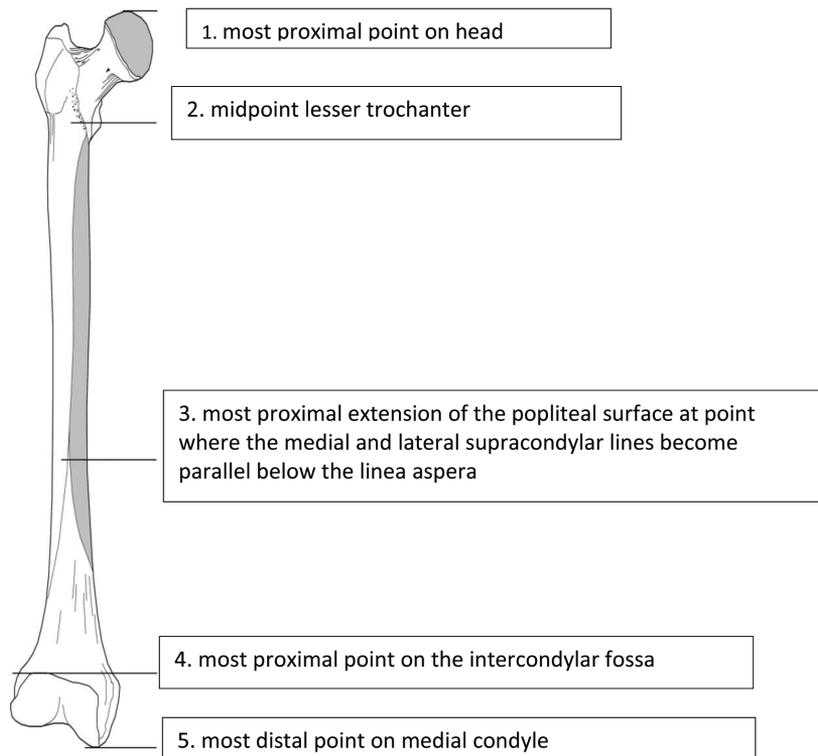
The regression equation is derived for each of the segment in order to find out the total length of femur.  $Y = ax + b$ , where Y is the total length of femur, x is the fragment length and b is the multiplication factor.

### DISCUSSION

It is important to estimate the total length of femur from fragments in living and dead. In living it comes handy when in trauma victims femur prosthesis or implants have to be made. In dead individuals it can be helpful in case of reconstruction of human remains. When many fragments of the bone are available it is important to know which one to choose for calculating femur length. Femur length in turn can help in estimating

stature of the individual using many formulae which have been derived in the past. Pan N( Indian)<sup>2</sup>, Steele DG and McKern TW(prehistoric Indian)<sup>3</sup>, Trotter and Gessler (American White and Negro)<sup>4</sup>, Wu L (Chinese).<sup>5</sup>

Estimation of stature from fragmentary remains has been a problem from many decades. In 1935 Mullers study was published in this regard. In 1970 Steele selected the femur, tibia and humerus to address the same problem of estimating stature from fragmentary long bones, The landmarks on femur are depicted in Figure 6.3 (from Steele 1970). Each segment is defined as the distance between two consecutively numbered points.<sup>6</sup>



According to Duyar and Pelin (2003) the relationship between the length of a long bone and stature may not be the same for short and tall individuals.<sup>7</sup> However according to Dupertuis and Hadden (1951) all long bones especially the femur contributes a constant relationship with the stature. It has been identified that the femur:stature ratio is more or less stable for different populations and are almost equal for both sexes (Feldesman 1992; Feldesman & Fountain 1996). The femur:stature ratio has been calculated to be 26.75. It indicates that the length of femur makes up about 26.75% of the total stature. In order to obtain the stature the maximum length of femur should be multiplied by 3.74 (Sjovold 2000).<sup>8</sup>

Generally two approaches have been followed for stature estimation from the skeletal remains. The first approach is to estimate the stature by measuring the length of a single bone or by combination of long bones. The second approach includes the complete skeleton and add the heights of all skeletal elements that contribute towards stature.

Fragmentary bones can be used to estimate stature in two ways. The common method is to estimate the length from its fragment and then apply it on existing formula. Another approach is that fragmentary length can be directly applied for stature estimation. Studies by Müller (1935), Steele and McKern (1969) and Steele (1970) are early examples. Some are of the opinion that it is better to use the direct method since it has a lesser standard error (Bidmos).<sup>6</sup>

Data for estimating stature from various fragmentary bones for a number of populations across the world have been published. These include the femur, humerus, tibia and fibula of Mayans (Wright & Vasquez 2003), femur from the Terry Collection (Simmons et al. 1990), femur and humerus of modern Portuguese (De Mendonça 2000), ulna in Indians (Badkur & Nath 1990), femur in South Africans (Bidmos 2008), and tibia in South Africans (Chibba & Bidmos 2007).<sup>8</sup>

Various studies have been conducted in India as well in this direction.<sup>9, 10</sup>

## CONCLUSION

This study therefore gives regression formulae that helps to estimate length of femur from fragmentary remains and there by find stature of the individual. This will be useful in identifying unknown bodies and also

in making prosthesis when only a fragment of the bone is available

The study can be taken be further taken forward by comparing the length of the body with the length of fragment on autopsies. This can help to find the stature from fragmentary remains directly.

**Ethical Clearance:** Permissions obtained from respective departments for examining academic material as per the institutional ethics committee, VIMS and RC

**Source of Funding:** Nil

**Conflict of Interest:** Nil

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# A Study of Caffeine Consumption Patterns and Dependence among Management and Science University Students

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## ABSTRACT

Caffeine consumption by university students has increased dramatically and caffeinated beverages have been one of the most consumed drinks. Therefore, the aim of this research will focus on examining the caffeine consumption patterns, assessing the level of awareness of caffeine and examining the incidence of caffeine dependence with the frequency of withdrawal symptoms. A cross-sectional study design using four sections of a questionnaire was distributed to 235 MSU students. 81.3% consume caffeine and 18.7% have abstained from caffeine. 42.6% consume caffeine 1-3 times a week with reasons to keep them awake and to stay up late at night. Mean amount of caffeine intake is 306.98 mg per day. In regard to the student's knowledge of the effects of caffeine, 58.7% have moderate knowledge. Meanwhile, 28.3% students have become dependence on caffeine by meeting three out of four criteria listed in DSM- IV. The high percentage of caffeine usage and moderate scores in the caffeine knowledge indicate that most of the students were using caffeine without having sufficient knowledge of the effects of caffeine and withdrawal symptoms they might experience. Caffeine consumption among MSU students is high and they are lacking awareness about caffeine. Some consumers also show to be dependent on caffeine and averting withdrawal symptoms during caffeine abstinence.

**Keywords:** *caffeine, knowledge, dependence, abstinence, withdrawal.*

## INTRODUCTION

Caffeine is a type psychoactive substances which come from the pharmacological class of methylxanthines<sup>1</sup>. Caffeine is most commonly consumed substances worldwide. Asian coffee market has continued to rise and has been acknowledged by the world coffee industry. In Malaysia, the drinking of local coffee has become a culture since a long time ago and now it has become a habit to the local community like the other western countries such as United States<sup>2</sup>. The caffeine consumption habits have been found to increase dramatically from the past few decades especially amongst adolescents and young adults<sup>3</sup>. Caffeine is like

other psychoactive substances whereby the regular intake can lead to dependence and when there is a sudden cessation of intake, the symptoms of withdrawal will be manifested<sup>4</sup>.

## METHOD

### Study Design

A cross-sectional study was carried out on a target population that included all MSU students. The participants have been chosen under inclusion and exclusion criteria and will be picked randomly. The sample size for the study was calculated using the formula to estimate a single population proportion and 235 students will be picked randomly to answer the questionnaire. Data were collected by means of a questionnaire. The types of questions asked were dichotomous questions and multiple choice questions which will be divided into four sections. In addition to

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demographic details, information regarding different types of caffeinated products and frequency of consumption, the questionnaire included multiple choice questions on their benefits, side effects and withdrawal symptoms of caffeine

**STATISTICAL ANALYSIS**

Statistical Package for the Social Sciences (SPSS) version 20.0 program is used. To represent the result of this study, a descriptive analysis will be used. Descriptive statistics include frequencies, percentages, mean and standard deviation were derived to describe participants’ demographic, consumption patterns, and withdrawal symptoms associated with caffeine use. One way analysis (ANOVA) tests and independent t-tests are used to compare the categorical and numerical variables respectively.

**RESULTS**

From the total of 235 students, 33.2% are male respondents while 66.8% are female respondents. Among the 235 respondents, 18.7% did not consume caffeine and the rest of them are consuming caffeine with 81.3%. Students are most likely consume caffeine about one to three times in a week (42.6%) (Figure 1) with main reason to keep them awake in the morning and because of the taste (Figure 2). The mean amount of caffeine intake is 306.08 mg/day (Table 1). Low intake between 1- 199 mg/day is 39.8%, moderate intake between 200-239 mg/day is 29.8% and high intake more than 400 mg/day is 30.4% (Table 2). Coffee is the most popular caffeinated beverages with 37.5% followed by tea 28.5% (Figure 3). 79.1% of students knew that caffeine can cause frequent urination and 70.6% of them know that caffeine will cause addiction but only 19.1% knew that caffeine can help to lose weight (Figure 4). 138 of them (58.7%) have moderate knowledge of caffeine and 19.6% have high knowledge while the rest of the have low knowledge (Table 3). Among the consumers, 134 out of 191 students experienced caffeine withdrawal symptoms and 68 of them did not experience withdrawal symptoms and headache is the most commonly reported symptoms of caffeine abstinence (Figure 5). Meanwhile, 28.3% of consumers met the criteria for caffeine dependence based on meeting at least three of the four criteria stated in DSM- IV (Table 4).

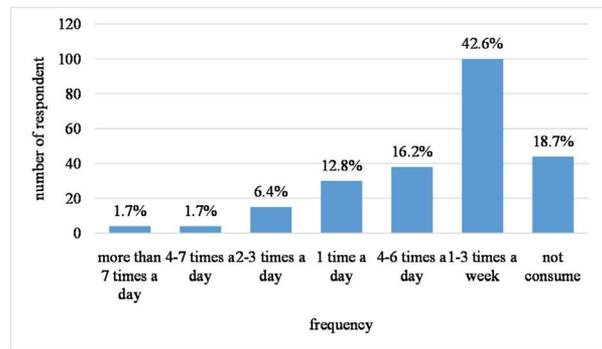


Figure 1: The overall frequency of caffeine intake

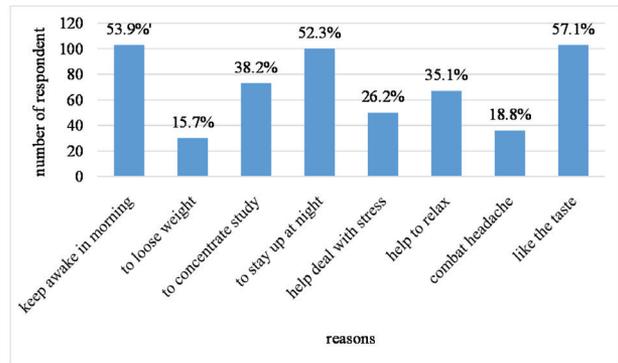


Figure 2: The reasons for consuming caffeine

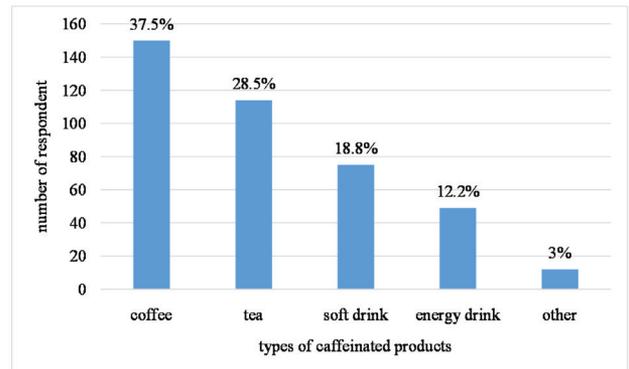


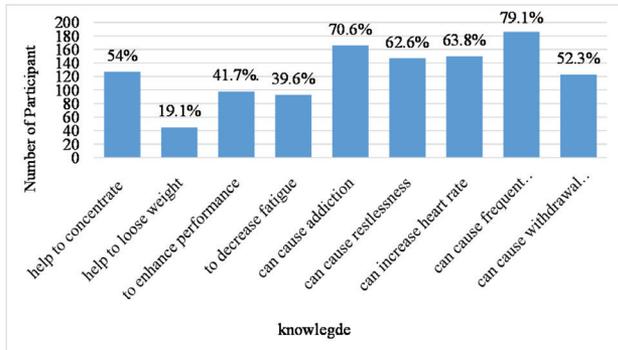
Figure 3: The types of caffeinated beverages that are most commonly consumed

**Table 1: Mean Caffeine Intake per Day**

	Mean caffeine consumed per day (mg/d)	Std. Deviation
Male	321.91	180.378
Female	296.07	217.180
<b>Total</b>	<b>306.08</b>	<b>203.61</b>

**Table 2: Classification of Caffeine Consumers**

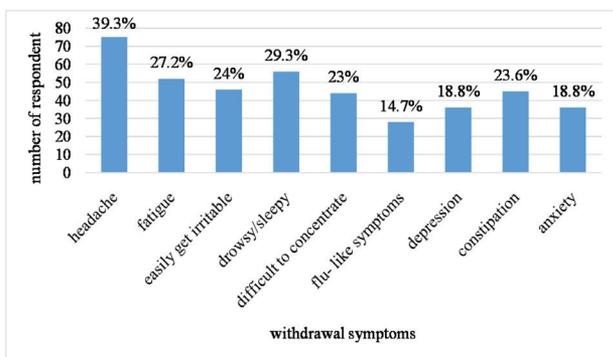
Category	Frequency (N)	Percentage
Low intake	76	39.8%
Moderate intake	57	29.8%
High intake	58	30.4%
<b>Total</b>	<b>191</b>	<b>100%</b>



**Figure 4 The knowledge of students on caffeine effects**

**Table 3: Level of Awareness of Students on the effects of caffeine consumption**

	Frequency (N)	Percentage
Low knowledge	46	21.7%
Moderate knowledge	138	58.7%
High knowledge	51	19.6%
<b>Total</b>	<b>235</b>	<b>100%</b>



**Figure 5: The frequency of reported caffeine withdrawal symptoms**

**Table 4: Incidence of Caffeine Dependence**

	Frequency (N=191)	Percentage
Not- dependent	137	71.7%
Dependent	54	28.3%

**DISCUSSION**

This present study found that students consume caffeine mostly one to three times a week and their reason of consuming caffeine is because they like the taste, keep them awake in the morning and to help them stay up late at night. When comparing the results between the previous study by<sup>5</sup> and this present study, it proves that almost every student did consume caffeine frequently and the reasons are almost similar with regards to their beliefs. The mean milligram of caffeine intake per day in the present study is 306.08 mg/day. However, according to European Food Safety Authority (EFSA) in a review of the safety of caffeine stated that a moderate amount of caffeine consumption of around 400 mg per day which is equivalent to 5 cups of coffee can be enjoyed as part of the healthy balanced diet and active lifestyle. Other research suggested that moderate amount of caffeine intake is associated with physiological and mental effects that can disrupt a normal body function<sup>8</sup>. Among the caffeinated beverages, coffee is the top caffeine sources. This is because coffee consists of largest consumers with high demand in the market all around the world. In addition, Asian countries like Malaysia people have started to use coffee like other western country decades ago. This may be the reason why coffee and tea have become preferable caffeinated beverages among MSU students.

Students have common knowledge in terms of caffeine effects since they were more aware of the side effects of caffeine. The results both in the present and previous studies to test the knowledge on the caffeine could have been influenced by the fact that a high percentage of participants were caffeine consumers. They could probably have experienced the effects personally and thus knew more about caffeine than non consumers<sup>8</sup>. Majority of students have moderate knowledge about caffeine. The test between the level of knowledge and amount of caffeine intake shows that there is no association between the two variables. It shows that even though students do have sufficient

knowledge regarding the benefits and adverse effects of caffeine consumption, but they still consume a high amount of caffeine. This concludes that they are still lacking awareness.

Headache is the most reported symptom followed by sleepiness and fatigue. It was reported that 70.2% of students who consume caffeine reported having at least one withdrawal symptoms and the respondents had a mean of 2.2 symptoms. In the present study, the respondents who regularly ingested caffeine in a moderate dose are found to experience withdrawal effects. The mean caffeine intake which is more than 300 mg/day is found to cause withdrawal to the consumers. The findings are being supported by many previous studies which recommended that significant caffeine withdrawal has been shown to occur after abstinence from a dose as low as 100 mg/day which is equivalent to one 6 oz. cup of brewed coffee<sup>9</sup>.

Daily caffeine use is associated with caffeine dependence in some adults. In the present results, the incidence of caffeine dependence is 28.3% out of 191 participants who consumed caffeine. They are found to be dependent on caffeine based on meeting at least three out of the four key DSM- IV substance dependence criteria. The independent t-test that was performed shows the p-value higher than 0.05 which indicates there is no association between the mean amount of caffeine intake with caffeine dependence versus non- caffeine dependence. It was found that some adults with caffeine dependence drink less than recommended average daily caffeine intake by which even though the participants consume a high amount of caffeine, but they did not meet the dependent criteria on caffeine.

### CONCLUSION

In conclusion, consumption of caffeine is popular among Management and Science University students. The caffeine intake among MSU students exceeded the recommended amount but their use is still on the safer side. With an only small percentage of respondents has high knowledge of the effects of caffeine, it shows that there is still lack of proper knowledge to the students regarding the effects of caffeine. Some consumers also reported being dependent on caffeine and experience withdrawal symptoms during the abstinence.

**Conflict of Interest Statement:** We certify that there is no conflict of interest with any financial

organization regarding the material discussed in the manuscript.

**Source of Funding:** Self

**Ethical Clearance:** No identifying details of the subjects reported here and all the data collected after informed consent.

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# An Epidemiological Study of Different Aspect of Child Maltreatment in Siliguri Police Commissionerate

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## ABSTRACT

Maltreatment in any form whether that is physical, emotional, neglect or sexual. **Aims & Objectives: To know** Prevalence of Child Maltreatment in Siliguri Police commissionerate. **Material Method:** A cross sectional study with stratified random sampling among 220 school going children in aged 13-18 year with the help of a pre-designed, pretested Questionnaire. **Results:** 33.2% children faced maltreatment of which 41.44%, 27.9%, 21.6%, 9.06% was physical, psychological, sexual and neglect respectively. It is statistically significant among males, nuclear family, increasing number of family members, and presence of family violence.

**Keywords:** Child Abuse, Prevalence, Accuse, family, teachers

## INTRODUCTION

Child abuse or maltreatment is one of the most grim and affective criminal offences across the entire world. Child abuse is sexual as well as asexual. Child maltreatment is a blanket term used to describe all child abuse and neglect. Child maltreatment is a huge global problem with a serious impact on the victims' physical and mental health, well-being and development. The newer concepts of human rights, law, forensic medicine and public health over the last decades have resulted in the problem of child maltreatment becoming more visible internationally. WHO defines "Child abuse or maltreatment constitutes all forms of physical and/or emotional ill-treatment, sexual abuse, neglect or negligent treatment or commercial or other exploitation resulting in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power".<sup>1</sup>

Maltreatment are commonly classified in to four types, i.e. (i) physical abuse (ii) sexual abuse

(iii) Emotional abuse (or psychological abuse), and (iv) neglect. Physical, psychological and sexual abuses involve acts of commission whereas neglect involves act of omission, and it is defined as failure by a caregiver to meet a child's basic physical, emotional, medical/dental or educational needs.<sup>1</sup> Prevalence of physical and emotional abuse and neglect in children are mostly occurs at home. Whereas, they are at greater risk of sexual abuse while outside the home, particularly in dating relationships.<sup>2</sup>

## AIMS & OBJECTIVES

**General Objective:** To find out the Prevalence and pattern of Child Maltreatment in

Child Age Group (13 to 18 years) in Siliguri Police Commissionerate area.

### Specific Objectives:

1. Prevalence of Child Maltreatment in Siliguri police commissionerate area.
2. Prevalence of different Types of Maltreatment.

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## MATERIAL AND METHOD

This study was conducted in 5 selected secondary school out of 48 school in Siliguri Commissionerate. Siliguri Police Commissionerate or Siliguri during July 2015- June 2016.

**Study Population: includes** were all school going children under Siliguri Commissionerate, aged 13-18 years in the study area.

### Inclusion criteria

1. Subjects resident of this area. 2. Those willing to give consent and assent for the study. 3. Stated age 13 – 18 year.

### Exclusion criteria

1. Subject having debilitating illness. 2. Those having some documented mental /psychiatric problem. 3. Stated age below 13 and above 18 year.

### Sample Size and Sampling Technique:

The sample size is calculated using single population proportion by taking the proportion (p) of child abuse as 50%, 95% confidence level and 10% absolute precision.

*The sample size is calculated using the formula:  $n = Z^2 (1 - \alpha/2) P (1 - P) / d^2$*

So calculated  $n = 220$

### Sampling Technique:

Multistage sampling technique

### Tools and Technique:

#### Tools:

1. Consent and assent forms.
2. Pre-designed pre-tested semi structured questionnaire.

### Study Techniques:

#### Data Collection

A total of 220 study participants were selected from 5 out of 48 schools including both Govt. and public English, Bengali, and Nepali (One from each type) under Siliguri Police Commissionerate by Simple Random Sampling. Students of these selected schools

were stratified into 5 classes according to the class in which they were studying i.e. 8, 9, 10, 11, and 12. Then the candidates were enlisted in these five strata's. Finally candidates from each of these strata were selected according to population proportion to size by simple random sampling..

## RESULTS

In study sample most of the population belongs to 17 to 18 years in which 58% females and 42% male. Most of them were Hindus and have completed secondary level of education and staying in a nuclear family. Around 35% of the children were addicted to substance abuse and among those cigarettes and cannabis smoking were favorite. Most of the mother were graduates and home-maker, while remaining one-third mother are working and lived in the same city with their family. Likewise, most of the Father were graduates, doing business and resides with their family. Substance abuse among father was around 21% the most common substance abused was alcohol followed by smoking. It was seen in the current study that, most of the study participants share their problems mainly with mother.

The prevalence of child maltreatment in this study was found to be around 33.2%. However, the prevalence of physical, emotional, sexual abuse and neglect was 20.9%, 14.1%, 10.9%, 4.5% respectively. Female were faced both the physical and sexually abused more than boys. But boys were more emotionally abuse than girls. Girls child are more commonly neglected.

In the physical abuse, the maximum proportion of was by throwing followed by hitting. While in sexual abuse maximum percentage was by fondling followed by exposing the body part in sexual manner even 29.2% were victims of attempted rape.

In emotional abuse form of child maltreatment, most common was by teasing/bullying followed by criticism. In neglect, most common was neglect of medical treatment followed by food, housing.

Statistically significant association was found between age, gender, religion, school level and history of child abuse.

The mean age of experiencing child maltreatment first time in their life was around 7.84 year  $\pm$  4.327. It was found male child who faced more maltreatment in

any form and it was found to be statistically significant.

Statically significance is seen between child abuse and increasing number of family members, substance abuse by father and no child abuse in family where mother was non-abuser. It was seen that child maltreatment was more in nuclear families found statically significant.

It was seen that most of the accused for child abuse were male being around 58.82% and here since multiple episodes of abuse has been recorded. It found that most of accused were Hindus and they were family members mainly the parents of the victim child. Majority of the accused belonged to age group 21-35 year and were married and graduates.

## DISCUSSION & CONCLUSION

The study was conducted to assess the prevalence of child maltreatment and its different aspects in Siliguri police Commissionerate area of Darjeeling district of West Bengal. In this context, the findings of the present study are discussed and interpreted objective wise as follows:

The prevalence of child maltreatment in this study was found to be around 33.2%. The prevalence of the physical abuse was more followed by psychological then sexual abuse and neglect here in Siliguri the rates of which were 41.44%, 27.9%, 21.6%, 9.06% respectively.

Similar study done in Tripura says the children has experienced psychological (20.9%), physical (21.9%) or sexual (18.1%) violence.<sup>3</sup> while a national level study in India found 66.66% children has experiences physical and psychological violence and 50% were sexually abused.<sup>4</sup> A study in china showing 7.8% lifetime prevalence of child abuse.<sup>5,6</sup>

My study shows among physical abuse, the maximum proportion here was by throwing followed by hitting. While in the Kurdistan Province of the Islamic Republic of Iran, 38.5% of the subjects reported experiences of physical violence at home that had caused mild to severe physical injury. With respect to forms of physical violence, gender wise differences have been observed; as male children were mostly beaten with belts, sticks or other objects, and female children were mostly pushed (46.2%), grabbed (41.9%) and kicked (54.8%).<sup>7</sup> Study done in Republic of Korea found that kicking, biting, choking and beating of children by parents are alarmingly common.<sup>8</sup> Two-thirds of

the parents reported whipping their children and 45% confirmed that they had hit, kicked or beaten them.<sup>9</sup>

Prevalence of sexual abuse is 21.6% in which maximum percentage was by fondling followed by exposing the body part in sexual manner even 29.2% were victims of attempted rape. According to review of epidemiological surveys from 21 countries says sexual abuse of female is from 14.0% to 56.0% and up to 25.0% in male children, was perpetrated by relatives or step-parents.<sup>10</sup> WHO estimates that globally, 8% of boys and 25% of girls below age 18 are estimated to suffer sexual abuse of some kind every year.<sup>11</sup> Physical contact sexual abuse, which includes molestation, touching, and attempted and forced sex, ranged from 1.7% in Hong to 11.6% in the Pacific Islands.<sup>11, 12</sup> A Government of India, Ministry of Women & Child Development (2007) survey showed that the prevalence of all forms of sexual abuse (50%).<sup>13</sup>

We found emotional abuse was the second most common form of child maltreatment followed by physical, 27.9% children were abuse in their life up to 18 year of age. In emotional abuse form of child maltreatment, most common was by teasing/bullying followed by criticism. In the neglect form abuse, most common was deserting medical treatment, followed by food, housing of the child. Statistically significant association was found between age, gender, religion, school level and history of child abuse.

Study done in China middle school students found Emotional abuse in 14.4%.<sup>15</sup> Philippines Study found 22.8% reported experiencing psychological or emotional abuse before the age of 18.<sup>14</sup>

In our study mean age of experiencing child maltreatment first time in their life is 7.84 year  $\pm$  4.327 may be because all these have started going to school and so physical abuse more. In 2012, children aged 0–3 years accounted for 33.6 percent of all victims, with 12.8% younger than 1 year of age. About one-quarter of victims were between the ages of 4 and 7 years, 18.7 percent were aged 8–11 years, 16.8 percent were aged 12–15 years, and 5.8 percent were aged 16–17 years.<sup>15</sup> With the exception of sexual abuse, children aged 0–2 years represented the largest proportion of victims in each maltreatment category.<sup>16</sup>

On the other hand, I have found different result as compare to above study. In my study the victim of

child maltreatment were mostly boys as compare to girl child. But when we see the gender distribution among child maltreatment the result is different if we compare the proportion according to gender found the physical abuse were more common in boys and sexual emotional as well as neglect common in female child. The large number of children in the family and family size was an important contributing factor in child abuse as revealed by present study. Even my result is also similar to the above studies. A study by Farah Malik in Pakistan found larger family size and higher number of children in family shows more child abuse.<sup>17</sup> A study done in Tripura revealed some relationship between violence against children and nuclear family as p value was less than 0.01 which was similar to our study.<sup>18</sup> However, this is in contrast to a study conducted in Pakistan not found any relation between child abuse in respect to different family system.<sup>17</sup> The family members or other people residing in or visiting a child's home - people normally trusted by the children and often responsible for their care are responsible for much of this sexual violence.<sup>19</sup>

In the current study the family which were non-abuser the children were more protected than the family were the father or the mother were substance abuser. Similar I found the family were father were abuser the children were more maltreated. I found 70.83% children were abuse in those family were father is also substance abuser. This result is also similar for mother who were substance abuser. One study the relationship between reported exposure to child abuse and a history of parental substance abuse (alcohol and drugs) was examined in Ontario, Canada, indicated that rates of physical and sexual abuse were significantly higher, with a more than twofold increased risk among those reporting parental substance abuse histories and that these rates were not significantly different between type or severity of abuse.<sup>20</sup>

Majority of maltreatment was seen among Hindu, probably because most of the study population were same. Similarly, in my study I found male were most commonly involved in this. Among this the Parents were the main perpetrator of victimization. Overall, 81.5 percent of perpetrators of abuse or neglect were parents of the victim (either alone or in conjunction with another person). Male relatives and male partners of the child's parent were the perpetrators in another 3.0 and 2.3 percent of victimizations, respectively.<sup>15</sup>

In my study, most common age group involved in child maltreatment were 21- 35 year followed by age group in 36 - 50 years. Among the over 244,000 alleged offenders investigated for instances of child abuse in 2014, some startling statistics included that 154,529 were 18+ years old, 26,294 were ages 13 to 17 years, 20,040 were under age 13 years, 95,913 were a parent or step-parent of the victim, 127,358 were related or known to the child victim in another way, 23,696 were an unrelated person the victim knew.<sup>21</sup>

**Some new observational data those which have not mentioned in the studies reviewed by me are as follows.**

- Majority of maltreatment was seen among Hindu, probably because most of the study population were same.
- Among the accused around 15% were addicted.
- Married person was found to be mostly involved in child maltreatment.
- Most of the accused were completed graduation.

## RECOMMENDATION

Several limitations hindered the establishment of true prevalence rates in this study.

The study relied upon children's self-reported victimization and did not include any independent verification

The data were collected solely from children in school, and the children who may be most at risk of being exposed to child maltreatment (e.g. drop-outs and children not sent to school) were therefore not included. Therefore, our data cannot be generalized.

There could be social desirability bias.

This study couldn't cover disabled children which are almost four times more likely to be sexually, physically and emotionally abused and neglected than non-disabled children.

**Source of Funding-** Self

**Conflict of Interest** – Nil

**Ethical Committee-** NBMC Darjeeling

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# Study of Pattern of Thoracoabdominal Injuries in Railway Deaths

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## ABSTRACT

India is a country where the use of railways as a transport is extensive, because it is economical as well as easily available. Though the utility of railways are many but drawback associated is railway death are also common. The current study is an attempt made to study the pattern of thoraco abdominal injuries associated with railway deaths. The incidence is common among males, and with age group of 21-30 years. Head injuries are common followed thoraco abdominal injuries. Lacerations and abrasions are common external injuries.

**Keywords:** Transportation, Railway death, Thoraco abdominal injuries.

## INTRODUCTION

Fatal railway injuries can be sustained by a victim in many ways like crossing track. Manner of the railway deaths in most of the cases are usually accidental, followed by suicidal, homicidal deaths are rare. Meticulous autopsy examination will become necessary for the determination of pattern, manner of death, cause of death and determination of identity of individual for many civil and criminal purposes.<sup>1</sup>

Indian Railway is a largest railway system in the world under a single management. Railway accidents occupied an important role in the medical and legal disclosures on trauma and traumatic disorders.<sup>2</sup> In India most of the railway tracks run to populated areas and being the cheapest mode of transportation, most trains travel thickly packed. All these factors increase the possibilities of accidents.<sup>3</sup> The Railway also provides a convenient mode of suicides and many cases have been reported were a person being deliberately lie across the

railway line or even place his head on the line in order to achieve self-destruction.<sup>4</sup>

## AIMS AND OBJECTIVES

Thoracoabdominal injuries due to railway accidents in relation to sex, age and identity

Pattern of Thoracoabdominal injuries due to railway accidents

Cause of death in relation to Thoracoabdominal injuries due to railway accidents

## MATERIALS AND METHOD

The study was conducted in Department of Forensic Medicine and Toxicology, Bowring and Lady Curzon Bangalore as a prospective study of all Railway related deaths for a period of one year that is from First of January 2016 to thirty first December 2016. A detail proformas was prepared for collecting data, information was also collected from police written in Form 146(i)&(ii). The pattern of fatal thoracoabdominal injuries due to railway death was analysed based on age, sex and Identity. Pattern of thoracoabdominal injuries and cause of death.

The study is a descriptive study.

The criteria for the current study:

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Inclusion criteria:

All cases of fatal thoracoabdominal injuries due to railway deaths autopsied in Bowring and Lady Curzon Bangalore.

**Exclusion Criteria:**

The cases other than thoracoabdominal injuries due to railway deaths.

## OBSERVATION & RESULTS

**Table 1: Shows number of cases as per age group**

Age Group	Number of Cases	% of Cases
1 to 10Years	0	0
11 to 20Years	11	10
21 to 30Years	35	32
31 to 40Years	18	16
41 to 50Years	15	15
51 to 60Years	12	11
61years & Above	18	16

**Table 2: Show case division as per fractures of bones.**

Fracture of Bone	Number of Cases	% of Cases
Ribs	61	55
Pelvic bone	11	10
Vertebra	64	58

**Table 3: Show number of cases as per cause of death**

Cause of Death	Number of Cases	% of cases
Injuries sustained	79	71
Shock & Haemorrhage	28	25
Shock	01	0.9
Skeletonised not determined	01	0.9

**Table 4: Shows number of cases as per gender**

Gender	Number of Cases	% of Cases
Male	94	85
Female	15	15
Others	0	0

**Table 5: Shows number of cases as per identity.**

Identity	Number of Cases	% of Cases
Known	64	58
Unknown	45	42

**Table 6: Shows external injuries of thoracoabdominal region.**

External Thoraco-abdominal injuries	Number of Cases	% of Cases
Laceration	87	78
Abrasion	96	86
Transacted body with ligature mark on neck	01	0.9
Mangled body	02	1.8

Total number of cases that were autopsied in Bowring and Lady Curzon during January 2016 to December 2016 for a period of one year was 1210. Number of railway deaths during this year was 216 which constitute about 18% of cases. Among those cases where thoracoabdominal injuries contributed for death due to railway injuries were 109 cases which constitute 50% of total railway deaths.

On considering the age group in the current study 35 cases were in the age group of 21-30years, 18 cases in the age group of 31-40years, 18cases 61 years and above. Incidence was common among males about 94 cases compared to female individual which constitute 15 cases. 45 individuals identity was not known and remaining 64 cases were identified.

Among external injuries 96cases showed abrasion, 87cases showed laceration, 2cases showed mangled body and one cases showed transacted body with

ligature mark over neck. Fracture of ribs seen in 61 cases, vertebra fractured in 64 cases and pelvic cases in 11 cases.

In majority of cases cause of death was given as death is due to injuries sustained in 79 cases. Shock and haemorrhage in 28 cases, shock in 1 case and cause of death could not be determined in 1 case due to skeletanization.

## DISCUSSION

The current study showed age group involvement was common in 21-30 years followed by 31-40years and  $\geq$  60years. This can be compared to a study done in Mandya.<sup>5</sup> But it is contrast to a study done in Trivandrum where incidences are common in 6<sup>th</sup> decade. Male predominance is seen in the current study, which is compared to majority of studies, this could be due to more outdoor activities by male individuals. Identity of 64 persons were known where as 45 individuals identity was not known, may be due to mutilation of the body, as well as involvement of migrating population.<sup>6,7,1</sup>

The region most commonly involved is head and neck followed by thoracoabdominal region which is in comparison to a study done in Sri Venkateswara Medical College, Tirupati.<sup>8</sup> Where head injuries are common, but contrast to another study in Kolkata where multiple injuries to multiple regions are common. In another study done in Indira Gandhi Government Medical College, Nagpur crush injury to limbs were common followed by head injuries.<sup>9,10</sup>

Most common external injuries that were noticed were laceration followed by abrasions. The study can be compared with a study done in Kolkata where laceration was common followed by fractures. The current study showed transaction of body in one case where as a study done in Mandya decapitation followed by hemi section of body was common among suicides.<sup>11,5</sup>

In the current study cause of death was due to injury sustained in majority of cases, followed by shock and haemorrhage. Which is in contrast to study by Mangesh Ramchandra Ghadge where shock and haemorrhage is common cause.<sup>12</sup>

## CONCLUSION

The railway related fatalities are increasing as the protective measures are not much ensured by law making

authorities. The pattern related to thoracoabdominal injuries had been analysed in this particular study. Railway fatalities usually involves multiple regions at a time, thoraco abdominal injuries constitute second most common region sustaining injuries, with involvement of internal organ of thorax and abdomen which is mangled in majority of cases.

**Conflict of Interest:** Nil

**Ethical Clearance:** Not Applicable

**Source of Funding:** Self

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# A Study on Histopathological Changes in Deaths due to Burns

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## ABSTRACT

Thermal burns are common next only to road traffic accidents in India. On an average, 1/4th of the deaths are due to burns of all postmortem examinations conducted. Mortality rate due to burns in India is much higher than any other developed county. Every year more than 2 million people sustain burns in India, most of which are treated as outdoor patients. About 2,00,000 are admitted in hospitals and 5,000 die. The major cause of death in the burn patients includes multiple organ failure and infection. This can be understood better with pathological study of the victim's organs. Hence this study has been done an effort to identify the pathological changes in various organs of burn victims.

The present study was carried out in the Department of Forensic Medicine & Toxicology, S N Medical College, Bagalkot, for one year from 1-1-2012 to 31-12-2012. A total of 48 cases with burn injuries brought to the mortuary for autopsy was studied tissues for histopathological examination were collected. From the present study it was observed that on histopathological examination congestion was the most common finding in lungs and liver. In the kidneys almost 1/3rd of the cases exhibited acute tubular necrosis. Curling's ulcer was seen in only one victim. Suprarenal gland, stomach, brain and kidneys were unaffected in the majority of cases.

**Keywords:** Thermal burns, multiorgan failure, infection, histopathological examination.

## INTRODUCTION

Thermal burns are common next only to road traffic accidents in India. On an average, 1/4th of the deaths are due to burns of all postmortem examinations conducted. Mortality rate due to burns in India is much higher than any other developed county.<sup>1</sup> Every year more than 2 million people sustain burns in India, most of which are treated as outdoor patients. About 2,00,000 are admitted in hospitals and 5,000 die.<sup>2</sup> The death rate due to fire in the USA (57.1deaths per million in 1988) is the second highest in the world and the highest of all industrialized countries.<sup>3</sup>

The occurrence of burns in developing countries like India is due to various socio-cultural factors. Some of these factors are harassment for dowry, use of crackers in festivals like Diwali, poor housing conditions, poor maintenance of electric appliances, custom of wearing sarees or dupatta, lack of education and poverty. Mortality due to burn injuries is higher in developing countries as compared to developed countries because of lack of health awareness among general population and poor availability of health care services. The developing countries also differ from developed countries with respect to sex of people affected, place of injury etc. Females are more affected in developing countries than developed countries and domestic burns are more common in developing countries while non-domestic burns are more in developed countries. The ultimate goal of medical treatment is to help the patient to return to his/her usual lifestyle as early as possible, so that he / she does not become a burden on his / her family.<sup>4</sup>

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Several studies on epidemiology of burns have been done in different countries and in India. Most of the studies have included different epidemiological factors such as age, sex, occupation, place of burns, cause of burns etc. in their study. Although flame, scald, chemical, electricity seem to be the direct causes of burns, underlying social factors like interpersonal relationship in the family, mental stress, negligence, male dominance, female battering by in-laws is rarely considered in any of these studies.<sup>4</sup>

*Current study contributes to the understanding the demographic profile of burn cases, as well as histopathological changes in various organs of deaths due to burns.* The major cause of death in the burn patients includes multiple organ failure and infection. This can be understood better with pathological study of the victim's organs. Hence this study has been done an effort to identify the pathological changes in various organs of burn victims.

### OBJECTIVES

1. To know the histopathological changes in Brain, Liver, Lungs, Kidneys, Suprarenal glands and Stomach following deaths due to burns.

### METHODOLOGY

The present study was carried out in the Department of Forensic Medicine & Toxicology, S N Medical College, Bagalkot, for one year from 1-1-2012 to 31-12-2012. A total of 48 cases with burn injuries brought to the mortuary for autopsy was studied tissues for histopathological examination were collected. Thorough and complete postmortem examination was conducted on all the cases in this study.

Histopathology reports of the organs sent.

During autopsy, samples of lung, liver, kidneys, suprarenal glands, stomach and brain were collected and preserved in 10% formalin solution. These were forwarded to department of pathology for histopathological examination.

After proper fixation of organs in 10% formalin, grossing was done and sections from representative areas were taken and processed for microscopic histopathological examination using H&E stains.

### RESULTS

The present study comprises the profile of 48 cases of deaths due to burns that were subjected to autopsy at Department of Forensic Medicine & Toxicology, S N Medical College, Bagalkot, for one year from 1-1-2012 to 31-12-2012. The following observations were made in the study.

**Table no 1: Distribution of cases according to pathological findings in Lungs.**

Pathological findings in lungs	Number	%
Normal	8	16.67
Bronchial oedema	1	2.08
Congestion & oedema	34	70.83
Interstitial oedema	2	4.17
Pneumonitis	3	6.25
<b>Total</b>	<b>48</b>	<b>100.00</b>

The above table depicts distribution of cases according to pathological findings in lungs. Most of the cases (34) showed congestion and oedema (70.83%), pneumonitis was seen in 3 cases (6.25%), interstitial oedema in 2 cases (4.17%) and bronchial oedema in 1 case (2.08%). In 8 cases (16.67%) no significant pathological changes were seen.

**Table no 2: Distribution of cases according to pathological findings in Liver.**

Pathological findings in liver	Number	%
Normal	18	37.50
Venous congestion & infiltration	20	41.67
Fatty liver	9	18.75
Fatty liver & haemorrhage	1	2.08
<b>Total</b>	<b>48</b>	<b>100.00</b>

The above table depicts distribution of cases according to pathological findings in liver. Venous congestion and infiltration were seen in 20 cases (41.67%), fatty liver in 9 cases (18.75%) and fatty liver with haemorrhage was seen in 1 case (2.08%). Remaining 18 cases (37.50%) showed no obvious pathological changes.

**Table no 3: Distribution of cases according to pathological findings in Kidney.**

Pathological findings in kidney	Number	%
Acute tubular necrosis	17	35.42
Normal	18	37.50
Cellular swelling & congestion	13	27.08
<b>Total</b>	<b>48</b>	<b>100.00</b>

The above table shows the distribution of cases according to pathological findings in kidney. Acute tubular necrosis was observed in 17 cases (35.42%) and cellular swelling and congestion were seen in 13 cases (27.08%). Remaining cases showed normal histopathological appearance.

**Table no 4: Distribution of cases according to pathological findings in Suprarenal gland.**

Pathological findings in kidney	Number	%
Congestion	15	31.25
Haemorrhage and necrosis	1	2.08
Normal	32	66.67
<b>Total</b>	<b>48</b>	<b>100.00</b>

In suprarenal glands congestion was observed in 15 cases (31.25%), 1 case (2.08%) showed haemorrhage and necrosis and in remaining cases there were no significant changes.

**Table no 5: Distribution of cases according to pathological findings in Stomach.**

Pathological findings in stomach	Number	%
Normal	33	68.75
Acute erosive gastritis	1	2.08
Chronic gastritis	3	6.25
Mucosal necrosis & congestion	3	6.25
Curling's ulcer	1	2.08
Gastric ulcer	7	14.58
<b>Total</b>	<b>48</b>	<b>100.00</b>

Ulceration of gastric mucosa was seen in 7 cases (14.58%) and mucosal necrosis and congestion and chronic gastritis was seen in 3 cases (6.25%) each. Acute erosive gastritis and curling's ulcer were seen in 1 case (2.08%) each. In the remaining 33 cases the stomach showed no histopathological changes.

In the present study oedema in 12 cases (25.00%) and haemorrhage in 1 case (2.08%) were observed in the brain samples. And in the remaining cases there were no significant changes.

## DISCUSSION

In the present study, large number of histopathological features was observed. In vast majority of cases 30 (70.83%), histopathological features of congestion & oedema were found. This finding is similar to studies of Argamaso RV<sup>4</sup>, Hasleton PS<sup>5</sup>. In our study pneumonitis was seen in 6.25% of cases whereas in studies of Argamaso RV<sup>4</sup>, it was seen in 23.33% cases and in the study of Toor AH<sup>6</sup> it was seen in 21.21% of cases.

### Pathological findings in liver

Current study showed venous congestion and infiltration in 20 cases (41.67%) followed by fatty liver in 9 cases (18.75%) and fatty liver with haemorrhage was seen in one case (2.08%). Remaining 18 cases (37.50%) showed no obvious pathological changes.

This observation is in line with Baker RD<sup>7</sup> (22.90%) and Argamaso RV<sup>4</sup> (16.60%). Venous congestion and infiltration of liver was observed in 20 cases (41.67%) of our study, this was not seen in studies of Baker RD<sup>7</sup> and Argamaso RV<sup>4</sup>. In the present study no cases of liver necrosis were observed whereas in studies of Baker RD<sup>7</sup> and Argamaso RV<sup>4</sup> it was seen in 14.90% and 23.30% cases respectively.

### Pathological findings in kidney

In the present study it was observed that in the majority of 18 cases (37.50%), gross findings in kidneys were normal while in 17 cases (35.42%) acute tubular necrosis was found and in the remaining 13 cases (27.08%) cellular swelling & congestion were seen. while in studies of Sevitt S<sup>8</sup> tubular necrosis was seen in 59.23% of cases and in that of Cerenca D<sup>9</sup> it was seen in 64.1% of cases, it was seen in only 35.42% of cases in our study.

**Pathological findings in suprarenal gland**

In this study, congestion was observed in 15 cases (31.25%), one case (2.08%) showed haemorrhage and necrosis and remaining 32 cases (66.67%) showed no significant changes.

**Table No 6: Showing comparison of Suprarenal haemorrhage with other studies**

Author	Year	Suprarenal haemorrhage
Argamaso RV <sup>4</sup>	1964	6.60%
Kalline O <sup>10</sup>	2005	5.55%
Nayak VC <sup>11</sup>	2006	38.18%
Vijay Kumar AG <sup>12</sup>	2011	27.20%
Present study	2013	2.08%

From the above table it is seen that presence of suprarenal haemorrhage is comparable to those of Argamaso RV<sup>4</sup> and Kalline O.<sup>12</sup>

**Pathological findings in stomach**

In the present study, ulceration of gastric mucosa was seen in 7 cases (14.58%) and mucosal necrosis and congestion and chronic gastritis was seen in 3 cases (6.25%) each. Acute erosive gastritis and Curling's ulcer were seen in one case (2.08%) each. In the remaining 33 cases stomach showed no histopathological changes.

The gastric ulcer was seen in 14.58% cases of our study while it was seen in 20% of cases in study of Argamaso RV.<sup>4</sup> Gastritis was seen in 2.08% of cases of our study, which is comparable to the study of Argamaso RV<sup>4</sup> where it was seen in 6.60% of cases.

In our study Curling's ulcer was seen in one case (2.08%), whereas it was seen in 4.00% of cases in the study of Chawla R.<sup>13</sup>

**Pathological findings in brain**

Current study showed oedema in 12 cases (25.00%) and haemorrhage in one case (2.08%) and no significant changes in the remaining cases. This is similar to the study of Argamaso RV<sup>4</sup> where oedema was seen in 8 cases (26.67%) and haemorrhage in one case (3.33%).

**SUMMARY**

On histopathological examination congestion was the most common finding in lungs and liver. In the kidneys almost 1/3<sup>rd</sup> of the cases exhibited acute tubular necrosis. Curling's ulcer was seen in only one victim. Suprarenal gland, stomach, brain and kidneys were unaffected in the majority of cases.

**Ethical Clearance:** Obtained

**Conflict of Interest:** Nil

**Source of Funding:** Self

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# Incidental Diagnosis of Tuberculosis on Histopathology: A 6 Year Autopsy Study

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## ABSTRACT

Tuberculosis (TB) is a major respiratory cause of morbidity and mortality globally. Miliary tuberculosis is a lethal form of disseminated tuberculosis (TB), deriving its name from the millet-seed-sized granulomas in the multiple organs. Miliary tuberculosis needs to be diagnosed early to ensure early and aggressive treatment at the earliest possible time. Histopathology remains one of the most important and gold standard method for diagnosing tuberculosis. We conducted the present study on 213 medicolegal cases in which lung was received as the part of viscera in the department of Pathology at GGS medical college, Faridkot in last 6 years (2010-2017). Of the total, 13 cases (6.1%) were labelled as Tuberculosis and only 7 cases (3.2%) were diagnosed as miliary tuberculosis. This study highlights the utility and indispensability of histopathological autopsies for the incidental findings and diagnosis.

**Keywords:** Tuberculosis, Autopsy, Pulmonary, Miliary Tuberculosis.

## INTRODUCTION

Tuberculosis (TB) remains a major respiratory cause of morbidity and mortality worldwide and has been identified as a 'global emergency' by the WHO. It continues to remain one of the most pressing health problems in India with the highest TB burden country in the world, accounting for one-fifth of the global incidence with an estimated 1.96 million cases annually.<sup>1,2,3</sup> In 2006, India recorded 1.9 million new cases. Of all fresh cases in the country, 1.2 % is infected with HIV and 2.8 % of all new cases have been diagnosed with multidrug resistant TB.<sup>3</sup>

Due to the stigma associated with this disease, there is either delay in the diagnosis or treatment leading to unrestricted exposure of bacilli to environment. In addition, the patients also have poor treatment compliance leading to multidrug resistance. The other contributing factors for increased incidence are HIV infection, lack of access to health care in the developing nations, ineffective preventive and control programmes etc.<sup>1</sup>

Even after the complete cure, complications like tuberculoma, cavitations, bronchiectasis, chronic

empyema, pneumothorax and opportunistic infections can occur due to which, a subset of patients may require surgical intervention.<sup>1,2,3</sup>

The diagnostic procedures like imaging techniques (computed tomography, nuclear magnetic resonance imaging) have made great advances in the past few decades, contributing to the false positive as well as false negative diagnosis thus making histopathology as the gold standard for the diagnostic confirmation.<sup>4</sup> Autopsy has been called "the ultimate audit" and remains gold standard for identifying specific causes of death as it offers valuable insights into the accuracy of earlier clinical diagnoses and can identify previously undiagnosed disease burden.<sup>2,4,5</sup>

In day to day practice, the forensic pathologists deal with sudden and unnatural deaths in which the underlying disease is unknown/ undiagnosed. Majority of these sudden deaths reportedly involve the cardiovascular system (45%), respiratory system (25%), or the nervous system (20%), other causes contribute to remaining 10% of the sudden deaths.<sup>3</sup>

Due to high prevalence of tuberculosis in the Indian subcontinent many cases may not be diagnosed until

after an autopsy is performed.<sup>1</sup>

The aim of our present study is to highlight the magnitude of undetected pulmonary and miliary tuberculosis diagnosed at autopsy.

**AIMS AND OBJECTIVES**

To highlight the histopathological diagnosis of incidental granulomatous inflammation on post-mortem autopsies.

To highlight the histopathological diagnosis of incidental military tuberculosis on post-mortem autopsies.

**MATERIALS AND METHOD**

The present study is a prospective study done over period of six years (2011-2017) in Department of Pathology in which total of 213 medicolegal cases were received for histopathology in which bilateral lungs/ part of lung was received alongwith the other viscera. Clinical details including the age, sex, suspected cause of death and post-mortem findings were noted from the post-mortem and police papers send along with the viscera. The viscera was received in 10% formalin solution; haematoxylin and eosin staining was done after the routine tissue processing. Special stains including Zeihl- Neelson stain (20%) and Periodic acid Schiff stain were used; wherever necessary. The slides were subjected to light microscopy and positive findings were noted.

**RESULTS**

This study was conducted over a period of 6 years on a total of 213 medicolegal cases in which bilateral lungs/ part of lung was included alongwith the other organs sent for post-mortem autopsy. Of the total, 21 cases (9.8%) were diagnosed with the underlying granulomatous pathology (with/without caseation necrosis) in the either one or both the lungs.

In our study, male preponderance was noted with M:F ratio of 2.5:1. The highest incidence was seen in 2<sup>nd</sup> to 4<sup>th</sup> decade of life with mean age of presentation 34± 4.2 years. Of these, the youngest was 22 year old male and oldest was 74 year old male (**Table No.1**).

**TABLE NO.1 AGE AND SEX DISTRIBUTION OF 21 PATIENTS WITH GRANULOMATOUS PATHOLOGY**

AGE (YEARS)	MALES	FEMALES	TOTAL
<20	-	-	-
21-30	3	1	4
31-40	3	1	4
41-50	2	1	3
51-60	3	-	3
61-70	2	1	3
71-80	2	1	3
Unknown	-	1	1
<b>Total</b>	<b>15</b>	<b>6</b>	<b>21</b>

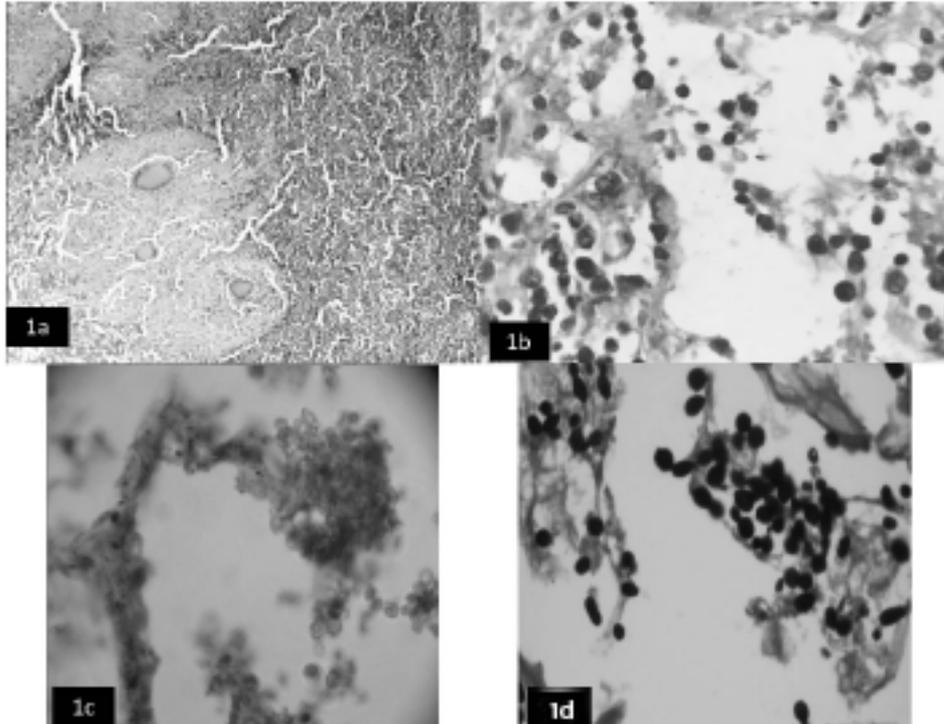
The 21 cases in which granulomatous inflammation was observed and were then subjected to special stains to see the cause for granulomas (**Fig 1a**). The two special stains i.e; Zeihl- Neelson stain (20%) for acid fast bacilli and Periodic acid Schiff stain for fungus were used. The findings were recorded in **Table No. 2**.

**Table No.2 Findings of special stains used in 21 patients with granulomas on light microscopy**

No. of Cases	Zeihl- Neelson Stain for acid fast bacilli	Periodic acid Schiff stain for fungus
13	Positive	Negative
06	Negative	Negative
02	Negative	Positive

Of the total cases with granulomatous pathology, 13 cases (6.1%) were positive for the acid fast bacilli (AFB) and were labelled as Tuberculosis (**Fig.1b**). In rest of the 8 cases (3.7%) with granulomatous pathology, the acid fast bacilli were negative. Two (0.9%) of these cases showed presence of round to oval budding spores, thus suggesting the possibility of Candidiasis and Cryptococcus. These two cases were positive for the PAS stain thus making the diagnosis of Candidiasis (**Figs.1c, d**). Rest of the cases (06) were negative were

both PAS and Z-N stain.



**Figs-1 a. Sections from lungs show epithelioid cell granulomas & Langhan’s type of giant cells (H&E 400X) b. Acid fast bacilli (Z-N stain 1000X) c. Numerous colonies of fungal spores (H& E 400X, PASx1000)**

Of the total, 7 cases (3.2%), granulomas were also noted in the other organs, thus, suggesting the diagnosis of Disseminated/ Miliary Tuberculosis. The clinical details of these patients with miliary tuberculosis including the age, sex, chief complaints and the underlying disease/ diagnosis were noted (Tables no.3, 4).

**TABLENO.3CLINICALCHARACTERISTICSOFPATIENTS(07)WITHMILIARYTUBERCULOSIS**

Patient	Age(yrs)/Sex	Chief Complaints	Underlying disease/Clinical Diagnosis
1.	35Y/M	Fever, Dyspnea	Interstitial Pneumonia
2.	22Y/M	Anorexia, Weight loss	Hepatitis-C
3.	76Y/F	Pain abdomen	Old treated Tuberculosis
4.	47Y/M	Fever, Sezuire	Liver Cirrhosis
5.	58Y/M	Chest Pain	Hypertension
6.	40Y/F	Lumbar Pain	Chronic Renal Failure
7.	64Y/M	Urinary Retention	Diabetes Mellitus

**TABLE NO.4 AUTOPSY FINDINGS IN CASES (07) OF MILIARY TUBERCULOSIS**

Patient	Granulomas containing multinucleated giant cells	Bacteria by Ziehl-Neelson stain	Underlying disease	Cause of death
1.	Lungs, Liver, Spleen	+	Interstitial Pneumonia	Tuberculosis
2.	Lungs, Kidneys, Spleen	+	Hepatitis C	Tuberculosis
3.	Lungs, Kidneys, Spleen	+	Old treated TB	Tuberculosis
4.	Lungs, Liver, Spleen	+	Liver Cirrhosis	Tuberculosis
5.	Lungs, Kidneys	+	Hypertension	Tuberculosis
6.	Lungs, Liver, Spleen	+	Chronic Renal Failure	Tuberculosis
7.	Lungs, Kidneys	+	Diabetes Mellitus	Tuberculosis

## DISCUSSION

TB is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extrapulmonary TB). It is characterized pathologically by presence of necrotizing granulomas. The hallmark of *Mycobacterium tuberculosis* infected tissue is necrotizing granulomatous inflammation, composed of epithelioid histiocytes surrounding a central necrotic zone, and can be accompanied by multinucleated Langhan's type of giant cells and lymphocytes.<sup>1,2,3,6,7,8,9,10</sup> The major function of these epithelioid histiocytes is to contain the infection to a localized area, thus avoiding bacterial spread to surrounding healthy tissues and to other organs, and to concentrate the immune response to a limited infectious area.<sup>1,3,10</sup>

In our study, most of the patients were young, in the second to fourth decade of life with a male predominance. Aziz et al. in a study on cases of tuberculosis of lung observed an equal number of patients less than 30 years and more than 50 years.<sup>11</sup> A study by Ganapathy et al. also observed a male predilection.<sup>12</sup> The reason for the male preponderance are thought to be due to epidemiological differences, exposure to risk of infection, and use of immunosuppressant in females for the various autoimmune diseases.<sup>1,6</sup>

Pulmonary tuberculosis can present with a variety of radiological findings and are not diagnostic. Tuberculoma and focal organizing pneumonia can mimic neoplasm. Also, diffuse bronchoalveolar carcinomas can radiologically resemble pneumonia. Disseminated tuberculosis, fungal infection or metastasis appear as ill-defined masses or cavitating nodules. In such cases final diagnosis is made on histopathology.<sup>1,2,6,7,9</sup>

In our study we had 6.1% patients who were incidentally diagnosed with tuberculosis and 3.2% with miliary tuberculosis. Clinically undiagnosed TB constitutes a substantial proportion of active TB cases which are diagnosed at autopsy.<sup>1,3</sup> Majority of our patients with miliary tuberculosis had sudden cardiac death. Rastogi et al. observed tuberculosis as the most important cause of sudden unexpected death involving respiratory system in 61.64%.<sup>18</sup> Rarely pulmonary tuberculosis may present as an acute pneumonia with respiratory failure.<sup>1,3,6,10</sup>

Miliary TB is a potentially fatal form of TB that results from massive lymphohematogenous dissemination. The complex of non-specific radiological findings with false negative Mantoux test can lead to further delay in the diagnosis.<sup>1,2,3,6,10</sup> Necrotizing granulomas were observed in 9.8% of the total cases in the present study. Similar findings were observed by Mamta et al.<sup>1</sup> Granulomatous diseases of lung often present a diagnostic challenge to the pathologist and usually requires appropriate use and interpretation of the special stains. Many infectious granulomatous lesions like fungal infections may also mimic tuberculosis. Demonstration of fungal spores and hyphae with the use of special stains can help to clinch the diagnosis.

Acid fast bacilli (AFB) positivity in smears and histological specimens depends on the bacillary load of the specimen and the type of the material.<sup>1,13</sup> Acid fast bacilli positivity was seen in 6.1% in the present study. However, Park et al and Mamta et al had a higher percentage of microbiologically confirmed pulmonary tuberculosis in 50% and 57.5% of patients. The definitive diagnosis of tuberculosis can be made on immunohistochemistry or use of molecular techniques such as polymerase chain reaction, the application of which was restricted on the autopsy study.

Miliary TB is a pathological term coined by John Jacob Manget in 1700 derived from the Latin word "miliarius," describing millet-seed-sized (1-2 mm) granulomas in various organs affected by the tubercle bacilli. It results from massive lymphohematogenous dissemination from a *Mycobacterium tuberculosis*-laden focus.<sup>10,13</sup> This term was coined by On chest X-ray, this pattern of involvement is seen in only 1-3% of all TB cases. However, autopsy studies of adults have documented a higher proportion of patients, accounting for 0.3-13.3% of all autopsies, and 11.9-40.5% of all cases of TB.<sup>6,10</sup>

In the present study, we had 7 cases (3.2%) of miliary tuberculosis. Spleen (05), followed by bilateral kidneys (04) and liver (03) were the commonest organs involved by miliary tuberculosis. Amongst the chief complaints fever was the commonest (02) followed by dyspnea, lumbar and abdominal pain. The underlying diagnosis in these patients were pneumonia, Hepatitis-C, liver cirrhosis, chronic renal failure and diabetes mellitus. The fact that active TB was not diagnosed in majority of our patients before autopsy points to the

need for physicians to have a basic understanding of the likelihood of miliary TB. It is often fatal if not promptly treated.

### CONCLUSION

Pulmonary tuberculosis is one of the oldest known diseases with rapidly increasing newer diagnostic modalities and treatment strategies. But still with the high incidence of disease histopathology remains one of the important methods for diagnosis. Undiagnosed tuberculosis may be a health hazard to the public and healthcare providers. Protective strategies like risk assessment, early diagnosis, recognition of lesions, use of methods to reduce infection transmission, and effective regular treatment are advocated to curtail the spread of tuberculosis

**Acknowledgments** - None

**Conflict of Interest** – None

**Source of Funding** – Self

**Ethical Clearence** – The above study was conducted on the post mortem viscera under the laws of the state.

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# Sex Determination and Personal Identification using Frontal Sinus and Nasal Septum – A Forensic Radiographic Study

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## ABSTRACT

**Aim:** To examine the variations in frontal sinus and nasal septum, its combinations using postero-anterior cephalogram for its use in personnel identification, sex determination in forensics.

**Materials and Method:** 96 Digital PA cephalograms taken on Planmeca Promax Digital Panoramic and Cephalometric system were examined for patterns of Frontal Sinus (Symmetry, lobulations) and Nasal Septum. The average area of frontal sinus was recorded for both males and females.

**Results:** The analysis on the frontal sinus pattern showed that FS asymmetry is seen in n=50 (63.45%) of subjects whereas symmetry in n=15( 23%). On analyzing the nasal septum deviation pattern, straight nasal septum n=29(30.2%) was most commonly seen followed by left deviated nasal septum n=23(23.95%), right deviated nasal septum n=19(19.79%), sigmoidal nasal septum n=14(14.58%) and reverse sigmoidal nasal septum n=11(11.45%). There is no sexual dimorphism in the patterns of frontal sinus and nasal septum. The total lobulation of FS on right side, mean area of FS were sexually dimorphic. 425 unique combinations of frontal sinus pattern and nasal septum deviation pattern with lobulations were reported. The sensitivity, specificity and discriminant function analysis showed that the use of area and lobulations of frontal sinus is about 71% reliable in forensics.

**Conclusion:** Combined use of the nasal septum and frontal sinus patterns along with the area and lobulations of frontal sinus using posteroanterior cephalogram will be of quite useful tool and an easy, quick method for a tentative screening in case of mass disasters for sex determination and personal identification.

**Keywords:** Frontal sinus, nasal septum, personal identification, forensic study, posteroanterior skull radiograph, Sex determination

## INTRODUCTION

For human identification, the most reliable means of identification include fingerprints, dental comparison when the body is not recognizable, ante and postmortem comparative details of anatomical structures in skull may be needed for personnel identification <sup>[1,2]</sup> Radiographs are important components in forensics that can be used for individual identification in human remains as well as living persons. Radiographic identification is simple and cost effective and thus makes the identification process faster. They are essential in anthropological identification in cases where the soft tissue or DNA

samples have severely degraded. The skull especially has several unique structures that differ among people of different age, sex etc. Structures such as frontal sinus, nasal septum, sella turcica, mastoid process, vascular groove patterns have been regularly used for identification. <sup>[3]</sup>

The frontal sinus is an anatomical structure widely used for human identification is absent in only 4% of the population and possesses areas that are unique among individuals. <sup>[4]</sup> Frontal sinus is a cavity which is lobulated. It is situated on right and left sides in between the external and internal cortical surface of

the frontal bone. Frontal sinus is a pneumatic cavity that becomes evident in a very young age of 5-6 years. They become completely developed around the age of 20. They are different for different individuals even between monozygotic and dizygotic twins.<sup>[5]</sup> Frontal sinus pattern can be an excellent identification marker as they not only vary among individuals but also between the two sides of the sinus. It has a stable and resilient structure during adult life. It has very strong walls and is maintained intact in human remains as its internal bony structure and arched nature protect it from insults and putrefaction. Its radiographic size and patterns have a potential to be used as aids for personal identification, age, and sex estimation. Among the paranasal sinuses frontal sinus shows the maximum variations.<sup>[6]</sup>

The nasal septum is a structure made of cartilage and bone that separates the nasal cavity into the two nostrils.<sup>[7]</sup> They are radiologically evident from birth and clearly visible in posteroanterior view radiographs. Along with the frontal sinus pattern they can be used as a marker for accurate identification. So the study aimed to analyze the frontal sinus and nasal septum deviation pattern in personnel identification and sex determination using postero-anterior cephalogram for its use in forensics.

## MATERIALS AND METHOD

The study was conducted using 96 digital PA radiographs obtained from 65 males and 31 females age range 20-45 years were selected from the Oral Medicine and Radiology Department, Saveetha dental college. The study was conducted for a period of 3 months. Radiation protection protocol was ensured for all patients. PA cephalogram was chosen as it provides clear visualization of standard frontal sinus and nasal septum dimensions with less distortion. Radiograph was performed on planmeca Promax OPG X-ray machine with cephalogram attachment and Dental Imaging Software 6.3.4.

The radiographs were observed for the frontal sinus (Symmetry, lobulations, area) and nasal septum deviation patterns. The average area of frontal sinus was recorded for both males and females with Microsoft Image J software (Figure 3).

The greatest horizontal dimension was measured from the central septum on either side. The difference in the right and left side dimensions was divided by the greatest dimension and multiplied by 100. If the

percentage was more than 20% then it was classified as asymmetrical.

Frontal sinus pattern classification: (Figure 1)[4]

- o Symmetrical
- o Asymmetrical
  - Left dominant
  - Right dominant
- o Aplastic
  - Unilateral
    - Right
    - Left
  - Bilateral

Nasal septum deviation pattern classification (Figure 2)[4]

- o Straight
- o Left deviation
- o Right deviation
- o Sigmoid
- o Reverse sigmoid

The participants in the present study include subjects without any history of, traumatic fractures, developmental anomalies affecting the jaw or syndromes of craniofacial structures. Statistical Analysis:

The patterns were tabulated and the frequencies of different types of frontal sinus and nasal septum were found. The various possible combinations of resultant pattern of FP and NSP were evaluated. Mean area of frontal sinus were calculated. The sexual dimorphism for frontal sinus and nasal septum deviation pattern was evaluated using chi square test. The sexual dimorphism of the lobulations and area of frontal sinus was assessed using independent samples t-Test to compare mean values between Genders.

ROC curve analysis was done to obtain the threshold value for the significant parameters to differentiate between males and females. Sensitivity and Specificity for Area and lobulations of frontal sinus were performed

and the accuracy were analyzed by discriminant function analysis.

**RESULTS**

The analysis on the frontal sinus pattern and nasal septum deviation showed that left domination of frontal sinus n=35(35.41%) and straight nasal septum n=29(30.2%) were more common among patients. Among males, the order of prevalence of frontal sinus were left dominant frontal sinus n=22 (38.84%), right dominant frontal sinus n=16(24.61%), symmetrical frontal sinus n=15 (23%), bilateral aplasia of frontal sinus n=6 (9.23%) and unilateral aplasia of frontal sinus n=6 (9.23%). This is true in even females were the the following prevalence is seen: left dominant frontal sinus n=12 (38.7%), symmetrical frontal sinus n=8 (25.8%), right dominant frontal sinus n=6 (19.35%), bilateral aplasia of frontal sinus n=4 (12.9%), unilateral aplasia of frontal sinus n=1(3.22%). [Table 1]

In case of nasal septum deviation of males the prevalence is of the following order: straight nasal septum n=19(29.23%), left deviated nasal septum n=14(21.53%), right deviated nasal septum n=13 (20%), sigmoidal nasal septum n=12 (18.46%) and reverse sigmoidal nasal septum n=7(10.76%). In females, the nasal septum deviation pattern is similar with the following proportions: straight nasal septum n=10(32.25%), left deviated nasal septum n=9(29.03%), right deviated nasal septum n=6(19.35%), reverse sigmoidal nasal septum n=6 (12.9%) and sigmoidal nasal septum n=4 (6.45%)[Table 2].

There is no sexual dimorphism in the frontal sinus and nasal septum deviation pattern in our study. As for the area, the mean area of frontal sinus in males(2118.27 mm<sup>2</sup>) is more when compared to females(1564.79mm<sup>2</sup>) (Figure3)

On analyzing the lobulations of frontal sinus, a significant variation was found between the number of lobes found on the right side of the frontal sinus between male and female. The average number of lobes present in total in males is 4.89 and females is 3.88. The average number of lobes on the right side of frontal sinus are 2.38 and 1.77 for males and females respectively. The average number of lobes on the left side of the frontal sinus are 2.50 and 2.26 for males and females respectively.[Table 3]

The right lobe and area of frontal sinus showed sexual dimorphism. ROC curve analysis was done for these and the cut of value differentiating between males and females was found. If the threshold values were found to be greater than or equal to 3 for right lobe and greater than or equal to 1372.03 for area then it is presumed as male.

On statistically analyzing the data using sensitivity and specificity, for right lobe sensitivity and specificity values were 50.85%, 77.78% respectively and for area 71.19%, 62.96% respectively. Positive predictive value for right lobe and area were 83.33%, 80.77% respectively. Discriminant function analysis on right lobe and area of frontal sinus found that, the use of area and lobulations of frontal sinus is 70.9% reliable for sex determination in forensics.

**Table 1- Frequency of frontal sinus pattern(percentage)**

Gender	Left dominant	Right dominant	Symmetrical	Right unilateral aplasia	Left unilateral aplasia	Bilateral aplasia	Total
Male	38.84%(22)	24.61%(16)	23%(15)	4.61%(3)	4.61%(3)	9.23%(6)	67.7%(65)
Female	38.7%(12)	19.35%(6)	25.8%(8)	0%(0)	3.22%(1)	12.9%(4)	32.3%(31)
<b>Total</b>	<b>35.41%(34)</b>	<b>22.91%(22)</b>	<b>23.95%(23)</b>	<b>3.125%(3)</b>	<b>4.166%(4)</b>	<b>10.416%(10)</b>	<b>100%(96)</b>

a)Chi-Square value: 2.259

b)P-Value = 0.812

**Table 2-Frequency of Nasal septum deviation pattern(percentage)**

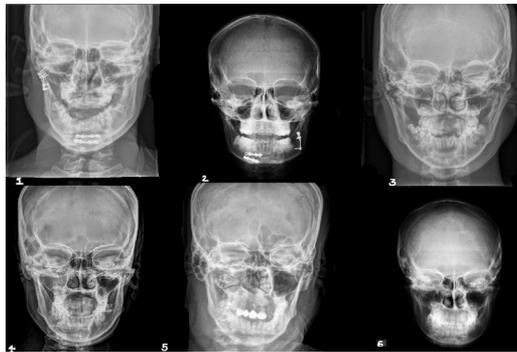
Gender	Left Deviation	Right Deviation	Straight	Sigmoid	Reverse Sigmoid	Total
Male	21.53%(14)	20%(13)	29.23%(19)	18.46%(12)	10.76%(7)	67.7%(65)
Female	29.03%(9)	19.35%(6)	32.25%(10)	6.45%(2)	12.9%(4)	32.3%(31)
Total	23.95%(23)	19.79%(19)	30.2%(29)	14.58%(14)	11.45%(11)	100%(96)

a) Chi-Square value: 2.719. b) P-Value = 0.606

**Table 3- Independent samples t-Test to compare mean values between Genders**

Variables	Gender	N	Mean	Std. Dev	t-Value	P-Value
Left lobes	Male	59	2.51	1.501	1.296	0.199
	Female	27	2.15	1.027		
Right lobes	Male	59	2.39	1.218	2.316	0.023*
	Female	27	1.78	0.934		
Area	Male	59	2118.3	1185.1	2.094	0.039*
	Female	27	1564.8	1024.0		

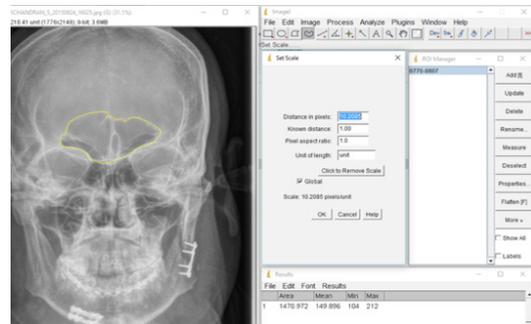
\*The result is significant at  $p < 0.05$



**Figure 1: 1.Bilateral aplasia 2.Left unilateral Aplasia 3. Right unilateral Aplasia 4. Right dominant Sinus 5. Left dominant Sinus 6. Symmetrical**



**Figure 2: 1.Straight 2. Left deviation 3.Right deviation 4.Sigmoid 5. Reverse Sigmoid**



**Figure 3: Measurement of area of Frontal Sinus using image J software**

## DISCUSSION

Frontal Sinus uniqueness in personnel identification was first observed by Zukerkandl in 1875 due to its morphological asymmetry.<sup>[6]</sup> The first human identification through morphological analysis of FS was described in 1927 by Culbert and Law which was later accepted in the United States court of law.<sup>[7]</sup> Previous studies of us, have focused on determining gender through linear measurements of teeth in incisocervical,mesiodistal,buccolingual dimensions in population specific groups.<sup>[8]</sup>In situations where teeth are severely attrited,fractured or missing, anatomical structures in skull may be of helping hand to department

of forensics in sex determination as well as personnel identification. In the present study, asymmetry of frontal sinus is seen in 63.45%(38) of the sample whereas symmetry in 23%(15) of the sample which is in contradictory to the observations made by David and Saxena who reported asymmetry and symmetry in 32% and 58% respectively, Taniguchi et al obtained 43.1% symmetry and 56.6% asymmetry in his study.<sup>[5,7]</sup> This can be attributed to the variation in craniofacial configuration, thickness of frontal bone and growth hormone levels. Unilateral aplasia and bilateral aplasia was seen in 9.23%(6) of individuals. Krogman, observed frontal sinus absence in 5% of the adults, while Gulisano et al observed its absence in 4.8% of the cases.<sup>[10,11]</sup> Schuller suggested that the presence of a metopic suture was associated with the absence of the frontal sinus.<sup>[12]</sup>

Nasal septum patterns revealed various pattern in our study. In our study, straight nasal septum is present in 30.2%(29) of individuals, Taniguchi et al and David et al showed straight nasal septum in 13.4% and 22% respectively.<sup>[7,9]</sup> Genetic factors, trauma, compression of nose during childbirth, variations due to climatic changes, some genetic connective tissue disorders such as Marfan syndrome, Ehlers-Danlos syndrome, Homocystinuria cause deviated NS. We observed 43.74%(42) of deviation of the nasal septum which is in concordance with Talaiepour et al. who observed 63% nasal deviation (28% to the right, 31.5% to the left, and 3.5% others).<sup>[13]</sup> Sigmoid, reverse sigmoid were assessed in 26%(25) of the individuals in our study. On the other hand Taniguchi et al. assessed 6%, 6.3% respectively.

The average area measurement of frontal sinus is greater in males(2118.27 mm<sup>2</sup>) than in females(1564.79 mm<sup>2</sup>).<sup>[3]</sup> This is in accordance to Verma et al who obtained an average of 1602.57mm<sup>2</sup> in males and 1099.34mm<sup>2</sup> in females.<sup>[7]</sup> The Microsoft Image J software provided a two dimensional area for the irregular shape of the frontal sinus accurately. Thus this is superior to other studies where only greatest width and height (a mathematical approach) were used to obtain the area of the sinus. Morphological differences in the cranium between both gender are determined by genetic factors which might be the reason for larger FS in males.<sup>[5]</sup>

When the combined usage of both frontal sinus and nasal septum patterns with lobulations was assessed, we obtained 425 unique combinations. The lobulations

of frontal sinus was also statistically analysed. It was found that there is significant difference between males and females with respect to right lobe and area of frontal sinus. Thus the number of lobulations and area can give us an insight of the gender of the person too. This is in accordance with study done by Sudhakara Reddy et al.<sup>[5]</sup>

Our study is the first to use both lobulations and area for finding the gender of the person. In cases where frontal sinus and nasal septum deviation patterns are similar in two individuals, the area and lobulations of frontal sinus can be used along with them to identify the victim. The sensitivity and specificity and discriminant function analysis showed that the use of frontal sinus and nasal septum deviation pattern is more than 70.9% reliable for sex determination which in turn helps in personal Identification. There is no sexual dimorphism in the frontal sinus and nasal septum deviation pattern in our study. Area and right lobulation of frontal sinus shows significant sexual dimorphism along with Patterns of FS and NS combinations can help in precise personal identification in mass disasters. Prior antemortem records need to be preserved for victim identification.

## LIMITATIONS

Since the study was done within a restricted time limit and the number of samples obtained from patients may be inadequate. PA view was mainly taken for patients with maxillary and mandibular fractures. Hence the radiographs obtained were mostly from male patients who are more susceptible to road traffic accidents than female patients.

## CONCLUSION

It was shown that a combined use of the nasal septum deviation (straight, simple deviation to the left or right, sigmoid and reverse sigmoid) and the frontal sinus pattern (symmetry, left or right dominant asymmetry in combination with unilateral and bilateral aplasia) achieved different types of variations. Thus it can be used in personal identification. The area and lobulations of frontal sinus will provide means of obtaining the gender of the victim. The results witnessed in the present study suggests that a combined use of the nasal septum and frontal sinus patterns along with the area and number of lobes of frontal sinus using posteroanterior cephalogram radiograph will be of quite useful tool and an easy, quick method for a tentative screening in case of mass disasters. Nevertheless,

preservation of ante mortem radiographs is of utmost importance in personal identification. Further studies can be done with larger sample size with more female patients to obtain precise results.

Declaration on **Conflict of Interest:** we have no conflict of interest

**Financial Support** and sponsorship:nil

**Source of Funding:** Self

‘All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5). Informed consent was obtained from all patients for being included in the study.’

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# Current Status of Knowledge, Attitude and Awareness of Medical Students on Forensic Autopsy in Tumkur District of Karnataka

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## Abstract

**Background:** Autopsy is an investigative procedure that has been in use since several years. Even though it helps in arriving at a decision regarding the cause of death and many other things, its use is declining recently, which should be a cause of concern. **Material and Method:** It is a descriptive, cross sectional study which was carried out among 3<sup>rd</sup> and 4<sup>th</sup> year medical students of a tertiary care teaching hospital, using set of questionnaires. **Results:** Questionnaires were distributed to 250 medical students. 15 students didn't return the proforma and 25 student's data were not included due to incomplete and lack of internal consistency. Finally the data of 210 participants were collected and included in the study and results were analysed. This study shows the students had a reasonable knowledge and good attitude towards medicolegal autopsy. Almost 89.5% of students had knowledge and awareness about postmortem examination from their medical curriculum and 67.1% of the students would not mind autopsy to be performed on themselves or relatives. **Conclusion:** Knowledge, awareness and attitude has a main role in improvement in the field of Forensic Medicine and Toxicology.

**Keywords:** Autopsy; Postmortem; Knowledge; Medical students.

## INTRODUCTION

The autopsy has played a vital role in the accumulation of medical knowledge and as an indispensable examination tool in the medicolegal investigation of unnatural and unexplained deaths.<sup>1,2</sup> It is, however, a procedure burdened with a variety of misconceptions, myths, and emotions by lay people as well as by physicians.<sup>3</sup>

Various studies have been conducted to assess the attitude of medical professionals in order to identify factors related to decline in use of autopsy as a teaching tool. Medical students occupy a privileged position and act as an interface between the laymen and the qualified

professional and would play a central role in improving use of autopsy as an educational tool in any country, the desired goal. Therefore present study was conducted to ascertain the knowledge, attitude and awareness of medical students towards medicolegal autopsy examination.

## MATERIALS AND METHOD

The present descriptive, cross sectional study was carried out among undergraduate students of a tertiary care teaching hospital in Tumkur district of Karnataka in the month of November 2017 using set of questionnaires. The study population consisted of undergraduate medical students, who had studied Forensic Medicine & Toxicology subject (3<sup>rd</sup> year and 4<sup>th</sup> year medical students). Students were requested to fill the questionnaires which were distributed by authors in the classrooms just after the completion of classes. Those students who could not be retrieved even after the third visit to classes and those incomplete filled proforma were excluded from the study.

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A detailed proforma containing 12 questions concerning student's knowledge, awareness and their attitude towards post-mortem examination were framed. Informed consent was obtained from all the students after explaining about the purpose of the study.

## RESULTS

Questionnaires were distributed to 250 medical students. Out of which, 235 students returned the filled

questionnaire proforma, making the overall response rate of 94.0%. Twenty five proforma's were not considered for the study analysis, as they were found to be incomplete and lacking internal consistency. Finally the data of 210 participants were collected and included in the study. The data obtained was tabulated in a Microsoft Excel spreadsheet and analyzed statistically for number and percentage for all questions (Table 1).

**Table 1: Questionnaires**

Medico-legal postmortem examination is mandatory in all unnatural and sudden unexpected and suspicious death cases?	Yes (n=205, 97.6%)
	No (n=05, 2.4%)
	Don't Know (n=0, 0%)
Is there any utility of taking out of viscera for histopathological examination and toxicological analysis for medico legal autopsy?	Yes (n=194, 92.4%)
	No (n=09, 4.3%)
	Don't Know (n=07, 3.3%)
Postmortem examination is?	Done to know the cause of death (n=204, 97.1%)
	Harassment to the relative of the deceased (n=02, 0.9%)
	Mere legal formality (n=04, 1.9%)
Do you think that autopsy helps in solving crimes and give important information to police?	Yes (n=209, 99.5%)
	No (n=1, 0.5%)
The reaction of the students on the first exposure to postmortem examination?	Comfortable (n=44, 21.0%)
	Slightly uncomfortable (n=111, 52.8%)
	Moderately uncomfortable (n=47, 22.4%)
	Very uncomfortable (n=08, 3.8%)
Students should attend more postmortem examination?	Yes (n=180, 85.7%)
	No (n=03, 1.4%)
Wished to have postmortem examination on self/ relative when required?	Yes (n=141, 67.1%)
	No (n=69, 32.9%)
Given a chance would you choose not to watch P.M examination at all?	Yes (n=46, 21.9%)
	No (n=164, 78.1%)
The utility of postmortem examination in medical education?	Yes (n=208, 99%)
	No (n=02, 1.0%)
Whether doing postmortem examination causes disfigurement of the body?	Yes (n=132, 62.9%)
	No (n=78, 37.1%)
Postmortem examination is disrespect to human body?	Yes (n=05, 2.4%)
	No (n=205, 97.6%)
Source of information and knowledge about Postmortem examination?	Medical curriculum (n=188, 89.5%)
	Magazine and newspaper (n=9, 4.3%)
	TV (n=18, 8.6%)
	Internet (n=04, 1.9%)
	Friend and relative (n=2, 0.9%)

## DISCUSSION

The autopsy is helpful in defining, the cause of death, validity of therapeutic modalities, the time of death, potential medico legal issues surrounding death, and providing data on disease and injury.<sup>4</sup> The value of autopsy has also been proven in its elucidation of the clinical quality control, medical auditing and in medical education.<sup>5</sup> The central areas of knowledge that can be learnt effectually by the medical students by attending autopsy include Clinico-pathological correlation, Pathophysiology, Anatomy and Observation skills.<sup>6</sup>

Recently; there has been a marked reduction in the number of hospital autopsies being requested. Besides curriculum reform, technological alternatives such as videos and CD-ROMs<sup>7</sup>, the general decline in clinical autopsy rate prevailing legislation, and legal, bureaucratic, financial, political, religious reasons have all contributed to the declining use of the autopsy as a teaching tool. Despite the fact that the literature indicates that Forensic autopsy rates, worldwide, remain fairly constant<sup>8</sup> there is little mention of their use in undergraduate medical training. The use of the autopsy as an educational tool is in decline and there is evidence that many recent Undergraduates and junior doctors have never attended an autopsy.<sup>9</sup>

In the present study, the knowledge of the necessity of the forensic autopsy in unnatural, sudden unexpected and suspicious death cases and for the utility of using viscera for the histopathological and toxicological analysis were present with 97.6% and 92.4% of the medical students respectively. These findings were similar to results of the study by Tayade PJ<sup>10</sup> and Jadav JC.<sup>11</sup> And also in our study 89.5% of students gained knowledge and information on postmortem examination from medical curriculum and 99% of students are aware that postmortem is very useful in medical education.

In our study, 99.5% of students agreed that conducting postmortem examination will help in solving crime and providing information to police. Similar observations of 97% students agreed to the same in the study by Bharathi.<sup>12</sup>

Only 21.0% of students answered that they were comfortable on the first exposure to postmortem examination. This is similar to the findings of Nihal Ahmed<sup>13</sup> where only 21% were comfortable. In the current study, 52.8% of the students were slightly

comfortable and 22.4% were moderately uncomfortable. In the study by Ekanem<sup>14</sup> showed 37% were slightly comfortable and 31% were moderately uncomfortable.

85.7% of the students recommend that medical students should attend more autopsies. This finding is similar to the study conducted by Nihal Ahmad who found 87.6% of their participants agreeing that more autopsies should be witnessed by medical students.<sup>13</sup>

For the question if given a chance would they chose not to watch autopsy at all, 21.9% answered as yes. While comparing with study by Jadav JC<sup>11</sup>, 32.5% students chose not to watch autopsy if given a chance.

62.9% students were of the opinion that post mortem examination causes disfigurement of body. This finding is similar to study by Roa GV, wherein 57% of students said yes for the same question.<sup>15</sup> And also in our study 2.4% were of the opinion that postmortem examination is disrespect to the human body.

To the question that if the need arises, will they allow post mortem examination on them or their relatives, 67.1% said they will allow. This is similar to the findings of Bharathi M<sup>12</sup> who found 78.5% of students responding positively and Nihal Ahmad in their study found 55.6% of positive response.<sup>13</sup>

To the question, the purpose of doing post mortem examination, 97.1% were of opinion that post mortem examination is done to know the cause of death, whereas 1.9% believed that it is a mere legal formality and 0.9% were of view that it is harassment to the relatives of the deceased. And to the question of source of information about postmortem examination, 89.5% of students answered that they gained knowledge and were aware about postmortem examination from their medical curriculum.

## CONCLUSION

The findings of the current study clearly showed that medical students possess a reasonable knowledge and positive attitude on the subject in this part of country (South India). But, knowledge, awareness and positive attitude alone may not be enough for increasing the post-mortem/autopsy as an education tool, unless they acquire the skills required for the procedure as currently they are not provided with any training during their medical curriculum. Hence we suggest revising the forensic medicine curriculum and for increased training

in the autopsy procedure and other medicolegal issues during their clinical and internship years too.

The students' emotional reactions are important, but unfortunately neglected aspect of medical training. The dissection of a dead body is not simply a technical exercise; it raises emotional feelings with regard to human mortality and dignity. Hence taking students into confidence and their comfort is also utmost important.

**Conflict of Interest:** Nil.

**Source of Funding:** Self.

**Ethical Clearance:** Obtained from the Institutional Ethical committee.

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# The Pattern of Blunt Abdominal Injuries among Autopsies Conducted at Mysore Medical College and Research Institute

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## ABSTRACT

Abdominal trauma is among the leading causes of morbidity and mortality in all age groups in the world. However, identifying serious intra-abdominal pathology due to trauma can be a challenge

Visceral injuries of the abdomen following blunt trauma present a great medicolegal problem to the forensic experts. Thus the doctor should remain alert to the development of signs and symptom after blunt trauma to the abdomen otherwise he may be charged of negligence. Among 100 cases of blunt abdominal injury, maximum number of cases belongs to the age group 21-30 yrs. Males were the predominant victims with ratio 2.5:1. It was found that road traffic accidents were responsible for 58% of blunt abdominal injuries. Among 100 cases of blunt injury, the incidence of the involvement of liver was the most commonly injured organ. Only abdominal injuries were present in the 67% of cases.

**Keywords** - Blunt injuries, trauma, Vehicular Accident and Visceral Injuries

## INTRODUCTION

Trauma is one of the leading preventable causes of death in developing countries, and is a major health and social problem. Trauma affects generally the young people, and accounts for loss of more years of life, than lost due to cancer and heart diseases put together.

Accidents are epidemic in civilized world; and our country is not an exception to this universal trend, and has witnessed a steady increase in accidental trauma, at present ranking fourth among chief causes of death. Abdominal trauma is among the leading causes of morbidity and mortality in all age groups worldwide.<sup>1</sup> Men tend to be affected slightly more than women.<sup>2</sup>

Abdomen is considered as a magic box both by the surgeons as well as the physicians. Sometimes exact injury is diagnosed only when abdomen is opened either during operation by the surgeon or during autopsy by the autopsy surgeon.

Often the victims are unconscious due to alcoholism, drug abuse or head injury, and shock. The problems in diagnosis are compounded by the fact that relatively trivial injury may rupture abdominal viscera. So suspicion should be very high, if the diagnosis is to be accurate. In

his series of 90 patients with free intraabdominal fluid but without solid organ injury, Livingston showed that 19% of patients without abdominal tenderness actually had a significant abdominal injury.<sup>3</sup> One indirect sign, which seems to be associated with hollow organ injury (if free fluid without solid organ injury is found) are seat belt marks, which increase the likelihood of a significant abdominal injury 2 to 4 fold.<sup>4</sup>

In open cases of abdominal trauma the clinical manifestations, diagnosis and management will be easier. But closed cases of trauma, offers a great challenge to the treating surgeon. Sometimes it may escape detection or lead to an error in diagnosis from medico-legal point, and the same is often true with autopsy doctor, where in closed cases of abdominal trauma, the autopsy findings may some times be trivial or complex and frustrating. It may be difficult to interpret the anatomic abnormalities to understand the mechanism of death, and may require a lengthy explanation. The aims and objective of the study is to make a comprehensive study of pattern of blunt abdominal injuries.

## MATERIALS AND METHOD

This retrospective study was conducted at the Department of Forensic Medicine, Mysore Medical

College and Research Institute. A total of 100 cases of deaths from blunt abdominal trauma from 1<sup>st</sup> January 2016 to 31<sup>st</sup> December 2016 randomly selected were taken up for study. Routine information like age, sex, occupation brief facts of the cases collected from the inquest report.

Clinical history like time of admission, and deaths and other relevant data were collected from the hospital case sheets and death summaries.

Pattern, nature of injuries, complications and cause of death was obtained from a study of the autopsy reports. Descriptive statistics will be used to analyze and they will be depicted using tables.

#### **Inclusion criteria**

- Cases with blunt injury to the abdomen.

#### **Exclusion criteria**

- Decomposed bodies
- Cases having both blunt and sharp injuries.

### **RESULTS**

The peak incidence was observed in the age group of 21-30 years comprising 32% of cases. It was also observed that 16% belonged to the age

group 41-50 years. So the highest number of cases due to blunt force injuries to the abdomen occurred in second and fourth decade. (Table-1) The least number of cases were observed between 0 -10 years (10%).

Males comprised a majority and constituted 72% compared to females who were only 28%.

Largest number of cases was due to road traffic accident (58%) followed by fall from height (12%). (Table-2) Miscellaneous causes include fall on to a table, stampede, animal kicks etc.

Out of 100 cases, liver was found to be injured in 44% cases, spleen in 31% cases, mesentery in 27% of cases, intestine in 10% cases, kidney in 17% cases, stomach in 5% cases, urinary bladder in 11% cases. Hence liver is the most common injured organ in blunt injury abdomen. (Table-3)

Only blunt injury to the abdomen was present in 67% of cases. However 7%, 19% and 7% of abdominal blunt injuries were associated with head injury, chest injury and injuries to multiple parts of the body respectively.

(Table-4)

### **DISCUSSION**

As shown in table 1, most common age group affected in this series was between

21-30 yrs. It was consistent with the findings of Chandra et al.<sup>5</sup> This may be because this is the age where lot of people are outgoing. Persons below 10 years of age contributed very less. This reduction in children fatalities could be due to better treatment, better education and more attention by parents. Males were more commonly involved as they are the bread winners of the family, they are suppose to do the outside work and females are house makers and are expected to do the household work.

As shown in table 2 maximum number of cases of blunt injuries of abdomen was due to motor vehicles. This findings was in agreement with the studies conducted by Aziz<sup>6</sup> and Chandre.<sup>5</sup> this may be due to increase in the number of vehicles in our country along with not so stringent punishment for traffic violation.

Perusal of table 3 shows that out of 100 cases with significant intra abdominal injury, the commonest organ injured was liver with 44%, spleen 31%, mesentery 27%, intestine 10%, kidney 17% and bladder 11% with relatively low accounting for stomach, that is about 5%. In most of the cases multiple organ involvement was very common. In all cases bladder involvement is associated with fracture pubic symphysis. Compared to hollow viscera involvement of parenchymatus organs is more common in both sexes. The liver is the most commonly injured abdominal organ. This may be due to the size of the liver and its solid (non-compressible) consistency, superficially placed, combined, renders it vulnerable to blunt forces, applied either to the upper abdominal or lower thoracic regions, especially on the right. This is in agreement with the studies conducted by Mousami et al.<sup>7</sup>

In the present study, majority of the victims (67%) had multiple intra abdominal injuries. Similar findings have also been reported by Singh Mousami et al<sup>7</sup> and Reddy N et al.<sup>8</sup> This+ high incidence can be explained by the following fact that Blunt injuries of abdomen as result of compression, traction or bursting forces cause widespread involvement of internal abdominal viscera.

As shown in Table 4, associated injury to chest was the most common (19%) followed by head (7%). Only abdominal injuries involved 67% cases. Similar findings was observed by Naik V et al.<sup>9</sup> This was in contrast to the studies conducted by Goyal A et al<sup>10</sup> and Reddy N et al.<sup>8</sup>

**CONCLUSION**

1. Majority of the Victims were Male ( 72% )
2. Youngsters in the age group of 21-30 Years (32%) were most commonly involved in trauma cases.
3. Road Traffic Accidents are most frequently noted as the cause of blunt injury abdomen (58%).
4. Liver was the most commonly involved organ. (44%)
5. Thoracic injury is the most commonly associated injury (19%)
6. Without any external injury to abdomen visceral injury is seen.

**TABLE 1 – Distribution of cases according to the age group**

Age Group	Male	Female	Total
0-10 Years	6	4	10
11-20 Years	10	4	14
21-30 Years	26	6	32
31-40 Years	10	4	14
41-50 Years	10	6	16
More than 50 Years	10	4	14
<b>Total</b>	<b>72</b>	<b>28</b>	<b>100</b>

**TABLE 2- Distribution of cases according to the cause of injury.**

Type	Male	Female	Total
Assault	8	2	10
Road Traffic Accidents.	37	21	58
Fall from Height	10	2	12
Accidents at work place.	8	0	8
Wall collapse	5	2	7
Others	4	1	5
<b>Total</b>	<b>72</b>	<b>28</b>	<b>100</b>

**Table 3 – Distribution of injuries to the abdominal viscera**

Viscera	No. of cases
Stomach	5
Intestine	10
Mesentery	27
Liver	44
Spleen	31
Kidneys	17
Bladder	11

**Table 4 – Distribution of cases according to the injuries to the different parts of the body**

Associated injuries	No. of Cases
Head Injury	7
Chest Injury	19
Injuries to different parts of the body	7
Abdominal injury alone	67

**Conflicts of Interest:** None.

**Source of Funding:** Self.

**Ethical Clearance:** yes, obtained from ethical committee.

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# Comprehensive and Analytical Study of Medico Legal Autopsies at Tertiary Care Center

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## ABSTRACT

**Background:** A medico legal autopsy will be required in criminal offence cases, when the death poses aspects of interest to the police, if the manner of death is unknown and if it is necessary to prevent later suspicion. Postmortem examination is a statutory requirement in all sudden, violent, unexplained, suspicious and litigious deaths.

**Aim and Objectives:** To study the gross postmortem findings in all Medico legal Autopsies.

**Type of Study:** Analytical prospective study.

**Place of Study:** Study was done by the upgraded department of Forensic Medicine & Toxicology, Osmania Medical College, Hyderabad.

**Observation and Discussion:** Preponderance of male sex (53.8%) is seen over female sex (33.4%) in known cases, maximum incidence of deaths are seen in the third decade of life as 24.9%, leading cause of death are head injuries (20.39%) followed by hanging (18.4%), burns (17.02%), multiple injuries (13.86%), poisoning (9.70%), majority of deaths caused by accidents (49.2%) followed by suicide (37.5%) and least by homicides (6.2%). Perception of autopsy findings in medico legal investigation has not only perspective value but also prospective value for future deliberations of criminology and criminalists.

**Conclusion:** Medico legal Autopsies form an integral and indispensable part of an investigation of a sudden suspicious death. The skills and experience of a Autopsy surgeon facilitate the law enforcement agencies in administration of justice and bring the guilty to the gallows.

**Keywords:** Medico Legal Autopsy, Cause of Death, Manner of Death

## INTRODUCTION

The term 'Autopsy' originates from ancient 'Autopsia' which is derived from 'Autos' i.e. 'Oneself' and 'Opsis' i.e. 'to see for oneself'<sup>1</sup>. The word autopsy

is used to denote a scientific postmortem examination of the deceased to determine cause and manner of death. Though necropsy is the most accurate term for the investigative dissection of a dead body, the term autopsy is used more commonly. Post mortem examination is an alternative expression, but it unfortunately suffers from a lack of precision about the extent of examination, for in some countries many bodies are disposed of after external examination without dissection<sup>2</sup>.

Autopsies are of two types i.e. Medico legal autopsy and pathological autopsy. An autopsy is frequently done in cases of sudden death where a doctor is not able to give a death certificate or when death is believed due to an

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unnatural cause. The most essential features of medico legal autopsy are that it must be proper and complete. Apart from determining cause of death (which may be the simplest, least controversial part of investigation) the Pathologist must be able to recognize, interpret and preserve evidence, whereas in hospital autopsy, it can be limited where the primary objective is to determine cause and mechanism of death.

Autopsy is the scientific examination of bodies after death, where the whole surface of the body as well as all body cavities and organs are explored and findings recorded. While doing so, all the possible findings are collected to help in establishing the circumstances leading to the death and also may help the law enforcing agencies<sup>3</sup>. A medico legal autopsy will be required in criminal offence cases, when the death poses aspects of interest to the police, if the manner of death is unknown and if it is necessary to prevent later suspicion<sup>4, 5</sup>. Postmortem examination is a statutory requirement in all sudden, violent, unexplained, suspicious and litigious deaths.

### MATERIAL AND METHOD

The present study is a record-based study of medico legal autopsies performed at a Medico legal Centre of a tertiary healthcare centre in Hyderabad, In the present work, all the autopsies collected for the study were done by the upgraded department of Forensic Medicine & Toxicology, Osmania Medical College, Hyderabad, during the period of July 2011 to the end of June 2013. Necessary permission was taken from the Institutional Ethical Committee. Data were collected using a pre-designed format from Post mortem registers/records,

and Post mortem reports maintaining confidentiality. Further details were obtained from hospital case records, police records and inquest reports submitted with autopsy requisition in each case by concerned police officer. In relevant cases, where necessary the organs was collected and sent for histopathological examination. The data was tabulated using Microsoft excel work sheet and analysis was done using Epi-info software (version 3.2).

### OBSERVATION AND DISCUSSION

The incidence of deaths is about 2350 (24.7%) in the last six months of 2011. The figures for the year 2012 are 4720 and for the first six months of 2013 are 2453 (25.8%) out of 9523 Autopsies. This shows increased incidence of deaths occurred in first six months of the year.

The preponderance of male sex (53.8%) is seen over female sex (33.4%) in known cases. As most deaths confides to their dwellings or the work places, the establishment of recognition and identity which is an essential part of corpus delicti is not a problem. In cases of unknown identity the dead bodies are either found or disposed off in remote areas or faraway places, in some cases mutilated by postmortem burns or dismemberment. The primary objective in these cases is to prevent detection and if detected to prevent recognition and identification. Even though during autopsy procedure identification stigmata are preserved in such cases, the positive identification is very low. Taking into consideration the total number of unidentified cases 12.8% reflects a failure in the direction of investigation. In this study, the subjects of medico legal autopsies were predominantly male, which was similar to other studies<sup>3, 11, 12, 13, 14</sup>.

**Table No 1: Age wise distribution of cases**

Age in years	Male		Female		All classes	
	n	%	n	%	n	%
0-10	206	2.2%	241	2.5%	447	4.7%
11-20	516	5.4%	627	6.6%	1143	12.0%
21-30	2368	24.9%	1650	17.3%	4018	42.2%
31-40	1217	12.8%	640	6.7%	1857	19.5%
41-50	1012	10.6%	312	3.3%	1324	13.9%
51-60	420	4.4%	199	2.1%	619	6.5%
>61	48	0.5%	67	0.7%	115	1.2%
<b>TOTAL</b>	<b>5787</b>	<b>60.8%</b>	<b>3736</b>	<b>39.2%</b>	<b>9523</b>	<b>100%</b>

As per Table No 1, it shows that the maximum incidence of deaths are seen in the third decade of life as 24.9% and 17.3% in case of males and females respectively. No age is exception for deaths. Increasing tendency is seen from childhood to middle age and a decreasing tendency from middle age to old age. In adolescent age group the etiology is intricate ranging from love, hate relationship to dowry deaths. It is nothing but natural for maximum number of homicides in the middle aged group as etiology is complex interwoven and revolves around 3W's i.e. wine, woman & wealth. After middle age the deaths are mostly related to property disputes with children, dacoits and sex related deaths. To get killed no age group is safe but to make murder age counts. Studies from Nigeria<sup>12</sup>, Dhaka <sup>13</sup> similarly reported the most common victims of unnatural deaths were middle-aged adults.

Majority of the victims are in Hindu (57.3%) followed by Muslim (22.8%) and Christian (7.1%) community respectively. When demography of population is taken in to consideration the ratio between these three communities corresponds to the ratio of the total population in & around the city of Hyderabad. This clearly shows that religion has no role and emotions spurt, subside and play same role in all human beings irrespective of the religion.

Maximum incidence is in middle (48.8%) socio economic strata followed by lower (35.2%) and in upper (3.2%) socio economic groups respectively. The miniscule death incidents in upper income group with high incidence in lower and middle income group clearly shows to the monetary influence apart from emotional and environmental factors. Half of the deaths incidents confines to middle socio economic strata and clearly shows the influence of illiteracy, ineptness, insufficient income, inebriation and indecency as causative factors<sup>6,7</sup>.

Study shows that 65.6 % death victims are married where as 21.6% victims are unmarried. The surveillance of other partner in the life of women brings additional factors to come into play like violent acts for more money, sex, faithfulness.

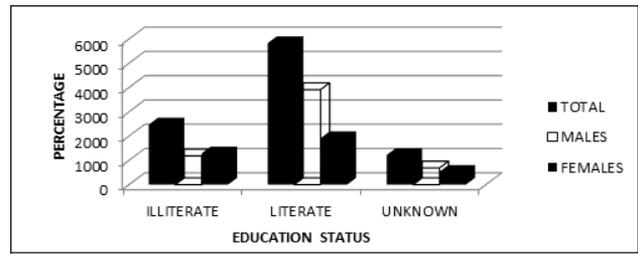


Fig. No: 1 Educational Status of Death Victims

Perusal of Fig. No 1 shows that 26% death victims are illiterate where as 61.2% are literate victims. This shows, with education crime also increasing gradually. Emotions play similar role in all human beings irrespective of education. The reason and judgment is more connected with the personality rather than with academics.

Study shows that majority of deaths in both sexes occur in others 49.7%, in that males 38.9% and females 10.8% respectively. By this study we can tell most of the females die at home (28.0%) but in case of males it is other than home (38.9%). Only males were attacked to death at their work place in full public view where in females the deaths were confined to within four walls of a house. In case of victims murdered at their house the perpetrator are closely related and the family disputes, quarrels and dacoity are stimulating factors. Whereas deaths at work place or others areas, the motivating are accidents, disputes, jealousy, revenge, extramarital relationships, no proper care at work place<sup>8</sup>.

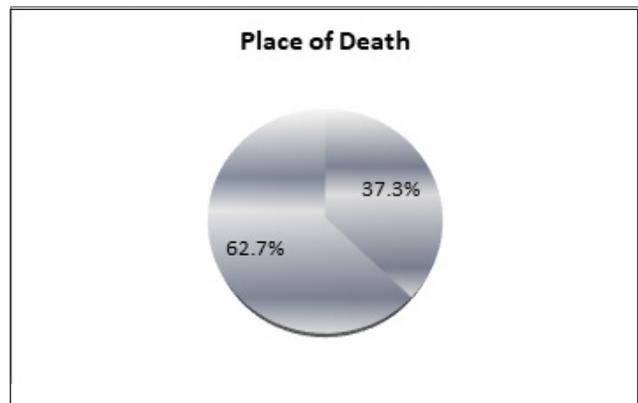


Fig. No: 2 Place of Death

Perusal of Fig. No 2 shows that less than 1/3<sup>rd</sup> of the cases are alive (37.3%) when brought to the hospital, who have died subsequently while undergoing treatment. In cases where deaths occurred by blast injuries, strangulation, by cutting instruments the intended act culminates into immediate result.

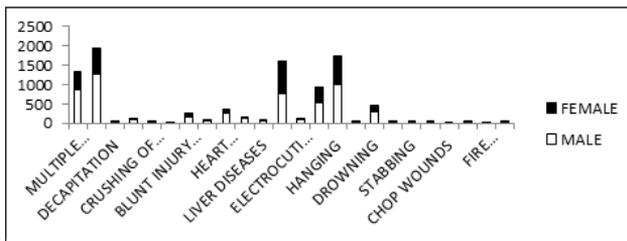


Fig. No 3: Cause of Death

Study of Fig. No 3 shows that leading cause of death are head injuries (20.39%) followed by hanging (18.4%), burns (17.02%), multiple injuries (13.86%), poisoning (9.70%) etc. In case of males accident is the most common cause of deaths. Recently heart, lung and liver diseases are increasing in males because of modified life styles by alcohol, smoking, food etc. As females are more sensitive and they prefer to die by hanging, burns, poisoning, drowning etc. Other non

conventional methods for deaths are firearms, bomb blasts, etc. Recently deaths due to heart diseases are increasing. Less common percentage of cause of deaths are spinal injuries, blunt injuries, chronic diseases, strangulation, stabbing, cut throat, chop wounds, snake bite etc. Many people are dying recently by train accidents also. Deaths are usually not witnessed, In that cases careful investigation is necessary to identify cause of death and manner of death. In homicidal deaths from physical violence the location, multiplicity, severity and distribution of injuries are themselves diagnostic of homicide. In a few cases an expression of doubt about the accident may be raised. In contrast in thermal and chemical violent deaths, to differentiate homicides from suicides and accidents, these cases require strong corroborative evidence to establish the manner of death<sup>9,10</sup>.

Table. No 2: Manner of Death

Manner of death	Males	%	Females	%	Total	%
Accident	3124	66.7%	1561	33.3%	4685	49.2%
Suicide	1948	54.6%	1623	45.4%	3571	37.5%
Homicide	377	63.8%	214	36.2%	591	6.2%
Natural	338	50.0%	338	50.0%	676	7.1%

Study of Table No 2 shows that majority of deaths caused by accidents (49.2%) followed by suicide (37.5%) and least by homicides (6.2%). Deaths by accident are increasing day by day because of increasing usage of motor vehicles and no proper protection, etc. Perception of autopsy findings in medico legal investigation has not only perspective value but also prospective value for future deliberations of criminology and criminalists. This is slightly at variance with the earlier work of Rafindadi<sup>14, 15</sup>.

**CONCLUSION**

The above study radically evaluates data pertaining to medico legal cases brought for autopsy at a medico legal centre at a tertiary healthcare centre. Medico legal Autopsies form an integral and indispensable part of an investigation of a sudden suspicious death. The skills and experience of a Autopsy surgeon facilitate the law

enforcement agencies in administration of justice and bring the guilty to the gallows. The data generated would facilitate the medico legalist in having a greater insight in the baffling occurrence of a sudden suspicious death in their area of jurisdiction.

Some Forensic Pathologists argue that more autopsies are performed than necessary. However, recent studies show that autopsies can detect major findings about a person’s condition that were not suspected when the person was alive. And the growing awareness of the influence of genetic factors in disease has also emphasized the importance of autopsies. It is important to note that autopsies can also provide peace of mind for the bereaved family in certain situations. Therefore autopsy should be encouraged in all communities regardless of religion upon all unnatural death for the check of justice.

**Conflict of Interest:** This study is an insight and eye opener of scenario in India and there is no conflict of interest involved so ever.

**Source of Funding:** The article does not have any funding issue involved in its generations.

**Ethical consideration:** Clearance from the Institutional Ethical committee was obtained in advance.

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# Comparitive Analysis of Computed Tomography Scan and Post Mortem Findings in Cases of Head Injury at a Tertiary Health Centre

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## ABSTRACT

**Background-** Head injury is the leading cause of morbidity and mortality among young adults in developing economies like India and the incidences in elderly population is increasing. Computed tomography serves as the primary modality of choice in detecting fatal legions in the head. In spite of this, the fallacies of CT scan in finding these legions can't be ignored. The present study tries to evaluate the pattern of head injury and fallacies of CT scan.

**Material & Method:** Total 300 cases of head injury were selected for the study based on the inclusion criteria during period of December 2014 to November 2016.

**Results:** CT scan could not detect 22.22% cases of occipital bone fracture, 21.95 % cases of temporal bone, 10.76% cases of frontal bone & 7.36% cases of parietal bone fracture. In case of fractures of base of skull, CT could not detect 71.42 % fractures of anterior & middle cranial fossa and 42.85% of the posterior fossa. Autopsy detected 20%, 71%, 10% & 100% more depressed fractures of frontal, temporal, parietal & occipital than that of CT scan respectively. CT missed linear fracture of frontal bone, parietal bone, temporal bone & occipital bone in 0%, 17%, 3%, 22% cases respectively. Considering the intracranial haemorrhages, the disparity between CT scan and autopsy in detecting extradural haemorrhage, subarachnoid haemorrhage, subdural hematoma, intracerebral haemorrhage and intraventricular hemorrhage was 7.01%, 15.21%, 15.65%, 5.40% and 11.76% respectively. With respect to traumatic brain injuries the CT could not detect cerebral oedema, brain contusions and brain lacerations in 2.45%, 2.12% and 70% cases.

**Conclusions:** To improve the sensitivity of CT scan the use of multi detector CT with sagittal & coronal reformation should be implemented in a routine interpretation of a CT head so that forensically important fractures will not get missed.

**Keywords:-** pattern, head injury, skull fracture, intracranial hemorrhage, CT scan, post mortem findings.

## INTRODUCTION

Brain damage as a result of head injury constitutes a major problem worldwide and is a frequent cause of death and disability and makes considerable demands

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on health services. Being one of the most important regional injuries, they were known to human beings since time immemorial<sup>1</sup>. It has been defined as, "morbid state, resulting from gross or subtle structural changes in the scalp, skull, and or the contents of the skull, produced by mechanical forces<sup>2</sup>. More than 1.25 million people die as a result of road traffic crashes and an estimated 646 000 individuals die from fall each year. Other causes like assault, railway accident etc also significantly enlarge the figure of head injury cases. As

per report by the ministry of road transport, Government of India (2007) 1.4 lakh road accident happened in 2007 with 40,612 people killed and 1.5 lakh people injured<sup>3</sup>.

In this new era of radiology, computed tomography has become the primary modality of choice in the initial assessment of head injury patients as it is widely available, faster and highly accurate in detecting skull fractures and acute intracranial haemorrhage. In acute setting, these imaging studies can determine the presence and extent of injury and guide surgical planning and minimally invasive interventions. However Conventional CT also has its own limitations. CT scans are an inadequate detection tool for forensic pathologists, where a definitive diagnosis is required, because they have a low level of accuracy in detecting traumatic injuries. CT scans may be adequate for clinicians in the emergency room setting, but are inadequate for courtroom testimony. If the evidence of trauma is based solely on CT scan reports, there is a high possibility of erroneous accusations, indictments, and convictions<sup>4</sup>.

Present study highlights epidemiological aspect of head injury along with potential pitfalls of newer technology with enhanced resolution and the continued value of the autopsy in serving as a 'gold standard' for validating newer and emerging technology.

## MATERIAL & METHOD

**Sample size-** It is a cross sectional study, carried over a period of 2 years from December 2014 to November 2016. A total of 300 cases of fatal head injury brought for postmortem examination to Dept. of Forensic Medicine, LTMMC and GH, Sion, Mumbai fulfilling the inclusion criteria were selected for the study.

**Data collection-** Only those cases of head injury which were admitted, CT scan was performed and died in this institution were selected. The cases which are excluded from this study are -1) those brought dead 2) cases with no history of injury 3) cases which were admitted but no CT was done. The deceased's clinical records from this institution were collected and all important information including preliminary data, clinical history latest CT scan findings were noted. A thorough autopsy with detail examination of head was carried out in every case. CT scan findings and autopsy findings of head were later compared and the results were analysed.

## OBSERVATIONS & DISCUSSION

Head injury is one leading cause of death globally and India. There is no doubt that CT scan, since its discovery, has been proving the boon in diagnosing head injury. But it can be proven that CT scan also misses the lesions sometimes those present in head in cases of head injury, after comparing it with the autopsy findings. Authors as mentioned below have made a sincere effort in observing fallacies of CT scan. This study is just concerned with the same. Besides this, the present study has also tried to observe the trends in head injury cases in Mumbai suburban region.

Considering the age & sex of the victims, maximum fatalities were observed between 19 to 50 years (53.33%) and the victims of age >50 years were 101(33.67%). Male victims were 88% having male to female ratio of 7.33:1. This is in accordance with the study of Hemalatha et al<sup>5</sup>, Sunil Kadam et al<sup>6</sup>, Ranjit Tandle et al<sup>7</sup>, Arvind Kumar et al<sup>8</sup> and Mahendra Namdeo et al<sup>9</sup> who found maximum deaths in young males. The age group 19 to 50 years is most endangered group as people of this group are mostly working outside for the purpose of education, job, business etc. and, they have to deal more with the traffic, crowd in the trains and work hazards more than those of other age group which were less exposed to these factors.

Regarding distribution of cases as per cause of head injury, cases of fall (32.3%) and road traffic accidents (31.7%) formed the majority, followed by railway accident (26.33%). Fatal head injuries due to assault were found least in our study (3%). Remaining cases included fall of object on head, machinery injuries, etc. (6.67%).

Maximum victims were injured between 9 am to 12 pm (29.67%) and least during 12 pm to 6 pm (20%). Maximum road traffic accidents occurred during 6 pm to 9 pm (34.73%) and railway during 45.56% and least during 9 am to 11.55 am (16.84%).

Millions of people in Mumbai travel by bus, local trains and their private vehicles. 9 am to 12 pm and 6 pm to 9 pm are busiest time intervals as maximum employees and students travel during the same. The local trains and roads are overcrowded during this period. Many immigrants who are not accustomed to crowd of local train and stunt maniac are losing their lives.

Out of total 95 cases of road traffic accident, pedestrians were most commonly injured on the road (54.74%) followed by 2 wheelers (including rider and pillion rider) counting 40%. Findings of study by Menon A. et al<sup>10</sup> is in concurrence with the present study who observed that out of total RTA victims, pedestrians were 48 % and two wheeler riders were 43 %. Out of total pedestrians, maximum cases (50%) were of age group > 50 years and least (8%) between 0-18 years.

The present study showed that 40% of victims died between 4 to 7 days which was maximum figure while only 3% died within 24 hours. B. C. Shiva Kumar et al<sup>11</sup> illustrated that maximum victims (22%) died during period of 1 day to 1 week. The percentage of victims dying after 1 week was least i.e. 12%. Amit Patil et al<sup>12</sup> observed that maximum victims (91.74%) had survived for 24 hr while least (6.34%) for 1 to 3 days. This disparity may be because our study included all cases of blunt head injury while study of B. C. Shiva Kumar et al<sup>11</sup> included cases of 2 wheelers only and the study of Amit Patil et al<sup>12</sup> was carried out in different institute.

The victims presented with loss of consciousness and vomiting were 78 and 218 respectively while intracranial haemorrhage was found in 278 cases. Cases with bleeding from nose and black eye were 53 and 73 but fracture of anterior cranial fossa was found in 21 cases only. Bleeding from ear was present in 73 and fracture of temporal bone was detected in 82 cases.

Most common type of fracture that found during autopsy was linear fracture (41%) followed by comminuted fracture (14%), and least common was depressed fracture (6%). 41% cases detected no fracture. This findings were equivalent with that of Mahendra Namdeo et al<sup>9</sup>, Ahmad M et al<sup>13</sup>, Sunil Kadam et al<sup>6</sup> and R.K. Chaturvedi et al<sup>14</sup>.

The most common site of skull vault fracture was temporal bone 31.67%, followed by fracture of parietal bone 27.34%, frontal bone 21.67%. Least common was the occipital bone which was fractured in 9 % cases only. This is accordance with the findings of Hemalatha N et al<sup>5</sup>, Ranjit M. Tandle et al<sup>7</sup>, Arvind Kumar et al<sup>8</sup>, Ahmad M et al<sup>13</sup>, & Jacobsen C. et al<sup>19</sup>. Anterior cranial fossa, middle cranial fossa and posterior cranial fossa were involved in 7%, 7% & 4.67% cases respectively.

In the present study, subdural hematoma was most common finding seen in 76.67% cases followed by

subarachnoid haemorrhage in 61.33% cases, extra Dural hematoma in 19% cases, intracerebral haemorrhage in 12.33% cases & intraventricular haemorrhage in only 11.33% cases. These findings are consistent with that of Arvind Kumar et al<sup>8</sup>, Menon A. et al<sup>10</sup> & B. C. Shiva Kumar et al<sup>11</sup>.

Among all traumatic brain injuries, cerebral oedema of brain was most common and present in 54.33% cases. Contusion was found in 31.33%. Laceration of brain was the least common among above injuries (3.33%). Sharma R et al<sup>15</sup> and Menon A. et al<sup>10</sup> also noticed nearly the same findings.

Regarding the study about comparison between CT scan and autopsy findings in cases of skull fracture (table 01), CT scan could not detect 22.22% cases of occipital bone fracture, 21.95 % cases of temporal bone, 10.76% cases of frontal bone fracture & 7.36% cases of parietal bone fracture. Findings are consistent with that of Sharma R et al<sup>15</sup>, Srinivasa Reddy et al<sup>16</sup> and Hitesh Chawla et al<sup>17</sup>. In case of fractures of base of skull, CT could not detect 71.42 % fractures of anterior & middle cranial fossa and 42.85% of the posterior fossa (Table No 02). Autopsy detected 20%, 71%, 10% & 100% more depressed fractures of frontal, temporal, parietal & occipital than that of CT scan respectively (Table No 03).

CT missed linear fracture (table 04) of frontal bone, parietal bone, temporal bone & occipital bone in 0%, 17%, 3%, 22% cases respectively. So the disparity with parietal and occipital bone fracture was the most.

Considering the intracranial haemorrhages (table 05), the disparity between CT scan and autopsy in detecting extradural haemorrhage, subarachnoid haemorrhage, subdural hematoma and intracerebral haemorrhage was 7.01%, 15.21%, 15.65% and 5.40% respectively. For intra ventricular haemorrhage it was 11.76%. More or less similar proportions of discrepancy were also observed by Sharma R et al<sup>15</sup>, Srinivasa Reddy et al<sup>16</sup> and Ashish Pathak et al<sup>18</sup>.

With respect to traumatic brain injuries (table 06), present study observed that CT could not detect cerebral oedema in 2.45% cases and 2.12% of brain contusions. Also CT missed brain laceration in 70% of the cases.

## CONCLUSION

It is necessary to do much more studies on RTAs

and strict implementation of the already existing rules. Better enforcement of laws is an integral part of road safety; legislation embodies codified set of rules. These are enforced by state to prevent accidents.

In developing countries the images interpreted in the axial plane only on a CT scan of a head. It may perhaps be due to lack of financial and human resources. Because of which fractures are sometime missed by CT. To improve the sensitivity of CT scan the use of multi detector CT with sagittal & coronal reformation should be implemented in a routine interpretation of a CT head so that forensically important fractures will not get missed.

**Table no 01- Correlation between CT findings and Autopsy in cases of all types of skull fracture**

Bone	Location of fracture	CT findings	PM findings	Disparity	Percentage
Skull vault	Frontal	58	65	7	10.76%
	Temporal	64	82	18	21.95%
	Parietal	88	95	7	7.36%
	Occipital	21	27	6	22.22%

**Table no 02- Correlation between CT finding and Autopsy regarding base of skull fracture**

Bone	Location of fracture	CT findings	PM findings	Disparity	Percentage
Base of skull	ACF	6	21	15	71.42%
	MCF	6	21	15	71.42%
	PCF	8	14	6	42.85%

**Table no 03- The disparity between CT and Autopsy in detection of depressed fracture**

Depressed fractures	CT findings	PM findings	Disparity	Percentage
Frontal	8	10	2	20%
Temporal	2	7	5	71%
Parietal	9	10	1	10%
Occipital	0	1	1	100%

**Table no 04- Disparity between CT and Autopsy in detection of linear fracture.**

Linear fractures	CT findings	PM findings	Disparity	Percentage
Frontal	31	31	0	00%
Temporal	56	64	8	13%
Parietal	56	58	2	3%
Occipital	18	23	5	22%
ACF	3	15	12	80%
MCF	6	21	18	86%
PCF	8	13	5	38%

**Table no 05- Disparity between CT findings and Autopsy regarding cases of intra cranial haemorrhage**

Type of intracranial hemorrhage	CT scan	Post mortem	Disparity	Percentage
Extradural hematoma	53 (17.66%)	57 (19%)	4	7.01%
Sub arachnoid hemorrhage	156 (52%)	184 (61.33%)	28	15.21%
Subdural hematoma	194 (64.66%)	230 (76.66%)	36	15.65%
Intra cerebral- hemorrhage	35 (11.66%)	37 (12.33%)	2	5.40%
Intra ventricular hemorrhage	30 (10%)	34 (11.33%)	4	11.76%

**Table 06- Disparity in detection of traumatic brain injury**

Type of traumatic brain injury	CT scan	PM	Disparity	Percentage
Cerebral oedema	159(53%)	163(54.33%)	4	2.45%
Contusion	92(30.66%)	94(31.33%)	2	2.12%
Laceration	3	10	7	70%

**Conflict of Interest-** Nil

**Source of Funding-** Self

**Ethical Clearance-** Taken from the Ethical clearance committee.

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# To Study Natural Variations in Handwriting with Temperature Variation

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## ABSTRACT

In this paper, an attempt was made to study variations in writings of an individual with variation and temperature. The primary data for this study was taken from males and females under varying temperature conditions which is 3-7°C in morning before 9 a.m. and 15-20°C in the afternoon around 2 p.m. The samples taken in cold and normal temperature were compared, a definite variation in the handwriting was observed, which can be classified under natural variations. The individual characteristics in such cases somehow remained reliable.

**Keywords** – Questioned document, temperature, natural variations

## INTRODUCTION

Document is something which contains some information or conveys a message. A document when used as evidence creates a connection between the crime and an individual. Any document whose authenticity is under question is a questioned document. A document is considered to be a questioned document in cases of forgery, disguised, tampering caused due to erasure, addition, alteration, or obliteration. It also includes the charred, damaged and torn documents.<sup>1</sup>

Handwriting is an acquired skill which an individual learns at a very early age. It changes with time but their habitual patterns remains constant even after so many years. It can be similar but not identical in every detail even if prepared by the same person because of the presence of natural variations.<sup>4</sup> Therefore, it can be said that natural variations are the integral part of a genuine writing. The main reason for these natural variations is that our hand is not a computer and cannot copy the exact image formed in the brain and signaled to it. The embellishments will remain the same but the

pattern might change like a single person can make 't' in different styles and these different styles will be counted as a natural variation.<sup>3</sup> Natural variations are studied in the master pattern formed by an individual. Master pattern is the range of writing in which a person writes including all the characteristics and the variations he can make in a writing. This master pattern helps in determining the extent to which the natural variations can occur in an individual's handwriting as it differs among different writers.<sup>6</sup> Natural variations are the impressions which executes the discriminatory elements or in simple language the habits of the individuals.

There are factors which diverge the natural variations in handwriting-

Internal or intrinsic factors which includes the physical as well as mental health of the writer. The temporal status i.e., if the individual is under the influence of alcohol, drugs, etc is also considered during the examination of their writing.

External or extrinsic factors which include the physical environment, physiological constraints, literacy, surface provided for writing, writing instrument used, etc.<sup>2</sup>

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## LITERATURE REVIEW

Miss. TejashreeBhoir, Dr. Deepak B. Anap, Dr.

Ashish J. Prabhakar reviewed on the Effect of cold and hot temperature on hand grip strength in normal individuals and stated that on comparing normal grip strength with warm water, there was a slight increase in the grip strength which was statistically not significant whereas on comparing normal grip strength with cold water there was slight decrease in the grip strength which was statistically significant<sup>5</sup>

T S Kapoor, M Kapoor, G P Sharma researched on the Study of the form and extent of natural variation in genuine writings with age and concluded that the range of natural variation, rather than the characteristics themselves, will change gradually with time. This change justifies the necessity for contemporary writings in comparison of handwriting, even though handwriting characteristics remain more or less permanent.<sup>7</sup>

Richard C. Hanlen, Patricia A. Manzillo, Robert J. Muehlberger, and Grant R. Sperry researched on the Survey of Handwriting Habit Areas Used by Forensic Document Examiners: Degree of Use and Discriminatory Power and the information obtained from this survey was intended to provide the data necessary to select a preliminary set of characteristics for analysis. The particular circumstances surrounding the examination of handwriting can dictate a far different ordering of habit areas.<sup>8</sup>

Roy A. Huber studied on The Heterogeneity of Handwriting and stated that any kind of error does not lead to inaccuracies in writer identification. The frequency of occurrence reported of the discriminating elements selected provides some indication of their relative significance.<sup>9</sup>

Diana Harrison, Ted M. Burkes, Danielle P. Seigerviewed on Handwriting Examination: Meeting the Challenges of Science and the Law demonstrating the validity of the expertise and supports the principle of handwriting individuality.<sup>10</sup>

## **METHODOLOGY**

For the present study, the samples were collected from Amity Institute of Forensic Science, Amity University, Noida. All the samples were collected randomly. Since, this study was carried out to see the effect of temperature over the handwriting of same individual, all the samples were collected in the winter season.

All the exemplars were collected at varying

temperature conditions. One was taken at morning time i.e., before 9 a.m. when the temperature was in between 3-7°C and the other one was taken during afternoon i.e., around 2 p.m. when the temperature was in between 15-20°C.

All the samples were collected on A4 size sheet with the help of blue ball and gel pen.

Two samples from each individual were taken. Sample size for this study, 50 samples from 25 individuals including male and female were collected with their consent for study purpose. All the samples were preserved in a paper envelope at room temperature for their analysis. Materials used during the study were scale, hand lens, pencil and camera for photography.

Samples at low and normal temperature were examined to study the class characteristics of that particular writing. Once the analysis was done observations were recorded in a tabular format. Later on, recorded observations were compared to know the affected characteristics due to varying temperature.

## **OBSERVATIONS**

Below are the illustrations of how samples were collected and examined. The encircled words represent the natural variations in the writing due to temperature variation.

### **EXAMPLE 1**

Connecting stroke of 'h' and 'a' in the word 'hand'

More simplifications were observed in the sample taken at low temperature

Size of the letters were expanded horizontally

### **EXAMPLE 2**

Pen lift in word 'my' was seen repeatedly in samples of low temperature which is absent in sample of normal temperature

Simplifications were observed in the sample taken at low temperature

Uneven size change in words was observed

## **RECORDINGS**

Depending on varying temperature, recordings were tabulated in Table 1 (for low temperature) and

Table 2(for normal temperature). In these tables, 9 class characteristics for each sample was recorded.

**Table-1: effect on handwriting characteristics at low temperature**

Sample No.	Alignment	Pen Pressure	Pen Lift	Line Quality	Slant	Size	Space	Terminal stroke	Spacing between lines
1	Ascending	Low	Unusual lifts	Moderate	Highly inconsistent	Expand	Inconsistent	Tailing	Irregular
2	Ascending	Low	Usual lifts	Moderate	Inconsistent	Expand	Inconsistent	Tailing	Irregular
3	Straight	Low	Unusual lifts	Moderate	Forward	Expand	Highly inconsistent	Sharp	Irregular
4	Straight	Low	Unusual lifts	Moderate	Highly inconsistent	Expand	Highly inconsistent	Tailing	Irregular
5	Straight	Low	Unusual lifts	Moderate	Inconsistent	Expand	Even and broader	Tailing	Irregular
6	Descending	Low	Unusual lifts	Moderate	Highly inconsistent	Expand	Highly inconsistent	Not frequent	Irregular
7	Ascending	Low	Usual lifts	Superior	Forward	Expand	Highly inconsistent	Not frequent	Irregular
8	Straight	Low	Unusual lifts	Superior	Inconsistent	Normal	Even	Not frequent	Irregular
9	Descending	Low	Unusual lifts	Moderate	Highly inconsistent	Expand	Highly inconsistent	Sharp	Regular
10	Straight	Low	Unusual lifts	Superior	Highly inconsistent	Expand	Inconsistent	Tailing	Irregular
11	Straight	Low	Unusual lifts	Superior	Highly inconsistent	Expand	Highly inconsistent	Tailing	Irregular
12	Straight	Low	Unusual lifts	Superior	Inconsistent	Expand	Highly inconsistent	Tailing	Irregular
13	Descending	Low	Usual lifts	Moderate	Forward	Expand	Highly inconsistent	Not frequent	Irregular
14	Ascending	Low	Usual lifts	Superior	Highly inconsistent	Expand	Highly inconsistent	Sharp	Irregular
15	Descending	Low	Unusual lifts	Moderate	Inconsistent	Expand	Highly inconsistent	Tailing	Irregular
16	Straight	Low	Unusual lifts	Moderate	Highly inconsistent	Expand	Highly inconsistent	Tailing	Regular
17	Straight	Low	Unusual lifts	Superior	Inconsistent	Expand	Highly inconsistent	Sharp	Irregular
18	Ascending	Low	Usual lifts	Superior	Highly inconsistent	Normal	Highly inconsistent	Not frequent	Regular
19	Descending	Normal	Usual lifts	Superior	Inconsistent	Normal	Even	Sharp	Regular
20	Straight	Low	Usual lifts	Superior	Forward	Expand	Highly inconsistent	Tailing	Irregular
21	Straight	Low	Unusual lifts	Superior	Highly inconsistent	Expand	Even and broader	Tailing	Irregular
22	Straight	Low	Usual lifts	Moderate	Highly inconsistent	Expand	Highly inconsistent	Tailing	Irregular
23	Descending	Low	Usual lifts	Moderate	Highly inconsistent	Expand	Highly inconsistent	Not frequent	Irregular
24	Straight	Low	Unusual lifts	Superior	Highly inconsistent	Expand	Highly inconsistent	Tailing	Irregular
25	Descending	Low	Unusual lifts	Superior	Highly inconsistent	Expand	Even and broader	Sharp	Irregular

**Table-2: effect on handwriting characteristics at normal temperature**

Sample	Alignment	Pen Pressure	Pen Lift	Line Quality	Slant	Size	Space	Terminal stroke	Spacing between lines
1	Ascending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Sharp	Irregular
2	Ascending	High	Usual lifts	Superior	Straight	Normal	Inconsistent	Blunt	Regular
3	Straight	High	Usual lifts	Superior	Backward	Normal	Inconsistent	Blunt	Regular
4	Straight	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Blunt	Regular
5	Straight	High	Usual lifts	Superior	Straight	Normal	Even	Pointed	Regular
6	Descending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Frequent	Regular
7	Ascending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Frequent	Regular
8	Straight	High	Usual lifts	Moderate	Straight	Normal	Even	Frequent	Regular
9	Ascending	High	Usual lifts	Moderate	Inconsistent	Normal	Inconsistent	Blunt	Regular
10	Straight	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Tailing	Regular
11	Ascending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Sharp	Regular
12	Straight	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Sharp	Regular
13	Descending	High	Usual lifts	Moderate	Inconsistent	Normal	Inconsistent	Frequent	Regular
14	Ascending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Blunt	Regular
15	Descending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Sharp	Regular
16	Straight	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Tailing	Regular
17	Straight	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Blunt	Regular
18	Ascending	High	Usual lifts	Superior	Inconsistent	Expand	Inconsistent	Frequent	Regular
19	Descending	Normal	Usual lifts	Superior	Inconsistent	Normal	Even	Blunt	Regular
20	Straight	High	Usual lifts	Superior	Forward	Normal	Inconsistent	Tailing	Regular
21	Concave	High	Usual lifts	Superior	Inconsistent	Normal	Even	Sharp	Regular
22	Straight	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Sharp and pointed	Regular
23	Ascending	High	Usual lifts	Moderate	Inconsistent	Normal	Inconsistent	Frequent	Regular
24	Ascending	High	Usual lifts	Superior	Inconsistent	Normal	Inconsistent	Tailing	Regular
25	Descending	High	Usual lifts	Superior	Inconsistent	Normal	Even	Blunt	Regular

(Depending on the sample size(25), the recordings were compared to find the similarities and dissimilarities in the class characteristics at varying temperature. More the difference more pronounced will be the effect on particular characteristic)

**Table-3: Comparison of handwriting characteristics at low and normal temperature**

CHARACTERISTICS	DIFFERENT	SIMILAR
Alignment	5	20
Pen pressure	24	1
Pen lifts	16	9
Line quality	10	15
Slant	20	5
Size	23	2
Space	20	5
Terminal stroke	21	4
Spacing between lines	20	5

### CONCLUSION

The effect of temperature in an individual's writing is highly significant. Characteristics like pen pressure, slant, spacing were most affected and were clearly noticeable. Other than this, there were characteristics such as alignment and line quality which had least affect on the writing under low temperature. Individual characteristics such as presence of hiatus, letter formation, letter connectivity were seen in some of the samples. Not every handwriting was affected but most of them were found to be affected due to the temperature.

The characteristics like arrangement, style, paragraphing, and punctuations remain same in both the conditions.

Due to the study of these characteristics it can be concluded that the handwriting of an individual can be determined and the nature of handwriting that is, the variations are caused due to the temperature change is also known.

**Ethical Clearance-** Taken from internal RPC committee

**Source of Funding-** Self

**Conflict of Interest -** Nil

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# Sexual Dimorphism in the Mandibular Canine - A Study in South Indian Population

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## ABSTRACT

**Introduction:** Teeth are found to be a very useful tool for forensic investigations because of their nature, exhibiting the least turnover of natural structure and effective resistance to mechanical, chemical, physical or thermal destructions. In addition, teeth are readily accessible structure for examination.

Amongst all the teeth, the mandibular canine found to exhibit greatest sexual dimorphism. Considering the fact that there are differences in odontometric features in specific populations, the present study was taken up to investigate whether Mandibular Canine Width (MCW), Inter-Canine Distance (ICD) and Mandibular Canine Index (MCI) can be used as a tool for sex determination in South Indian Population.

**Materials and method:** The present study was carried out on 60 apparently healthy individuals from students of Medical college who are origin of south India whose ages ranged between 17-21 years in the Department of Forensic Medicine and Dentistry in the Sri Muthukumaran Medical College Hospital and Research Institute to establish significance of sexual dimorphism in the mandibular canine.

**Results:** The present study confirms that, the means of mandibular canine width and an inter-canine distance were higher in males than in the females and difference is statistically significant. ( $P < 0.05$ ), but the MCI revealed no statistically significant sex differences ( $p > 0.05$ ) and overall accuracy of predictive value in respect to sex determination from MCI is only 47.08%. Further we observed whenever mesio-distal canine width less than 6.88 mm, the probability of sex being female and if width is more than 7.4 mm the probability of sex favored towards male.

**Conclusion:** Our study provides a conclusive proof of mandibular canine width and Inter-canine distance exhibits great potentiality of sexual dimorphism. However, MCI per se has limited value and can use as adjunct with other parameters.

**Keywords:** Sexual dimorphism; mandibular canine width, Inter-canine distance, Mandibular Canine Index.

## INTRODUCTION

With the exception of dramatic murders, the activity, which focuses most public attention on the work of forensic expert, is mass disaster. Unfortunately,

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such tragedies are becoming more common with the increase of terrorism, expansion of travel facilities, and increase in the number of aircraft passengers. As a forensic expert, one of the major roles in the practice is establishing identity what so ever the cause. Such establishment is not possible unless establishing sex of the individual. In many disasters, teeth are the most indestructible part of the body; exhibit the least turnover of natural structure and also readily accessible and do not need any special dissection for examination.

Among all teeth, mandibular canines found to exhibit the greatest sexual dimorphism.<sup>1,2,6</sup> 'Sexual dimorphism' refers to those differences in size, structure and appearance between male and female, at an equal age, which can be applied to identification.<sup>2</sup> In addition, the mandibular canines are also known to be very much less exposed to plaque, periodontal diseases and abrasion from brushing or heavy occlusal loading than other teeth. These findings made mandibular tooth as the "key teeth" for personal identification.<sup>3,4</sup>

As we know the standards of morphological and morphometric sex differences in the skeleton may differ with the population sample involved especially with reference to dimensions & indices and thus cannot be applied universally. With respect to tooth, the study of indices is still more complicated as it is known to be influenced by cultural, environmental and racial factors.<sup>5,6</sup> Even though there are literatures on this subject<sup>1,2,6,8-15,17-19</sup> there is controversial opinion in respect to sexual dimorphism of Mandibular Canine Index. Hence, the present study was taken up with aimed at establishing a proof of whether MCW, ICD and MCI be used as a tool for sex determination in South Indian Population.

## OBJECTIVES

Gender based comparison of mandibular canine width and linear inter-canine distance.

Gender based comparison of mandibular canine Index.

## MATERIALS AND METHOD

For the purpose of the study, 60 healthy individuals who never had any odontological diseases, surgeries or trauma were selected from students of our Medical College who are origin of south India, whose ages ranged between 17-21 years. Study was conducted in the Department of Forensic Medicine and Dentistry in the Sri Muthukumaran Medical College Hospital and Research Institute, Chennai.

### Method of collection of Data

From the known aged individuals the required measurements of teeth were taken using a Vernier caliper, taking into account the error if any, in the instrument. With the subject in a sitting position, a divider with fixing device was also used for taking the

measurements. The mandibular canine width was taken as the greatest mesio-distal width between the contact points of the teeth on either side of the lower jaw and linear inter-canine distance was measured between the tips of right and left canines on mandible.

The **Sexual Dimorphism**, calculated by adopting the formula given by Garn *et al.*<sup>7</sup> as follows:

Sexual dimorphism =  $(X_m / X_f - 1) \times 100$  where,  $X_m$  = Mean value of male canine width,  $X_f$  = Mean value of female canine width.

**The Mandibular Canine Index** calculated based on the formula adapted from Rao *et al.*<sup>8</sup> who derived Mandibular Canine Index (MCI) for establishing sex identity:

$$MCI = = MCI_o$$

**Standard Mandibular canine index (MCIs)** value has obtained from the measurements taken from the samples by applying following formula:

$$\text{Standard MCI (MCIs)} = [(Mean\ male\ MCI_o - SD) + (Mean\ female\ MCI_o + SD)] / 2$$

MCIs value is used as a cut-off point to differentiate males from females. If the calculated Mandibular Canine Index (observed MCI =  $MCI_o$ ) for the individual is higher than the Standard Mandibular Canine Index (MCIs) the individual considered as male, if it is less than the MCIs, the subject considered as a female.

**Inclusion Criteria:** Subjects with the following status of teeth were included in the study:

Healthy state of gingiva and periodontium.

Absence of spacing in the anterior teeth.

Class I molar relation.

Normal over jet and overbite.

Exclusion criteria

Underwent previous orthodontic management

Caries teeth

**Statistical Analysis Used:** The observed Mandibular Canine Width, Inter-Canine Distance and Mandibular Canine Index were subjected to statistical analysis to assess sex difference using unpaired t-test.

**RESULTS**

The study sample was composed of 60 healthy individuals who never had any odontological diseases, surgeries or trauma were selected from students of our Medical College who are origin of south India, whose ages ranged between 17-21 years. Among them 35 individuals were males and 25 were females with a mean average age of 19.6 years. From them, the Right Mandibular Canine Width (RMCW), Left Mandibular Canine Width (LMCW), Inter-canine distance, sexual dimorphism and Mandibular Canine Index were calculated and summarized in the tables as follows.

**Table 1: Right and left mandibular canine width and mandibular Inter-canine distance in relation to sex.**

Parameter	Sex	MeanSD (mm)	Range	't' value	p-value
RMCW	Male	7.650.50	6.88 - 8.60	-5.822	<0.001
	Female	6.960.36	6.10 – 7.40		
LMCW	Male	7.660.49	6.89 - 8.60	-5.837	<0.001
	Female	6.970.37	6.10 – 7.40		
Inter canine distance	Male	26.551.57	23.40 – 29.50	-4.654	<0.001
	Female	24.731.40	22.90 – 28.30		

**Table 2: Summary of sexual dimorphism in mandibular canine width**

Parameter	Sexual Dimorphism (%)
RMCW	9.914
LMCW	9.899

**Table 3: Mandibular canine Index in relation to sex.**

Parameter	Sex	MeanSD (mm)	't' value	p-value
RMCI	Male	0.28850.0181	-1.252	0.215
	Female	0.28230.0196		
LMCI	Male	0.28890.0180	- 1.249	0.217
	Female	0.28270.0198		

**Table: 4 Overall predictive value in respect to sex determination with Standard MCI (right-0.286 & left – 0.287)**

Sex	Number	MCI Right side	MCI Left side	Overall average	
		%	%	%	
Male	35	56.25	54.84	55.55	47.08
Female	25	39.29	37.93	38.61	

**Table 1** depicts sex related differences amongst parameters such as mandibular canine width on both sides and inter-canine distance. The width of the mandibular canine was almost bilaterally symmetrical for both males and females and there is no significant difference between the right and left sides amongst males and females. However, right and left mandibular canine widths has compared between males and females, the females showed lesser value and it has found to be statistically significant. Similarly, the mean value of inter-canine dimension in males (26.55 mm) was greater by 1.82 mm, than in females (24.73 mm) and the difference is statistically significant. ( $P < 0.01$ )

The sexual dimorphism [table 2], calculated based on Garn and Lewis method<sup>7</sup> and it found that the right mandibular canine exhibited a greater percentage of sexual dimorphism (9.914 %) as compared to left canine (9.899 %).

The table 3 shows that, the left MCI is marginally higher than right MCI in both male and females. The mean value of MCI in males is slightly higher (on both sides by 0.0062). However, the difference is statistically insignificant. ( $P > 0.05$ )

The calculated standard MCI for right side found to be 0.286 and on left side 0.287. From the MCIs value, which has used as a cut-off point to differentiate males from females, we could predict sex correctly on an average with accuracy of 55.55 % and 38.61 % correctly as males and females respectively. (Table 4)

From the above, (tables 1) it confirms that, the means of mandibular canine width and an inter-canine distance were higher in males than in the females and difference is statistically significant ( $P < 0.05$ ), but the MCI (table 3) revealed no statistically significant sex differences ( $p > 0.05$ ) and overall accuracy of predictive value in respect to sex determination is only 47.08%. (table 4).

## DISCUSSION

Sex determination is the foremost step of identification of any mutilated or skeletonized bodies. Even though there are different methods for such identification such as morphology of skeletal remains, DNA profiling etc., amongst, teeth are found to be an excellent material for forensic investigations as because of their nature, exhibiting the least turnover of natural

structure and the effective resistance to destruction by decomposition, burns, chemicals and other methods of destruction. In addition, teeth do not need any special dissection and are readily accessible. Moreover, it is simple, inexpensive and easy to do. Amongst all the teeth, the mandibular canines known to exhibit the greatest sexual dimorphism.<sup>1</sup> Vandana et al., 2008, have quoted it that; canines differ from other teeth with respect to survival and sex dichotomy. These findings made mandibular tooth as the “**key teeth**”.<sup>9</sup>

Considering the fact that there are differences in odontometric features in specific populations, even within the same population in the historical and evolutionary context, it is necessary to determine specific population values in order to make identification possible based on dental measurements.<sup>10</sup>

Hence, the present study has conducted to determine the sexual dimorphism that exists in the mandibular canines. In our study, sample was composed of 60 individuals being 35 males and 25 females whose age ranged from 17- 21 years with a mean age of 19.6 years, which is attributed to minimum rates of attrition and abrasion. In addition, subjects of this age group will be having completed growth in width of dental arches and eruption of canines.

In the present study, the width of the mandibular canine was almost bilaterally symmetrical for both sexes and there is no statistically significant difference between the right and left sides. In similar studies by other workers<sup>1, 11-13</sup> who have also observed no significant difference in canine width of either side. Such observations helps medico-legal expert for reconstruct easily the other half of the profile of individual whenever necessary. When the mean values for right and left mandibular canine widths has compared between males and females, the females showed lesser value. Our findings are well corroborated by a number of workers in the previous studies by Srivastava,<sup>14</sup> Sharma M and Gorea,<sup>15</sup> A B. Acharya et al,<sup>16</sup> Ibeachu et al,<sup>17</sup> Raza Iqbal et al.<sup>18</sup>

The mean value of inter-canine distance in males is 26.551.57 mm and in females 24.731.40 mm, thus values in males being higher than those of females and the difference is statistically significant. Similar observations in males and females been observed by other workers, such as Anderson & Thompson from

Canada Population,<sup>3</sup> Abdullah and Khan from Saudi Arabian,<sup>19</sup> Olav from Norwegian,<sup>20</sup> Muller et al from French,<sup>21</sup> Kaushal et al from north Indian population,<sup>1</sup> Bindu et al. from Indian,<sup>22</sup> Ibeachu et al from Nigerian<sup>17</sup> and by many other authors. (Table 5, 6)

Hence, we also confirm the existence of statistically significant sexual differences in the mandibular canine width and inter-canine distance in this study. The sexual dimorphism calculated based on Garn and Lewis<sup>6</sup> method and found that the right mandibular canine exhibited a greater percentage of sexual dimorphism (9.914 %) as compared to left canine (9.899 %). This is consistent with the results of Srivastava<sup>14</sup> (2006), who had reported that right mandibular canine exhibit greater percentage dimorphism of 2.804% as compared to left (2.326) with still lower value. But our findings contradicts, Kaushal et al. (2003) who reported 9.058 on left side and 8.891% on right side<sup>1</sup> and Nair et al.(1999) reported that the left mandibular canine exhibited a sexual dimorphism of 7.7% when compared to right side (6.2%).<sup>2</sup>

Of late, MCI been implicated as a tool for sexual dimorphism. However, in the present study MCI per se does not reveal statistically significant male–female differences ( $p > 0.05$ ; Table 2) even though study indicated a greater Mean Canine Index in males than in females. Sharma M and A B. Acharya et al made the similar observations, in their studies. The first author reported that MCI in lower jaw was greater in males than females but the difference found to be statistically insignificant.<sup>15</sup> The author A B. Acharya et al., said, the MCI does not reflect sexual dimorphism however, which exists in absolute dimensions from which it has derived.<sup>16</sup> Our results were in consistent with this theory. The probable reason for this could be, the inter-canine distance increases with an increase in the mandibular canine width and hence, their ratio or proportion remains same across the sexes as said by author A B. Acharya et al.<sup>16</sup> These factors are probably responsible for the minimal sex difference in the MCI in the present study.

Interestingly, a number of authors,<sup>1, 8, 11, 18, 24</sup> in contrast to our observation, have reported that there existed a statistically significant sexual dimorphism by observing MCI.

A comparison of observed MCI with standard MCI utilized for predicting sex of an individual. The calculated standard MCI for right side has found to be 0.286 and on left side 0.287. From the MCIs value, which used as a cut-off point to differentiate males from females, we could able to establish the correct prediction of sex is 55.55 % and 38.61 % for males and females respectively. The overall predictive value in respect to sex determination with standard MCI is only 47.08%. Further, we observed, the probability of correct prediction of sex using MCI is higher for males though the difference of prediction among males and females is not very significant (47.08%). Our observations were in accordance with the Reddy et al.,<sup>11</sup> on their sample have reported the overall accuracy of predictive value to be 55% and 35% for males and females respectively. In contradiction, Kaushal et al.,<sup>23</sup> in their study quotes the overall probability of sex determination using MCIs is 68.3% for males and 81.7% for females. The other workers in the field observed even higher rate of overall accuracy of 82.15%, 85.9%.<sup>8, 24</sup>

In the table no 5, we attempted, comparison of studies of various authors on mandibular canine width, inter-canine distance and Mandibular Canine Index between the different populations was done to look into the variation in tooth morphometry, which is influenced by race, sex, heredity, genetics and environment factors.

Further, in our study we observed that whenever mesio-distal canine width was less than 6.88 mm, the probability of sex being female and if width is more than 7.4 mm the probability of sex being favored towards male. However, between these two values it is always better to corroborate with other methods such as morphology of skeletal remains, etc.

**Table No.5: Comparison of canine width, inter- canine distance, and Mandibular canine index in different populations**

Population	Author	Age	Canine width (mm)				ICD (mm)		Mandibular Canine Index			
			M		F		M	F	M		F	
			R	L	R	L	R	L	R	L	R	L
Bareilly, Uttar Pradesh India	Srivastava (2006)	17-21 Years	6.60	6.60	6.42	6.45	25.76	25.28	0.256	0.255	0.257	0.256
Punjab, India	Sharma M and Gorea (2010)	17-30 years	6.77	6.78	6.41	6.39	25.56	24.95	0.265	0.265	0.259	0.257
India	A B. Acharya et. Al (2010)	19-32 years	6.73	6.8	6.47	6.51	27.62	26.58	0.2456		0.2452	
Nigeria	Ibeachu et al.(2012)	18-30 years	7.79	7.88	6.76	6.75	34.20	32.64	0.228	0.230	0.208	0.207
Uyghur China	Raza Iqbal et. Al (2015)	18 - 25 years	6.91	6.87	6.18	6.26	26.94	26.24	0.2572		0.2368	
Present study		17-21 years	7.65	7.66	6.95	6.96	26.55	24.73	0.288	0.282	0.289	0.283

M= Male, F= Female, R= Right, L= Left, Inter Canine Distance = ICD

**Table No.6: Comparison of inter- canine distance in different populations (The authors studied on inter-canine distance only)**

Population	Author	Age	Inter Canine Distance (mm)	
			Male	Female
Canadian	Anderson & Thompson (1973)	3-20 years	26.080	25.330
Saudi Arabian	Abdullah and Khan (1996)	15-18 years	27.010	26.460
Norwegian	Olav(1998)	24-34 years	19.060	18.240
French	Muller et al. (2001)	3-20 years	26.280	25.030
Indian	Kaushal et al (2003)	17-21 years	25.830	25.070
Patiala, India	Bindu et al.(2008)	17-21 years	26.003	25.001
Uttar Pradesh, India	Vandana et al.(2008)	17-25 years	26.860	26.287

### CONCLUSION

The morphometric study of mandibular canines in South Indian population provides a conclusive proof of mandibular canine width and Inter-canine distance

exhibits great potentiality of sexual dimorphism. Hence, it has immense medico-legal use in establishing the profile of an individual. However, MCI per se has limited value and can use as adjunct with other

parameters. In addition, sex prediction found to vary in specific populations, even within the same population, it is necessary to determine specific population values in order to make identification possible.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance** obtained prior to the study.

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# A Study of Demographic Profile of Death Due to Burns

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## ABSTRACT

Fire has been known to mankind for about 400,000 years. Although the use of fire was known to ancient man, it is probably the potential fury of an unharnessed fire that made man bow before it. Burn injuries occur universally and have plagued mankind ever since antiquity till the present day. Burn injuries are the commonest cause of unnatural death in India and constitute a major cause of death and morbidity in the world and in this country too. Burns always have posed a threat to the sensitive human body.

The present study is from the data collected of 48 burn cases which were autopsied at mortuary, Department of Forensic Medicine and Toxicology SNMC Bagalkot. It was observed that majority of the victims were in the age group of 21-30 years, with female to male ratio of 5:1. Most of the victims were married and the majority were housewives, belonging to rural area and of class-I socioeconomic strata. Most of the burns took place in the kitchen, mostly due to kerosene stove burst. Body surface area involvement was more than 76% in maximum number of cases. Septicemia was the leading cause of death and majority of the victims died within a week.

**Keywords:** Fire, Burns, Unnatural death, Morbidity, Septicemia

## INTRODUCTION

The use of fire by man in various aspects has not only added to his comforts, but also added to his miseries by increasing the risk of burns. Since ages, man has paid the price for his comforts in terms of thermal injuries.

Burn injuries occur universally and have plagued mankind ever since antiquity till the present day. Burn injuries are the commonest cause of unnatural death in India. Burns constitute a major cause of death and morbidity whatever reason may be, in the world and in this country too. Burns always have posed a threat to the sensitive human body.<sup>1</sup>

Burns are one of the most challenging conditions encountered in medicine. The burn injury represents an

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assault on all aspects of the patient, from the physical to the psychological. It affects all ages, from children to elderly people, and is a problem in both the developed and developing world. All of us have experienced the severe pain that even a small burn can cause.<sup>2</sup>

Burns are a global public health problem, accounting for an estimated 195 000 deaths annually. The majority of these occur in low- and middle-income countries and almost half of them occur in the WHO South-East Asia Region. In many high-income countries, death rates due to have been decreasing, and the rate of child deaths from burns is currently over seven times higher in low- and middle-income countries than in high-income countries. Non-fatal burns are a leading cause of morbidity, including prolonged hospitalization, disfigurement and disability, often with resulting stigma and rejection. Burns is among the leading cause of disability-adjusted life-years (DALYs) lost in low- and middle-income countries.<sup>3</sup>

## OBJECTIVES

1. To know the demographic profile of death due to

burns during 01-01-2012 to 31-12-2012

**METHODOLOGY**

The present study was carried out in the Department of Forensic Medicine & Toxicology, S N Medical College, Bagalkot, during the period of one year from 1-1-2012 to 31-12-2012 and total 48 cases with burn injuries brought to the mortuary for autopsy were used as material for study purpose and collection of tissues for histopathological examination. Thorough and complete post mortem examination was conducted on all the bodies

**Selection criteria**

**Inclusion criteria**

All cases of burns, brought for medico-legal postmortem examination to mortuary at S N Medical College Bagalkot for autopsy.

**Exclusion criteria**

Cases with history of sustaining other thermal injuries like scalds, electrocution and lightening were excluded from the study.

**Source of data:**

Data for the present study was collected from 48 burn cases which were autopsied at mortuary, Department of Forensic Medicine and Toxicology SNMC Bagalkot. The data collection was done as per the proforma (mentioned in the appendix) from the following sources-

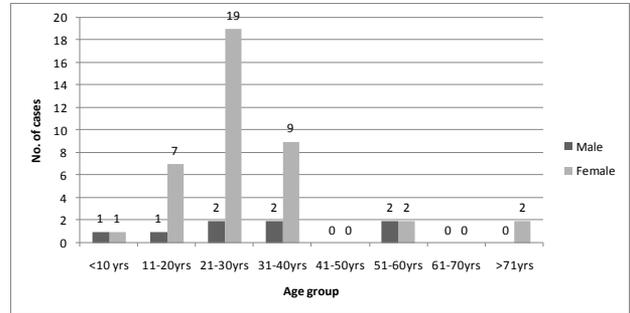
- History obtained from the relative of the deceased.
- Inquest papers furnished by police for autopsy.
- In-house case papers.
- Postmortem reports of burn cases.

**RESULTS**

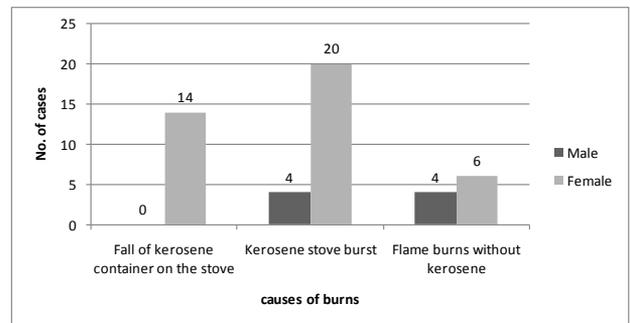
The present study comprises the profile of all 48 cases of deaths due to burns that were subjected to autopsy at Department of Forensic Medicine & Toxicology, S N Medical College, Bagalkot, during the period of one year from 1-1-2012 to 31-12-2012. The following observations were noted from the study.

Out of 48 cases, 40 (83.33%) were females and 8

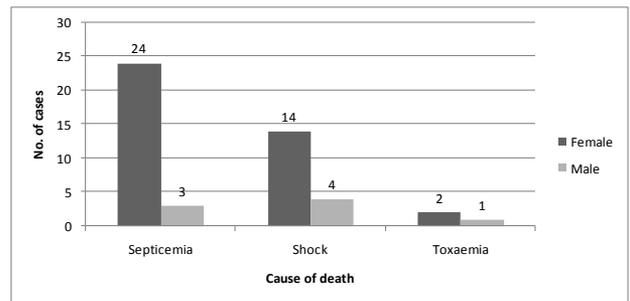
were males (16.67%)



**Graph No 1: Distribution of cases according to age and sex.**



**Graph No 2: Distribution of cases according to causes of burns.**



**Graph No 3: Distribution of cases according to cause of death.**

**DISCUSSION**

**Age & sex**

The study comprises a total of 48 fatal burn cases of which 40 (83.33%) were female and 8 (16.66%) male. Maximum number of victims were found in the age group of 21-30 years with 21 cases (43.75%) followed by 31-40 years with 11 cases (22.92%) and the least number of victims were in the age group of 10 years or less and more than 71 years category with 2 cases (4.17%) each. Females outnumbered males with 5:1 ratio.

**Table No 1: Showing comparison of age and sex with other studies**

Study	Year	Male	Female	Age group in Years (% of cases)
Babladi PI <sup>2</sup>	2002	26.80%	73.20%	21-30 (44.70%)
Chawla <sup>1</sup>	2005	36.00%	64.00%	21-30 (52.00%)
Shinde AB <sup>3</sup>	2008	14.55%	85.45%	21-30 (45.55%)
Buchade Dhiraj et al <sup>4</sup>	2010	37.14%	62.86%	21-30 (40.93%)
Present study	2013	16.66%	83.33%	21-30 (43.75%)

The table above shows good correlation of other studies with the present study. Young Indian women (21-30 years) mostly do the cooking in the family; dowry deaths are also common in this age group. This explains the observations of present study.

#### **Occupation:**

Among women, housewives topped the list of fatal burn cases i.e., 29 (72.20%) followed by students 8 (20.00%) least affected were kids with 1 case (2.50%). Among males, labourers topped the list with 4 (50.00%) and least and children were at the bottom with 1 case (12.50%). Our findings are comparable to those of Singh D<sup>5</sup> (65.70%), Chawla R<sup>1</sup> (56%).

#### **Domicile**

In the present study, the maximum number of burn victims were from rural areas i.e., 37 (77.08%) and the rest were from the urban areas i.e., 11 (22.91%). The findings of the present study are similar to the study of Gupta R<sup>6</sup> (84.60%), Zanjad NP<sup>7</sup> (76.30%) and Shinde AB<sup>8</sup> (83.93%).

This finding can be explained by rural people's preference of wood and kerosene as a fuel source for cooking appliance that makes them prone to risks of burns.

#### **Socioeconomic Status**

Majority of the victims, both among male with 4 cases (15.00%) and female with 18 cases (45.00%) belonged to class I of socioeconomic strata in contrast to the WHO report<sup>9</sup> and study of Memchoubi PH<sup>10</sup>, who found highest numbers of the victims were from low socio – economic status with 35 cases (53.84%).

This finding may also be explained by the use of

wood and kerosene stove by the lower income group of society as their main source for cooking, as they can't afford other means of cooking due to high price and unavailability, and are likely to suffer burns.

#### **Marital status and age**

In the present study majority of the victims were married 34 (70.83%) and 14 (29.17%) were unmarried. Our study is consistent with Ambade VN<sup>19</sup> (79.90%), Gupta R<sup>14</sup> (88.50%) and Buchade D<sup>4</sup> (76.50%).

More number of burn victims are married people, this can be explained by the fact that they are more likely to have domestic responsibilities and stresses besides dowry related problems.

#### **Place of occurrence**

In the present study, maximum number of burn deaths occurred at victim's kitchen i.e., 39 (81.25%) and few cases (3) in bathroom and house, (2) bedroom and one in fields. This observation is also seen with that of Gupta R<sup>6</sup> (75.00%), Ambade VN<sup>19</sup> (69.30%) and WHO Report<sup>9</sup> (80-90%).

Since kitchen is the place of cooking it is the place of highest occurrence of burn incidents.

#### **Causes of burns**

Kerosene tops the list of the causative agents of burns with 38 cases (79.17%) (Either due to stove burst or due to falling over of kerosene can). There was no involvement of kerosene in 10 cases (20.83%).

This finding is similar to the studies conducted by Ambade VN<sup>12</sup> (69.30%), Singh D<sup>6</sup> (82.00%) and Zanjad NP<sup>8</sup> (89.03%). As kerosene is easily available and highly inflammable and because of its wide use it poses the highest risk.

**Mode of burns**

In our study as per the police inquest reports, hospital case sheets and history gathered from relatives of deceased no homicidal cases of burns were seen. Maximum deaths were due to accidental burns i.e 38 cases (79.17%) and the rest were due to suicidal burns i.e 10 cases (20.83%). These observations are similar to the studies of Kumar V<sup>12</sup> (75.8%), Singh D<sup>5</sup> (64.00%), Ambade VN<sup>11</sup> (75.00%) and Babladi PI<sup>2</sup> (85.67%)

The majority was accidental cases due to poor cooking conditions and using cooking appliances without any safety measures and suicidal cases were due to domestic strife, dowry issues, and employment problems and like.

**Total body surface area and sex**

The total body surface area burnt (TBSA) in majority of the victims was more than 76.00% in 30 cases (62.50%). Among these 25 cases (83.33%) were females and 5 (16.67%) were males.

The above table shows that our finding is similar to those of Memchoubi PH<sup>10</sup> (73.84%), where as in studies of Zanjad NP<sup>7</sup> (41.48%) and Koulapur VV<sup>13</sup> (43.70%) number of victims with more than 76% burns were 41.40% and 43.70% respectively.

**Total body surface area and manner of burns**

In the majority of accidental (60.50%) and suicidal (70.00%), more than 76.00% of TBSA of burns were seen.

No such studies correlating between total body surface area and manner of burns were found in the literature for comparison with present study.

**Total body surface area and survival period**

It is observed from the present study (as shown in table No.3) that the relationship between the percentage of TBSA and survival period of burn victims was highly significant (P = 0.001)

The maximum number of cases (38 (79.17%)) cases survived for one week.

**Table No 2: Showing comparison of survival period with other studies**

Author	Year	Survival period upto 1 week
Singh D <sup>5</sup>	1997	86.00%
Kumar V <sup>12</sup>	2002	61.00%
Afify MM <sup>14</sup>	2010	86.00%
Present study	2013	79.17%

In the studies done by Singh D<sup>5</sup> (86.00%), Kumar V<sup>12</sup> (61.00%), Afify MM<sup>14</sup>(86.00%) maximum number of cases had duration of survival within one week of burns incident which is in accordance with present study.

In our study 6 victims (12.50%) suffered 26 to 50% burns. Out of these 4 cases survived for a week and 1 victim survived upto 2 weeks and 1 victim survived for more than 2 weeks.

Similarly 12 victims (25.00%) suffered 51 to 75% burns, of which 6 survived for a week, 4 survived upto 2 weeks and 2 victims survived for more than 2 weeks.

A total of 30 victims (62.50%) suffered more than 76% burns of whom 28 succumbed within a week and remaining 2 cases in 2 weeks.

From these observations it can be inferred that if percentage of burns is more, survival period is less and vice versa.

**Age and survival period**

In the 21-30 years category, out of 21 cases (43.75%) majority of victims i.e. 9 cases (50.00%) survived up to one day followed by 8 cases (40.00%) up to one week. In our study both the child victims died within one week. 3 cases (42.86%) survived up to 2 weeks and 1 case (33.33%) survived for more than 2 weeks.

Comparison could not be made with the present study due to lack of literature.

**Survival period and sex**

It is observed from the present study that majority of female victims i.e. 16 cases (40.00%) survived for a week, while among males 4 cases (50.00%) survived up to one day and remaining 4 cases (50.00%) up to one week. Among females, 6 victims (15.00%) survived up

to 2 weeks and 4 victims (10.00%) survived for more than 2 weeks, while in case of males no victim survived after a week.

Similar material is not found in the literature to compare with the present study.

### Cause of death

In present study majority of cases i.e. 27 (56.75%) died due septicemia of which 24 were (60.00%) females and 3 were (37.50%) males. Second major cause was shock with 18 cases (37.50%) of which 14 (35.00%) females and 4 (50.00%) were males. The least common cause was toxemia with 3 cases (6.25%) of which 2 were (5.00%) females and 1 was (12.50%) male.

**Table No 3: Showing comparison of cause of death with other studies**

Author	Year	Percentage of septicemia
Singh D <sup>5</sup>	1997	53.00%
Babladi PI <sup>2</sup>	2002	65.30%
Gul A <sup>15</sup>	2008	60.00%
Koulapur VV <sup>13</sup>	2009	58.90%
Gupta R <sup>6</sup>	2010	50.00%
Present study	2013	56.75%

### Cause of death and survival period

From our study as shown in table No 17, shock was the commonest cause of death in case of victims who survived for 1 day only. Similarly septicemia was the predominant cause of death among victims who survived for one week or more. And toxemia was seen in 3 victims who died within a week.

No similar material was found in the literature for comparison with our study.

### CONCLUSION

Following conclusions are derived from the present study:

- Maximum number of victims were found in the age group of 21-30 years i.e., 21 cases (43.75%).
- There was female preponderance with 40 cases

(83.33%) and female to male ratio was 5:1.

- Majority of burn cases were seen in married people i.e., 34 (70.83%).
- Most of the burn victims i.e., 29 (60.42%) were housewives.
- Rural victims outnumbered the urban victims 37 cases (77.08%).
- Majority of the victims were from class I socioeconomic strata 22 cases (45.83%).
- Kitchen was the place of occurrence in majority of burn incidents 39 cases (81.25%).
- Kerosene stove burst constituted the major reason for burns i.e. 24 cases (50.00%).
- Body surface area involvement has been found to be more than 76% in maximum no. of cases i.e 30 (62.50%).
- Taking survival period into account 37.50% of victims could not survive for more than 24 hours while 41.67% victims survived for up to one week.
- Septicemia turned out to be a major cause of death in maximum no. of cases i.e 27 (56.75%).

**Ethical Clearance:** Obtained

**Conflict of Interest:** Nil

**Source of Funding:** Self

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# Study of Craniocerebral Injuries in Chitradurga Region

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## ABSTRACT

Cranio-cerebral damage has been recognized since ages. Head injury as defined by the national advisory neurological diseases and stroke council, “is a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and or the contents of the skull, produced by the mechanical forces”. Of all the regional injuries, Craniocerebral-injuries are the most important in Forensic practice, as the incidence and severity of head injuries are increasing with burgeoning industrialization and more rapid methods of transportation. Head injury is a major public health problem and has attained epidemic proportions in India<sup>2</sup>. The present study includes data over a period of 3 years (2 years retrospective and 1 year prospective). This study includes 338 cases (118 prospective cases and 220 retrospective cases) of head injury. In retrospective analysis data were collected from the medical records. Road traffic accidents 256(75.74%) constitute the majority followed by 60(17.75%) are due to falls. 68(26.56%) of road traffic accident victims had history of alcohol consumption before the incident. 316(93.49%) cases survived and 22(6.51%) cases were dead. Head injuries due to assault were 20(5.92%) of which use of blunt weapon is more common 17(85%) cases followed by sharp weapon constitute 15% cases. Intracranial hemorrhages more common in road traffic accidents followed by falls from heights. Subdural hemorrhage was the commonest with 96(28.40%) cases followed by subarachnoid hemorrhage in 91(26.92%) cases. Extradural hemorrhages stand next with 72(21.30%) cases.

**Keywords:** Road traffic accidents, Motorcycle riders, Subdural hemorrhage, Skull fractures

## INTRODUCTION

Cranio-cerebral damage has been recognized since ages<sup>1</sup>. Head injury as defined by the national advisory neurological diseases and stroke council, “is a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and or the contents of the skull, produced by the mechanical forces”. Of all the regional injuries, Craniocerebral-injuries are the most important in Forensic practice, as the incidence and severity of head injuries are increasing with burgeoning industrialization and more rapid methods of transportation<sup>1</sup>. Head injury is a major public health problem and has attained epidemic proportions in India<sup>2</sup>. Injuries to the head are particularly important because of the brain's vital role

in sustaining the life of individual<sup>5</sup>. Traumatic brain injury(TBI), in which severe head injury plays a major role in over 50% cases, remains the leading cause of death in person below 45 years of age and overall the third leading cause of death responsible for 8% of all deaths<sup>4</sup>. Falls and motor vehicle accidents are the primary cause of TBI, while sports, assaults and gunshot wounds also contribute to these type of injuries. TBI is one of the leading causes of death and disability worldwide, including the developing world<sup>3</sup>. In India, road traffic injuries projected to become the second leading cause of death by the year 2020<sup>4</sup>. Head injury due to fall is the second most common cause of cranio-cerebral trauma leading to death<sup>5</sup>. An assault leading to scalp injuries is mostly homicidal in nature, and is generally produced by blunt weapons and occasionally by cutting instruments<sup>2</sup>. This study was undertaken as this problem needs serious attention for the prevention of unnatural deaths, which requires a worldwide epidemiological, medicolegal and clinical study on such victims. The

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present study was therefore conducted to ascertain age, sex wise distribution, cause of head injury, pattern of head injuries, skull fractures, brain injuries, intracranial hemorrhages and outcome in head injury cases.

### **AIMS AND OBJECTIVES**

The Traumatic brain injury is a medico-legal, epidemiological and social problem and one of the leading causes of mortality in the world more so in our country. To counter this problem in a given area various aspects of demographic profile of TBI is necessary. With this broad view in mind this study was carried out involving the data obtaining from cases of traumatic brain injury with the following aims to determine causes of head injuries, age, sex, time & place of occurrence, distribution of victims according to nature of hurt, consumption of alcohol in relation to head injuries, outcome and period of survival of victims and pattern of causes of head injuries

### **MATERIALS AND METHOD**

The present study was conducted in Basaveshwara hospital and District hospital, Chitradurga. The study includes data over a period of 3 years (2 years retrospective and 1 year prospective). This study includes 338 cases (118 prospective cases and 220 retrospective) of head injury. In retrospective analysis data were collected from the medical records. The cases where history was incomplete were discarded from the preview of the present study.

### **RESULTS AND OBSERVATIONS**

In the present study total 338 head injury cases, road traffic accidents 256(75.74%) constitute the majority followed by 60(17.75%) are due to falls. Males comprised the majority with 271(80.18%) compared to females 67(19.82). Age of the victims varied from 1-87 years with the peak incidences occurred between the age group of 21-30 years comprising 96(28.40%) cases. 68(20.12%) belonged to age of 31-40 years. 61(18.05%) belonged to the age of 41-50 years. Thus 66.57% belonged to the age group of 21-50 years. Most of the incidents occurred between 5-10PM with 164(48.52%) cases. More number of road traffic accidents 74(28.91%) occurred between 5-8PM. More number of falls from height 7(14.28%) occurred between 5-7PM. Among 338 cases, 170(50.30%) cases belonged to rural areas and 168(49.70%) belonged to urban areas. 68(26.56%)

of road traffic accident victims had history of alcohol consumption before the incident. 316(93.49%) cases survived and 22(6.51%) cases were dead.

Among 256 road traffic accident cases death occurred only in 16(6.25%) cases. Survival of the victim varied from 3 hours to 20 days. Most of the deaths, 10(45.45%) cases occurred between 3-5 days and 5(22.73%) deaths occurred between 3-13 hours. Most of the incidents occurred with the motorcycle riders 142(55.47%) followed by motorcycle occupants and pedestrians were equally involved in 42(16.41%) cases. Bicycle rider injured in only 1(0.39%) case. Most commonly involved vehicle is two wheeler 38(29.69%) cases followed by four wheelers in 28(21.88%) cases and three wheelers in 21(16.41%). Out of 42 victimized pedestrians, most commonly hit by two wheeler 15(35.71%) cases followed by four wheeler in 11(26.19%) cases. Most common mechanism is skid and fall from bike in 103(40.23%) cases followed by hit by vehicle occurred in 93(36.33%) cases. Collision was the mechanism in 39(15.23%) cases. Among head injuries due to falls, fall from height was more common involving 49(81.67%) cases of which 34(69.39%) occurred in home followed by 10(20.41%) occurred in fields.

Head injuries due to assault were 20(5.92%) of which use of blunt weapon is more common 17(85%) cases followed by sharp weapon constitute 15% cases. In present study the commonest type of scalp injury is contusion 244(72.19%) followed by laceration 188(55.62%). Contusion is the commonest scalp injury in RTA followed by laceration. In falls from height, contusion is the commonest scalp injury followed by laceration. In cases of assaults the commonest type of scalp injuries contusion and laceration followed by abrasion. Skull fractures were seen in 137(40.53%) cases. It was observed that frontal region was the commonest region involved in vault fractures in 60(17.75%) cases followed by temporal region in 50(14.79%) cases. Vault fractures commonly seen in frontal region in RTA whereas in temporal region in falls from height. In case of assaults, vault fractures commonly seen in the frontal region. Out of 97 cases of basal skull fractures, the commonest site is anterior cranial fossa 59(17.46%) followed by middle cranial fossa 54(17.46%). The commonest type of skull fracture is linear fractures in 120(35.50%) followed by comminuted fractures in 13(3.85%) cases. Intracranial hemorrhages more common in road traffic accidents

followed by falls from heights. Subdural hemorrhage was the commonest with 96(28.40%) cases followed by subarachnoid hemorrhage in 91(26.92%) cases. Extradural hemorrhages stand next with 72(21.30%) cases.

## DISCUSSION

**Mukul kumar saxena** et al<sup>6</sup> studied traumatic brain injury from Andhra Pradesh during 2008, observed that road traffic injuries as the leading cause (60%) of traumatic brain injuries followed by falls (20-25%) and violence (10%) which are consistent with our study. **Ashok Parchani** et al<sup>7</sup> studied traumatic brain injuries in Doha, Qatar between 2004-2008 and observed that common mechanisms were motor vehicle crash (69%) followed by falls from height (27%) which are consistent with our study. **Mohd kaleem khan** et al<sup>2</sup> observed out of 2850 cases 2442 (85.68%) were males while 408 (14.31%) were females. These findings are consistent with present study. **Lalith Kumar** et al<sup>8</sup> studied head injury cases from Dehradun, India, during 2011-2013 and observed that common age group involved in head injury was of 21-40 years. The peak incidence was observed in the age group 21-30 years comprising of 45% of the cases. It was also observed that 21% belonged to the age group 31-40 years. Thus 66% of cases belonged to the age group of 21-40 years in the study. Individuals in the age group of 0-10 years were the least affected i.e. in 4.2% of total cases. These findings are consistent with our study. **Akhade S P** et al<sup>4</sup> studied pattern of fatal vehicular accidents involving head injuries in Maharashtra during 2010-2012 and observed that most of the incidents occurred between 6pm to 9pm. These findings are consistent with our study. **Tejus Prajapati** et al<sup>9</sup> studied pattern of head injury cases in Ahmedabad and observed that the frequency of head injury cases and especially RTA cases are seen almost equally in urban areas (51%) and rural areas (49%). These findings are consistent with our study. **Shamsuddin R. Kakeri** et al<sup>10</sup> studied pattern of injuries and death sustained by the occupants of the two wheeler during road traffic accidents in Karnataka during 2005-2008 and observed that 6(4%) cases were under the influence of alcohol at the time of death and all of them were males. These findings are consistent with our study. **Amit M Patil** et al analysed period of survival in head injury cases, it is evident that 16.90% of the victims died on the spot. Of the remainder, 27.76% died within 24 hours of sustaining injury, 6.34% within 1-3 days, and 47.70% within 3-15

days. Only 5.3% survived for more than 15 days. Falls causing fatal blunt head injury (whether accidental or suicidal) had occurred in 24.9% cases. Falls from heights were responsible in 48.9%, slipping in bathrooms in 31.9% and from staircase or ladders in 19.2%. These findings are consistent with our study. **Akhilesh Pathak** et al<sup>11</sup> observed that incidence of deaths due to RTA were maximum (49.37%) in two wheeler riders followed by pedestrians in 32.91% cases. Four wheelers were involved in 15.19% cases and bicyclists in only 5.53% cases. These findings were consistent with our study. **Harish S Gauda** et al<sup>12</sup> studied about pattern of skeletal injuries in victims of fatal road traffic accident shows linear fracture (54.83%) was the most common type of skull fracture followed by comminuted (32.25%), depressed (10.48%) and sutural (2.43%) fractures. These findings are consistent with our study. **Akhilesh Pathak** et al<sup>11</sup> studied the pattern of road traffic accidents and head injury in Jaipur during 2003-2004 shows that the incidence of subdural hemorrhage was the maximum in 94.94% cases followed by subarachnoid hemorrhage in 20.25% cases and extradural hemorrhage in only 10.13% cases. These findings are consistent with our study.

## CONCLUSION

The commonest cause of head injury was road traffic accidents (75.74%) followed by fall from height (14.50%) and assault (5.92%). Head injuries were more in males (80.18%) compared to females (19.82%) with male: female ratio of 4:1. The commonest age groups are adults between 21-40 years. The most common age group in road traffic accident was 21-40 years. Fall from height was common in 21-40 years with peak incidence at 40 years. The most common age group in assault was 31-40 years about 30%. The peak time of head injuries was in the evening between 5-10pm (48.52%). More number of road traffic accidents occurred between 5-8pm and falls from height between 5-7pm. The incidence of head injuries are almost equal in both rural (50.30%) and urban (49.70%) areas. Most of hospital deaths (45.45%) due to head injury were occurred between 3-5 days of hospital stay. Death among cases of head injuries was more common in fall from height (12.24%) followed by road traffic accidents (6.25%). Two wheelers (85.98%) were the commonest vehicle involved in road traffic accidents and most common mechanism of accident was skid and fall from bike (40.23%) and the commonest victims were motorcycle

riders (55.47%). And 7.75% victims were below the age of 18 years. This is because of not following the traffic rules, fast and careless driving, drunk and driving and driving without license, instability of two wheelers. Pedestrians and motorcycle occupants were equally involved. Motor vehicle occupants victimized in 7.81% cases, followed by motor vehicle driver in 3.52% cases. Lack of knowledge on traffic rules and carelessness in crossing roads are reasons for the pedestrians being victimized in road accidents. Home was the common place of incidence of fall from height and ground level falls. In old people who spend more time at home and age related disability are the main reasons. Blunt weapons used to cause head injury for assaults more commonly and majority of them were seen on streets. The commonest type of scalp injury was contusion followed by laceration and abrasion. Abrasions are less as the scalp is protected by hair. Linear fracture was the commonest type of skull fracture present in 35.50% cases followed by comminuted fractures in 3.85% cases and depressed fractures in 3.25% cases. Among intracranial hemorrhages, subdural hemorrhages (28.40%) was the commonest followed by subarachnoid hemorrhage (26.92%). SDH is commonest in road traffic accidents (28.12%).

**Ethical Clearance:** Taken from College Ethical Committee, BMCH, Chitradurga.

**Source of Funding:** Self

**Conflict of Interest:** NIL

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# Determination of Stature from Hand Length in Adults: A Regional Study in Chennai

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## ABSTRACT

**Introduction:** Estimation of stature from dismembered body parts assumes great significance and interest in the field of forensic medicine. Stature can be determined using the measurements of different body parts. Hand anthropometry is found to yield good predictive information about an individual's stature. The aim of the present study was to formulate regression equations from hand length for stature estimation of both sexes in Chennai region. **Materials and methods:** In this cross sectional study, 619 subjects of both sexes with age ranging from 18 to 59 years of Chennai region were studied for stature and its relevance with that of hand length. Simple regression equations were derived by using two parameters – right hand length (RHL) and left hand length (LHL) - for estimation of stature of an individual for either sex separately. **Findings:** In the present study we found a significant ( $p < 0.01$ ) positive correlation between stature and hand length in both sexes. Stature estimation was relatively more accurate in males compared to females. **Conclusion:** The present study gives statistically significant positive correlation between stature and hand length. Stature can be successfully and accurately determined in this regional population by applying these regression equations.

**Keywords:** Stature, Hand length, Regression equations, Forensic anthropometry.

## INTRODUCTION

Personal identification is paramount in person living or dead. It becomes difficult or impossible in cases of fires, explosions, advanced decomposition, mutilation, aircraft accidents, earthquakes, mass disasters and terrorist activities.<sup>1</sup> In such cases, the anthropometry plays a central role in identifying the individual by formulating the biological profile– age, sex, ethnicity and stature. Stature is one of the most important elements in the identification of an individual.<sup>2</sup> The stature estimation is considered to be an important assessment in the identification of individual in forensic sciences.<sup>3</sup> The stature determination occupies relatively

a central position in the anthropological research and it has immense medico-legal importance when there is a difficulty in identifying the deceased from few body parts.<sup>4-6</sup>

There are lot of regional and international studies regarding the stature estimation and other aspects of identification from lengths of various bones and body parts. For instance, clavicle length,<sup>7</sup> forearm length,<sup>8</sup> phalangeal length,<sup>9</sup> metacarpal bone length,<sup>10</sup> long bones such as femur and foot lengths,<sup>11-14</sup> and hand length<sup>9,15-22</sup> are used in the estimation of stature. A mere superficial perusal of the various studies regarding the stature estimation clearly indicates that there is wide and distinct variation from country to country, region to region and place to place. Therefore, our aim was to make simple regression equations from hand length for stature estimation of both sexes in Chennai region.

## MATERIALS AND METHOD

The present study was conducted in the Institute

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of Forensic Medicine, Madras Medical College and in the Institute of Internal Medicine, Government General Hospital, Chennai, in the year of 2007 over a period of 9 months from January to September. The study sample consisted of 619 healthy individuals comprising 311 males and 308 females in the age group of 18 to 59 years. This age group was selected based on the fact that all the centers of ossification in the foot, hand and long bones get completely fused around 18 years. Subjects with age above 60 years were excluded since stature and hand length significantly decline due to osteoporotic changes.

All the measurements were taken in well lit room. The measurements were taken using standard anthropometric instruments in centimeter (cm.) to the nearest millimeter (mm.) accuracy according to the technique given in the manual of biological anthropology.<sup>23</sup> An ethical clearance was obtained from the Institutional Human Ethics Committee (IHEC) and an informed written consent in the regional language was obtained from each subject. The standing height method was chosen for measuring stature of each subject. Stature is the vertical distance between the highest point on the vertex and platform of stadiometer (Figure 1 & 2). The total hand length method was applied for measuring hand length. It is the straight distance from dactylion III and mid-point of the most distal flexing crease of the wrist, while the hand is extended along the long axis of the forearm and measured using a specially designed instrument (Depth gauge 12 inch size) (Figure 3 & 4).

### STATISTICAL ANALYSIS

Statistical analysis was performed in Systat version-12 and regression equations were derived with various combinations to reach the best estimate possible. Pearson correlation coefficient ( $r$ ) was calculated to assess the correlation of stature with hand length. Independent sample  $t$ -test was applied to determine statistical significance of hand length and gender differences in height and hand length.  $p$  - values of less than 0.05 were considered significant. To assess accuracy of prediction of stature by regression formula, standard error of estimate (SEE) and coefficient of determination ( $R^2$ ) were used. With the increase in value of SEE, accuracy of prediction of stature by regression formula decreases, while with the increase in value of  $R^2$ , accuracy of prediction of stature by regression formula increases.

### FINDINGS

Simple regression equations were derived by using the two parameters – RHL and LHL- for estimation of stature of an individual for either sex separately. Table 1 shows the sex distribution among the study subjects. They consisted of 311(50.2%) males and 308 (49.8%) females. Table 2 shows age group-wise distribution of study subjects. Both males and females were grouped together under five broad categories and no single age was omitted between 18 and 59 years. Table 3 shows mean, standard deviation and the range of the stature, RHL and LHL of the study subjects. The average stature for male adults was 167.5 cm. and ranged from 146.1 cm. to 190.0 cm. and for female adults it was 154.1 cm. and ranged from 139.6 cm. to 178.0 cm. The average RHL for males was found to be 18.7 cm. and ranged from 16.2 cm. to 21.4 cm. while for females it was 17.3 cm. and ranged from 15.1 cm. to 19.6 cm. The average LHL for males was found to be 18.9 cm. and ranged from 16.5 cm. to 21.6 cm. while in females it was 17.3 cm. and ranged from 15.0 cm. to 19.2 cm.

Table 4 shows Pearson correlation coefficient of the stature, RHL and LHL for males. The Pearson correlation coefficient of the stature, RHL and LHL for males clearly shows that these are statistically highly significant and there was a positive correlation between stature and hand length. For example RHL increased proportionately while the stature increased and vice versa. This was true for left hand as well. Table 5 shows Pearson correlation coefficient of the stature, RHL and LHL for females. They were statistically significant and there was a positive correlation between stature and hand length. For example RHL increased proportionately while the stature increased and vice versa. This was true for left hand as well.

However, stature estimation is relatively more accurate in males compared to females. Table 6 shows simple regression equations between the stature of male adults and RHL and LHL. The stature of the adult male was estimated by two different regression equations for right and left hands respectively. Table 7 shows simple regression equations between the stature of female adults and RHL and LHL. The stature of the adult female was estimated by two different regression equations for right and left hands respectively.

**Table 1: Sex distribution among the study subjects**

Sex	Frequency	Percentage
Male	311	50.2
Female	308	49.8
<b>Total</b>	<b>619</b>	<b>100.0</b>

**Table 2: Age group-wise distribution of the study subjects**

Sl. No.	Age distribution	No. of cases	Percentage
1	Age from 18 – 20 years	134	21.6
2	Age from 21 – 30 years	236	38.7
3	Age from 31 – 40 years	137	22.1
4	Age from 41 – 50 years	71	11.5
5	Age from 51 – 59 years	38	6.1
<b>Total</b>		<b>619</b>	<b>100.0</b>

**Table 3: Mean and SD and range of the stature, RHL and LHL of the study subjects**

Selected variables in cm.	Male				Female				Comparison	
	Mean	S.D.	Range		Mean	S.D.	Range		t-value	p-value
			Min.	Max.			Min.	Max.		
Stature	167.455	7.213	146.1	190.0	154.106	6.389	139.6	178.0	24.364	<0.001
RHL	18.748	0.922	16.2	21.4	17.253	0.792	15.1	19.6	21.630	<0.001
LHL	18.892	0.914	16.5	21.6	17.291	0.781	15.0	19.2	23.430	<0.001

**Table 4: Correlation co-efficient of stature, RHL and LHL for males**

Variables	RHL in cm.	LHL in cm.	p-value
Stature in cm	0.745	0.728	<0.01

**Table 5: Correlation co-efficient of the stature, RHL and LHL for females**

Variables	RHL in cm.	LHL in cm.	p-value
Stature in cm.	0.670**	0.650**	<0.01

**Table 6: Simple regression equations from RHL and LHL in males**

Independent Variables	Equations	SEE	R	R <sup>2</sup>
RHL	S = 58.161 + 5.830 (RHL)	4.818	0.745	0.555
LHL	S = 58.940 + 5.744 (LHL)	4.956	0.728	0.529

**Table 7: Simple regression equations from RHL and LHL in females**

Independent Variables	Equations	SEE	R	R <sup>2</sup>
RHL	60.932 + 5.401 (RHL)	4.753	0.670	0.448
LHL	62.268 + 5.311 (LHL)	4.865	0.650	0.422



**Figure 1: Technique of recording stature**



Figure 2: Measurement of stature

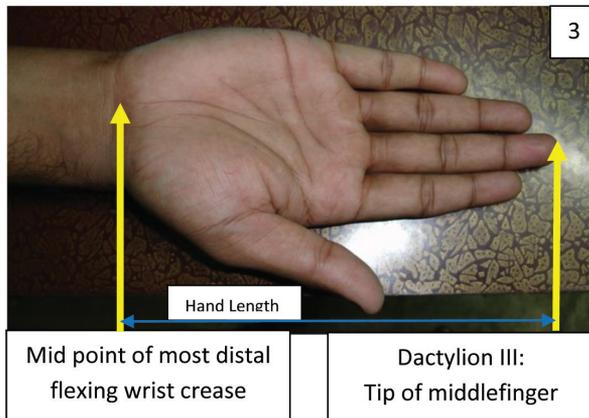


Figure 3: Technique of recording hand length measurement



Figure 4: Measurement of hand length

### DISCUSSION

The present study found a significant ( $p < 0.01$ ) positive correlation between stature and hand length. The result indicates that there is a significant difference in stature and hand length between male and female study subjects. The males showed higher stature and hand length than the females. It is because in general the male individuals are having 1-2 years of extended

growth period than the female individuals which results in longer and heavier bones, increase in stature and other dimensions of the body parts. These findings are in good agreement with earlier studies<sup>5,16,22,24,25</sup> Many studies reported regression equations for the determination of stature using the hand length.<sup>4, 24,26</sup> The findings of the present study are in consonance with these studies. Stature determination can be done using the measurements of different body parts. The hand measurements are highly reliable for determination of stature.<sup>5,24</sup> The present study found that the stature estimation is relatively more accurate in males compared to females (Tables 6 and 7). It could be due to high variation in the attainment of puberty and unpredictable age of menopause in women. However, our findings are in contrast to other studies.<sup>5,16</sup> These studies showed that the stature estimation was relatively more accurate in females than males. Variations in body dimensions are inherent among races and ethnic groups due to genetic, nutritional and environment factors. Moreover, there is a significant difference in body dimensions found between males and female counterparts. As a result, equation derived for one ethnic group and gender may not be applicable to other ethnic group and sex.<sup>18,19,21,22</sup> Therefore, the regression equations derived from the present study can be applied for stature determination of population in Chennai region.

### CONCLUSION

Simple regression formulae are derived from RHL and LHL to estimate the stature of both sexes. The present study gives statistically significant positive correlation between stature and hand length. Stature estimation can be more accurately calculated by applying these regression equations among population in Chennai region.

**Conflict of Interest:** No conflict of interest

**Source of Funding:** Self-funded research work

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# Prospective Analysis of Electrolytic Changes in Vitreous Humour Regarding Estimation of Time Since Death

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## ABSTRACT

Estimation of time since death is a practical task daily in forensic casework. The main principle of determination of the time since death is the calculation of a measurable time which will be immensely useful for the investigation of unnatural death by the investigating police officer.

Vitreous humor is a fluid that is relatively well protected from postmortem degradation and contamination due to its postmortem stability. The biochemical constituents of vitreous humor, especially potassium have been widely used in postmortem interval examination. The time dependent rise of vitreous potassium levels in the post mortem period has been considered to be helpful in PMI determination.

Out of 100 autopsy cases in GRH Madurai when dying of natural and unnatural causes, TSD was estimated using vitreous humor electrolytes changes. A linear association was obtained upto certain hours, when mean value of k<sup>+</sup> level plotted against PMI on a graph.

**Keywords:** vitreous humor, potassium, postmortem interval

## INTRODUCTION

Study of vitreous humor is chosen in eyes due to various reasons:

Vitreous humor in eyes are anatomically separated, well protected, sterile fluid, resistant to putrefaction for long time.

Relative stable when compared to other body fluid like CSF and blood

Energy metabolism continues for relatively long period

Diffusion process is slower in vitreous humor when compared to other body fluid

Well preserved and less susceptible to contaminations when compared to blood and CSF

Madea and Henssge <sup>(1)</sup> proposed the following formula  $PMI = 5.26 \times k. conc - 30.9$ . There is a linear relationship between vitreous potassium concentration and time since death upto 120 hours. The 95% limits of confidence are + w20 hours up to 100 hours. The rise

is mainly due to diffusion from retina into the centre of globe.

## MATERIALS AND METHOD

### Source of data

All medico legal cases autopsied at mortuary, Department of Forensic Medicine and Toxicology, Madurai Medical College, Tamil Nadu during the year 2016.

### Procedure

Vitreous humor collected by making a puncture 5-6 mm away from the limbus using 10 ml sterile syringe and 20 gauge needle. Aspirated vitreous poured in a rubber stopped vial. Normal saline injected into the eye for cosmetic purpose. Specimen forwarded to Department of Biochemistry for biochemical analysis immediately centrifuged for 10 mins, 3000 revolutions per unit supernatant fluid for Ion Selective Electrolyte method, Madurai Medical College and reports will be collected for further interpretation.

## OBSERVATIONS

100 cases of known postmortem interval (PMI) were included in this study. Of the 100 cases 71 were male and 29 were female with the age ranging from 16 to 60 years (average age = 38.2)

The reported PMI in the present study was in the range of 1.15 hours to 65 hours. Deaths due to both natural and unnatural causes were included in this study.

The mean value of postmortem vitreous potassium concentration for all the cases was  $9.83 \pm 2.48$  mmol/L (mean  $\pm$  SD) and the mean time since death for all the cases was  $20.42 \pm 13.09$  hours (mean  $\pm$  SD)

### Age distribution

Age distribution	No. of cases	Male	Female
<_20	6	2	4
21-40	57	41	16
41-60	31	26	5
>60	6	1	5
<b>Total</b>	<b>100</b>	<b>70</b>	<b>30</b>

### Sex distribution

Sex distribution	No. of cases
Male	71
Female	29

## Post- mortem interval

Post mortem interval	No. of cases
< 12 hrs	29
12-24 hrs	33
24 hrs	38
<b>Total</b>	<b>100</b>

## Post mortem interval vs potassium

Post mortem interval	no. of cases	Potassium (k+)		P value
		Mean	SD	
< 12 hrs	29	7.121	0.611	
12-24 hrs	33	9.286	0.572	< 0.001 Sig
>24 hrs	38	12.372	1.832	
<b>Total</b>	<b>100</b>			

## Electrolytes range and P value

Electrolytes	Range	Average	SD	P value
Sodium	114 to 182	146.58	15.628	0.860 NS
Chloride	119.3 to 15.32	124.97	15.323	0.153 NS
Potassium	6.02 to 18.3	12.372	1.832	0.001 NS

## The mean value, SD value of potassium, sodium, chloride and mean PMI for different groups

Reason for death	No. of cases	Na		K		Cl	
		Mean	SD	Mean	SD	Mean	SD
Accidental fall	6	157.5	15.515	10.54	1.92	133.833	17.256
Burns	17	141.706	15.575	10.069	2.775	119.588	11.694
Electrocution	4	148.25	16.07	9.25	0.332	122.25	8.421
Hanging	10	142.5	6.536	10.43	2.347	118.5	
Head injuries	3	137.333	3.786	8.533	0.569	112	4.359
Natural death	3	149.333	7.572	9.233	2.371	130.333	4.933
Poison	15	146.267	10.859	8.38	1.994	116.733	9.513
RTA	39	148.872	12.355	10.376	2.688	125	12.538
Snake bite	2	133.5	6.364	6.6	0.283	119.5	16.263

## DISCUSSION

In vitreous humor Na, Cl concentration remain consent Na+ Cl concentration decreased level of 1 mmol /L/hour. K+ concentration increases with PMI more than 24 hours. After slightly fall occur 0.2 meq / hour with an interest up to 0 time of 3.6 meq / 95% confidence him of all cases + 12 hours when PMI was more than 24 hours.

In 1959 NAUMAN<sup>(1)</sup> study in vitreous concentration K+ not correlate with PMI. Average K+ value 7.2 / dl average 9 hours. In 1964 Stunder and Gunter<sup>(14)</sup> K+ value in vitreous concentration between two eyes, difference hour 01. Meq /L and regression model study. My flame photometry 104 postmaster hour with 95% confidence limit 9.5 hours' relationship evaluate by investigators.

1984 Balasooriya<sup>(8)</sup>, Na+ K+ significance change is proportional to PMI. Liner rise of K+ concentration. Significant and Na level decreasing during first 85 hours and difference between two eyes of K+ significant change  $P < 0.001$  after death. 1989 NOWAK and Balabonova study significant relationship between PMI and K+ Ca+ concentration in Asphyxial death. Significant correlation  $R = 0.356$ , 2003 Prasad study K+ level vitreous humor strong relationship with PMI

Our study findings correlate with other investigations noted that K + concentration level increased in regularly average rate of rise was 0.17 mm /L. K+ value range 6.02 to 18.2 SD value 1.832 P value  $< 0.001$  significant value Na concentration level was nonlinear relationship between Na+ & PMI. Na range 114 to 182 mmol/L average Na 146.65 SD deviation 15. 628 P value 0.860 vitreous Na + concentration level constant more than 24 hours. Our study findings were consistent with other studies concentration of Na level declining head of 1mmol/L Cl concentration level nonlinear relationship between Cl & PMI. Cl range 102 to 161 mmol/L, average non-significant vitreous Cl remained concentration for more than 24 hours. Any formula used for only adults cannot be used in infant to establish. PMI advantage of this formula is that is case where the PMI is in question. It can be determined by simply estimating vitreous concentration and inserting its value into the formula. However, many scientist have stated different 95% confidence limit.

All unnatural cases Na+, Cl-, K+ concentration was within the normal range except burns, RTA, Accidental

fall, where the vitreous Na+ Cl- K+ concentration was either below the normal range or very close to lower limit of normal range. This shows the ante mortem electrolytes imbalance which could be pointer to primary cause of death or it can be used as corroborative evidence. Natural death cases showed vitreous Na+ Cl- K+ concentration less than the normal range. This indicates that there was electrolyte imbalance just before death, which resembled the low salt pattern of Coe<sup>(5)</sup> study Vishal garg (2004) burns and non-burns vitreous analysis shows that there is linear relationship between K+ concentration and TSD. K+ level increased up to 104 hours, factor like temperature, age, sex, humidity has no appreciable effect on K+ concentration.

## CONCLUSION

Among three electrolytes like Na+ k+ Cl- estimated from postmortem vitreous humor by Ion Selective method. K+ level concentration serves as potential marker for estimating time since death in early period of postmortem. There is linear relationship between TSD and K+ concentration. External factors like temperature, humidity has no appreciable effect on vitreous K+ concentration.

Age has got no appreciable effect in determining concentration of potassium in vitreous humor. 95% confidence limit of over +/- 12 hours limits the usefulness in determining PMI.

Concentration of postmortem potassium levels is higher in deaths due to burns, hanging, poisoning, accidental fall, RTA and natural deaths than snake bite, electrocution and head injury. The sodium and chloride concentration in vitreous humor has no linear relationship between PMI, Na+, Cl- are little significance when compared with K+ in achieving estimate of postmortem interval, K+ value is most significant there is considerable rise in k+ level in vitreous with increasing PMI. Due to autolysis of vascular choroids and retinal cells, there was rise of K+ and rise of PMI which indicate that rise in K + level after death has strong correlation with the PMI.

**Ethical Clearance:** Taken from institutional review board / independent ethics committee, Govt. Rajaji Hospital, Madurai

**Source of Funding :** Self

**Conflict of Interest :** None

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# Studies on Prevalence of Accessory Tooth Cusps in Some Ethnic Populations of Northern India and their Forensic Relevance

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## ABSTRACT

A dental cusp is a prominence on the crown of the tooth and is present normally on posterior teeth. This study was carried out to determine the frequency of different accessory cusps, their sites and presence of unilateral/bilateral cusps among males and females of three distinct ethnic populations of North India – Brahmin, Rajput and Muslim with reverence to their forensic utility. The frequency analysis revealed that the male had higher presence of accessory cusps than the females, while the communities showed minor variation in the accessory cusps. The Brahmins had the most bilateral cusps (15.3%) followed by Rajputs (14.4%) and Muslims (8.6%) the least. Further, the Carabelli's cusps were found with highest frequency than the talon cusps which are the rarest type of cusps in these communities. However, the findings suggest that the accessory dental cusps may provide the clue the identity of the individuals in the absence of any other physiognomic characteristics.

**Keywords:** Accessory Tooth Cusps, Prevalence, North India, Dental anomalies

## INTRODUCTION

The principal basis of the dental identification lies in the fact that no two dentitions are alike and the teeth are unique to an individual. The dental characteristics such as the shoveling or scooping of the upper incisor (most common in Asiatic Mongoloids and Amerindians), taurodontism, chisel shaped incisors, Carabelli's cusp, hypocone, and protostylid, peg shaping of the teeth can be used to determine the ethnicity of the individual [1-3].

Developmental variations of teeth like anomalies of number, size and shape are frequently observed during a routine dental examination [4]. One such developmental variation is presence of accessory cusps on the teeth. Accessory cusps are quite common, but their incidence and prevalence do differ with respect to the types of tooth. The most common accessory cusps are cusp of Carabelli found on molars, Talons cusps of incisors and Leong's tubercle of premolar. Their prevalence depends on their type and they differ in structure as well as size [5, 6].

Accessory tooth cusps are quite helpful in anthropological and phylogenetic analysis [7]. They help in understanding the genetic variance and relationships among different races and ethnic populations. The study of accessory tooth helps in population studies and their characterization sheds light on the interbreeding trends or history among the populations [8]. Genetic as well as external factors can play significant role in development of dentitions although studies have shown that genes play a more dominant role in their presence [9].

### Forensic significance of Accessory tooth cusps

Forensic odontology is primarily concerned with the use of teeth and oral structures for identification in a legal context. Various forensic odontology techniques help in the identification of the human remains in incidents such as terrorists' attacks, airplane, train and road accidents, fires, mass murders, and natural disasters such as tsunamis, earth quakes and floods, etc [10].

Typically, dental identification has been done by comparative analysis of ante mortem and postmortem

data of either tooth fillings or prosthetics, and less frequently through natural dental anatomical features [9, 11].

Depending upon the frequency of a particular type of feature within a population, it can be treated as unique and hence important, for the purpose of identification. So far, dental anatomy has been used in comparative analyses for determining the origin and the sex of individuals [12, 13].

By determining the presence and frequency of a particular type of accessory tooth in a population, it can be as one of the identification factors of comparative analysis in forensics [9].

In view of the above, this study is an endeavor to determine the frequency of different accessory cusps, their sites and presence of unilateral/bilateral cusps among males and females of three distinct ethnic populations of North India – Brahmin, Rajput and Muslim with reverence to their forensic utility.

## MATERIALS AND METHOD

The present study is an exploratory study conducted at Amity Institute of Forensic Science, Amity University, Noida, Uttar Pradesh, India where the sample population was surveyed for the presence of different accessory cusps (talon, carabelli and protostylid) in some of the ethnic populations of North India – Brahmin, Rajput and Muslim. The study was carried out on 150 subjects (50 individuals from each population, 150 subjects in total) at the age group 15-25 years. The age range selected is expected to ensure that eruption of the full permanent dentition through the second molar and minimal effects from tooth wear and tear. The fully erupted permanent teeth, healthy state of gingiva and caries free teeth were selected from the three ethnic populations.

The informed consent was obtained from the subjects and the data was collected by clinical observations, using the simple mouth mirror and probe supplemented by examination of the dental casts, followed by the oral radiographs, wherever required.

Apart from this, cross tabulation studies were also conducted to found the incidence of accessory cusp types viz. talon cusp (figure 1), Carabelli's cusp (figure 2) and protostylid (figure 3), sites of these cusps (left/right) and types of cusps (unilateral/bilateral) among males and females of the three communities under study.

in relation to potential forensic utility. The carabelli trait was categorized as present and absent using Goose and Lee classification (1971) while Hattab's (1996) criteria was used for assessment of Talon's cusp. The protostylid was studied using Grine's (1986) criteria [14-16].

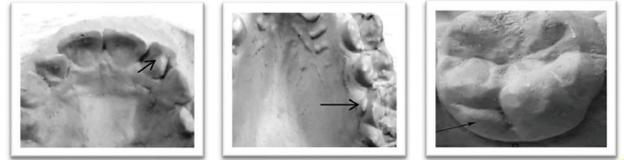


Figure 1: Talon Cusp Figure 2: Carabelli's Cusp Figure 3: Protostylid

## Analysis and Interpretation

In order to evaluate the presence of different types of accessory cusps across different sections of society in North Indian population, frequency analysis was performed on the data collected.

## Cross-Tabulation Results

Presence of cusps in the Respondents (Community wise)

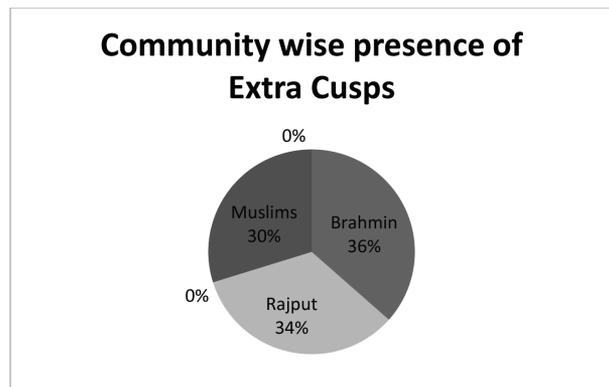
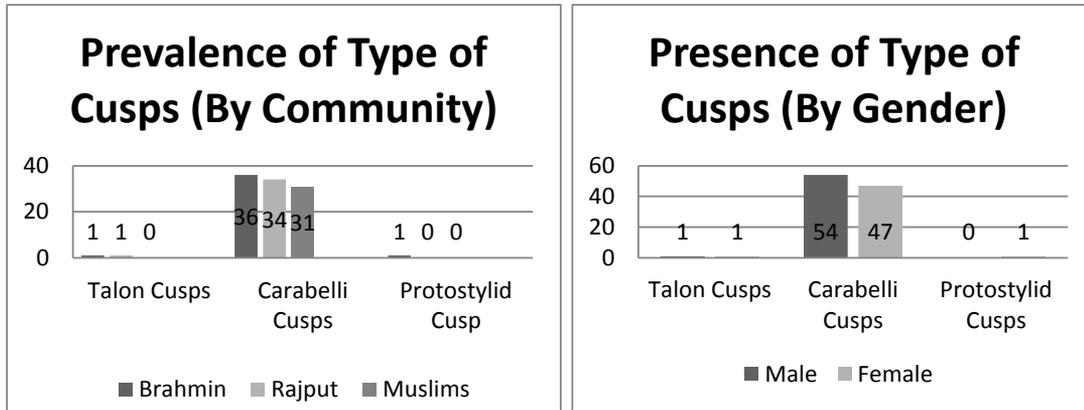


Figure 4: Community wise distribution of cusps among the respondents

Figure 4 shows that all the communities have almost the same frequency of prevalence with different types of cusps. Since the frequency of prevalence is similar in the three populations, their potential to discriminate between the populations for forensic studies is not quite useful. Although community based studies of accessory cusps have not been done in North India but it's done to study prevalence of anomalies on basis of social and/or economic background and among school children belonging to the Punjabi community of Chandigarh, India. [12].

Presence of cusps in Respondents (Type of Cusp)



**Figure 5: Community and Gender Wise Distribution of different types of Cusps among respondents**

As seen in Figure 5, the presence of different type of cusps, Talon, Carabelli and Protostylid cusps, varied quite significantly among the male and female sample population, where Carabelli cusps showed the highest frequency and the incidence of protostylid cusps was lowest. The study conducted for presence of talon cusps in North Indian population found almost similar results, with 0.65% of prevalence as compared to 0.02% in the present study [13].

The talon cusp is also known by various other names dens evaginatus, supernumerary cusp/ horn, hyperplastic cingulum, evaginated odontome, cusped cingulum, accessory cusp and supernumerary lingual tubercle [13,17].

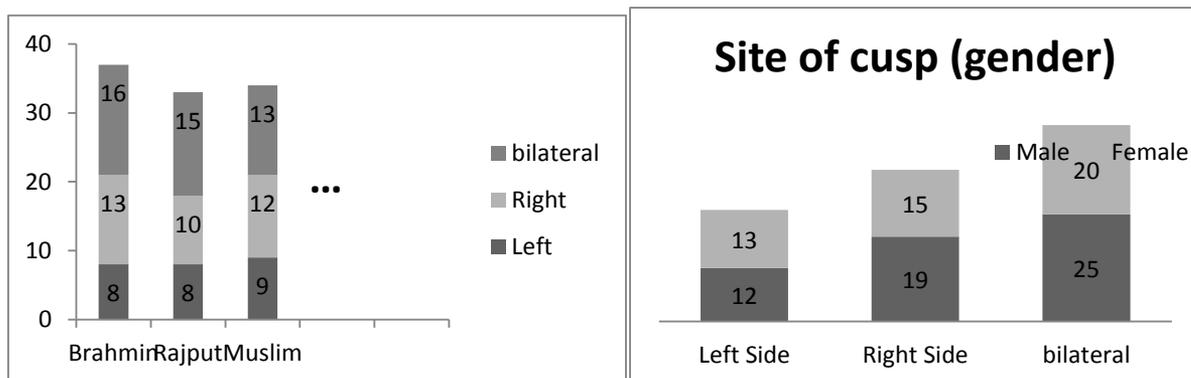
Carabelli cusps had the maximum frequency of prevalence (67.3%) and also have been studied in school population. The Brahmins had the most bilateral cusps (15.3%) followed by Rajputs (14.4%) and Muslims (8.6%).

children of South India, when researchers found that 89.8% of primary second molars and 63.7% permanent first molars had Carabelli cusps [18].

Last of all, protostylid cusps were found in the population at a frequency of 0.06%. Since the presence and distribution of talon and protostylid cusps among the different communities of North India is rare, they can be adopted as a forensic characteristic during identification process of individuals.

**Presence of cusps in the Respondents (Site of cusp)**

As seen in Figure 6, cusps were commonly bilateral. In case of unilateral cusps, more frequency was observed in the right side of the jaw for respondents of all communities as well in terms of male and female



**Figure 6: Caste and Gender wise distribution of cusps among respondents**

With respect to respondents' gender, 52.8% males and 47.1% females had accessory cusps. Khraisat et al. also concluded the prevalence, association, and sexual dimorphism of Carabelli's molar and shovel incisor traits amongst Jordanian population<sup>[19]</sup>. In our study also males have a slightly higher prevalence of cusps than women.

The studies conducted for understanding the prevalence of dental anomalies in Indian population, where the incidence of talon cusps was shown to be higher of bilateral cusps (7.8%) than unilateral (2.9%)<sup>[20]</sup>.

Considering the rarity of bilateral and unilateral cusps, this property can be used as a forensic characteristic in comparative analysis during identification.

### CONCLUSION

The study on the presence of accessory tooth cusps among different ethnic communities of the North Indian population was undertaken to understand the trends and determine their forensic relevance. Analysis of the collected data revealed that different groups showed almost similar trends for the three cusps talon, protostylid and carabelli cusp. Therefore to determine the ethnicity based on the accessory cusps is not possible.

Among the types of cusps, carabelli cusp had the strongest presence, while talon and protostylid cusps were rare, signifying that presence of talon cusp and protostylid can be used as a forensic characteristic in personal identification. The previous studies on talon cusps in India have also shown that it is rare in the population, as evaluated for different sub-sections of the Indian population, thereby providing an opportunity for forensic identification.<sup>[12, 13, 21]</sup>

**Conflict of Interest:** None declared

**Source of Funding:** Intuitional

**Statement of Informed Consent:** The informed consent was obtained from the subjects before doing their oral examination.

**Statement of Human and Animal Rights :** No human rights were violated during the course of study and the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national)

and with the Helsinki Declaration of 1975, as revised in 2000 (5).

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# Analysis and Outcome of Head Injury Cases due to RTA in Tertiary Hospital in North West Uttar Pradesh

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## ABSTRACT

Head injuries and road traffic accidents have been seen to occur in maximum number in the state of Uttar Pradesh. The present study details the pattern of head injuries arising out of road traffic accidents admitted to a hospital in North West Uttar Pradesh and aims to provide an idea of the similarities and differences in the pattern and outcome of head injury cases in comparison to other studies around the country.

**Keywords:** Head Injury, RTA, Uttar Pradesh.

## INTRODUCTION

Worldwide, traumatic brain injury (TBI) is the single largest cause of death and disability following injury. Most TBI's are due to roadside accidents. According to WHO data, by the year 2020, head trauma will be third largest killer in the developing world. The statistics from India are even more alarming. Studies by traffic police have shown that on an average one person dies every six min, 70% of these being directly attributable to head and spinal trauma. Number of 'Traffic Accidents' in the country have increased by 5 % (from 4,81,805 in 2015 to 4,96,762 in 2016) during 2016 compared to 2015.<sup>(1,2)</sup>

A multitude of awareness campaigns were held in the country and are still being held to promote road safety measures but a drastic reduction in road traffic accidents is still an awaited dream. According to provisional police data provided by states, Uttar Pradesh recorded the maximum number of road deaths (17,666), followed by Tamil Nadu (15,642), Maharashtra (13,212), Karnataka (10,856) and Rajasthan (10,510). Since the head contains brain, a very important vital organ, trauma to this region challenges the individual because

of its anatomical position, size, and movements in all directions. Despite improvements in safety measures in vehicles and greater availability of emergency measures, head injuries have not declined.<sup>(3,4)</sup>

The present study was done to ascertain the outcomes in cases of Head Injuries due to road traffic accidents and to ascertain if associated factors were responsible towards contributing to the outcome. We have attempted to create a profile of victims, causes, injuries sustained, risk factors and possible preventive measures in cases of head injuries in Bareilly, Uttar Pradesh.

## METHODOLOGY

The study was a retrospective, non randomized, descriptive study which was conducted in a tertiary Hospital and Medical College in Bareilly, Uttar Pradesh. The study was conducted over a period of one month comprising of individuals who were admitted with a history of trauma to the head in the past one year. The subjects included both genders and all age groups. The data was collected as per Patient information sheet. Data such as age, sex and injuries was collected along with OPD/IPD number as reference so that duplication of entries does not occur. Individuals who suffered head injuries and were treated in the institution were only taken as subjects. Institutional ethical clearance was obtained prior to start of study. The outcome was evaluated based on the status of patient on discharge as evident in case notes. The data was compiled and

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analyzed using SPSS software and in consultation with statistician.

### RESULTS

A total of 107 cases were recorded during the study period. The cases comprised of 69 males and 38 female victims. The ratio of male to female was 1.81: 1 i.e. males were almost twice the number of females. The age distribution of the subjects is as depicted in table 01. The maximum number of patients were in the age group of 31 to 40 years (31%), followed by 11 to 20 years and 21 to 30 years having 20 % and 19 % cases respectively. The younger age group was commonly found to be involved in RTA's.

Table 02 depicts the period of survivability and outcome of the victims of the RTA. 38% of the victims were brought dead to the Hospital, this is followed by 28 % of the victims who were successfully treated and discharged. 23% of the victims passed away within 24 hours of the accident despite treatment. While 11% of the victims died within a week of treatment. The survivability was better in cases who were brought to the hospital as evident by the results.

Table 03 depicts the external injuries as noted in the hospital records, while table 04 depicts the radiological findings of the head injuries. The commonest external injuries were Contusions and Lacerations to the scalp and Forehead as seen in 92% and 86% of the cases. History of Loss of consciousness was found in 38% of the cases. Radiologically, comminuted fractures were found in 48 % of the cases under study, followed by fissure fractures in 28 % of the cases. The fractures were associated with internal injuries, with Subdural haemorrhage (SDH) being the commonest with 66% occurrence. Subarachnoid haemorrhage(SAH) was second commonest at being found in 50% cases. Extradural Haemorrhage(EDH) , Intracerebral haemorrhage(ICH) and Intraventricular haemorrhage (IVH) were seen infrequently in 14%, and 12 % cases only.

**Table 01: Age Distribution**

Age	NO	%
Less Than 10 Years	1	1
11 to 20 Years	21	20
21 to 30 Years	20	19
31 to 40 Years	34	31
41 to 50 Years	15	14
51 to 60 Years	7	6
61 to 70 Years	8	8
More than 70 Years	1	1
<b>TOTAL</b>	<b>107</b>	<b>100</b>

**Table 02: Outcome based distribution**

Outcome	No	%
Spot Dead	38	36
Died Within 1 hr	15	14
Died within 24 hrs	10	9
Died within 1 week	12	11
Died after More than a week	3	2
Discharged Successfully	29	28
<b>Total</b>	<b>107</b>	<b>100</b>

**Table 03: External Injuries to Victims**

External Injuries	No	%
Scalp Contusion	98	92
Scalp Laceration	92	86
Black eye	49	46
Ear Bleed	42	40
Nose Bleed	12	11
LOC	40	38

**Table 04: Radiological Data (CT Results)**

CT Finding	No	%
No. Fracture	15	14
Fissure #	30	28
Comminuted #	51	48
EDH	11	10
SDH	70	66
SAH	52	50
ICH	15	14
IVH	13	12

## DISCUSSION

In the present study, a total of 107 cases of RTA of all age groups and both sexes were studied admitted along the duration of one year. Highest incidence of admissions occurred in the age group 30-40 years (31%) followed by 11-20 years (20%) and 21-30 years (19%). Since the age group 20-40 years is the most active phase of life - physically and socially, and outnumbers the other road users, they therefore accounted for the maximum number of accidental cases. Teenagers in upper limit of age group of 11-20 years are young and enthusiastic, and thus tend to drive bit rashly. Also, individuals of this age group were either students or prime bread earners of the family and thus remained outdoors during most of the day. Children below 10 years of age were least involved so also was the case with person beyond 70 years of age. This could be explained as the persons in extremes of the age usually remain indoors, whereas children are confined to the outskirts of the residential premises only. (4) The findings are similar to those reported by Bahera C et al, Dandona R and Khajuria B in their studies that the most vulnerable age group lies between 21 to 40 years in terms of accidents on the road. (5,6,7)

Our findings regarding a increased number of cases among males as compared to females is due to the fact that males have a more preponderance to outdoor work and travel as compared to females and thus are more prone to RTA's and is supported by studies from the above authors as well as by Tandle R M in his study. (5-8).

In our study, majority of the RTA victims (38%) died on the spot or brought dead to the hospital or died within 24 hours of the accident (25%); 11% victims died within one week and 2% cases expired after one week despite getting adequate treatment. Our findings were well corroborated by other workers in the field in terms of majority of cases being brought dead or died with 24 hours (9,10), the percentages among the study populations have varied according to the methodologies of the authors.

In our study, we noted contusion and laceration of scalp and forehead in 92% and 86% cases respectively. Khajuria et al (7) noted in their studies that laceration was highest among all brain tissue injuries which were contradictory to our observations, as we observed, incidence of contusion being the highest. 76% of the victims suffered fracture of the skull - either vault or

base of the skull or both. Among the skull fractures, 28% sustained fissured fracture and 48% comminuted fracture. Probably this type of fracture is more common in cases where RTA type accidents occur. Our findings were not in concurrence with studies by Pathak et al (9) who reported in 120 cases of head injury deaths, linear fracture of the skull being the highest (43.04%). Khajuria et al (7) noted an incidence of 68.85% fracture of skull among 173 cases of head injuries. The study by us reported that the most commonly found intracranial haemorrhage was subdural haemorrhage (SDH) (66%) followed by subarachnoid haemorrhage (SAH) in 50% of the victims of RTA. The study conducted by Gupta et al (11) revealed that subdural haemorrhage was the commonest type of intracranial haemorrhage supporting our observations; followed by extradural haemorrhage as second common and intracerebral haemorrhage least common whereas we noted subarachnoid haemorrhage being the second commonest that too with very high incidence (50%) and extradural haemorrhage being the least common (10%).

## CONCLUSION

We conclude that it is males who are more prone to head injuries in RTA and prevention and awareness strategies must be directed towards males more than females in case of RTA prevention. A variation exists between the pattern of injuries and age groups affected that are seen in our study population and those that have been documented in other studies from other population groups. We hope this study shall help to educate the medical fraternity towards the pattern of Head Injuries commonly encountered in this part of the country. A limitation of this study lies in the fact that postmortem examination and injuries found on autopsy must also be included but could not be done due to inaccessibility.

**Conflict of Interest:** Nil

**Source of Funding:** Self

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# Awareness among Undergraduate Medical Students about the Acid Attack in Criminal Law (Amendment) Act, 2013

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## ABSTRACT

We tried to assess the level of knowledge in Criminal Law Amendment Act 2013 among the first and second year MBBS students, with regards to acid attack. A questionnaire based cross-sectional survey was conducted among 274 randomly selected students of first year MBBS (100) and second year MBBS (174) in Aarupadai Veedu Medical College and Hospital in Puducherry City of India. The questionnaire comprised of 10 items out of which 7 are of fixed-response type (yes/no) and remaining 3 of multiple choice question. There was a disparity between the levels of knowledge with regards to acid attack among students. The study provides valuable insight into how much knowledge students have regarding the acid attack. We recommend doctors should be thought in a proper way on this important issue, so it would be helpful for them in handling such cases in future. We recommend that the medical students should be kept abreast of the criminal laws in connection with medical practice.

**Keywords:** acid attack; criminal amendment act; corrosives; acids; corrosives

## INTRODUCTION

The nationwide protests over the brutal gang rape and subsequent death of physiotherapy intern in New Delhi on 16<sup>th</sup> December 2012, was the major reason for passing the Criminal Law (Amendment) Act, 2013 which came into force from April 2013. It brought about changes in Indian Penal Code, Indian Evidence Act, Code of Criminal Procedure, on laws related to sexual offences.<sup>1</sup>

In Criminal Law Amendment Act, 2013 other than rape, there is provision for punishing persons involved in sexual harassment, stalking, voyeurism and acid attacks. The acid attack is also known as acid throwing, vitriol attack or vitriolage, is a form of violent assault. Vitriolage is defined as the act of throwing of any

corrosive substance, on a person with malicious intent for destroying vision or causing facial disfigurement.<sup>2</sup>

Before the Criminal Law Amendment Act, 2013 there was no specific law in India to deal with the cases of acid attack. The acid attackers were dealt in section 326 of the Indian Penal Code, which is voluntarily causing grievous hurt by dangerous weapons or means. It was not so effective in dealing with this odious form of crime because it did not include acid attack as a separate violence.<sup>3</sup> The Criminal Law (Amendment) Act, 2013 resulted in adding Sections 326 A IPC & 326 B IPC for dealing with acid violence cases. The new section deals with:

Section 326 A IPC: Voluntarily causing grievous hurt by the use of acid. Is punishable by imprisonment of not less than ten years, but may extend to life, and with fine.<sup>1</sup>

Section 326 B IPC: Voluntarily throwing or attempting to throw acid. Is punishable by imprisonment of not less than five years and also fine.<sup>1</sup>

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The National Crime Records Bureau report in 2014, has mentioned the incidence of acid attack cases (225) and attempt to throw acid were cases (52) in India.<sup>4</sup> There were 154 people arrested throughout India, relating to acid attacks, out of which only 12 were convicted.<sup>5</sup> Although there was a change made in Indian Law to punish the person involved in the acid attack, there is a lack of awareness among Indian population regarding the legal changes made and also the reporting of cases to the concerned authority. There is steady rise in the number of acid attacks each year. The National Crime Records Bureau report in 2015, has mentioned the incidence of acid attack cases (249) and attempt to throw acid cases (46) in India, which is more than the previous years.<sup>6</sup> This rise speaks more in favour of the increase in acid attack incidences rather than possible awareness to report the same.

With changing legal perception there is a compelling need for MBBS students to be aware of the amendments made to the IPC, CrPC and IEA regarding the acid attack. Though there are many review literature on social and legal issues about the acid attack, no literature about the awareness of the same is available. Considering the above facts this study was undertaken to explore the knowledge and awareness among the MBBS students with regards to acid attack and also to do a gender based analysis of the same.

## **MATERIAL AND METHOD**

This cross-sectional survey was conducted on the awareness of Criminal Law Amendment Act 2013 with respect to acid attack among Group I (first year MBBS students) and Group II (second year MBBS students) at Aarupadai Veedu Medical College and Hospital, Puducherry during the year 2017. These students were taken for the study after obtaining valid consent. They were asked not to disclose their names, or roll numbers. Various types of questions were kept to enhance their level of participation and express their knowledge about the acid attack. Ethical clearance was obtained from Institutional Ethics Committee prior to the study. Self designed, validated questionnaire proforma, covering sets of questions involving both facts and hypothetical situations, relating to acid attack, were given for all participants to check their level of knowledge and awareness.

These comprehensive questionnaires were prepared, based on content relevance, and evidence from the literature after consulting other faculty members of the department. The questionnaire was peer-reviewed and validated. The questionnaire proforma was given to 20 students as a pilot survey to see whether these questions are framed in the trouble-free way for students to understand and respond. After receiving the responses separate interaction with each student was done and their feedbacks were noted. Taking this into consideration final questionnaire was prepared.

Then the questionnaires were distributed to the Group I and Group II students. The filled up proforma were polled in a box, kept specifically for this purpose. Student's who haven't responded to all question were excluded from the study. Their responses to each and every question were analyzed in detail.

A total 300 proformas were distributed among both the groups of MBBS students, out of which 274 valid proformas were received within the stipulated period.

Descriptive and analytical computation of data was done using SPSS v20. All data were examined for their distribution and the tests of significance were employed accordingly. The frequency and mode for each question were analysed as group wise. The significance of the difference between Group I and Group II was tested by chi-square test. The null hypothesis is rejected at a p-value of 0.05; however, analysis with statistical significance between 0.05 and 0.15 was also taken into consideration for discussion.

## **RESULTS**

The received responses were checked in terms of subjective (level of awareness) and objective (level of knowledge) evaluation. The results were tabulated and statistically analysed.

**Table 1: Ideas in relation to acid attack**

Sl.no.	Questions	Group I		Group II		Chi square	P value
		Yes (%)	No (%)	Yes (%)	No (%)		
1	Are you aware of The Criminal Law Amendment Act?	66 (66%)	34 (34%)	116 (67%)	58 (33%)	0.0126	0.9105
2	If a male, throws acid on a female is it punishable?	96 (96%)	4 (4%)	172 (99%)	2 (1%)	2.4004	0.1213
	If a female, throws acid on a male is it punishable?	92 (92%)	8 (8%)	157 (90%)	17 (10%)	0.2391	0.6248
3	A person who throws acid, irrespective of being a male or a female will be punished in the same way (irrespective of the outcome of acid throwing)	79 (79%)	21 (21%)	119 (68%)	55 (32%)	3.5530	0.0594
4	The term acid attack only refers to acid and does not include any corrosives capable of producing bodily injury.	26 (26%)	74 (74%)	32 (18%)	142 (82%)	2.1954	0.1384
5	The term acid attack only refers to attacks which produce injury leading to scar or permanent disfigurement.	64 (64%)	36 (36%)	118 (68%)	56 (32%)	0.4131	0.5203
6	The act of only threatening to throw an acid is not a punishable offence	35 (35%)	65 (65%)	56 (32%)	118 (68%)	0.2262	0.6343

**Table 2: Correct responses in relation to acid attack**

Sl.no.	Questions	Group I		Group II		Chi square	P value
		Right Answer (%)	Wrong Answer (%)	Right Answer (%)	Wrong Answer (%)		
1	If a male, throws acid on a female is it punishable?	96 (96%)	4 (4%)	172 (99%)	2 (1%)	2.4004	0.1213
2	If a female, throws acid on a male is it punishable?	92 (92%)	8 (8%)	157 (90%)	17 (10%)	0.2391	0.6248
3	A person who throws acid, irrespective of being a male or a female will be punished in the same way (irrespective of the outcome of acid throwing)	79 (79%)	21 (21%)	119 (68%)	55 (32%)	3.5530	0.0594
4	The term acid attack only refers to acid and does not include any corrosives capable of producing bodily injury.	74 (74%)	26 (26%)	142 (82%)	32 (18%)	2.1954	0.1384
5	The term acid attack only refers to attacks which produce injury leading to scar or permanent disfigurement.	36 (36%)	64 (64%)	56 (32%)	118 (68%)	0.4131	0.5203
6	The act of only threatening to throw an acid is not a punishable offence	65 (65%)	35 (35%)	118 (68%)	56 (32%)	0.2262	0.6343

**Table 3: Awareness of Criminal Amendment Act 2013**

Question	Response	Group I	Group II	Chi square	P value
Came to know about Criminal Amendment Act 2013 through	Hearsay	9 (9%)	52 (30%)	23.69	<0.0001
	Printed Media	19 (19%)	22 (13%)		
	Electronic Media	24 (24%)	16 (9%)		
	Not aware	48 (48%)	84 (48%)		

**Table 4: Punishment for acid attacker**

Question	Response	Group I	Group II	Chi square	P value
Convict of an acid attack will be punished with	Imprisonment	85 (85%)	144 (83%)	23.69	<0.0001
	Fine	-	-		
	Both imprisonment and fine	-	-		
	Not aware	15 (15%)	30 (17%)		

**Table 5: Changes in Criminal Amendment Act**

Question	Response	Group I	Group II	Chi square	P value
The criminal amendment Act made changes in	Indian Penal Code	23 (23%)	26 (15%)	2.2856	0.130
	Criminal Procedure Code	-	-		
	Indian Evidence Act	-	-		
	Not aware	77 (77%)	148 (85%)		

**DISCUSSION**

In the pursuit of knowing the ideas the students were having regarding various aspects of acid attack, Table 1 shows that two-third of the students from Group I (66%) and Group II (67%) are aware of the Criminal Law Amendment Act 2013, while one-third of Group I (34%) and Group II (33%) were not aware. The reason being they are not keeping themselves updated with various aspects of violence with respect to medical jurisprudence. The response between the groups did not differ in a statistically significant manner. This indicates that the present curriculum has to be incorporated with

the latest changes with regard to medical jurisprudence.

The data in Table 3 reflects an attitude and change in the Group II students who are motivated to discuss and appreciate the newer developments in medical jurisprudence. This further infers that, having a separate department for forensic medicine is having a profound impact on the attitudinal development of students towards medical jurisprudence.

In Table 1, responses to question 2 and 3 of both the groups have an idea that both genders are punished for throwing acid. However, in response to question 3, there is the difference between Group I and Group II

regarding the severity of punishment between genders. Group I have predominantly responded that there is no gender difference in the severity of the punishment (79%) whereas in Group II many have responded that there may not be gender equality in the severity of punishment (32%). Though the statistical significance of this observation is very less ( $p=0.0594$ ), we can certainly infer that introduction of forensic Medicine class to MBBS students has sensitised them towards the coherence of gender with regards to the punishments for various offences.

In Table 1, response to question 4, the percentage of Group I students having the idea that acids are the only corrosives referred in acid attack is higher (26%) compared to the Group II (18%), though there is no statistical significance ( $p=0.1384$ ) between the Groups. This reflects that Forensic Medicine classes have sensitised the students that acids are not the only corrosives. However in both the groups the common idea is that acids are not the only corrosives used for acid attack (74% and 84%).

In Table 1, responses to question 5 and 6 from both the groups have a common idea that the term acid attack does not necessarily refers only the attacks producing injury as well as the idea that threatening to throw an acid is also a punishable offence.

In Table 2, factually correct answers were given more by Group II in certain questions and Group I in certain questions. For those responses where Group I have got more factually correct responses demand more inquisition. After much deliberation, it was found the background idea between Group I and Group II were different regarding the gender. This has made Group II score less in the question “if a female is punished if she throws an acid”.

In Table 2 response to question 3 shows a difference in the marks scored between the groups. Ironically Group II has scored fewer marks than Group I ( $p=0.0594$ ). This again reflects the fact that Group II students who were sensitised about the gender differences in the legal proceedings of our country have influenced them to choose the wrong response in this regard.

In Table 4 Group I has responded imprisonment as a punishment for a convict of an acid attack more than Group II in a statistically significant manner ( $p=0.0001$ ). This could be interpreted that Group II

students are sensitised with the fact that proceedings and societal moral are significantly different. This could have influenced them in responding as observed.

In Table 5 students in both groups have responded that Criminal Amendment Act made changes only in the Indian Penal Code (IPC). There were no participants in either group who responded with an option to Criminal Procedure Code (CrPC) or Indian Evidence Act (IEA). The majority of both the groups have opted that they are not aware of changes made.

## CONCLUSION

This is first attempt to identify the awareness and knowledge among medical students with regards to acid attack. Despite its limitations, the study provides valuable insight into how students of the first year and second year MBBS have perceived acid attack as an offence. There is a definite shift in the awareness and knowledge about the term “acid” and “acid attack” between the first and second year MBBS students in Medical Jurisprudence. This reflected in a positive way which justifies the need for Forensic Medicine in MBBS curriculum.

The students are to be made aware that though there is gender difference between the punishments offered for the various offence as per the law of a land, they have to comprehend that there are also offences which are gender neutral.

With the changing trends in the medico-legal scenario, it is mandatory that the students should be kept abreast of the recent amendments to the criminal laws in relation to medical practice. This needs an increase in teaching hours for Forensic Medicine and including it in the curriculum of both prefinal and final year of MBBS. The recent changes to the criminal laws pertaining to Medical Jurisprudence have to be brought under “must know” area of MBBS curriculum.

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# Study of Awareness of Cyber-Security among Medical Students

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## ABSTRACT:

Cyber-crimes, in simpler terms the name implies the crime committed using any computing device has been present since advent of computers, but now has become common threat as smaller and compact devices like mobile and free network provisions are present. Among various population groups, young students are frequently involved in this technological advance and are exposed to cyber-crimes. A questionnaire-based survey method was applied to analyze the medical student's awareness in the area of cyber security and some suggestions are set to overcome these issues.

**Keyword:** *medical students, awareness, cyber-security, cyber-crime*

## INTRODUCTION

Cyber-crime is described in a simpler term as any unlawful activity which is committed using any computing devices, like computer/smartphone and which is a part of internet. Cyber security is protecting an internet connected system including hardware, software, or any form of data from cyber-attacks, as well as from disruption or misdirection of the services they provide. There are different methods by which cyber-crime is committed and which include 1. Attacks on computer systems, 2. Cyber-bullying, 3. Email spam, 4. Phishing, 5. Identity theft. According to the latest NCRB (National Crime Record Bureau) publication of 2017, there is an increasing incidence of cybercrime in India from 9622 cases in 2014 to 12,317 in 2016 (28%). Maximum number of cases were reported in Uttar Pradesh (2,639 cases) followed by Maharashtra (2380 cases) and Karnataka (1,101 cases).<sup>1</sup>

Even with knowledge of existence of firewalls, antivirus and many other effective measures to control cyber-crime, India is still far behind in combating

cybercrime.<sup>2</sup> In recent year's cyber-crimes are more popularly committed through mobile<sup>3</sup> since they are easy to use and widely used by the population since internet access becoming cheaper and cheaper and most of them are now connected to network. Among different population groups, students (74%)<sup>4</sup> are more vulnerable to cyber-attacks and awareness of cyber security among them is of paramount importance.

With this scenario of increased cyber-crimes and lack of awareness among youths we conducted the study with the objectives to analyze the awareness of cyber-security among medical students and give them the necessary knowledge in issues where they lack.

## METHODOLOGY

To conduct the study, we included the students enrolled in a medical college on voluntary basis. The study was approved from Institutional Ethics Committee. The survey was conducted using online questionnaire prepared in Google Forms and the link was distributed using e-mail and social media among all the students. Survey questions were framed as multiple-choice questions which covered basic knowledge of cyber security including questions related to different patterns of internet usage and knowledge regarding cyber-security. The questionnaires were sent to 350 students out of which the first 200 student responses were analyzed for our study. The study was on voluntary basis and study participants remained anonymous. The

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results were analyzed and tabulated using Microsoft Excel.

## RESULTS

After analyzing the survey, it was found that 36% of students used internet for nearly 3 to 4 hours and 12% even admitted of using internet for more than 8 hours a day (Table-1A), most of the time they used internet for browsing (56%), than for streaming (22%), and least used for gaming (6%) (Table-1B). Nearly 30% of students admitted using internet for online transaction daily, and 48% used weekly (Table -1C). Even among them 68% had knowledge of using secure website, 22% were aware about it but still negligent to use secure website for online browsing, and 10% didn't even know anything about such secure website (Graph-1).

Among the study participants 56%, were aware of downloading content over internet, compared to 4% who presumed downloading everything from internet was legal (Table -1D). Nearly all the students (90%) were using trusted internet provider.

**Table 1. Profile of Internet usage by Medical Students**

A. Frequency of Internet usage		
Time	No. of Respondents	Percentage
0-2hrs	48	24%
3-4hrs	72	36%
5-6hrs	56	28%
>8hrs	24	12%
B. Purpose of Internet Usage		
Purpose	No. of Respondents	Percentage
Browsing	112	56%
Chatting / Messaging	32	16%
Streaming / Downloading	44	22%
Games / Online Games	12	6%
C. Frequency of online transaction		
Time	No. of Respondents	Percentage
Daily	60	30%
Weekly	44	22%
Monthly	96	48%
D. Downloading over Internet		
Response	No. of Respondents	Percentage

Yes	40	20%
No	8	4%
Maybe	40	20%
Depends on content and website	112	56%

**Graph 1: Awareness of secure website**

**Table 2. Awareness of Cyber-Security**

A. Usage of Anti-Virus		
Response	No. of Respondents	Percentage
Yes	120	60%
No	80	40%
B. Changing Password		
Time	No. of Respondents	Percentage
Weekly	4	2%
Monthly	28	14%
Yearly	32	16%
Rarely	112	56%
Never	24	12%
C. Sharing Password		
Response	No. of Respondents	Percentage
Yes	16	8%
No	132	66%
Only to Family Members	52	26%

About half of students were aware of cyber-crimes and 8% were not even familiar with it. With regards to anti-virus 60% were using mobile or laptops (Table -2A). Regarding Password protection many students, 56 % admitted that they rarely changed their password, and 12% never changed their password (Table -2B), and 8% admitted of sharing password (Table -2C).

## DISCUSSION

Analysis of results shows that students were using internet regularly and around some even used it more than 8 hours a day (12%) which makes them vulnerable for cyber-crimes. Among them majority used it for browsing the internet (56%), then downloading, chatting and lastly for gaming. Similar results were found in a study done by Afrozulla Khan Z5 on MSW students where they found 8% of students were using internet for more than 9 hours a day among them 28% used it for browsing the internet.

Some of the students used online transaction daily and which increases the risk of exposing them for phishing attacks. More than half of students were aware of secure website which is important while entering our personal data, doing online transaction or chatting in social media, few were negligent about it and some never even knew about it. With password protection most of students (56%) rarely changed their password; some of them (12%) never even changed it. Contrary to this in study done on MSW students showed that 33% never changed the password this may be due lack of awareness among them<sup>5</sup>. Some of the students were even sharing the password (8%) with others, some with family members (26%), which increases their risk of identity theft and loss of personal data.

Regarding downloading over internet nearly half of them were aware of which contents are legally downloadable, but some were negligent which increased their vulnerability to malware/spyware attack through downloaded content. Most of students were using mobile data as their internet provider, and more than half of them used anti-virus in their system which helps to curb malware/spyware load downloaded from internet. It is similar to study done by Senthil Kumar K<sup>6</sup> where 70% college students were using antiviruses.

About half of students were aware of cyber-crimes being committed in the society and 8% were not even familiar with it. It is similar to study done by Bijoy Saima's<sup>7</sup> on level of awareness of cyber-security among Law students. It was found out that students were moderately aware of cyber-crimes and had knowledge of laws against cyber-crimes.

### CONCLUSION

To conclude, the hours of usage of internet is increasing among students. They are frequently exposing their bank details by online transaction and ignoring importance of secure website. Many are aware of legally downloading from internet and using proper protection by using trusted internet service provider and protecting their system by Anti-virus. In regard to password protection many are exposed to cyber-attacks by sharing their password and not changing their password frequently.

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# Autopsy Study of Thoraco-Abdominal Injuries in Road Traffic Accidents in Chitradurga

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## ABSTRACT

Geographically, Chitradurga district, in central Karnataka, is well connected by roads- National Highways State highways, and hence density of vehicles traversing is also high. Having said this, morbidity and mortality by RTAs is also on a high, however this is preventable. Thus this study was done know the incidence and also implement safety measures and to strengthen legal measures. Injuries caused by RTAs to chest and abdomen were studied in detail. This study includes victims died of RTA of age of all year age groups. Most incidents occurred in National Highways, Urban roads and village roads. Majority of the cases died on spot by fatal injuries. Heavy motor and two wheeler vehicles were involved in majority of cases followed by two wheelers only. External injuries most frequently observed were abrasions. Fatal injuries were noted in the region of head followed by abdomen and chest.

**Keywords:-** RTA, Vehicles, Road user, Highway, thoraco-abdominal injuries.

## INTRODUCTION

India is growing with leaps and bounds in all spheres and so is morbidity and mortality due to RTAs. India being a developing nation has highest growth in the number of motor vehicles. This rise can be attributed to faulty roads, poor maintenance of public transport vehicles, intoxication by alcohol while driving, lack of knowledge about traffic rules, and lack of responsibility over traffic rules. Accidents rank fourth among the leading causes of death as per Ministry of Road Transport & Highways, Government of India<sup>1</sup>. More than 25% of the global accidental deaths occur in South East Asia region<sup>2</sup>.

RTAs in younger age group adversely affect both families and growth of society as it encompasses wastage of educational training and loss of productive years of life. In this study we consider, the injuries on the thorax and abdomen, epidemiological factors relating to the victims, vehicles and site of impact, facts pertaining

to hosts (roads) the agents (vehicles) and profile these injuries. Most of the deaths of RTA victims have medico legal implications. So it's necessary to establish the cause of death to get compensation from the state or from insurance companies.

### Materials and Methods:

This study was Descriptive Observational Study conducted for 18 months between 1<sup>st</sup> December 2015 to May 31<sup>st</sup> 2017 in Department of Forensic Medicine, Basaveshwara Medical College and District Hospitals Chitradurga. This included 102 cases of fatal thoraco abdominal injuries due to RTAs. Victim profile contained data collected from police, deceased relatives and eyewitnesses and fatal thoraco-abdominal injuries analysed.

## RESULTS

Age & sex distribution of Road user victims involved in the RTAs: In the study conducted, males are predominant victims taking a share of 76%. Age group of 15-44years, were more prone for thoraco-abdominal injuries. Among the elderly age group of 55-65years, it was men who had thoraco-abdominal injuries accounting to 54.5%.

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In our study, the most common victim of RTA sustaining thoraco-abdominal injuries are Pedestrians (30.4%) followed by vehicle occupant in LMV (30%), Motor Cycle rider (29%) . Occupants of HMV(8%) and 1.96% bicycle riders.

Distribution of different types of Vehicles impacted to the victim involved in RTAs.

In the study conducted, Heavy Motor Vehicles(56%) produced more Thoraco-abdominal injuries of all other impacts.

Distribution of accidents in relation to the number of vehicles involved: Impact of vehicle to vehicle is 54.5% followed by vehicle to pedestrian(30.09%)

In the current study most commonly RTAs occurred on National highway(56%) followed by State Highway(40.25%.) The victims died on spot (68%) ,18% during transit to hospital and 14% at hospital.

Position of the victim in the vehicle during impact: Motorcycle rider and rear row seater in LMV & HMV 34% each formed majority in the victim position.

External Injuries noted on Thorax and Abdomen: In the present study with thoraco Abdominal Injury by RTA, the most frequent external injuries are Abrasion account to 85% followed by laceration 19%. Contusions account for 15.5%

In the present study, abrasions are common external injury is (87%) in vehicle occupied victims. Motor cycles are commonly involved vehicles, producing external injuries (34.8%).

In the study conducted, abrasions are common external injury produced (67.4%) by impacted vehicles. The Heavy Motor Vehicle are the commonly involved vehicle producing external injuries (56.8%).

Distribution of internal injuries noted in Thorax as vehicle occupied by the victim

Thoracic Injuries	Vehicle occupant/ Pedestrian						%
	BC	HMV	LMV	MC	Pedestrian	Total	
Rib #	2	8	25	26	20	81	48.5%
Sternum #	2	4	2	4	4	16	9.6%
Vertebra #	0	2	0	2	2	6	3.6%
Lungs	2	2	12	9	9	34	20.45%
Heart	0	2	4	2	2	10	6.05%
Other Vessels	0	4	2	0	10	16	9.6%
Spinal Cord	0	0	0	2	2	4	2.4%
Total	6	22	45	45	49		
%	3.6%	13.2%	26.9%	26.9%	29.3%		

In the study, most common internal injury in thorax is rib fracture accounting for 48.5% followed by lung injury accounting for 20.45 %. The majority of victims were pedestrians accounting to 29.3%.

**Distribution of internal injuries noted in Abdomen and the vehicle occupied**

Abdominal Injuries	Vehicle occupant/ Pedestrian						
	BC	HMV	LMV	MC	Pedestrian	Total	%
Vertebra	0	0	0	0	4	4	2.5%
Spinal cord	0	2	0	0	2	4	2.5%
Omentum	2	0	4	0	2	8	4.9%
Stomach & Intestine	2	0	0	0	0	2	1.2%
Liver	2	6	19	15	23	65	40.1%
Spleen	2	4	20	9	9	44	27.2%
Pelvic Fracture	2	2	2	0	0	6	3.7%
Kidney	2	2	10	8	5	27	16.7%
Other Vessels	0	0	0	0	0	0	0.0%
Urinary Bladder	0	0	0	0	0	0	0.0%
Genitals	2	0	0	0	0	2	1.2%
Total	14	16	55	32	45	162	
%	8.6%	9.9%	34.0%	19.8%	27.8%		

In the study conducted, most common internal injury in abdomen is liver injury accounting for 40.1% followed by spleen injury accounting for 27.2 %. The majority of vehicle involved are Light motor vehicles accounting to 34.0%.

**Distribution of internal injuries noted in Abdomen as vehicle impacted to the victim**

Abdominal Injuries	Impacted Vehicle						Total	%
	HMV	LMV	MC	OTV	UKV			
Vertebra	0	2	0	0	2	4	2.5%	
Spinal cord	0	2	0	0	2	4	2.5%	
Omentum	6	2	0	0	0	8	4.9%	
Stomach & Intestine	0	2	0	0	0	2	1.2%	
Liver	37	14	2	6	6	65	40.1%	
Spleen	28	9	2	5	0	44	27.2%	
Pelvic Fracture	2	2	0	2	0	6	3.7%	
Kidney	16	9	0	2	0	27	16.7%	
Other Vessels	0	0	0	0	0	0	0.0%	
Urinary Bladder	0	0	0	0	0	0	0.0%	
Genitals	0	2	0	0	0	2	1.2%	
Total	89	44	4	15	10	162		
%	54.9%	27.2%	2.5%	9.3%	6.2%			

In the study conducted most common internal injury in abdomen is liver injury accounting for 40.1% followed by spleen injury accounting for 27.2 %. The majority of impacted vehicle are Heavy motor vehicles accounting to 54.9%.

### Most common organs injured in the Study of Thoraco-abdominal injuries

Thoracic organs	No s.Injured	%	
Lungs,	34	53.1	64
Heart	10	15.6	
Other Vessels	16	25.0	
Spinal Cord	4	6.3	
Abdominal Organs			
Liver	65	42.2	154
Spleen	44	28.6	
Kidney	27	17.5	
Omentum	8	5.2	
	4	2.6	

The most common organ injured in Thoracic region is Lung and; in the Abdominal region is liver which is accounting to 53.1% and 42% respectively in relating to each region.

Fatal injuries noted in thoraco-abdominal injuries with vehicles occupied by the victim:

The fatal injuries noted more in vehicle occupant cases is thorax accounting to 36.1% and the common vehicle involved is Light motor Vehicle at 31.8%.

Most common cause of death is Shock and hemorrhage predominantly counting to 61.8%. and head injury(30.4%); cardiac tamponade (5.9%) and septicaemia in (2%)

Distribution based among wearing helmet in two wheelers: none of wore helmets.

Smell of Alcohol was detected in only one case out of 102 cases in the study

## DISCUSSION

Salient and interesting observations were recorded, analyzed, discussed and compared with findings of similar studies in other regions.

Active and productive age group is involved in RTAs, which adds a serious economic loss to the

community. In our study, people in the extremes of age group comprised the minimum number of cases. Similar observations were also made by Mishra B et al,<sup>3</sup> Bener A<sup>4</sup>

Gender distribution of accident cases showed male preponderance, accounting for 76.5% of cases and male: female ratio was almost 3:1. Female victims in the present study accounted for 23.5 % demonstrating the male predominance of more mobility in the Indian Context. The study conducted by Ganveer G B et.al<sup>5</sup> showed that the male: female ratio of 6:1 can be attributed to the fact that proportion of males as compared to females is more

Pedestrians and Light Motor vehicles occupants are the most frequently involved victims. Our study shows similar results as study conducted at Allahabad by Kaul et al. with majority victims being pedestrians followed by motor cyclists<sup>6</sup>. Heavy motor vehicle is the common offending agent measuring 54%. Similar results are seen in Allahabad study where majority offending vehicles are heavy motor vehicles<sup>6</sup>.

Impact of vehicle to vehicle is majority of RTAs in the study accounting for 55%, which is similar to the study conducted by Kaul A et.al.<sup>6</sup>. RTAs in Highways are major occurrence in the study 56%, which is similar to the observations made by Ravikiran et.al<sup>7</sup> and Mandal BK<sup>8</sup> et.al in Nepal. High number of RTAs in highways

attributed to high speed, rash driving and more number of heavy vehicles indulge in the iron ore mining and has three national highways in the District.

Victims died on spot is the major count in the study which is of 68% is similar to study done by Tirupade BH<sup>9</sup>, Kaul A<sup>11</sup>

Abrasion is the most frequently seen among the external injuries noted in the study accounting to 87% is similar to study at Rhotak (Haryana) by Harman Singh et.al<sup>14</sup>.

Among internal thoracic injuries major injury noted is Ribs fractures in 49% of the cases followed by showed injuries in the lung accounting to 21% of the cases. This was in accordance with study done by Archana Kaul et.al<sup>11</sup>. Wakeman G et.al<sup>12</sup> noted in their study that liver injuries occur commonly in RTA. There were 52% of cases with liver injury were due RTAs. Similar findings observed our study were liver was most commonly affected organ accounting for 40%. Reason for vulnerable liver injury is due to its large surface area, solid nature of the organ making it less pliable or reducing capacity to absorb impact force. Rich vascular supply leading to massive haemorrhages.<sup>14</sup>

Costa G et al observed splenic injuries accounts for 25% of all solid abdominal injuries, many studies showed spleen is the most common organ in RTA, but our study showed 27% of splenic injury in 102 cases studied and our study is in accordance with Pestana G et al where he mentioned liver is the most common organ involved

There were 17 % cases of renal injury in our study. But all the renal injuries were associated with other visceral injuries. This is in accordance with B Suresh Kumar Shetty et al<sup>13</sup> as they observed that renal trauma occurred in 23% of RTA cases.

The most common cause of death in the study is shock and hemorrhage accounts to 63.8%. Similar studies are found in Hariyana by Harnam Singh et al<sup>14</sup>

1.2% cases had intestinal injuries, this was in accordance with Dauterive AH et al. It was observed that proximal jejunum was more prone for perforation and similar findings were stated by DiMaio D et al<sup>15</sup>.

La Greca G et al , who observed that isolated vascular injury is rare and in our study it supports the

same findings. The authors report on the case of a child with an isolated injury of the superior mesenteric artery caused by a lap belt during a motor vehicle crash<sup>16</sup>

In our study 4% of cases had pelvic injury, with 1.5% genital injury involved and no cases had bladder injuries. They are frequently caused by RTA and affected both the vehicle occupant and pedestrian .Our study also has similar findings as by Driscoll P.<sup>17</sup>

In our study 4% of cases had vertebral injury. Lumbar vertebral, spinal injuries have also been observed by the Beaunoyer M et al<sup>18</sup>

## CONCLUSION

The peak incidence of RTAs was in age group of 15-44years. Male predominance was seen in 76.5% compared female group 23.5%. Out of 102 cases studied, most common victims are Pedestrians accounting for 31%. Heavy motor vehicles impact accounted for 56% of vehicle to vehicle impact. Driver and rear row seaters in LMV & HMV were the common victims. 56% RTAs occurred in National highways killing 67% on spot. The most common injury noted was Abrasions. Rib fractures, Liver and splenic injuries were most commonly noticed which were fatal. Shock and haemorrhage accounts to the common cause of death in the study. Among motor cycle victims none were wearing the helmet. Alcohol smell was seen in only one case.

**Source of Funding:** Self

**Institutional Ethical Clearance:** Obtained

**Conflict of Interests:** None

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# Challenge in Management of Aggressive Clients in Psychiatric Setting: Development of Four-Point Physical Restraints

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## ABSTRACT

**Introduction:** The use of physical restraints is a very common procedure in psychiatric setting from the beginning of psychiatry as a branch of medicine. Any measure that keep someone under control is called a restraint. Four-point physical restraints are required for managing clients with mental illness. **Material and Method:** The objective of the project was to develop a safe and secure soft limb restraints for aggressive clients. A set of soft limb restraints (two each for upper and lower limbs) was developed along with user guidelines. High quality narrow woven fabric material was selected for preparing the restraints. The restraints were tested in 5 psychiatric hospitals. A 12 item checklist was developed and validated for assessing the user friendliness of the restraints. Necessary modifications were made based on the feedback given by the nurses who tested it. **Results:** All the nurses (100%) reported that the developed restraints were easy to apply, easy to remove and met the safety of the clients. **Conclusion:** The restraints developed was found to be more safe and operable as compared to other commercially available restraints.

**Keywords:** Challenge, management, aggressive clients, restraints

## INTRODUCTION

The use of physical restraints is a very common procedure in psychiatric setting from the beginning of psychiatry as a branch of medicine<sup>1</sup>. Although it is challenging and many ethical dilemmas associated with it, we continue to use it to safeguard the therapeutic environment. Any measure that keep someone under control is called a restraint. Four-point physical restraints are required for managing some of the clients with mental illness. Most of the time clients are strong enough to break the traditional restraints, however use of

hard materials to restrain the clients could cause injury to them. Preserving client's dignity, rights and safety is important while restraining.

Aggressive behavior are very common in psychiatric setting. Nearly 10% of the psychiatric clients visiting the emergency department exhibit violent behavior. Those clients require some form of restraints.<sup>2</sup> Many studies have shown that nurses and other healthcare providers working in the mental healthcare setting are at an increased risk of work related violence. Hence physical restraints are very important safety measure in many situations.

A cross-sectional study was conducted in Ethiopia to explore the use of physical restraints among clients with manic disorder. An interview was conducted among 400 clients and health professionals to elicit the data. It was found that the prevalence of physical restrain use was 65%. The use of physical restraints were significantly associated with use of antipsychotic

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medicines, comorbid conditions, history of violence and two or more episodes of manic attack. All the clients were restrained either hands or legs or both. With regard to the time of application of restraints, 215(53.8%) of the clients were restrained during day time.<sup>3</sup>

The new ‘Mental Healthcare Act’ has been implemented in India on 7 April 2017. Chapter 5 (section 20) of ‘Mental Healthcare Act - 2017’ clearly states that all mentally ill person shall be protected from painful, uncaring or humiliating behaviour in any mental healthcare setting. Chapter 12 (section 97) of the Act clearly states that, a client with psychiatric disorder will not be secluded or locked in a room alone. However, physical restraints can be used in emergency situation to avoid harm to the client or care providers. The Act also emphasize about other safety measures to be followed while restraining a client.<sup>4</sup>

Developing proper restraints and developing skills to use it properly is vital for minimizing the damage to the clients as well as to the healthcare team who is involved in treatment. The purpose of the study was to develop and test a set of soft limb restraints (two each for upper and lower limbs) including user guidelines. The investigators has been working for many years to come up with a safe and secure restraints for psychiatric clients. The restraints has been tested in many settings all

over India. Finally refined and finalized a set of soft limb restraints. This was developed as a part of developing and implementing an aggression management and violence prevention training program for nurses working in psychiatric and emergency setting.

**Material and Methods:**

The objective of the project was to develop safe and secure soft limb restraints for aggressive clients. An intensive review was done and discussed with the experts before developing the restraints. One group post-test only design was used to test the quality of the restraints.

The restraints were tested in 5 psychiatric hospitals of Dakshina Kannada and Udupi Districts of Karnataka. Ten nurses (two nurses from each setting) was trained to use the restraints and they were instructed to apply the restraints on two violent clients (Total twenty clients). A 12 item checklist was developed and validated for assessing the user friendliness of the restraints. The nurses who tested the restraints were instructed to fill the checklist immediately after releasing the clients from restraints. Necessary modifications were made based on the feedback given by the nurses who tested the restraints. The investigator also collected the feedback from the key personnel like nurse supervisors to make sure the quality of the designed restraints.

	<ul style="list-style-type: none"> <li>● The restraints are packed in a bag with instructions and directions to use for easy access during emergency</li> </ul>
	<ul style="list-style-type: none"> <li>■ The straps of the restraints are colour coded for easy recognition and access                     <ul style="list-style-type: none"> <li>➤ Upper limb: Black</li> <li>➤ Lower limb: Beige</li> </ul> </li> </ul>

Cont... Figure 1

	<ul style="list-style-type: none"> <li>▪ Easily able to pass two fingers between the device and the wrist ensures that the developed device will not create any skin injury</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Able to attach the connecting straps to the bed or stretcher frame, out of the clients' reach as the straps are lengthy</li> </ul>

Figure 1: Soft limb restraints developed for the study.

The figure 1 shows the four-point soft limb physical restraints which was developed for the study. High quality narrow woven fabric material was selected for preparing the restraints. The material used was washable and skin friendly (tested for skin sensitization and irritation by the manufacturing company). Restraints were well padded to decrease the chance of pressure damage and abrasion to skin and underlying tissues; proper size and type were ensured. A proper size nylon bag was also designed to keep the restraints. The user guidelines was prepared and attached with the outer pocket of the bag for easy reference.

**Propose/Indication to use the developed restraints:** To provide increased safety for clients who has decreased level of consciousness, agitated or aggressive with mental health conditions, or physical disability that might pre-dispose them or others to injury.

**RESULTS**

The results were prepared based on the feedback given by the nurses who used the restraints and also the opinion given by the nurse supervisors of each setting.

**Table 1: Feedback given by the trained nurses working in psychiatric setting N=10**

SI No.	Area	Frequency	Percentage
	Adhere with infection control measures	10	100
	Easy to provide skin care to the clients	10	100
	Padding of the restraints are adequate	10	100
	Easy to teach other staffs	10	100
	Satisfied with the length and quality of the strap material	10	100
	Easy to apply	10	100
	Easy to remove	10	100
	Better client cooperation	10	100
	Able to apply in all the phases of violence (All type of clients)	9	90
	Meet the safety of the clients	10	100
	Appropriate size for all the clients	9	90
	Never observed abrasion/ bruises/ injury due to the application of restraints	10	100

Table 1 shows that all the nurses (100%) who tested the restraints reported that the developed restraints were easy to apply, easy to remove and met the safety of the clients. None of the nurses reported injury/bruises for their clients due to the use of four-point soft limb restraints. Majority (90%) of the nurses reported that the restraints were appropriate size for all the clients.

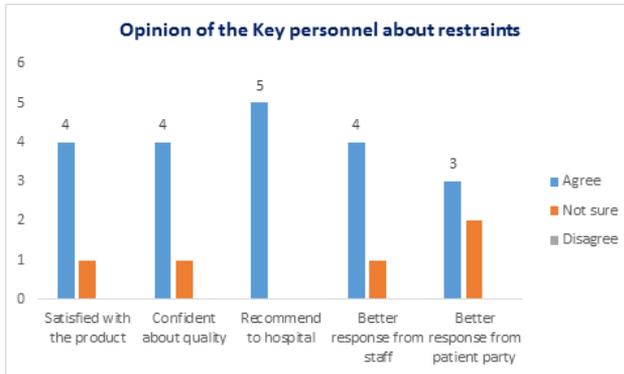


Figure 2: Opinion of the key personnel about the restraints

Figure 2 shows that all the key personnel (100%) agreed to recommend the developed restraints to their hospital. Majority of the key personnel (80%) were satisfied with the product and were confident about the quality of the product.

## DISCUSSION

The use of physical restraints for psychiatric clients is a controversial issue. But still around 27% of the psychiatric clients are using physical restraints.<sup>5</sup>The investigator developed a set of soft limb restraints and tested its quality. Majority of the participant nurses were satisfied with the quality of the product. The study results are supported by a qualitative study conducted in Iran among psychiatric nurses which concludes that physical restraint is an accepted intervention in the psychiatric wards and has positive effects such as better client cooperation.<sup>6</sup>Rolf Wynn, 2015 found that 94% of the staffs expressed that the use of physical restraints will not help for clients' recovery which is contradicting with the present study.<sup>7</sup>

Caroline et al 2013 conducted a study to assess the clients' perspective of applying restraints and seclusion. A questionnaire survey revealed that some of the clients found helpful and some other clients found not helpful.<sup>8</sup> However the present study did not collect any opinion from the clients as well as clients' relatives. Amal Sobhy Mahmoud, 2016 conducted a study to assess the mental health nurses practice and attitude towards restraint

use. The study found that nurses are having a positive attitude and high knowledge of practice related to the use of restraints. Most of the nurses considered the use of restraints as a last resort of care.<sup>9</sup> In the present study also nurses showed a favourable attitude towards restraint use.

## CONCLUSION

The soft limb restraints developed was found to be more safe and operable as compared to other commercially available restraints. Safety and security aspects of the restraints may minimize the challenges in psychiatric setting.

**Conflict of Interest:** There is no conflict of interest for this article

**Source of Funding:** Self

**Ethical Clearance:** Ethical clearance was obtained from institutional ethics committee of Kasturba Medical College, Mangaluru.

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# Pattern of Unnatural Deaths in Jammu Province of J&K

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## ABSTRACT

The present study was conducted in the Deptt. of Forensic Medicine & Toxicology Govt. Medical College, Jammu in an attempt to explore pattern of unnatural deaths in Jammu Province. The main aim of this study was to analyze different causes of unnatural deaths and its epidemiological aspects which will help us in identifying the risks of unnatural deaths to improve overall planning and enable to prevent avoidable deaths.

**KEYWORDS-** Unnatural deaths, medicolegal autopsy, epidemiological study.

## INTRODUCTION

Unnatural deaths claim a substantial no. of lives in developing countries like India. This paper investigates the pattern to analyze different causes of unnatural deaths and its epidemiological aspects because it will help us to improve overall planning and enable to prevent avoidable deaths. The present study was conducted in the Deptt. of Forensic Medicine & Toxicology GMC Jammu in an attempt to explore pattern of unnatural deaths in Jammu Province. A total of 8100 cases of medicolegal autopsies were conducted during a period of 10 yrs. As per this study, RTA's constituted the most common cause of death and the least common cause is electrocution.

## MATERIAL & METHOD

The present study is a 10yrs retro respective study which was conducted in the Deptt. of Forensic Medicine & Toxicology in Govt. Medical College, Jammu during a period extending from Jan.,2008 to Dec.,31 2017 Findings have been presented in the aggregate as well as by gender, manner and according to cause of death. The material of this study consisted of 8100 cases. The autopsy report as well as Police requisition

and inquest report was used for collecting data age, sex, cause of death and supposed manner of death. The causes of death are divided into RTA's, poisoning, burns, infanticide, drowning, hanging, and electrocution and miscellaneous. The data thus collected compiled and analyzed statistically After classifying according to cause of death, it was found that Road Traffic Accident was responsible for 42% of cases, followed by drowning (10.9%) of cases, the least common cause was electrocution.

## DISCUSSION

A total of 8100 cases were conducted in a period of 10 yrs. labeling the manner of death is quiet difficult as investigations are not yet completed. Just medicolegal autopsy is not sufficient tool to decide manner of death deduced from police requisition and inquest might change afterwards.

**TABLE I - DISTRIBUTION OF UNNATURAL DEATHS REGARDING THE MANNER OF DEATH**

MANNER OF DEATH	NO. OF CASES	PERCENTAGE
Accidental	5575	68.9%
Suicidal	1900	23.4%
Homicidal	625	7.7%

After dividing, unnatural deaths according to manner of death, it was found that accidental deaths constitute the major cause of death followed by suicidal

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and homicidal. The findings were similar to a study conducted by Numan Hussani et al<sup>1</sup>.

**Table II. DISTRIBUTION OF UNNATURAL DEATHS ACCORDING TO SEX:**

SEX	NO. OF CASES	PERCENTAGE
Male	5500	67.9%
Female	2600	32.1%

The sex wise distribution of causes of deaths revealed that no. of cases in males are more as compared to females and trauma was the leading cause of death among males while thermal injuries and poisoning were common causes among females . These findings are similar to the findings in study conducted by NS dingre et al and Kaulaska Shashikant<sup>2</sup>. Similar study by Bansude M et al<sup>3</sup> and Singh B et al<sup>4</sup> also revealed male preponderance in their respective studies.

**TABLE III- DISTRIBUTION OF UNNATURAL DEATHS ACCORDING TO CAUSE OF DEATH**

<b>RTA's (Road Traffic Accident)</b>	<b>42%</b>
Drowning	10.9%
Burns	10.03%
Poisoning	9.3%
Hanging	4.4%
Electrocution	3.0%
Miscellaneous (Infanticide, Assault, Accidents other than RTA's and Natural deaths)	20.7%

After classifying according to cause of death, it was found that trauma RTA was responsible for 42% of deaths followed by miscellaneous causes and drowning. Least common were hanging and electrocution.

Therefore, RTA's were responsible for approximately half of the cases of unnatural deaths. this finding is comparable with but slightly higher than Kaulaskar S et al<sup>2</sup> and Vaghela P<sup>5</sup>.

Higher preponderance of traumatic deaths due to RTA's are the major cause of deaths in Jammu Province. This is mainly due to poor condition of roads, hilly terrain, lack of strict laws and the city being connected to National Highways.

However the findings are discordant with the study conducted by Chaitanya R, Devraj Patel<sup>6</sup> who reported burns as the commonest cause of death in their study

with road traffic injuries as the second commonest cause.

**CONCLUSION**

Analysis of unnatural death is an instrumental tool to find the manner of death causes of the same. It also reflects the socioeconomic status and assessment of the overall state of the society .It can be utilised as the developmental parameter to improve and prevent the unnatural deaths due to road traffic accidents and other preventable causes and also improve the living standards, empowerment of females and taking preventive measures to counter drug and alcohol abuse. Measures to improve health care facilities to save the precious lives can also be implemented and fast track legal facilities may also be provided to the aggrieved.

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**Conflict of Interest -Nil**

**Source of Finding- Nil**

**Ethical Clearance-** Obtained from Ethical Committee, GMC Jammu.

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# Assessment of Nurses' Knowledge about Restraint and Seclusion used for Aggressive Patients in Psychiatric Wards

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## ABSTRACT

Violence and aggression in mental health settings occur most frequently in psychiatric inpatient, and most acute hospital assaults take place in emergency departments. A descriptive correlation study used the assessment approach to assess the levels of nurses' knowledge regarding restraint and seclusion at the psychiatric teaching hospitals in Baghdad City. A non-probability (purposive sample) study. The sample consisted of (41) nurse ((20) male and (21) female) were selected from the psychiatric teaching hospitals (AL-Rashad Psychiatric Teaching and Ibn-Rushed Psychiatric Teaching) in Baghdad City, during the period of 1<sup>st</sup> November 2017 to 16<sup>th</sup> June 2018. The data was collected by questionnaire which consisted of two parts, first part consists socio demographic data, Second part is about restraint and seclusion which consist of (50) items scale of knowledge about restraint and seclusion. In the present study, data were analyzed through the use of statistical package for social sciences (SPSS), version 21. The finding of the study indicated that Most of the nurses who participated in the study have preparative school graduates, and they have an extremely low level of knowledge more than others. And there is a non- significant relationship between demographic characteristics and domains of knowledge for the sample.

**Keyword:** Knowledge, Restraint, Seclusion, and Aggressive patients.

## INTRODUCTION

Violence and aggression in mental health settings occur most frequently in psychiatric inpatient, and most acute hospital assaults take place in emergency departments<sup>1,2</sup>. Acute psychiatric wards manage patients whose actions may threaten safety to themselves, other patients and hospital staff by coercive measures such as restraint or seclusion. To aid in management, wards may be fitted with a seclusion room and/or have direct or indirect access to a Psychiatric Intensive Care Unit<sup>3</sup>. Staff act to prevent or minimize harm through the use of a variety of containment methods designed to keep patients and staff safe, these methods include the use of tranquillizing medications, increased levels of observation, manual restraint<sup>3</sup>. The use of restrictive measures have reasons, These reasons include threats or

use of violence against oneself or other people, attempts to escape, aggression towards property, inability to care for oneself and agitation/disorientation<sup>2,17</sup>. The reported rate of threatening or inciting actual violence has varied between approximately one-third and two-thirds of incidents<sup>4</sup>. An even greater number of patients have been reported to be agitated or disorientated while secluded (92.6%, with or without restraint). In contrast, 77.5% of secluded patients behaved aggressively<sup>17</sup>. Restraint and seclusion are fraught with risks of various adverse effects, from patients' deaths to deleterious physical and psychological effects for both the patient and the personnel<sup>9</sup>. In addition, evidence is still lacking regarding their effectiveness in reducing patient's aggressive behavior or alleviating serious mental illnesses. Nurses are one of the most important groups who have a significant role in providing care for psychiatric patients.

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## METHODOLOGY

**Study Design:** Descriptive correlation study used the assessment approach to assess the levels of nurses'

knowledge regarding restraint and seclusion at the psychiatric teaching hospitals in Baghdad City.

**Study Sample:** A non-probability (purposive sample) study. The sample consisted of (41) nurse ((20) male and (21) female) were selected from the psychiatric teaching hospitals (AL-Rashad Psychiatric Teaching and Ibn-Rushed Psychiatric Teaching) in Baghdad City, during the period of 1<sup>st</sup> November 2017 to 16<sup>th</sup> June 2018. The questionnaire consisted of three parts:

**Part 1:** covering letters to obtain the agreements of the nurses to participate in the present study.

**Part 2:** Socio-demographic Data sheet contains information; Gender, age, level of education, years of experience in nursing, and years of experience in psychiatric field.

**Part 3:** This part of the questionnaire includes the knowledge about the restraint and seclusion: it consist of (50) items scale of knowledge about restraint and seclusion.

**Data Collection:** The data collection was carried out from February 15<sup>th</sup> 2018 to June 13<sup>th</sup> 2018. Data was collected after obtaining the permission from the Directorate of Hospitals. The data was collected by self-report. The researcher met each nurse staff of the study for explain the objectives of the study and how to fill out the questionnaire, then filled by the nurses after obtain their agreement to participate in the study. The participants need approximately (30) minutes to complete all items of the questionnaire.

## DATA ANALYSIS

The first domain is designed through the use of (2) level type Likert Scale (yes and no), a numerical value was given to each rating point, (1) for right answer, and (0) for the wrong answer. The second is designed through the use of multiple choice question, a numerical value was given to each rating point; (1) for right answer, and (0) for the wrong answer. In the present study, data were analyzed through the use of statistical package for social sciences (SPSS), version 21.

## RESULTS AND DISCUSSION

In the present study, data were analyzed: table 1 shows that the highest percentage of the sample (34.15%) were at age group (30-39 years), while the

lowest percentage of them (14.63%) were at age group (40-49 year). For the level of education 61.0% of the sample are from the preparative nursing schools. Also the table shows that the highest percentage of the sample (43.9%) were experience in nursing at period ranging (1-5 years), while the lowest percentage of them (2.4%) were at period ranging (16-20 year). Regarding the years of experience in psychiatric field (70.7%) of the sample were ranging from (1-5 years), while the lowest percentage of their experience (7.3%) were (more than 16 years). Table 2 revealed that highest percentage of the sample (85.4%) have extremely low knowledge about agitation and violence (domain one), whereas (2.4%) of them have intermediate level of knowledge about agitation and violence. The table shows that highest percentage of the sample (63.4%) have extremely low of knowledge about the procedure of restraint and seclusion (domain two), and (9.7%) of them have intermediate level of knowledge. And it reveals that the highest percentage of the sample (78.0%) have extremely low knowledge about restraint and seclusion (total knowledge), while (22.0%) of them have low knowledge. Table 3 shows that (39.0%) of male have extremely low level of knowledge about restraint and seclusion and also (39.0%) of female have extremely low level of knowledge. Also it shows that (29.2%) of the sample have extremely low level of knowledge within the age group (30-39) years, while (2.4%) of them have low level of knowledge within the age group (40-49) years. Table 4 indicates that there is a high significant differences between males group and females group regarding demographic characteristics: age  $t = 2.25$ ,  $p = 0.03$ , years of experience in psychiatric field  $t = 2.54$ ,  $p = 0.01$ , and years of experience in nursing there is a significant differences  $t = 2.25$ ,  $p = 0.05$ . Table 5 indicates that there is no significant differences between males group and females group regarding level of education  $z = -1.23$ , sig. 0.93. Table 6 indicates that non-significant differences between males group and females group regarding their knowledge about restraint and seclusion. The result of the study revealed that equivalence of both males 48.8% and females 51.2% for the sample who are participated in the study. This results is disagree with Yas who has reported that there is a shortage of female nurses who are working in the psychiatric hospitals. Also the table indicated that the age of the study sample, most of them 34.15% were at age (30-39) years old; these findings coincide with the findings of Mohammed<sup>(18)</sup> who has found that most common age

is around (30-39). This is considered this group of age for the sample is age of youth and the productive age of the person and it is more preferable than other age to work in psychiatric hospitals to be able give care to this patients. These results interpreted that the nurses are working in psychiatric field according to their wills to work in this field, also this result supported the idea of increasing the number of admitted psychiatric inpatients to the psychiatric hospitals in which they need more care; thus, they need nurses in these wards to meet their needs. This result reveals that the study sample are more likely to have extremely low level of Knowledge (both gender) Table 3. This results indicate the lack of the nurses' knowledge who are working in the psychiatric hospitals about how to use the restraint and seclusion ,and what are the reasons that lead to use it and in which cases can used them and they do not know the rules and regulations for use it, and what are the alternatives used in the case of rejection, and have low level of awareness about the alternative methods for restraint and seclusion and, or its complications. These findings correspond with the findings of Azab and Abu Negm<sup>2</sup>; stated that the majority of the study's participants (97.2%) believed that seclusion or restraint is highly important in protecting patients or others from harm due to their lack of awareness of alternative methods. Chien & Lee<sup>5</sup> reported the principal reasons for reluctance in their study were concern about deficiency of effective alternative measures (restraint and seclusion) and perceptions about safety, and these concerns have been reported. Concerning level of education, the results of the study have found that 61.0% of the sample in level of education group (preparative school graduate) have differences in the levels of knowledge about restraint and seclusion; 46.3% of the sample have extremely low level of Knowledge regarding total knowledge (Table 3). About the years of experience in nursing, the results of the study show that 43.9% of the sample who are spending (1- 5) years of experience in nursing have differences in the levels of knowledge about restraint and seclusion; 34.1% have of the sample extremely low level of Knowledge regarding total knowledge (Table 3). The results revealed that the nurses who have a low level of knowledge and clinical experiences had a positive attitude towards using restraint and seclusion more frequently and vice versa. This result coincides with the work of Jaeger et al. (12) who reported that professionals have positive attitudes toward using restraint and seclusion with negative attitudes toward the

patients. In our findings, about the years of experience in psychiatric field, the results of the study show that 70.7% of the sample who are spending (1- 5) years of experience in psychiatric field have differences in the levels of knowledge about restraint and seclusion; 56.1% of the sample have extremely low level of knowledge regarding total knowledge (Table 2). This study found that a high significant differences between the two groups regarding demographic characteristics. (table 4). Unfortunately, there are no supportive studies for this results.

**Table 1. Distribution of the nurses according to their sociodemographic data**

	Demographic	F	%
Age	20-29 years	13	31.71
	30-39 years	14	34.15
	40-49 years	6	14.63
	More than 49 years	8	19.51
	Total	41	100.0
	Level of Education	Preparative	25
Institution		4	9.8
College		12	29.2
Total		41	100.0
Years of Experience in Nursing.	1 - 5	18	43.9
	6 - 10	9	22.0
	11 - 15	7	17.1
	16 – 20	1	2.4
	More than 20	6	14.6
	Total	41	100.0
years of Experience in psychiatric field	1 - 5	29	70.7
	6 - 10	5	12.2
	11 - 15	4	9.8
	More than 16	3	7.3
	Total	41	100.0

**Table 2. Distribution of the sample regarding to their domains of knowledge about restraint and seclusion**

Domains of Knowledge	No.	Levels of Knowledge									
		Extremely Low		Low		Intermediate		Good		Total	
		f	%	F	%	F	%	F	%	f	%
Knowledge about restraint and seclusion	41	32	78.0%	9	22.0%	0	0.0%	0	0.0%	41	100.0%

**Table 3. Distribution in levels of Knowledge about Restraint and Seclusion according to Demographic Characteristics for the Sample**

Demographics f		Levels of Knowledge									
		Extremely Low		Low		Intermediate		Good		Total	
		%	f	%	f	%	f	%	F	%	f
Gender	Male	16	39.0%	4	9.8%	0	0.0%	0	0.0%	20	48.8%
	Female	16	39.0%	5	12.2%	0	0.0%	0	0.0%	21	51.2%
	Total	32	78.0%	9	22.0%	0	0.0%	0	0.0%	41	100.0%
Age (Years)	20 -29	10	24.4%	3	7.3%	0	0.0%	0	0.0%	13	31.7%
	30 – 39	12	29.2%	2	4.9%	0	0.0%	0	0.0%	14	34.1%
	40 – 49	5	12.2%	1	2.4%	0	0.0%	0	0.0%	6	14.6%
	≥50	5	12.2%	3	7.3%	0	0.0%	0	0.0%	8	19.6%
	Total	32	78.0%	9	22.0%	0	0.0%	0	0.0%	41	100.0%
Level of Education	Preparative	19	46.3%	6	14.7%	0	0.0%	0	0.0%	25	61.0%
	Institution	3	7.3%	1	2.4%	0	0.0%	0	0.0%	4	9.8%
	College	10	24.4%	2	4.8%	0	0.0%	0	0.0%	12	29.2%
	Total	32	78.0%	9	22.0%	0	0.0%	0	0.0%	41	100.0%
Years of Experience	1 – 5	14	34.1%	4	9.8%	0	0.0%	0	0.0%	18	43.9%
	6 – 10	8	19.6%	1	2.4%	0	0.0%	0	0.0%	9	22.0%
	11 – 15	6	14.6%	1	2.4%	0	0.0%	0	0.0%	7	17.0%
	16 – 20	1	2.4%	0	0.0%	0	0.0%	0	0.0%	1	2.4%
	≥21	3	7.3%	3	7.3%	0	0.0%	0	0.0%	6	14.7%
	Total	32	78.0%	9	22.0%	0	0.0%	0	0.0%	41	100.0%

**Table 4. Comparison between male and female groups for: age, Years of Experience in nursing**

Demographic Characteristics	Group				Independent t-test	
	Male		Female		T	p
	Mean	St. d.	Mean	St. d.		
Age	2.60	1.04	1.86	1.06	2.25	0.03
Years of Experience in nursing	2.65	1.56	1.81	1.16	1.95	0.05
Years of Experience in Psychiatric Field	1.90	1.21	1.19	0.40	2.54	0.01

**Table 5. Comparison between Control and Intervention groups for: level of Education and Rank**

	Males group		Females group		Mann-Whitney U	
	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks	Z	sig.
Level of education	23.05	461.0	19.05	400.0	-1.23	0.21

**Table 6. Comparison between Control and Study groups for Knowledge domains**

Variables	Group				Independent t-test	
	Male		Female		T	P
	mean	St. d.	mean	St. d.		
Total knowledge about restraint and seclusion	1.20	0.41	1.24	0.43	-0.28	0.77

## CONCLUSION

Coercive measures (seclusion) are still widely used despite attempts to introduce alternatives in to prevent the risks associated with the use of seclusion in psychiatry. The nurses believed in use restraint and seclusion as a method of exerting power and control over the aggressive psychiatric patients' behavior. The participants who are at age (30 - 39 years) are have an extremely low level of knowledge more than others. Most of the nurses who participated in the study have preparative school graduates, and they have an extremely low level of knowledge more than others. There is a non- significant relationship between demographic characteristics and domains of knowledge for the sample

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Ministry of Health, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Effectiveness of an Education Program on Nurses' Knowledge about the Triage System in Emergency Department of Qalat Salih Hospital

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## ABSTRACT

**Objective:** The aim of the study is to assess the effectiveness of an educational program on Nurses' knowledge about the triage system in Emergency department of Qalat Salih Hospital. An experimental design was carried out at Qalat Salih general hospital from 20 May, 2018 to 15 the of July, 2018. The program and instruments were constructed by the researcher for the purpose of the study. Random sample comprised of (60) nurses was divided into two groups, study group consisted of (30) nurses exposed to the nursing educational program and control group consisted of (30) nurses were not exposed to the program. The measurement of effectiveness of nursing educational program through the multiple choice and (true, false) questions includes (40) items are divided to seven main domain related to triage system in emergency department concerning nurses' knowledge. The analysis of the data was used descriptive statistics and statistical inferential (t- test and Anova) In order to find the differences between the study group and the control group. The study findings indicated that there were highly significant differences between pre and post tests in the study group in overall main domains related to nurses' knowledge.

**Keyword:** nursing; education; program; knowledge; triage ; system.

## INTRODUCTION

Triage is derived from the French word trier, meaning "to sort" <sup>1</sup>. In the ED, triage is a rapid assessment of a patient's general appearance including a brief history of the presenting problem using limited physiological data. Triage is considered to be a core competency of an effective emergency department registered nurse <sup>2</sup>. ED triage is the complex process of sorting and prioritizing patients for care <sup>3</sup>. Triage acuity ratings are useful data that can be used to describe and benchmark the overall acuity of an individual EDs' case mix. This is possible only when the ED is using a reliable and valid triage system, and when every patient, regardless of mode of arrival or location of triage (i.e. at the bedside) is

assigned a triage level <sup>4</sup>. Thus, in addressing the link between the nurse enters into a health professional and patient. The Triage Nurse shares the responsibility of the hospital to ensure that patients who present to the ED are offered an appropriate assessment of their urgency of treatment requirements <sup>5</sup>. The value Triage systems are designed to serve the value of human life and health with fairness and the efficient use of resources. They do this by determining who will not be disadvantaged by longer waiting times and who requires immediate attention to achieve optimal outcomes. The need for triage is enhanced by the growing imbalance between needs and resources resulting from the twin challenges of access block and growing demand <sup>6</sup>.

## METHODOLOGY

A quasi - experimental design was carried out during the period from 3<sup>rd</sup> May, 2018 to 15 July, 2018. A random sample comprised of (60) nurses was divided into two groups, study group consisted of (30) nurses exposed to the nursing educational program and control

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group consisted of (30) nurses were not exposed to the program. The selection of present sample based on special criteria which include; (1) Nurses that should have at least one year of experience or more. (2) Nurses who worked in the morning and night shift. (3) Nurses who worked in the ( Emergency department ). The nursing educational program was designed to provide nurse's information related to the triage system in the emergency department ; Nursing interventions during the triage system application, and identification the main guide to the triage system . The study instrument was designed as multiple choice and (true ,false ) developed by the researcher for the purpose of this study. It was consisted of two parts: Self-administered questionnaire sheet related to demographic characteristics of the nurses, and multiple choice questions for nurses' knowledge regarding (the triage system). It was developed to evaluate nurses' knowledge for nurses carried out during the morning and afternoon shift. An knowledge questions of nurses was consisted of (40) items (27 multiple choice) and (13 true , false) and divided into seven parts: first, : Part one: Assess the knowledge related to principle of the triage. It was consisted of six item . Part Two classification of the patient and victims . It was consisted of six items. Part Three : Physical assessment during triage. In order to achieve the early stated objectives, the data of the study were analyzed through the use of Statistical Package of social sciences (SPSS) version 20 through statistical approach that includes (frequency, percentage, Mean of score (M.S.) and standard deviation. (SD) and an Inferential statistical approach that includes (ANOVA and t-test). Results were determined as highly significant at ( $P < 0.01$ ) significant at ( $P < 0.05$ ) and non-significant at ( $P > 0.05$ ).

## RESULTS AND DISCUSSION

Table -1- displays the frequency counts for selected variables. As stated above, the two nursing groups (control versus study) were equal in size. Ages of the nurses ranged from < 25 to 47 years (Mean age for the study group =  $31.2 \pm 6.98$ ), (Mean age for the control group =  $31.4 \pm 7.30$ ), there were somewhat more male nurses (63.3%) in the study group while the control group were female (53.3%). The most common educational attainment was from an institute (56.7%) in the study group and (60.0%) in the control group, these findings would suggest that the randomization process provide an acceptable level of equality between the

groups. The years of Experience were the majority for the class from (6-10) were (40.0%) in the study group and (36.7%) in the control group. Table -2- shows that the years of experience in the emergency ranged from (4-6) years was (30%) in the study group while the most in control group the class from (11-13) years was (30%). The majority of session participant in the study group (83.3%) were have training session in the study group, while (93.3%) in the control group. The majority of number of sessions both groups were (4-6) represented (56.7%) in study group and (60 %) in the control group. Statistically, show there are no significant differences between the (study and control groups) at experience years in emergency ; training participant and the training session. Table - 5- shows that there are high significant differences between pre and post tests of study group at  $P < 0.001$  in overall domain related knowledge concerning triage system when analyzed by ( t-test). Table - 8- shows that there are highly significant differences between post study group and post control group in overall domain related to nurses' knowledge when analyzed by ( t-test). The results of present study revealed that the Analysis of nurses' demographic characteristics ensured equivalence in both groups and there were no significant differences between study and control groups ( table-1, 2) . The majority of ages located between (26-30) present 9 (30%) in the study group while (21-25) present 9 (30%) also in the control group , there were somewhat more male nurses (63.3%) in the study group while the control group were female (53.3%) . This result of the study was accepted in the experimental study . Our study revealed that the majority of nurses in the study group 19(63.3%) were male and the majority of nurses in the control group 16(53.3%) were female, (table-1,2) . Researcher confirmed that the results can be interpreted in a way that due to the nature of the nursing profession ,male nurses were accounted for most of the nursing staff . Relative to their educational status ,most of the nurses in the study group 17(56.7%) and in the control group 19(60%) were nursing institute (table-1,2). The researcher believed that nurses with diploma degree were considered the major proportion of staff nurses in health organization. Our study revealed that the majority of the years of experience to the nurses were in the class from (6-10) were (40.0%) in the study group and (36.7%) in the control group. Also the study show the majority of the nurses in the study group 9 (30%) in class of (4-6) and control group 9 (30%) was in (13-11) experience

years in emergency . this study agree with (Kelley Toffoli,2016) <sup>17</sup> in his study (Improving Emergency Department Triage Quality Improvement Project) that remember Most nurses had either 0 – 5 years, 6 – 10 years, or 20 or more years of experience (26.2%,  $n = 11$  for each group). Next was 11 – 15 years of experience (16.7%,  $n = 7$ ), and 16 – 20 years (4.8%,  $n = 2$ ). (Table 1, 2 ). Our study revealed that the majority of the nurses in the study group 25(83.3%) was participant in training session and control group 28 (93.3%) was participant in training session also. Our study revealed that the majority of the nurses in the study group 17 (56.7%) in class of (4-6) and control group 18 (60.0%) was also in (4-6) have training session . Our study showed that the 5( 16.7%) of nurses in study group and 2 (6.7%) of nurses in control group did not have training courses in nursing, while all of the nurses in the study group and control group did not attend any training session and or conferences regarding knowledge and practice related to triage system in emergency department). According to the results of this study the majority of cases (91.4%) are male with a mean age of  $31.1 \pm 5.1$  and a mean record of  $6.8 \pm 5.0$ . This agrees with the Khatibian et al results. In this study, the majority of studied cases were male. The reason is that Iranshahr emergency medical center has employed male staff only. Therefore, all of them are

male <sup>9</sup>. The researcher confirmed that the triage system course will provide the necessary knowledge and skills to enable the participant to understand and interpret of the triage system so that the researcher suggests that encouraging the nurses to attend this conference with leading the triage system specialists who have long experience in teaching of the triage . The program below outlines the topics assembled to achieve our objectives .Regarding the performance of emergency medical staff in the identification of triage level after training ESI style, the results indicate that they accurately triaged 79.5% of patients. This agrees with <sup>11</sup> results where they studied the effect of triage video training through START style on the awareness and performance of emergency medical staff so that after training the accuracy of their performance increased to 75.57% . In that study START triage was trained using a training video. This differs with the training method employed in our study. our study also found the effective of nurses' knowledge scores as highly significant difference of ( $P < 0.01$ ) were found in all 7 domains when analyzing as post test between the control and study groups (table -4). The researcher confirmed that the health educational program is effective in improving the nurses' knowledge about the system triage in the study group.

**Table 1. Distribution of the study samples (study and control groups) related to ( Ages groups; Gender; education level and years of experience )**

Var.	Groups	Study			Control			P-value
		Freq.	%	Cum. %	Freq.	%	Cum. %	
Age Groups	21- 25	7	23.3	23.3	9	30.0	30.0	t= 0.265 P=0.218 HS
	26 – 30	9	30.0	53.3	7	23.3	53.3	
	31 – 35	7	23.3	76.7	4	13.3	66.7	
	36 – 40	4	13.3	90.0	5	16.7	83.3	
	41 – 45	2	6.7	96.7	4	13.4	96.7	
	46 and more	1	3.3	23.3	1	3.3	100.0	
Mean ± SD		31.2± 6.98			31.4± 7.30			
Gender	Male	19	63.3	73.3	14	46.7	46.7	t=0.705 P=0.720 NS
	Female	11	36.7	100.0	16	53.3	100.0	
Nursing Ed. Levels	College	2	6.7	6.7	1	3.3	23.3	t= 5.968 P=0.551 NS
	Institute	17	56.7	63.3	19	60.0	60.0	
	School	11	36.7	100.0	10	40.0	100.0	

**Cont.... Table 1. Distribution of the study samples (study and control groups) related to ( Ages groups; Gender; education level and years of experience )**

Experience years	1 - 5	1	3.3	3.3	3	10.0	10.0	t=0.410 p=0.945
	6 - 10	12	40.0	43.3	11	36.7	46.7	
	11 - 15	5	16.7	60.0	3	10.0	56.7	
	16 - 20	3	10.0	70.0	7	23.3	80.0	
	21 - 25	5	16.7	86.7	2	6.7	86.7	
	26 and more	4	13.3	100.0	4	13.3	100.0	

**Table 2. Distribution of the Research Sample (Study and Control Groups) according to Expert years in emergency; session participant and Training session.**

Var.	Groups	Study			Control			P-value
		Freq.	%	Cum. %	Freq.	%	Cum. %	
Expert years in emergency	1 - 3	4	13.3	13.3	3	10.0	10.0	t=0.1.5 p=0.831
	4 - 6	9	30.0	43.3	3	10.0	20.0	
	7 - 10.	8	26.7	70.0	8	26.7	46.7	
	11 - 13	3	10.0	80.0	9	30.0	76.6	
	14 - 16	6	20.0	13.3	7	23.0	100.0	
session participant	None	5	16.7	16.7	2	6.7	6.7	t=1.201 p=0.015
	Yes	25	83.3	100.0	28	93.3	100.0	
Training session	1 - 3	1	3.3	20.0	5	16.7	20.0	t=0.453 p=0.136
	4 - 6	17	56.7	76.7	18	60.0	80.0	
	7 - 10	7	23.3	100.0	6	20.0	100.0	

**Table 3. Comparison of Knowledge Scores Between the pre and post-tests related to study group.**

Score	Group	n	Total Mean	SD	η	T	P
principle of triage	Pre	30	0.36	0.189	0.251	11.771	0.00
	Post	30	0.78	0.125			
classification of the patient and victims	Pre	30	0.30	0.185	0.206	13.650	0.00
	Post	30	0.82	0.145			
Physical assessment during triage	Pre	30	0.32	0.270	0.015	6.954	0.00
	Post	30	0.73	0.184			
nursing intervention during triage	Pre	30	0.42	0.249	0.072	6.906	0.00
	Post	30	0.83	0.201			
Assessment of cardiopulmonary resuscitation	Pre	30	0.62	0.205	0.081	7.675	0.00
	Post	30	0.93	0.104			
Assess the knowledge related to the DC shocks device	Pre	30	0.17	0.240	0.076	8.635	0.00
	Post	30	0.77	0.314			
Knowledge Assess the knowledge related to drugs used in emergency department	Pre	30	0.47	0.140	0.313	15.975	0.00
	Post	30	0.87	0.081			

**Table 4. Comparison of Knowledge Scores Between the study and control groups at post test.**

Score	Group	n	Total Mean	SD	t	P
Knowledge principle of triage	Post Study	30	0.78	0.125	11.459	0.000
	Post Control	30	0.33	0.175		
Knowledge classification of the patient and victims	Post Study	30	0.82	0.145	12.361	0.000
	Post Control	30	0.29	0.188		
Knowledge of Physical assessment during triage	Post Study	30	0.73	0.184	7.593	0.000
	Post Control	30	0.30	0.253		
Knowledge of nursing intervention during triage	Post Study	30	0.83	0.201	6.639	0.000
	Post Control	30	0.43	0.262		
Knowledge of Assessment of cardiopulmonary resuscitation	Post Study	30	0.93	0.104	7.918	0.000
	Post Control	30	0.61	0.197		
Knowledge of Assess the knowledge related to the DC shocks device	Post Study	30	0.77	0.314	7.918	0.000
	Post Control	30	0.17	0.239	8.312	
Knowledge Assess the knowledge related to drugs used in cardiopulmonary resuscitation (CPR)	Post Study	30	0.87	0.081	13635	0.000
	Post Control	30	0.46	0.139		

### CONCLUSION

The triage system course will provide the necessary knowledge to enable the participant to understand and application of the triage system. The differences between pre, posttests indicated that the effectiveness of educational program regarding nurses' knowledge concerning the triage system.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the College of Nursing, University of Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Gastric Aspirates Gram Stain in Early Detection of Neonatal Sepsis

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## ABSTRACT

The aim of this study to evaluate role value of gastric aspirate gram stain as an early marker for diagnosis of neonatal sepsis in comparison with C-reactive protein and total white blood cell counts. The sample were taken from neonates admitted to the neonatal wards in Tikrit Teaching Hospital who were clinically diagnosed as sepsis. The study includes 50 cases each one was assessed clinically by prepared questionnaire including history, clinical assessment and laboratory parameters includes gastric aspirate, C-reactive protein (CRP) and total WBC count were done for all cases. Results revealed that, the number of probable sepsis was higher in males 30 (60%) than in females 20 (40%). Among all clinical manifestations, poor feeding had the highest proportion 39 (78%). Only 18 (36%) neonates were normal birth weight, while 32 (64%) were low and very low birth weight. Study of maternal risk factors revealed that the most frequent factor was maternal infection 30 (60%). In relation to positive results of investigations the cases with positive gram stain were more than cases with positive CRP and abnormal WBC count. The results of gastric aspirate showed that 19 (38%) of samples were positive.

**Keywords:** *Parameters in Early Detection of Neonatal Sepsis, early diagnosis of Neonatal Sepsis.*

## INTRODUCTION

Neonatal sepsis NS is a clinical syndrome of bacteremia with systemic clinical features of infection in 1<sup>st</sup> 28 days of life <sup>1</sup> and is 1<sup>st</sup> cause of neonatal deaths. NS early diagnosis and treatment with antibiotics and good supportive care, can save most cases of neonatal sepsis. NS divided according to its onset: (early onset) if in the first 72 hours of life, and later (late onset) <sup>2,3</sup>. Risk factors for early-onset sepsis are, low birth weight, prolonged rupture of membranes, foul smelling liquor, multiple per vaginum examinations, maternal fever, difficult or prolonged labour and aspiration of meconium <sup>4,5</sup>. Initially there are misleading non-specific clinical manifestations, this lead to difficulty in early clinical diagnosis of neonatal sepsis. This lead to a need for extended evaluation and to institute antimicrobial therapy <sup>6</sup>. Body fluid and surface cultures should be taken from neonates upon their admission to a neonatal intensive care unit in an attempt to identify potentially pathogenic organisms and guide antibiotic treatment, but their usefulness has not been evaluated <sup>7,8</sup>.

## METHODOLOGY

Approval and permission to conduct the study were obtained from Tikrit Medical College. A cross sectional, comparative hospital based study was done on 50 neonates suspected to have sepsis admitted to pediatric wards at Tikrit teaching hospital. Patients inclusion criteria: babies of age less than 72 hours of life and patients with clinical manifestations of sepsis. Patients exclusion criteria: the neonates with previous treatment with antibiotics. A special questionnaire contained patient's clinical information. History was taken from each family which include age, sex, maturity, residence, weight, risk factors and clinical features of NS. Investigations include gastric aspirate for gram stain, CRP and total WBC count were done for all neonates.

## RESULTS AND DISCUSSION

Most of the cases were males 30 (60 %) and 20 (40%) of cases were females. Most of neonatal sepsis cases occur in low and very low birth weight 32 (64%) and 18 (36%) occur in normal birth weight patients. Most of cases of neonatal sepsis occur in preterm patients 32 (64%) and 18 (36%) occur in full term

neonates. Most neonatal sepsis cases occur in normal vaginal delivery 32 (64%) and 18 (36%) occur in C.S. Most of cases of neonatal sepsis occur in neonates from rural area 29 (58%) and 21 (42%) occur in urban area. Maternal infection represents the most common risk factor of neonatal sepsis 30 (60%), followed by prolonged rupture of membrane 11 (22%), bad antenatal care 5 (10%) and meconium stained liquor 4 (8%), as shown in table (1). The clinical manifestations of neonatal septic cases were as follows: among all, poor feeding had the highest proportion recording 39 (78%), followed by shortness of breath 33 (66%), pallor had the smallest proportion recording 4 (8%), while the rest of signs and symptoms were in between as shown in table (2). The gram positive bacteria found in gastric aspirate gram stain was predominant 74% against gram negative bacteria 26%. As shown in figure (1). Cases with normal WBC count and positive gram stain were 10 (20%), normal WBC count with negative gram stain cases were 23 (46%) while high or low WBC count more in positive gram stain cases were 9 (18%), than in cases with negative gram stain were 8 (16%) as shown in table (3). Positive CRP results more in cases with positive gram stain were 12 (24%), than in cases with negative gram stain 3 (6%), the cases with negative CRP and positive gram stain were 7 (14%) and the cases with negative CRP and negative gram stain were 28 (56%) as shown in table (4).

#### Neonatal sepsis and gender:

Both males and females were included 30 (60%) were males while 20 (40%) were females this agreed with Mosayebi<sup>(15)</sup> who reported that more males are affected compared with females. A hypothesis to explain the male sex risk, is that the factors regulating immunoglobulin synthesis may be on the X chromosome, therefore, the presence of two chromosomes produce greater genetic diversity of the female immunologic defenses<sup>(9)</sup>.

#### Neonatal sepsis & weight:

The distribution of sepsis cases according to birth weight in our study LBW had the highest value. Only 18 case (36%) of neonates were of normal birth weight, while 28 (56%) were low birth weight, 4 (8%) very low birth weight, agreed with Abad-Al Karem<sup>(10)</sup> who found that the most predisposing factors for the incidence of disease are low birth weight and prematurity. This LBW may be caused by premature birth weight or intrauterine

growth retardation. Although LBW infants may generate IgM antibodies, their own IgG response to infection is reduced<sup>(11)</sup>.

#### Effect of maturity on neonatal sepsis.

In this study, vast majority among the cases of sepsis were preterm 32 (64%). Similar results were observed in Eisenfeld and Usmaniet studies who found that in preterm infants, chemotactic maturation begins after 2-3 weeks of life, proceeding slowly. In term infants, normal chemotactic function is established by the age of 2 weeks, whereas in preterm infants, chemotactic motility remains impaired for at least 3 weeks<sup>(12-13)</sup>. Preterm birth can interrupt the maturation of fetal neutrophils and place the preterm neonate at risk of life-threatening infections<sup>(14)</sup>. Preterm infants are at increased risk of infection due to low levels of passive immunity as most of the antibody transfer occur in the last 10 weeks of gestation<sup>(15)</sup>. Preterms have not received the full complement of maternal antibodies (IgG), which cross the placenta. These infants also have deficiencies of the alternate and, to a smaller degree, the classic complement activation pathway, which result in diminished complement-mediated opsonization<sup>(11)</sup>. In preterm infants and in septic or stressed infants, the neutrophil respiratory burst activity, phagocytosing capacity, or killing capacity are significantly depressed<sup>(16)</sup>.

**Neonatal & type of delivery.** The higher number of cases were born by normal vaginal delivery, and this due to ascending infection from the genital tract and neonatal colonization with bacteria.<sup>(17)</sup>

**Maternal Risk Factors;** the most frequent factor was maternal infection followed by prolonged rupture of membrane, bad antenatal care and meconium stained liquor. Javed and Memon<sup>(18)</sup>, stated that the presence of multiple maternal risk factors makes a child more susceptible to early onset neonatal sepsis. The most common Clinical presentations of neonatal sepsis were poor feeding followed by shortness of breath, poor moro reflex, lethargy, cyanosis, grunting, jaundice, hypothermia, hyperthermia, convulsion, vomiting, tachycardia and pallor. This results nearly similar to Rodriguez who found the presenting features were: poor feeding, lethargy, coffee ground vomiting, respiratory distress, signs of dehydration, hypothermia, pallor, cyanosis, apnea, mottled skin, sclerema & prolonged

capillary refilling time, reported significant association with outcome of death in neonatal sepsis<sup>(19)</sup>. This wide range of presentations may be due to that the signs and symptoms of neonatal sepsis are non specific and differ from patient to another.

#### Total White Blood Cell Count.

Majority of cases 33 (66%) were of normal value and the rest 17 (34%) were abnormal (leucopenia or leucocytosis), & this agree with Gomella<sup>(20)</sup> who found that a normal WBC does not rule out sepsis and only half of infants with WBC < 5000 or WBC > 20,000 have positive blood cultures. Also agreed with Grant and Hadley<sup>(21)</sup>, who found that abnormalities of WBC counts are not specific for infection, nor do normal values exclude it further!. It agreed with Klein<sup>(22)</sup> who stated that a normal WBC count in an infant with signs of sepsis, does exclude infections. Also this study goes with Manroe and Rod well found impaired sensitivity of a single WBC count assay in neonatal sepsis<sup>(23)</sup>. WBC count have served as diagnostic tools for neonatal infections but is insufficient to serve as the only markers for sepsis<sup>(24)</sup>.

#### C-reactive protein.

In this study, fifteen (30%) cases were positive CRP results, & this agreed with Burner<sup>(25)</sup> who stated that CRP did not elevated the whole time in proven septic cases. Cytokines stimulate hepatocytes to increase the synthesis and release of CRP<sup>(26)</sup>. CRP secretion starts within 4–6 h after stimulation, peaking only after 36 h<sup>(33)</sup> this might give a clue why most of cases were negative for CRP. Cunha,<sup>(27)</sup> reported that CRP is nonspecific marker of inflammation and should not be used in isolation to determine the need for antimicrobial therapy. However our result is disagreed with Jimenez<sup>(28)</sup> who reported that CRP has a sensitivity of 78% for differentiating bacterial infection from other causes of infection. Gram stain of gastric aspirate test in this study showed 19 cases positive (38%) mostly of gram positive bacteria (74%) against gram negative bacteria (26%), which correlated well with the finding of Fuchs and Sanyal<sup>29</sup>, who found that gram positive organisms have been increasingly identified as the source of sepsis and currently surpass gram negative pathogens as the etiologic agents of sepsis<sup>30</sup>. Gastric aspirate is beneficial in diagnosis of sepsis can be explained by that the intestinal tract can be colonized by organisms in utero

or at delivery by swallowing infected amniotic fluid. The immunologic defenses of the intestinal tract are not mature, especially in the preterm infants<sup>38</sup>. Examination of the buffy coat with gram or methylene blue stain may demonstrate intracellular pathogens. Demonstration of bacteria and inflammatory cells in gram-stained gastric aspirates on the 1<sup>st</sup> day of life may reflect maternal amnionitis, which is a risk factor for early onset infection<sup>(39)</sup>. The incidence of morbidity and mortality increased directly with the number of cells per high power field<sup>(31)</sup>. However other studies disagree with our result and regarded that gram stained smear of gastric aspirates may show the presence of polymorphonuclear leukocytes, but these may be maternal in origin and may not necessarily a fetal inflammatory response<sup>(32)</sup>. Other researchers showed that gastric aspirate examination is useful in the diagnosis of neonatal sepsis in high risk babies. The results of gastric aspirate gram stain as compared with previous two tests regarded to be more effective test. Other studies showed that gastric aspirate culture for polymorphs are highly sensitive in detection of culture negative cases of neonatal sepsis. Moreover, a combination of three tests enhances the sensitivity of these tests<sup>(33)</sup>.

**Table 1. Maternal Risk Factors of Neonatal Sepsis.**

Maternal Risk Factors	Sepsis	
	No.	%
Infection	30	60
PROM	11	22
Bad antenatal care	5	10
Meconium stained liquor	4	8
Total	50	100

**Table 2. Clinical Manifestations of Neonatal Septic Cases**

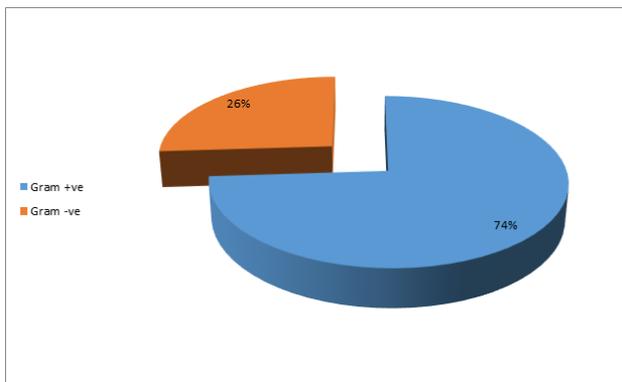
Presentations	Sepsis	
	No .	%
Poor feeding	39	78
Shortness of breath	33	66
Poor reflex	28	56
Lethargy	18	36
Cyanosis	16	32
Granting	13	26
Jaundice	12	24
Hypothermia	11	22
Hyperthermia	9	18
Convulsion	8	16
Vomiting	7	14
Tachycardia	6	12
Pallor	4	8

**Table 3. Relation of Gram Stain with WBC.**

WBC	Gram Stain				Total	
	Positive Results		Negative Results			
	No .	%	No .	%	No .	%
Normal	10	20	23	46	33	66
Abnormal (High or low)	9	18	8	16	17	34
Total	19	38	31	62	50	100

**Table 4. Relation between Gram Stain and CRP.**

CRP	Gram stain				Total	
	+ve results		ve results-			
	No .	%	No .	%	No .	%
+ve	12	24	3	6	15	30
ve-	7	14	28	56	35	70
Total	19	38	31	62	50	100



**Figure 1. Percentage of Gram Positive and Gram Negative Bacteria in Gastric Aspirate Gram Stain.**

### CONCLUSION

From this study and from many other studies in different countries we found that the priority of gastric aspirate among other tests because it can be available within hours of birth and before the results of blood culture, also this test is simple and can be done without specially trained staff and in a rural district hospital.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the College of Medicine-Tikrit University, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Effectiveness of Educational Program on Nurses' Knowledge toward Preventing Female Catheter-Associated Urinary Tract Infections

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## ABSTRACT

The study aims to assess nurses' knowledge toward preventing catheter-associated urinary tract infections, determining the effect of nursing educational program by comparing the pre-test and post-test score on nurses' knowledge in regards to catheter-associated urinary tract infections also to find out relationship between nurses knowledge and their demographic data. A quasi-experimental design study has been carried out in Al-Najaf City/Al-Najaf Al-Ashraf Health Directorate / Al-Sadder Medical City from October 8th, 2017 to, September 10th, 2018. In order to determine the face validity of the study, (15) experts were selected to review the questionnaire, and reliability of the questionnaire is determined through pilot study through the use of test and re-test. The researcher analyzed the data through the use of descriptive and inferential statistical analysis procedures. The results of the study show that the effectiveness of educational program regarding nurses' knowledge toward preventing of female catheter-associated urinary tract infections is positive and clear. It also shows that there is a good development with highly significant differences in study group between pre and post-test in all items related to preventing of female catheter-associated urinary tract infection.

**Keywords:** effectiveness, educational program, nurses, knowledge, prevention, catheter- associated urinary tract infections, urinary catheter.

## INTRODUCTION

Indwelling Urinary Catheter (IUC) is necessary for large number of people as well as inpatients, including continuing care centers, also those with many urological or genitor-urinary diseases<sup>1</sup>. IUCs are often used to manage such as perfect checking urine output of intensive conditions, improve the rest of severely ill patient, also catheterization helps to manage breakdown of skin caused by urinary incontinence, when it is useless of providing different ways and use for keep the constant voiding of urine for surgical patients, as it considered one of the important parts in during patient readiness, maintaining a uninterrupted steady flow of urine for patient with a void difficulty because of neurological diseases that lead to paralysis or failure in sense that disturbing urination, and providing urgent management of severe urinary retention<sup>2</sup>. Nurse considers a primary manager of all the schedule care and solving the problem that associated with patients

having IUC. They are responsible for urinary catheter placement, daily management, specimen collection, and catheter removal<sup>3</sup>. Moreover, Nurses play a vital role in the diagnosis of catheter-associated urinary tract infection which is one of the largest part widespread health care acquired infections encounter in clinical practice<sup>4</sup>, they often the first to notice a clinical change or technical problem among catheterized patients<sup>5</sup>. The single most important predisposing factor for (CAUTI) is the insertion of urinary catheter which produces substantial morbidity in hospitalized patients including discomfort, fever, and malaise<sup>6</sup>. The biggest risk factor for the presence of IUC is urinary tract infection (UTI). Each day an indwelling urinary catheter is in place can increases the risk of infection about 3% to 7%. CAUTIs are common, morbid, and costly, nearly 25% of hospitalized patients are catheterized yearly, and 10% develop UTI<sup>7</sup>. Annually more than 75% of these UTIs being associated with IUC worldwide, (UTI) consist

of 32 - 40% of all the hospital acquired infections occurring in approximately 1.7 million patients<sup>8</sup>. In the United States, UTIs are the most common healthcare-associated infections (HCAI), with an estimated annual rate of 560,000 per year; and of this, up to 387,550 are preventable (CAUTIs). They can lead to complications such as cystitis, pyelonephritis, bacteremia, sepsis, and increased risk of death<sup>9</sup>. The Centers for Disease Control and Prevention file more than 60 specific recommendations for CAUTI prevention, many of these recommendations address CAUTI prevention techniques specific to nursing practice, such as indications for catheter insertion, insertion technique, catheter materials, and management of obstruction, specimen collection, training, surveillance, and documentation<sup>10</sup>. The development of successful CAUTI prevention strategies is needed now more than ever. The overuse of antibiotics to treat potentially preventable infections is contributing to the increasing antibiotic resistance of bacteria<sup>12</sup>.

## METHODOLOGY

**Study Design:** A quasi-experimental design study has been used in the present study to evaluate the effectiveness of an educational program on nurse's knowledge toward preventing female catheter-associated urinary tract infections at Al-Sadder Medical City during October 8th, 2017 to, September 13th, 2018. The study was conducted in Al-Najaf City/Al-Najaf Al-Ashraf Health Directorate / Al-Sadder Medical City (CCU, Medical ward, Surgical ward and General surgical emergency ward). Purposive sample consist of (40) nurses. The sample is divided in two groups; (20) nurses as study group are exposed to the nursing education program, and the other (20) nurses are not exposed to the program considered as the control group. The two groups have proximately the same demographic (characteristics). Those who met the criteria for selection were nurses who were working at the teaching hospitals. Education program is established based on the nurse's knowledge. They have decided that the program is designed professionally to increase nurse's knowledge about prevention of female catheter-associated urinary tract infections. The program is formed to offer the nurses with information about anatomy, physiology of urinary system and information about catheter-associated urinary tract infections (its causes, risk factors, clinical manifestations and complications) and prevention strategies of catheter-associated urinary

tract infection including (insertion only for appropriate indications, preparation of sterile equipments for catheterization procedure, aseptic technique during insertion of indwelling urinary catheter procedure, caring of urinary catheter and aseptic technique during removal of indwelling urinary catheter procedure). Instrument Construction to estimate the effectiveness of nursing educational program on nurses' knowledge regarding prevention of female catheter-associated urinary tract infections at Al-Sadder medical city, the researcher establishes a questionnaire format in order to achieve the aims of the study.

## Statistical Analysis

The data of the present study were analyzed through the use of statistical package of social sciences (SPSS) version 19. The following statistical data analysis approaches were used in order to analyze and assess the results of the study.

## RESULTS AND DISCUSSION

Table 1 reveals that the high percentage of participants at age groups ( $\leq 24$ ) years, (55%) in the study group and the high percentage of participants at age groups (25 - 29) years (45%) in the control group. Regarding the marital status, half of the sample (50%) in study group, and (45%) of control group are single. Regarding the level of education, the highest percentage is (40%) of the sample in study group who graduated from Nursing Institute, and (35%) of the control group are graduated from Nursing Institute and Nursing secondary school. In regards to total years of experience, the table shows that (75%) of the sample in study group and (60%) of the sample in control group who have (1-3) years of experience in nursing, while (85%) of the sample in the study group and (75%) of them in control group who have training course. Regarding types of training courses the results show that the majority (70%) of both groups participant have training courses not related to urologic catheterization. Table 2 shows that (10%) of the study group and (15%) of the control group their knowledge is pass during the pre-test and the other percentage is for the fail knowledge. Table 3 shows that (95%) of the study group and (20%) of the control group their knowledge is pass during the pre-test and the other percentage is for the fail knowledge. Table 4 shows that there is a non-significant difference between the nurses' knowledge in pre-test for both

study and control group. Table 5 shows there is a high significant difference between the nurses' knowledge for both study and control groups during the post-test. With respect to the statistical mean, the study results indicate that the study group knowledge is better than the control group .i.e. education program is effective. The study results indicate that there is a non-significant relationship between the nurses' knowledge and there demographic data. According to (Table 1) that is related to socio-demographic data. Majority of the sample in both groups (study and control), their age are less than 30 years in study group ( $\leq 24$ ) years while in the control group are at age group of (25-29) years. Also Madeo and Roodhouse (2009)<sup>13</sup> pointed in their study "reducing the risks associated with urinary catheters" that nearly half of their studied nurses, their ages are less than 30 years. Concerning the years of experiences, the result of present study revealed that the majority of nurses in study and control groups are between (1-3) years of experience. This result is match with the result of Al-Hchaim and Hamza (2016)<sup>(14)</sup> who found that the higher percentage for both study and control groups are between (1-3) years of experience. This result takes place because when the nurses are young they will have a greater desire to develop their information than nurses who are included in higher age group (Researcher). In the present study, (40%) of the study group sample graduated from nursing institute, while in control group the highest percentage of sample are (35%) for nurses who graduated from Nursing Institute and (35%) for nurses who graduated from nursing secondary school while the less percentage in both groups are nurses who graduated from Nursing College and Post-graduate. This is because of the hospital wards totally depend on nurses who graduated from Nursing Institute and

Nursing Secondary School while nurses who graduated from Nursing College are allocated in special units as well as they are still in small number compared to other nurses (Researcher). Many previous studies were in agreement with this result. They found that the majority of study samples graduated from Nursing Institute (Sharif et al., 2016<sup>15</sup>; Naseer and Hassan 2014)<sup>16</sup>. About training courses, the majority of the sample in both study and control groups have training courses. This result comes along with Majeed and Al-Attar (2015)<sup>(16)</sup> in their study "Effectiveness of Educational Program on Nurses' Knowledge Concerning Side Effect of Radiotherapy" they reveal that (60%) of the study group and (63.3%) of the control group are participant in training courses. The majority of both groups participant have training courses not related to urologic catheterization. This result matched with the result of Sobeih and Nasr (2015)<sup>18</sup>, who declared in their study that none of the nurses attended any training courses regarding urinary catheters management. This result reflects the urgent need of training regarding urinary catheter management due to poor knowledge of the nurses' about prevention of catheter-associated urinary tract infection (Researcher). The results of the present study indicated that the majority of the study samples (90%) have deficit knowledge in the pre-test, while almost of the control group (85%) had failed in the pre-test. In regards to the result in (Tables 2; 3;4; 5), these tables show that nurses knowledge regarding preventing of female catheter-associated urinary tract infections in the study group has been improved after exposure to educational program. This is indicated by the significant difference between pre-test and post-test results, which is supported by a previous study that indicated there is a high significant difference between pre-posttest.

**Table 1. Socio-Demographic Characteristic of the Study Sample with Statistical Differences**

Demographic data	Rating and intervals	Groups			
		Study		Control	
		freq.	%	freq.	%
age / years	$\leq 24$	11	55	8	40
	25 – 29	7	35	9	45
	30 – 34	1	5	2	10
	35 – 39	1	5	1	5
Total		20	100	20	100

**Cont... Table 1. Socio-Demographic Characteristic of the Study Sample with Statistical Differences**

Marital status	Single	10	50	9	45
	Married	6	30	7	35
	Divorced	2	10	1	5
	Widowed	1	5	1	5
	Separated	1	5	2	10
Total		20	100	20	100
Levels of education	Nursing secondary school	7	35	7	35
	Nursing institute	8	40	7	35
	Nursing college	4	20	5	25
	Post-graduate	1	5	1	5
Total		20	100	20	100
Total years of experience	1-3	15	75	12	60
	4 – 6	4	20	4	20
	7 – 9	0	0	3	15
	10+	1	5	1	5
Total		20	100	20	100

**Table 2. Assessment of nurses’ knowledge in pre-test**

Measure	Responses	Study group		Control groups	
		Freq.	%	Freq.	%
Pre-test Assessment	Pass	2	10	3	15
	Fail	18	90	17	85
Total		20	100	20	100

**Table 3. Assessment of nurses’ knowledge in post-test**

Measure	Responses	Study group		Control groups	
		Freq.	%	Freq.	%
Post-test Assessment	Pass	19	95	4	20
	Fail	1	5	16	80
Total		20	100	20	100

**Table 4. Mean difference between the Nurses’ Knowledge (Study and Control Groups) before the Application of the Program (pre-test)**

Main measure	Groups	N	Mean	Std. Deviation	t-test value	d.f.	p-value
Pre-test assessment	Study	20	1.3283	.13861	1.222	38	0.229 NS
	Control	20	1.2633	.19343			

**Table 5. Mean difference between the Nurses' Knowledge (Study and Control Groups) after the Application of the Program (post-test)**

Main measure	Groups	N	Mean	Std. Deviation	t-test value	d.f.	p-value
Post-test assessment	Study	20	1.7383	.12105	9.149	38	0.001
	Control	20	1.2950	.17976			HS

**Table 6. Relationship between the study group demographic data and the post-test assessment**

Demographic Data	Chi-Square Value	D.F.	P-Value
Age/ Years	0.861	3	.835 Ns
Marital Status	1.053	4	.902 Ns
Levels Of Education	1.955	3	.582 Ns
Years Of Experience	0.351	2	.839 Ns
Training Courses	0.186	1	.666 Ns
Number Of Training Courses	0.861	2	.650 Ns
Types Of Training Courses	0.451	2	.798 Ns

## CONCLUSION

Most of nurses had knowledge deficit concerning prevention of female catheter-associated urinary tract infections. There were no differences between the knowledge in both study and control groups in the pretest. There is an improvement in the knowledge of the nurses in study group after exposure to an educational program concerning prevention of female catheter-associated urinary tract infections. The effectiveness of program show strong difference between the nurses' knowledge for both study and control groups during the post-test.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Faculty of Nursing, University

of Kufa, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Hereditary Human Disorders Identification through Finger Print Analysis

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## ABSTRACT

In Human Disorders Diabetes and Blood Pressure are predominant. Identification of these disorders can be done using different tools. Finger print analysis can distinguished as the most inexpensive method to distinguish the symptoms of diabetes in the human body. Especially type II diabetes can be identified from the fluctuating asymmetry in fingerprints. Type two Diabetes mellitus is identified as the most dangerous human disorder leads to dysfunction of organs like kidneys, Heart, eyes etc. In biometric identification system finger prints are regarded as the easiest measurable concept from the human body. Finger prints are unique and can be measured with the scanning process. But it is observed that the symptoms of diabetes mellitus causes the fluctuating asymmetry in fingerprints. This variation can be measured and used for identification of diabetes mellitus with the help of biometric scanners with crossmatch verification process. Predominantly the crossmatch analysis process can distinguish the patients with type 2 diabetes mellitus and Type 1 diabetes mellitus. In this paper we focus on the pattern asymmetry as well as wavelet asymmetry readings to identify the symptoms of Type 2 Diabetes Mellitus and Type 1 Diabetes Mellitus.

**Keywords:** *Finger Print scanning, diabetes mellitus, asymmetry scores, pattern analysis, ridge counts.*

## INTRODUCTION

Type 2 diabetes is a identified as the chronic hyperglycemia attributable to insulin resistance. It is caused by the pancreatic Bata cell dysfunction. Type 2 Diabetes Mellitus leads to the microvascular and macrovascular complications. The disorder is frequently found in the adults and rarely in children and adolescents. The root cause of the Type 2 Diabetes is smoking, aging, obesity, heavy consumption of alcohol, decreased physical activity and low amount of fiber contents diet. The identification methods with different tools are expensive in the medical examinations. The

symptoms of diabetes are not known the patients are affected unknowingly with high range of diabetes <sup>8</sup>. Finger print scanning and identification of persons is regarded as the most versatile process inherited by biometric identification system from long years. Finger print identification can be done with the help of finger print scanners. The finger print scanners are changing from time to time to increase the scanning capacity with the output of clarity. The scanning process is an easy method to take the print of the finger and verify the same with the similar kind of finger print stored in the database <sup>3</sup>. When the same pattern is matched it will send the signal that the finger print is matched. Artificial Neural Networks are predominantly used to identification of persons with the help of finger print scanner. The algorithms configured in the neural networks facilitate the exact match of the finger print from different storage system of finger prints <sup>4</sup>. Finger print scanning and identification mechanism is predominantly used with simple and easy process. The process starts with storing the finger prints in a database or a file storage folder.

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When the finger print is scanned from the finger print scanner the photorefractive polymers will convert the image of the thumb impression into jpeg format. The jpeg file of specific finger print will be stored in the file format in the internal folders of the computer system or stored in a column of a database. The finger print identification process will be done with the new finger print which is scanned by the person and verify or compare the same jpeg with the stored finger print jpeg files. The jpeg file comparison system would be done with pixel to pixel comparison in respect to the x-axis and y-axis positions. In the comparison process if the external jpeg scanned from the scanner is fully matched with the stored jpeg image it will notify that the finger print is matched <sup>5</sup>. The image comparison and verification process with pixel to pixel comparison will reveal the results with accuracy. The minute and unique pixel to pixel verification process of the JPEG will leads to get the results. Apart from the human identification with the unique finger print scanning and verification, a new version has been developed in the recent years to distinguish the dermatology disorders and grasping the symptoms of diabetes mellitus in distinguishing the type 1 and type 2 disorders. Asymmetry scores are predominant in identification of diabetes mellitus symptoms in the patients. The biometric scanning is considered to be the most economic and inexpensive examination process when compared with other tests and examinations <sup>7</sup>. In this clinical operations in identification of diabetes mellitus with finger print a powerful version is need to be used to get the clarity and obviousness of the finger print without any variation. In finger print scanning the image formulated by the scanner would be slightly different from the originally stored images in the database. The variation can be neglected when the patterns are measured accurately. The recent years observations and research outcome has revealed that the finger print ridges are slowly changing in the diabetes mellitus patients. Finger print scanning and verification can be done with the help of Ridges and Valleys. The effective scanning can be done with the higher power scanners like 320 LC. The cross match verifier scanner will be widely used in the clinical observations and disorders identification mechanism in the medical field. The Crossmatch verifier 320 LC will reduce the variations in scanning process to distinguish the human disorders like type 2 diabetes mellitus in the early patients with symptoms <sup>2</sup>. The previous analysis with finger print was done with the image comparison

and image processing techniques with distinct software applications and programs. The digital processing and analysis is advanced with pattern analysis to identify the human disorders. Finger prints are rich with Valleys and Ridges. The patterns of valleys and ridges are analyzed in the form of wavelet analysis and pattern analysis. The possible identification of the disorders can be revealed from the wavelet pattern analysis system. This method has given nearly 72 percentage of accuracy in identification of persons who are affecting diabetes <sup>12</sup>. Finger print recognition is regarded as the faster and accurate process in recognizing the distinct results from the humans. Finger print analysis is regarded as the most reliable source to reveal the distinct patterns and wavelets of the ridges and valleys. Finger Print will be predominantly used in the law enforcement and forensic science community. The recent improvements have paved the way for utilization of finger print analysis in diagnosing the diseases or disorders in clinical field. The reliability of finger prints have paved the way to perform many research work in the health care industry in diagnosing the dermatology complications and human disorders <sup>11</sup>. The wavelet analysis will be done with the session file comparison and image comparison with captured image recently taken for consideration and examination. In this process the patient's finger prints are stored in the database. When the patient visits the hospital or clinic the image will be taken for analysis. The patterns variation and ridges variation with negligible values will be identified and the symptoms can be presumed. The specific computation program can be designed and developed with the application developing tools like java or .Net programming <sup>13</sup>.

### **Image Comparison Technique**

Image comparison technique is predominantly used with the pixel comparison. The patient's first visit will give the first impression and scanning of a finger print. The finger print will be stored in the database in open and uncompressed image format. When the patient visits in consecutive periods to the hospital the finger print will be obtained by the doctor and send it for analysis in the same computer. The previous finger print image and new finger print image will be compared with the minutest part of the image i.e pixel. The pixel to pixel image comparison will provide the accurate results can reveal the minute variation of the patterns of ridges and valleys <sup>7</sup>. Image comparison process is done by the highly computational analysis with the pixel to pixel

comparison between two images. The captured image to stored image in the database will be incorporated in the image comparison with x-axis and Y-axis points positioned pixels. The millions of pixels comparison will provide the accurate results<sup>4</sup>. The process of image comparison will be done with finger print enhancement and finger print classification process. The comparison will be configured especially focused with the ridges and valleys patterns comparison. This will be done by the finger print features template process. The finger print matching process is predominantly accurate with this pattern template setting process comparison. This will be done on the basis of valleys and Ridges comparison with minute verification process<sup>9</sup>.

### METHODOLOGY

The diabetic Mellitus can be identified with the distinct process with the patients. The patients are distinguished with the family history of diabetes and without family history of diabetes. Genetic studies revealed that the finger prints are predominantly influenced by the genetic and gestational environment. The fluctuating asymmetry in finger prints can be the distinguishing point to identify the natural disorders of the human body. The participants who don't have any deviation in asymmetry patterns will be observed some more period. The participants who are not affected with the diabetes even they were from the diabetes affected family. The observations will be done for a period of time, when the observations reveal the fluctuating asymmetry in fingerprints then the symptoms are identified in the patients. The process is depending on the count taken from ulnar loop count and whorl count in the fingerprints. The variation leads to the identify the symmetric fluctuations in the finger prints. This is the first process to examine the finger prints<sup>11</sup>. The finger prints consists of Ridges analysis of the same person and the variation of the discrete analysis exemplify the symptoms of the diabetes mellitus of the patient. The computational analysis is linked with the age and gender of the finger print. Type 2 Diabetic Mellitus can be traced when the person is belongs to the family with the family history of diabetes. The gender also predominantly influence the occurrence of diabetes with age. The experimental results shows that the diabetes mellitus can happened to most probably to the men rather than women in the middle age group. More frequently the diabetes is found in elders than children<sup>8</sup>.

### RESULTS AND DISCUSSION

The recognition of diabetes in the samples taken from several families where the diabetes has been inheritably found. The following table reveals the results from the ridge count taken from the samples. The above results have been obtained from the parameters based on their weight, and general body functions. The calculations have been done from the clinical observations in respect to the finger print readings from the patients from diabetes family history. When the targeted diabetes patients have compared with other diabetes patients is matching 100 per cent. The previous tested samples are quite identical to the standard ridge count identified from diabetes patient. The ridge count is automatically equal to the diabetes patients. The results analysis has been conducted on the new patients also. The samples are demonstrating the identical ridge count with the diabetes patients. The results have been again examined with the general patients who have diabetes family history and those who doesn't have family history of diabetes. The following table has revealed the inherited disorders with the family history of diabetes. The finger print analysis could reveal different kinds of results for occurrence of the disorders in accordance with the age and gender with different family history. In the above table the clinical examinations have been conducted for 97 female participants. In this examinations the ridge count is almost nil results and no diabetes sign is identified. In the above table the clinical examinations have been conducted and found the diabetes patients who have the similar ridge count is identifiable for diabetes in male candidates. The ridge count is compared with the diabetes patient with normal male participants. The ridge count is similar to 0.254 percent with the ridge count of diabetes patient. In the following table the ridge count is compared with diabetes female candidates and male candidates from the random selection. The finger print ridge count of diabetes patients is similar to the specimen humans of 95 numbers. And the same clinical examinations and comparison has been conducted for 992 male candidates. The similarity is identified for only one candidate with same finger print ridge count. Based on the ridge count it is possible to identify the diabetes patients from the general public. The above results demonstrate the facts that the diabetes mellitus may happen to male personalities with the diabetes family history more than the women. The proximity of occurrence of diabetes symptoms are less in both male

and female candidates without occurrence of diabetes in their family history. The proximity of occurrence of diabetes symptoms are more in men of elders than the children.

**Table 1. Test results on samples**

Table of Recognition rate of test samples		
Type	No. of Samples	Recognition rate
Previously tested samples	20	100 %
New Samples	20	100 %
Overall recognition rate %		100 %

**Table 2. Analysis of diabetic family history**

Persons with diabetic family history		
Finger print Analysis	Gender	Ridge count
I (97)	Female	-0.026
II (90)	Male	0.254

**Table 3. Analysis of with, without and Adult diabetic family history**

Persons without diabetic family history		
Finger print Analysis	Gender	Ridge count
III (98)	Female	-0.022
II (91)	Male	-0.287
Adults with diabetic family history		
Finger print Analysis	Gender	Ridge count
III (94)	Female	-0.0182
II (93)	Male	0.2076
Children with diabetic family history		
Finger print Analysis	Gender	Ridge count
III (95)	Female	-0.0043
II (992)	Male	0.0101

## CONCLUSION

Finger print identification is predominantly used by the forensic departments and personal identification systems. The latest researches have revealed that the finger print patterns are useful to identify the symptoms of diabetes mellitus. The finger print is rich with ridges and valleys. The pattern analysis of ridges and valleys are used for wavelet analysis to distinguish the symptoms of diabetes mellitus. The results have revealed that the occurrence of diabetes symptoms are more visible in the men with the family history of diabetes at mostly elderly age only. In this research the focus is on finger print wavelet analysis and pattern analysis to distinguish the symptoms of the diabetes mellitus. The results have taken from different persons of different age groups to find the results for occurrence of diabetes mellitus. The results have been extracted on the basis of pattern analysis and wavelet analysis of the ridges and valleys found in finger print images. The image comparison and analysis is done in computerized pixel analysis with high accuracy.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the College of education for pure science, University of Babylon, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Immunohistochemical Assessment of SOX2 Expression in Iraqi Patients with Gastric Carcinoma (GC)

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## ABSTRACT

**Objective:** To evaluate whether the SOX2 protein could be used as a predictor in patients with GC and to assessment the correlation between the IHC expression of the SOX2 protein and the various clinic pathological Parameters as age, sex, histopathological subtypes, grade and stage of the tumor by immune-histochemical Technique. This is a retrospective study conducted on 60 randomly selected patients (30) normal versus (30) GC, at the pathology department of the Gastroenterology and Hepatology Teaching Hospital & some private hospitals. It were collected and diagnosed during the period between from 2014 to 2018. From each block were stained with H&E and IHC stained for SOX2. The Statistical analysis was done using SPSS system, and the difference was regarded as significant when the P-value was less than 0.05. IHC expression of the SOX2 protein was significantly lower in GC group compared with control group ( $p < 0.0001$ ). The mean age of the patients was a  $48.39 \pm 12.39$  year, ranging from 18 to 76 year. IHC expression of the SOX2 protein was shown in 18(60%) of the GC cases, in this study there was no significant correlation between SOX2 positivity and age, sex, histopathological subtypes, grad and TNM stage of the GC.

**Keywords:** Gastric Carcinoma, Immunohistochemical, SOX2 Expression

## INTRODUCTION

Gastric carcinoma (GC) is the fifth most frequent type of cancer, preceded by lung, breast, colorectum and prostate cancers respectively and the third most common cause of cancer-related death worldwide <sup>1</sup>. the global incidence is twice as much in men as in women, The incidence and mortality of the GC show varies geographically being high in undeveloped countries compared to developed countries <sup>2</sup>. In Iraq, the GC is one of the commonest ten cancer it ranks the 7<sup>th</sup> in both sexes <sup>3</sup>. The transcription factor SOX2 belongs to the group B of SOX proteins; they are expressed in embryos as well as in adults and are known to be involved in many different developmental and proliferative processes in different organs <sup>4</sup>. They are also implicated in the etiology of numerous severe clinical disorders and involved in later events of carcinogenesis, such as invasion and metastasis of tumor <sup>5,6</sup>.

## MATERIALS AND METHOD

A retrospective audit study on 60 cases for the

period from 2014 to 2018, the samples were divided into two groups 30 patients with GC and 30 healthy samples with Normal stomach (as control group). 60 formalin fixed paraffin embedded blocks of the GC tissue (partial or total gastrectomy specimens) are selected randomly from archived materials of Pathology laboratory of the Gastrointestinal and Hepatic Diseases, and some samples were collected from private hospitals in Baghdad in this study. All clinicpathological information including age, gender, histopathological type, grade and stage of tumor were taken from the patients reports. One section of the paraffin embedded of GC tissue blocks was stained with H&E and reviewed the histopathological diagnosis, while another one section were stained with IHC was carried out with the SOX2 polyclonal antibody (abcam, UK; optimal dilution, 1:250). Immunohistochemistry Deparaffinization and endogenous peroxidase inactivation of clinical tissues were performed For SOX2 and the samples were hydrated heating in 50 mm EDTA buffer solution (pH 7.0) at 95c was then placed in the water bath (Gallen kump, England) for 30 min for antigen retrieval. The primary anti-SOX2 antibody

was applied for one hour at room temperature. After washing in PBS two times, the secondary antibody (Dako, Denmark) was applied for 30 min at room temperature, and incubation with antibody conjugated to HRP (Dako, Denmark) for 10 min at room temperature. After that, the slides were counterstained with Mayer's hematoxylin for 5min and dehydrated in alcohol prior to mounting. IHC reaction is considered positive when brown staining is nuclear for SOX2, the positive control for SOX2 IHC reaction was taken from the Glioma stem cell cancer. Technical negative control for SOX2 was obtained by omission of the primary antibody (Fig 1). The results of IHC expressions of the SOX2 were analyzed in a semiquantitative fashion abased to Zhang and his coworker<sup>(7)</sup> Score 0: 0%, Score +1: 1-9%, Score +2: 10- 50%, Score +3: 51-100% of tumor cells were positive. The IHC expression of the SOX2 was analyzed statistically in relationship to Clinicopathological parameters of GC using Fisher's exact probability test, Student t-test. Values were considered statistically significant when  $P < 0.05$ .

## RESULTS AND DISCUSSION

A total of 60 cases were studied, the control group included 30 of GN cases, the patients' age ranged of between 33-48 years old, and the mean age was  $39.27 \pm 4.266$  years. 13 of the patients were male while the other 17 were female. The carcinoma group included 30 patient of GC, the patients' age ranged of between 18-76 years old, and the mean age was  $48.39 \pm 12.39$  years. 20(66.6%) of the patients were male while the other 10(33.3%) were female. The diffuse subtype of GC was 14(46.6%), while intestinal and mixed subtypes represented 12(40%) and 4(13.3%) cases respectively. In 19(63.3%) cases, the tumor was moderately differentiated, the rest 10(33.3%) cases, were poorly differentiated; however the well differentiated was found in one case (3.3%) only in this work. We divided the cases into two groups a based to the depth of invasion 28(93.3%) cases were with serosal invasion and 2(6.6%) cases were without serosal invasion. 25(83.3%) cases showed lymph node involvement. Only 5(16.6%) cases showed no lymph node involvement. According to the TNM staging system, 14(46.6%) cases were in early stage of carcinoma (IIA & IIB) and 16(53.3%) cases were in advanced stage of carcinoma (IIIA, IIIB & IV). The expression of the SOX2, in GC and control groups was measured by IHC. The mean percentage of SOX2 protein was increased 25(83.3%) in control group than

in GC group 18(60%), the differences in frequency of distribution of cases with positive and negative expression of SOX2 of the studied cases are significant ( $P < 0.0001$ ), as shown in table (1), Fig. (1). SOX2 was expressed immunohistochemically in 25(83.3%) of the studied normal stomach cases and expressed in 18 (60%) cases of GC, with significant decrease in its expression with increasing of the lesions severity ( $p < 0.0001$ ). Regarding SOX2 staining scoring, the majority of cases of carcinoma 30 out of 9(30%) showed in score +2, while only 5 out of 30 cases of GC (16.6%) were in score +3 and the rest of the cases showed 4(13.3%) in score +1, 12 out of 30 (40%) were negative for SOX2. The age of the patients which included 9(30%) of GC cases were positive SOX2 expression in the both age  $< 48$  &  $\geq 48$ . Out of 20 male cases of GC, only 11(36.6%) cases showed positive SOX2 expression, while out of 10 female cases of GC, only 7(23.3%) cases showed positive SOX2 expression; statistically there was no significant relation between SOX2 expression with age and gender as shown in Table (2). In consideration to the histopathological subtype, out of 14 cases of diffuse subtype GC, 7(23.3%) cases of them showed positive SOX2 expression, while out of 12 cases of intestinal subtype of GC, only 9(30%) cases showed positive SOX2 expression; while out of 4 cases of mixed subtype of GC, only 2(6.6%) cases showed positive SOX2 expression; although these results were statistically not significant As shown in table (2). Out of 19 cases of moderately differentiated type of GC, 12(40%) cases of them showed positive SOX2 expression, while out of 10 cases of poorly differentiated type of GC, 5(16.6%) cases of them showed positive SOX2 expression. Regarding the relationship between GC cases and TNM stage of tumor, out of 14 cases of the GC falling in early stages (II); 8(26.6%) cases of them showed positive expression for SOX2, while 10(33.3%) cases falling in advanced stage showed positive expression for SOX2. these results were no significantly correlation with TNM stage, as shown in table 2. Worldwide, GC is one of the commonest cancers after lung cancer and a major cause of mortality and morbidity, especially in undeveloped countries<sup>8</sup>. In our study the mean age was 48.9 years as shown by many other Iraqi studies<sup>9, 10</sup>. Also which is comparable with other study where they found the peak incidence was in the fifth to sixth decade<sup>(11)</sup>. In this study 66.6% patients were male and 33.3% patients were female with M: F ratio 2:1, these findings are in agreement with other Iraqi and abroad studies<sup>(12, 13)</sup>. In the

present study the diffuse subtype was the most common histopathological subtype of the GC, this is similar to other findings<sup>2,14</sup>, While Alahmadi *et al.*<sup>15</sup> and Badary *et al.*<sup>16</sup> are found that the intestinal subtype was higher than other subtypes of the GC, This discordance could be attributed to environmental, racial and geographical differences, in addition to sample size difference. In the current study noticed that Most of the cases of GC were moderately differentiated which is in accordance with other studies<sup>11,17</sup>, but some studies have found discordant results to the current study, Gharsall *et al.*<sup>(18)</sup> and He *et al.*<sup>(19)</sup> who they found that poorly differentiated was the most common. According to TNM staging system, the majority of carcinoma cases were of stage III&IV These findings go with that obtained by other authors<sup>20,21</sup>. This presentation (in stag III&IV) partly resulted from the lack of screening programmers for GC. In the present study has shown that SOX2 expression was significantly lower in carcinomas than normal stomach cases (60%versus 83.3%, p<0.0001). These observations of this study are comparable to the literatures which stated that the SOX2 was expressed in normal stomach mucosa with decrease in its expression with increasing severity of the lesion from normal to invasive GC<sup>22,23</sup>. Taking the age in consideration, this study revealed non-significant association between patient's age and sex and IHC expression of SOX2. This result nearly compatible with that obtained by other study done by Wang *et al.*<sup>(24)</sup>, and also with a study of Yang *et al.*<sup>25</sup>. Concerning the histopathological subtypes of GC, this study shows non-statistically significant difference in IHC expression of the SOX2 in histopathological

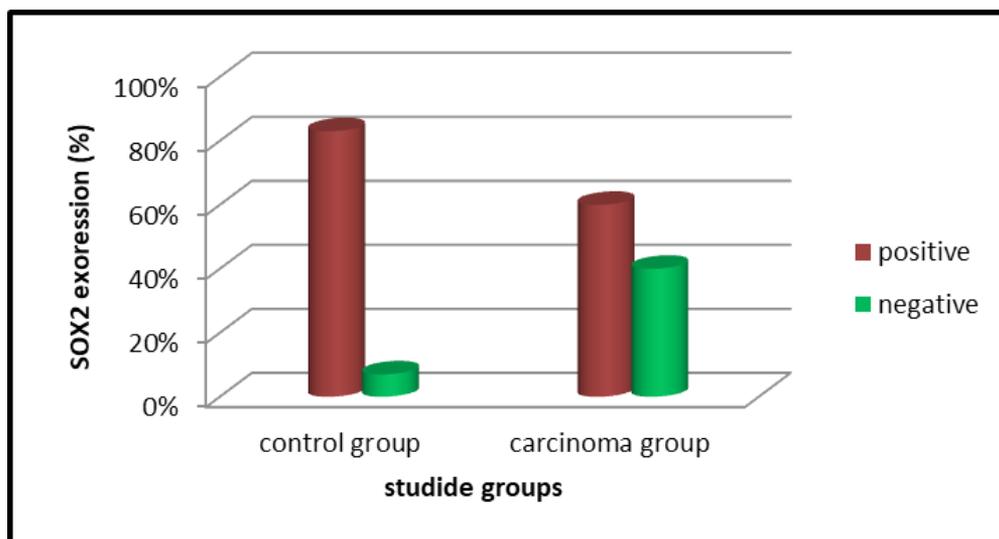
subtype of GC, This result is consistent with done by other studies<sup>24,25</sup> On the contrary to the above results, some studies found different observations. Some of these studies had found a significant relationship between IHC expression of the SOX2 and histopathological subtype of GC, the positivity rates were higher in intestinal subtype of GC than diffuse subtype<sup>(26)</sup>. Actually it was difficult to interpret the causes behind such conflicting data, it could be attributed to different factors such as geographical, racial, technical, analytical as well as the results have been interpreted using a wide variety of protocol variables and scores, which makes the comparison between studies rather difficult. Regarding the tumor grade of GC, in the current study was not found statistically a significant difference in IHC expression of the SOX2 among different grades of studied GC cases. The current work showed a significant lower SOX2 in poorly differentiated and higher value was detected in moderately differentiated. This result agrees with results similar other studies<sup>27,28</sup>.only one study is in discordance to the present one Zhong *et al.*<sup>(29)</sup>. recorded that IHC expression of the SOX2 was significantly correlated with and tumor grade. Moreover, the present study showed non-significant association of TNM stage to the IHC expression of the SOX2. This result is supported by other studies<sup>25,27</sup>, Some studies are in discordance to the present one. Matsuoka *et al.*, Recorded that IHC expression of the SOX2 was significantly correlated with and TNM stage, this difference is possibly due to different sample size, sensitivity and specificity of different antibodies used, and different modes of scoring systems and interpretations of the results.

**Table 1. IHC expression of SOX2 among studied groups**

studied group	SOX2 expression score				expression
	0	+1	+2	+3	
Control cases	5(6.6%)	0(0%)	25(83.3%)	0(0%)	25(83.3%)
HGC cases	12(40%)	4(13.3%)	9(30%)	5(16.6%)	18(60%)
Total	17(28.3%)	4(6.6%)	34(56.6%)	5(8.3%)	43(71.6%)
p-value	P= 0.0001				

**Table 2. Distribution of SOX2 expression in GC cases in relation to different studied Clinic pathological characteristic**

Clinic pathological characteristic		SOX2 expression		p-value
Age	>48	positive	9(30%)	P= 0.74 <sup>N.S</sup>
		negative	5(16.6%)	
	≥48	positive	9(30%)	
		negative	7(23.3%)	
Gender	Male	positive	11(36.6%)	P=0.64 <sup>N.S</sup>
		negative	9(30%)	
	female	positive	7(23.3%)	
		negative	3(10%)	
Subtype of tumor	intestinal	positive	9(30%)	P=0.56 <sup>N.S</sup>
		negative	3(10%)	
	diffuse	positive	7(23.3%)	
		negative	7(23.3%)	
	mixed	positive	2(6.6%)	
		negative	2(6.6%)	
Tumor grade	Well differentiated	positive	(3.3%)1	P= 0.34 <sup>N.S.</sup>
		negative	0(0%)	
	Moderate differentiated	positive	12(40%)	
		negative	7(23.3%)	
	poorly differentiated	positive	5(16.6%)	
		negative	5(16.6%)	
TNM stage	I&II	positive	8(26.6%)	P=0.51 <sup>N.S.</sup>
		negative	6(20%)	
	III&IV	positive	10(33.3%)	
		negative	6(20%)	



**Fig. 1. IHC expression of SOX2 among studied group**

## CONCLUSION

This study showed that the IHC expression of the SOX2 was significantly decreased in carcinoma tissue than in control group, the overall expression of SOX2 in GC cases in the present study was 60% and there was no significant correlation between IHC expression of the SOX2 and different clinicopathological variables such as: age, sex of patients, histopathological subtype, grade and TNM stage of the tumor. From the above results it is obvious that SOX2 plays an important role in the progression of the gastric neoplastic transformation and has utility to differentiate premalignant from malignant lesions of the GC, and this might improve the accuracy, precision and sensitivity of gastric lesions diagnosis.

## CONCLUSION

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Department of Biology/ College of Education for Pure Science (Ibn- AL-Haitham)/ University of Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Serum IgE Level in Systemic Lupus Erythematosus Associated Nephropathy

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## ABSTRACT

The present study aimed to measure the total IgE levels in Iraqi SLE patients with renal involvement. The study involved a total of 136 SLE patients with renal manifestations (76 females and 60 males) who attended one of Baghdad's private hospitals and had haemodialysis from January 2017 to May 2018. In addition, a total of 36 apparently healthy age and gender matched individuals were also included in the study as a control group. Measurement of C4 showed no significant difference between patients ( $57.30 \pm 1.393$  mg/dl) when compared to the control ( $55.17 \pm 3.111$  mg/dl). A highly significant increase was shown in the level of total IgE in patients as compared to control ( $43.04 \pm 28.75$  and  $16.11 \pm 5.075$  IU/ml respectively). Interestingly, analysis of total IgE levels according to the number of haemodialysis that the patients needed revealed that SLE patients who needed haemodialysis for three time had the highest level of total IgE ( $105.0 \pm 62.86$  IU/ml) at the beginning of SLE flare, followed by the patients who had haemodialysis for two times ( $62.64 \pm 18.26$ ), while the patients who needed haemodialysis for one time only ( $31.26 \pm 23.49$  IU/ml) had the lowest level of total IgE.

**Keywords:** SLE, total IgE, hemodialysis.

## INTRODUCTION

Systemic lupus erythematosus (SLE) is a systemic autoimmune disease mostly affecting females. The onset of the disease can be at any age but patients who develop the disease at early age (childhood or adolescence) tend to have a more severe immunological and clinical manifestation than those who develop the disease later in life<sup>1</sup>. This disease is characterized by the presence of autoantibodies directed against the patient's own "nuclear antigens". Anti-double stranded DNA (anti-dsDNA), anti-Smith, anti RNP, anti Ro and anti La are the main autoantibodies produced in SLE patients<sup>2</sup>. SLE is chronic, and can have cardiac, musculoskeletal, pulmonary, neurological and renal manifestation<sup>3</sup>. The variable clinical manifestation may be attributed to the deposition of immune complexes in various organs. One of the most serious complication of SLE

is lupus nephritis which effects approximately 40-75% of SLE patients<sup>2-6</sup>. Autoantibodies in SLE are mainly of IgM, IgA and IgG classes. In addition, auto-reactive antibodies of the IgE class can also be detected in the sera of SLE patients. Interestingly, auto-reactive IgE was thought to increase the activation of basophils and enhance disease activity in SLE patients<sup>7</sup>. The present study aimed to investigate whether the level of total IgE could assist in predicting/forecasting the degree of flare in SLE patients with renal complication.

## MATERIALS AND METHOD

This study included 136 SLE patients (76 females and 60 males), all of which have been diagnosed with kidney failure (based on clinical examination and laboratory results). All patients attended one of Baghdad's private hospitals and had haemodialysis from January 2017 to May 2018. Diagnosis of SLE was based on the criteria published by the American College of Rheumatology (ACR) for SLE classification. All SLE patients included in the study had positive anti ds-DNA antibody (investigated by ELISA). In addition, 36 apparently healthy age and gender matched individuals

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were also included as a control group. Whole blood was collected from patients (before haemodialysis) and control, and sera was separated and stored at  $-20^{\circ}\text{C}$  until further use. Serum levels of total C3, C4 and total IgE was measured by ELISA following the manufacturer's instructions. In addition, full clinical history of the patients were recorded. This study was carried out after acquiring approval of the relevant ethical committee. Human complement C3 ELISA kit (Assaypro, USA) was used for quantification of serum C3, while complement C4 human ELISA kit (Abcam) and total IgE ELISA kit (Immunolab, GmbH) were used for quantification of serum C4 and serum total IgE respectively. Statistical analyses was done using MS Excel and Graph Pad Prism 5.0. The data are expressed as means  $\pm$  standard deviation (SD). The results were considered to be statistically significant when p value was equal or less than 0.05.

## RESULTS AND DISCUSSION

The age of SLE patients included in the study ranged from 10 to 70 years old. The majority of patients (63.97%) were in the age group 50-70 years followed by 33.82% in the age group 20-40 years and 2.20% in the age group 10-19 years as shown in figure 1. Measurement of C3 in the sera of patients and control showed that the mean level of C3 was  $160.1 \pm 3.123$  mg/dl in the patients group and  $184.4 \pm 1.509$  mg/dl in the control group, with a highly significant difference between the two groups ( $p < 0.0001$ ) as shown in figure 2. Serum was collected from patients and control and the level of C3 (mg/dl) was measured in by ELISA. Statistical analysis using unpaired T test showed a highly significant difference between the two groups. Data are expressed as mean  $\pm$  SD. Figure 3 illustrates mean serum level of C4 in patients ( $57.30 \pm 1.393$  mg/dl) and control ( $55.17 \pm 3.111$  mg/dl). Statistical analysis using unpaired T test showed a non-significant difference between the two groups ( $p = 0.498$ ). Serum was collected from patients and control and the level of C4 (mg/dl) was measured by ELISA. Statistical analysis using unpaired T test showed a non significant difference between the two groups. Data are expressed as mean  $\pm$  SD. Total IgE was measured in sera of patients and control and the results showed that the mean total IgE level was  $43.04 \pm 28.75$  IU/ml in the former and  $16.11 \pm 5.075$  IU/ml in the latter with a highly significant difference ( $p < 0.0001$ ) between the two groups (a shown in figure 4). The level of total

IgE (IU/ml) was measured in the sera of SLE patients and control by ELISA. Statistical analysis using unpaired T test showed a highly significant difference between the two groups. Data are expressed as mean  $\pm$  SD. As mentioned previously, all SLE patients included in this study suffered from renal complications and underwent haemodialysis. These patients were divided into 3 groups according to the number of haemodialysis they subsequently had. The first group of patients subsequently needed one haemodialysis, while the second needed two and the third group had haemodialysis done three times. Figure 5 illustrates the mean total IgE level (IU/ml) according to the number of haemodialysis that the patients had. The mean level of total IgE (IU/ml) in the sera of SLE patients was calculated in SLE patients who had haemodialysis for 1, 2 and 3 times. Statistical analysis using one way ANOVA showed a highly significant difference between the three groups. Data are expressed as mean  $\pm$  SD. This figure revealed that the mean level of total IgE was  $31.26 \pm 23.49$ ,  $62.64 \pm 18.26$  and  $105.0 \pm 62.86$  IU/ml in patients who subsequently underwent haemodialysis for one, two and three times respectively. One way ANOVA showed a highly significant difference between the three groups ( $p < 0.0001$ ). Systemic lupus erythematosus is one of the diseases that has shown considerable variation among different ethnicities. Systemic lupus erythematosus patients of African, Chinese, Hispanic, Korean and Arabic origin tend to show a more severe form of the disease (8, 9). Furthermore, ethnicity seems to also effect the prevalence of the disease. A study carried out in the US found that Americans of Chaldean (Catholics from Iraq) and Arabic origin have a significantly higher prevalence, and a different disease burden than other ethnicities<sup>10</sup>. The age of SLE patients included in the study ranged from 10-70 years which is comparable to what has been previously reported in Iraq<sup>11,12</sup>. Most of the mortality and morbidity in SLE patients are due to renal complications<sup>4</sup>. Despite the high incidence of SLE in Arabic countries, but studies investigating renal involvement in these patients are scarce. Nevertheless, studies carried out on migrants in America and Europe revealed that SLE patients of African, Arab and Asian origin tend to have higher renal involvement. Furthermore, these patients show renal disease more frequently and earlier than other ethnicities confirming that ethnicity influences both the incidence and the clinical phenotype of the disease<sup>13</sup>. Diagnosis of SLE is based on clinical features and laboratory tests.

In 2009, hypocomplementemia was proposed as an immunological marker for the diagnosis/classification of SLE<sup>14</sup>. In agreement with this proposal, the mean level of C3 was significantly less in the sera of SLE patients when compared to the control. On the other hand, there was no significant difference in the level of C4 between SLE patients and control. Systemic lupus erythmatosus is a clinically heterogeneous disease with variable “clinical manifestation” and thus it is unexpected that all the biomarkers are changed in all patients<sup>15</sup>. Complement activation in SLE patients is linked with the tissue damage during SLE flare<sup>16</sup>. Although a decrease in both C3 and C4 levels have previously been reported in SLE patients<sup>17</sup>, but Birmingham and colleagues have suggested that C3 activation is associated with the actual tissue destruction during the renal flare, while the decrease in C4 level was mostly associated with the two month period prior to the onset of flare. This explains the significant decrease in C3 (but not in C4) observed in the present study as serum samples were collected at the onset of the renal flare. Nevertheless, we cannot exclude the effect of “genetic variability” in complement activation and thus individual differences in the complement activation during diseases<sup>18</sup>. All SLE patients included in the present study had positive anti-dsDNA antibodies which has previously been linked to impaired renal function<sup>19</sup>. Several studies have proposed that IgE antibodies might possess a possible pathogenic role in SLE patients with renal involvement (20). This proposal came due to the increased level of IgE in lupus nephritis patients, in addition to the detection of IgE in glomerular deposits of immune complexes of kidney biopsies from SLE patients with kidney manifestation. This increased level of IgE was found in non-allergic SLE patients and correlated with disease activity<sup>21,23</sup>. Further studies on SLE patients linked high total IgE levels with antinuclear IgE antibodies<sup>24</sup>. Charles and co-workers have proposed that Basophils, IgE and Interleukin-4 play a role in the pathogenesis of SLE associated nephritis via induction of the Th2 environment and auto-reactive B-cells activation. Basophils harbour the FcεRI receptor which has high affinity for IgE antibodies. The binding of IgE antibodies to this receptor results in the activation of basophils which explains the increased serum level of anti-ds DNA IgE and activated basophils found in SLE patients with active disease<sup>25-27</sup>. Both IgE antibodies and basophils amplify autoantibody production resulting in SLE associated nephritis. In the absence of allergy, SLE patients have been shown to have increased levels of

auto-reactive and total IgE antibodies which seems to correlate with the severity of the disease. The proposed role of IgE in the pathogenesis of lupus nephritis is supported by the finding of IgE in “glomerular immune complex deposits” in biopsies taken from the kidneys of SLE patients<sup>27</sup>. Compared to healthy individuals, SLE patients included in the present study had significantly higher levels of total serum IgE. Interestingly the group of patients who needed haemodialysis three times, were the ones with the highest level of total IgE followed by the group who had haemodialysis two times. On the other hand, the group of patients who only needed haemodialysis for one time were the ones with the lowest total IgE level when compared with the other two patient groups. These findings suggests that the level of total serum IgE at the onset of the renal flare could predict the prognosis of SLE patients with renal manifestations. The above conclusion is supported by the finding that SLE flares were more intense in SLE patients with positive anti-ds DNA (IgE) than those who were negative<sup>28</sup>.

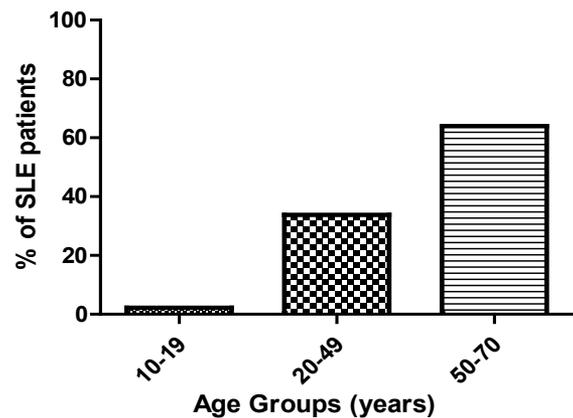


Figure 1. Distribution of patients according to age

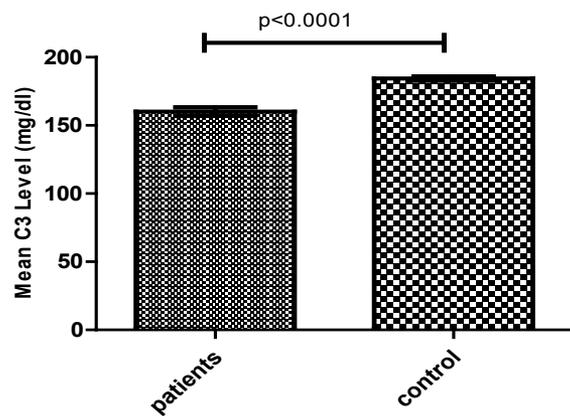


Figure 2. Mean level of C3 in the serum of patients and control.

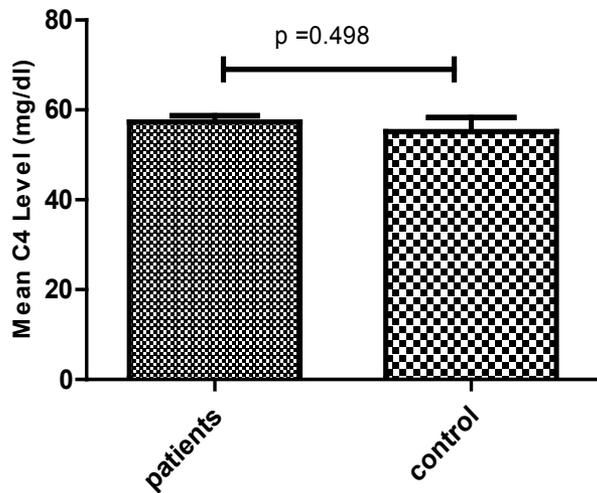


Figure 3. Mean level of C4 in the serum of patients and control

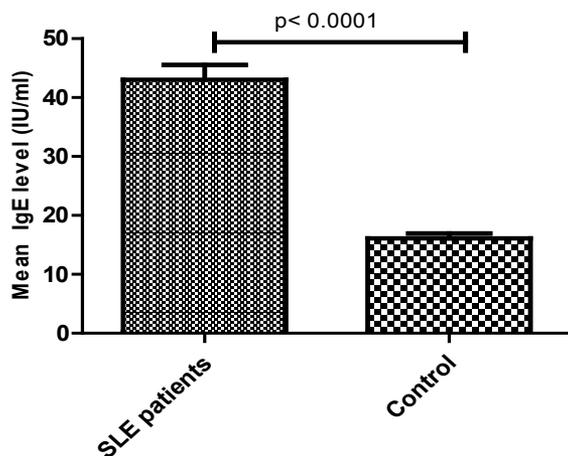
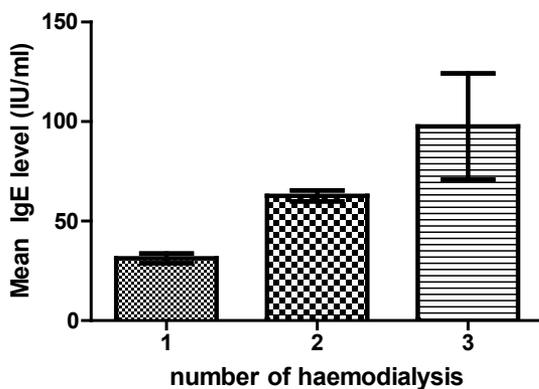


Figure 4. Mean level of IgE in the serum of patients and control

Figure 5. The mean level of total IgE according to the



number of haemodialysis

### CONCLUSION

Total serum IgE levels could be used as an indication of the intensity of the renal flare in SLE patients.

Furthermore, the level of serum IgE could be linked with exacerbation of SLE renal flare. Further studies are recommended to assess the role of periodic total IgE measurement in the management of SLE patients with renal manifestations.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Middle technical university, College of Health and medical Technology, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Effectiveness of An Instructional Program of Premarital Screening for Hereditary Blood Diseases on Student's Knowledge at Baghdad University

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## ABSTRACT

**Objectives:** To identify the effectiveness of instructional program concerning premarital screening of hereditary blood diseases on student's knowledge at Baghdad University. A quasi-experimental design (pretest-posttest approach) was conducted at six colleges and its college of education Ibn rushd, college of political science, college of law, college of literature, college of media and college of language. This study was conducted during the period of 1<sup>st</sup> April 2017 to 5<sup>th</sup> May 2018. Multistage stratified random sample of (40) students for both group control and study group at Baghdad University colleges. A questionnaire, instructional booklet, guide booklet was used as a tool of data collection to fulfill with objective of the study and it is consisted of three parts. The questionnaire and content validity was carried out through the eight experts. Descriptive and inferential statistical analyses were used to analyze the data. In general the results show a statistical significant improvement of university student's knowledge concerning premarital screening of hereditary blood diseases

**Keywords:** Effectiveness, Knowledge, Sexual Transmitted Diseases, University Students.

## INTRODUCTION

Hereditary blood screening are very important investigation for premarital screening and counseling for unmarried students can be provided with sufficient and effective knowledge on genetic inheritance of the disease and what it means and who at risk <sup>1</sup>. Premarital screening (PMS) is one of the most main approaches for prevention of hereditary blood disorders, congenital deformities and several medical, psychosocial marital problems <sup>2</sup>. Hereditary Blood Disorders are the main causes of infant and child death, morbidity, and disability in Arab countries. Hereditary hematological diseases, especially sickle cell anemia (SCA), and thalassemia make up one of the most common groups of genetic disorders in the region. These are not considered fatal diseases, in as much as they have an

impact on the health of affected individuals, since they require continuous support and health care, which is translated as economic and psychosocial burdens on both the family and society <sup>3</sup>. Sickle cell anemia and thalassemia major are the most common inherited hemoglobinopathies and are a major public health problem worldwide. According to the World Health Organization, approximately 240 million people are carriers for these disorders and at least 200,000 affected individuals are born annually; approximately equally divided between sickle cell anemia and thalassemia <sup>4</sup>. G6PD deficiency is one of heredity blood disorder and it was quite prevalent in many Middle East and Mediterranean countries including Iraq. Data regarding prevalence of G6PD deficiency are available from different parts of Iraq including Baghdad, Basrah and Duhok provinces <sup>5</sup>. Based on the WHO has frequently recommended several methods and measures to control and prevent genetic diseases including health education and instruction to improve of community knowledge about control of hereditary blood diseases <sup>6</sup>. So, in respect to these concepts this study was conducted to measure the effect of instruction program for premarital

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hereditary blood diseases screening on the knowledge among university students

## METHODOLOGY

A quasi-experimental design (pretest-posttest approach) was conducted at six colleges and its college of education ibn rushd, college of political science, college of law, college of literature, college of media and college of language. This study was conducted during the period of 1<sup>st</sup> April 2017 to 5<sup>th</sup> May 2018. Multistage stratified random sample of (40) students for both group control and study group at Baghdad University colleges. A questionnaire, instructional booklet, guide booklet was used as a tool of data collection to fulfill with objective of the study and it is consisted of three parts. The questionnaire and content validity was carried out through the eight experts. Descriptive and inferential statistical analyses were used to analyze the data. The questionnaire is comprised of three parts. Part I: This part is consisted of (6) items which are focusing on the students' demographic characteristics of age, gender, , father's and mother's education, father's and mother's occupation and residence. Part II: This part is about sources of knowledge about premarital screening (PMS). Part III: This part is consisted of (7) main domain which are measuring the knowledge about PMS of hereditary blood diseases .Overall items included in this part are scored and rated as two items as one for 'Yes' (correct answer), zero for 'No' (incorrect answer), and 'I don't know' also given zero. Reliability of questionnaire is measure through the use pretest -posttest approach and computing of correlation coefficients ( $r=0.98$ ). For the internal scale and content validity is determined through panel of experts. Data are collected through the use of the constructed questionnaire and the interview technique as a means of data collection. Descriptive and inferential statistical analyses were used to analyze the data. which includes frequency, percentage, mean and mean of scores and inferential statistical data analysis approach which includes mean score, test, T-test and analysis of variance (ANOVA) by using the statistical package of social science (SPSS) version (22) at ( $P$ -value  $\leq 0.05$ ). Assessments Intervals Scoring Scales: [L: Low (0.00 – 33.33)]; [M: Moderate (33.34 – 66.66)]; [H: High (66.67 – 100)].

## RESULTS AND DISCUSSION

Table (1) shows that the highest percentage (75%)

in study and control group in age group (21-22) years, regarding to gender (70%) (62.5%) were 'female' respectively in study and control sample, regarding to father's education (42.5%) (54%) were 'Institute and over' respectively in study and control sample, regarding mother's education (25%) in study sample were 'intermediate' while (30%) were 'Institute and over' in control sample, regarding to father's occupation (42.4%) were 'Employee' in study sample while (35%) were 'free work', regarding to mother's occupation (85%) (75%) were 'house wife', respectively in study and control sample. regarding to original residency (75%) (72.5%) were live in 'urban' respectively in study and control sample, regarding current residency (90%) (77.5%) were 'live with family'. Table 2 shows, in study group sample the level of assessment related to (By which hereditary blood diseases can be transmitted) had (H-High) assessment that know the correct answer is by (heredity) in pre – post period , and level of knowledge improve from (M- moderate) in pre period to (H-High) assessment in post period in item (infection) and it's wrong answer, while in control group sample were had (H-High) assessment in previous items at pre – post period. In study group sample the level of assessment related to ((what is the meaning of a person carrying genetic traits?)) were had (M- moderate) assessment that know the correct answer is (the person carries the traits of hereditary blood disease but does not show symptoms) in pre – post period , and level of knowledge improvement from (M- moderate) assessment in pre period to (H-High) in post period that known the wrong answer is by (the person has a hereditary blood disease and does not have symptoms), while in control group sample were had (M-moderate) assessment that know correct answer in pre – post period, and (H-High) assessment that know the wrong answer in pre – post period about previous sub-main domains in pre – post period. Table (3) shows , ((what hereditary blood diseases include)), In study group sample the level of assessment were had (L, L, M and M) assessment at items "thalassemia, sickle cell anemia, anemia of glucose-6-phosphate dehydrogenase (G6PD) and Hemophilia in pre period respectively and the level of knowledge increase to (H, M, H and H) assessment respectively in post period. While in control group sample had (M- moderate) level of assessment that know thalassemia, sickle cell anemia and (G6PD) in pre – post period, and reported (H-High) assessment at previous items in pre – post period. Table (4) shows

, ((Heredity blood diseases can be diagnosed by )) ,In study group sample the level of assessment were had (L- Low) assessment for all the following items: “Mean Corpuscular Hemoglobin (MCH) For Thalassemia, Hemoglobin S (Hbs) for sickle cell anemia, hemoglobin electrophoresis test for sickle cell anemia, G6PD (enzyme) test for the disease of anemia Deficiency of dehydrogenase glucose 6 phosphate G6PD, Coagulation factor VIII, IX and XI for hemophilia and Calculation of blood clotting time for hemophilia in pre period and the level of knowledge increase to (H) in post period. While in control group sample were had (L) assessment in all previous items level of assessment in pre – post period. Table (5) showed that along pre-post periods in the light of studied sub main domains highly significant differences at  $P < 0.01$  are accounted in the study group, while all

of sub domains having no significant differences along pre-post periods concerning controlled group at  $P > 0.05$ . The results also show (75%), (72.5%) for both study and control group respectively they live in urban (Table 1) and this finding agreed with study that conducted by Farouk and Mahmoud, (2018), that (82.3%) live in urban<sup>8</sup>. The results also show (90%), (77.5%) for both study and control group respectively they live with their family (Table 1). Current study represent that (42.5%) and (57.5%) of studied sample in the study and control groups respectively reported they obtained information regarding premarital screening of sexual transmitted diseases were from friend and relative. Meanwhile, 1% of the study group and 5% of control group obtained information from school. And results shows that studied groups recorded no significant differences at  $P > 0.05$

**Table 1. Distribution of the studied groups according to socio-demographical characteristics variables with comparisons significant**

Socio-Demographical Characteristics variables	Classes	Study (N=40)		Control (N=40)		C.S. (*) P-value
		No.	%	No.	%	
Age group	21 - 22	30	<u>75</u>	30	<u>75</u>	C.C.=0.139 P=0.663 (NS)
	23 - 24	7	17.5	9	22.5	
	25 - 26	2	5	1	2.5	
	27 - 28	1	2.5	0	0	
Gender	Male	12	30	15	37.5	C.C.=0.079 P=0.478 (NS)
	Female	28	<u>70</u>	25	<u>62.5</u>	
Father's education	Don't read, don't write	1	2.5	2	5	C.C.=0.326 P=0.091 (NS)
	Read and write	6	15	1	2.5	
	Primary	5	12.5	1	2.5	
	Intermediate	6	15	6	15	
	Secondary	5	12.5	12	30	
	Institute and over	17	<u>42.5</u>	18	<u>45</u>	
Mother's education	Don't read, don't write	2	5	0	0	C.C.=0.219 P=0.544 (NS)
	Read and write	5	12.5	4	10	
	Primary	7	17.5	6	15	
	Intermediate	10	<u>25</u>	7	17.5	
	Secondary	7	17.5	11	27.5	
	Institute and over	9	22.5	12	<u>30</u>	

**Table 2. Summary Statistics of Knowledge related to Premarital Screening of Hereditary Blood.**

Knowledge of premarital Screening for Hereditary Blood Disease items	Period MS	Study (N=40)			Control(N=40)			C.S.
		RS%	Ass.	MS	RS%	Ass.		
By which hereditary blood diseases can be transmitted								
Heredity Post	Pre	0.70	70	H	0.70	70	H	NS
		0.68	68	H	0.70	70	H	HS
Infection Post	Pre	0.53	53	M	0.70	70	H	NS
		0.75	75	H	0.70	70	H	HS
What is the meaning of a person carrying genetic traits?								
The person carries the traits of hereditary blood disease but does not show symptoms Post	Pre	0.53	53	M	0.57	57	M	NS
		0.45	45	M	0.55	55	M	HS
The person has a hereditary blood disease and does not have symptoms Post	Pre	0.55	55	M	0.80	80	H	NS
		0.83	83	H	0.80	80	H	HS
What is the meaning of a person with a hereditary blood disease?								
The person has genes responsible for hereditary blood disease and has symptoms Post	Pre	0.55	55	M	0.50	50	M	NS
		0.48	48	M	0.50	50	M	HS
The person carries the traits of genes responsible for hereditary blood disease and does not show symptoms Post	Pre	0.87	87	H	0.92	92	H	NS
		0.97	97	H	0.92	92	H	HS
In which case incidence of hereditary blood disease increase								
Relative marriage Post	Pre	0.77	77	H	0.80	80	H	NS
		0.73	73	H	0.80	80	H	HS
Distant marriage Post	Pre	0.93	93	H	0.95	95	H	NS
		1.00	100	H	0.95	95	H	HS

**Table 3. Summary Statistics of Knowledge related to Premarital Screening of Hereditary Blood according to (what heredity blood diseases include)**

Knowledge of premarital Screening for Hereditary Blood Disease items	period	Study (N=40)			Control(N=40)			C.S.
		MS	RS%	Ass.	MS	RS%	Ass.	
<b>Heredity blood diseases include:</b>								
Thalassemia	Pre	0.25	25	L	0.42	0.50	M	NS
	Post	0.75	75	H	0.42	0.50	M	HS
Sickle cell anemia	Pre	0.25	25	L	0.50	0.51	M	NS
	Post	0.62	62	M	0.50	0.51	M	HS
Anemia of Glucose-6-phosphate dehydrogenase (G6PD)	Pre	0.35	35	M	0.60	0.50	M	NS
	Post	0.85	85	H	0.60	0.50	M	HS
Hemophilia	Pre	0.63	63	M	0.80	0.41	H	NS
	Post	0.98	98	H	0.80	0.41	H	HS

**Table 4. Summary Statistics of Knowledge related to Premarital Screening of Hereditary Blood according to (Diagnosis)**

Knowledge of premarital Screening for Hereditary Blood Disease items	Period MS	Study (N=40)			Control(N=40)			C.S.
		RS%	Ass.	MS	RS%	Ass.		
Heredity blood diseases can be diagnosed by								
Mean Corpuscular Hemoglobin (MCH) For Thalassemia	Pre	0.15	15	L	0.15	0.36	L	NS
	Post	0.72	72	H	0.15	0.36	L	HS
Hemoglobin S (Hbs) for sickle cell anemia	Pre	0.15	15	L	0.03	0.16	L	NS
	Post	0.72	72	H	0.03	0.16	L	HS
Hemoglobin electrophoresis test for sickle cell anemia	Pre	0.08	7.5	L	0.10	0.30	L	NS
	Post	0.70	70	H	0.10	0.30	L	HS
G6PD (enzyme) test for the disease of anemia Deficiency of dehydrogenase glucose 6 phosphate G6PD	Pre	0.25	25	L	0.15	0.36	L	NS
	Post	0.80	80	H	0.15	0.36	L	HS
Coagulation factor VIII, IX and XI for hemophilia	Pre	0.20	20	L	0.18	0.38	L	NS
	Post	0.73	73	H	0.18	0.38	L	HS
Calculation of blood clotting time for hemophilia	Pre	0.23	23	L	0.30	0.46	L	NS
	Post	0.75	75	H	0.30	0.46	L	HS

**Table 5. Summary Statistics of Knowledge related to Premarital Screening Questionnaire’s sub main domains in (Pre, and Post) Periods of applying proposed instructional program in the studied groups with Comparisons Significant**

Knowledge of premarital Screening of Hereditary blood diseases	Periods	Study (N=40)			Control(N=40)		
		PGMS	t-test	P-value	PGMS	t-test	P-value
Hereditary blood diseases transmitted by	Pre	80.00	-0.467	0.643 NS	77.50	0.000	1.000 NS
	Post	82.50			77.50		
What is the meaning of a person carrying genetic traits?	Pre	51.25	-0.961	0.343 NS	62.50	0.000	1.000 NS
	Post	60.00			62.50		
What is the meaning of a person with a hereditary blood disease?	Pre	55.00	-1.016	0.316 NS	65.00	0.000	1.000 NS
	Post	65.00			65.00		
Incidence of hereditary blood disease increase in?	Pre	82.50	-0.443	0.660 NS	86.25	0.000	1.000 NS
	Post	85.00			86.25		
Hereditary blood diseases include	Pre	28.75	-6.980	0.000 HS	50.00	0.000	1.000 NS
	Post	76.25			50.00		
Genetic blood diseases can be diagnosed by	Pre	16.00	-10.683	0.000 HS	10.50	0.000	1.000 NS
	Post	75.50			10.50		
Screening for Hereditary Blood Disorders	Pre	56.01	-6.010	0.000 HS	63.53	0.000	1.000 NS
	Post	76.44			63.53		

**CONCLUSION**

The instructional program significantly carried out improvements in the knowledge of university students regarding premarital screening of hereditary blood diseases.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Maternal and Newborn Nursing Unit, College of Nursing, University of Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Evaluation of Anti-nociceptive Activity of 940 Nanometer Low Level Laser Therapy on Temporomandibular Joint in Rats

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## ABSTRACT

The usual cause that makes the patient requesting doctor advice is pain which is commonly found in many temporomandibular joint disorders (TMDs). TMDs don't follow simple etiological pathway nor simple treatment protocol and majority of these treatments protocols are targeted to pain therapy which is carried out using opioid and/or non-steroidal anti-inflammatory drugs (NSAIDs) and these drugs carry many side effects, thus there is great interest to patients as well as to clinicians to develop new kinds of treatments which are more effective and safer. low-level laser therapy with infra-red spectrum are good to treat deeply damaged tissues, such as that in TMDs without side effects but the optimum wavelength and energy density is still unknown. This study was done to assess anti nociceptive and analgesic effectiveness of 940 nm low level diode laser using two energy density 171 and 74 J/cm<sup>2</sup> by formalin test which is a valid well documented technique to assess analgesic, and comparing the results with control groups and diclofenac pretreated group. The results showed that LLLT significantly reduced the nociceptive responses induced by formalin. It was concluded that LLLT with energy density 74J/ cm<sup>2</sup> had very good anti nociceptive effect.

**Keywords:** TMJ, diode laser, formalin test, anti-nociceptive, LLLT.

## INTRODUCTION

Pain is commonly found in many temporomandibular joint disorders(TMDs) and it is the major symptom associated with the most of these TMDs <sup>1,2</sup> thus it is the usual cause that makes the patient requesting doctor advice <sup>3,4</sup>.TMDs are one of the most difficult disorder to be treated <sup>5,6</sup> because the exact etiology of most of these disorders is still unknown <sup>7</sup> and this uncertainty about the etiology makes the classification of these disorders based only on signs and symptoms <sup>8</sup> and collectively, these facts makes TMDs don't follow simple etiological pathway nor simple treatment protocol and majority of these treatments protocols are targeted to pain therapy<sup>7</sup>. Pain control in this major health problem <sup>5,6,8</sup> is carried out using opioid and/or non-steroidal anti-inflammatory drugs (NSAIDs) <sup>1,10,11</sup> which carry many side effects <sup>12</sup> such as increasing the risk of thrombotic events <sup>13</sup>, gastrointestinal upset <sup>14</sup> and some halt immune response<sup>9</sup>, thus there is great interest

to patients as well as to clinicians to develop new kinds of treatments which are more effective and safer. The analgesic effectivity of low level laser therapy (LLLT) in treating pain of traumatic or neuropathic origin has been confirmed by qualified clinicians in the medical field <sup>15</sup>, Beside that, patient acceptance and decrease drugs using to treat pain and thus decrease expected side effects of these drugs makes using laser phototherapy a charmed choice <sup>16</sup>. LLLT is the treatment that use light source of single wavelength which acts through photochemical non-thermal reactions in targeted cells <sup>7</sup>, most of therapeutic lasers used in biostimulation are operate in the red to infrared spectrum of light, both have biostimulation power but penetration depth in the infra-red spectrum much more than that in red spectrum Therefore, low-level laser therapy with infra-red spectrum are optimum to treat deeply damaged tissues, such as that in TMDs <sup>18</sup>. The aim of this study was to evaluate the anti-nociceptive and analgesic activity of low level laser therapy (LLLT) of wavelength 940 nm

with two different energy 171J/cm<sup>2</sup> and 74J/cm<sup>2</sup> and compare the nociceptive behavioral changes of these groups with control groups and diclofenac treated group to clarify the effectiveness and optimum energy needed to treat TMDs pain.

## MATERIALS AND METHOD

### Subjects

Following approval by the Committee of the college of Dentistry of the University of Baghdad, fifty male Wistar rats (150-200g) obtained from the animal house of the higher institute of infertility diagnosis and research assisting production of the University of Al-Nahrin were used in this study. Animals kept in acrylic cages lined with wood chips and maintained at 24 °C in a day/night light cycle with limitless access to food and water. Procedure was carried out in the animal house during light period of the day from 8:30 a.m. to 12:30 p.m.

### Preparation and calibration of laser device

Diode laser device emitting 940 nm ±10 wave length, 10-watt max power with deep tissue pain therapy hand piece was used in this study. Calibration of laser power output was made in the institute of laser graduated studies, university of Baghdad, using Laser power and energy meter (Mastero, Gentec, Quebec, Canada). After attaching the hand piece to the laser device, laser parameters were set to continuous mode (CW) with power 4 watts According to manufactural recommendations the hand piece was calibrated to emit laser in diameter of 15 millimeters. A diaphragm made of tin foil with central circular opening measure ten millimeters fixed to the hand piece. This opening would be delivering the laser power to TMJ and surrounding tissue of the rats and in the same way the diaphragm would protect the eye and other parts of the rat. The output power measured by Laser power and energy meter was ~1.5 watt. Then the input power was set to 1.6 watts and output power was 0.650 watts.

Rats were randomly assigned in five experimental groups:(table 1)

Group one (negative control): Rats were subjected to injections in the intraperitoneal region containing 0.2 mL saline solution (0.9%), then after 1 hr. in the TMJ one containing saline. For standardization, the

laser handpiece were applied on the TMJ without laser irradiation.

Group two (positive control): Rats were subjected to injections in the intraperitoneal region containing 0.2 mL saline solution (0.9%), then after 1 hr. in the TMJ one containing formalin. For standardization, the laser handpiece were applied on the TMJ without laser irradiation.

Group three: Rats were subjected to injections in the intraperitoneal region containing diclofenac sodium 10 mg/kg., then after 1 hr. in the TMJ one containing formalin. For standardization, the laser handpiece were applied on the TMJ without laser irradiation.

Group four: Rats were subjected to injections in the intraperitoneal region containing 0.2 mL saline solution (0.9%), After 1 hr. the TMJ region injected with formalin followed by Irradiation with ~171 J/cm<sup>2</sup> then Intraperitoneal injections of 0.2 mL saline solution (0.9%)<sup>1</sup>.

Group five: Rats were subjected to injections in the intraperitoneal region containing 0.2 mL saline solution (0.9%), After 1 hr. the TMJ region injected with formalin followed by Irradiation with ~74 J/cm<sup>2</sup> then Intraperitoneal injections of 0.2 mL saline solution (0.9%)<sup>25</sup>.

In order to ensure that all rats of the experiment were subjected to the same stressor conditions, we performed normal saline intraperitoneal injection without laser irradiation Table 1.

### Formalin injection

The rats were anesthetized by inhalation of Diethyl ether (stab/ BHT, Netherlands) in close plastic container then hair on TMJ area were removed using hair removal cream and plastic spatula then the posteroinferior border of the left zygomatic arch was palpated and a needle (30G\*8 indolor® experience) of an insulin syringe was inserted immediately below this point and then advanced in the anterior direction until reaching the posterolateral aspect of the condyle. Then, 50 µL of the chemical agent was injected into the left TMJ<sup>1</sup>

### LLLT procedure

Laser irradiation were conducted immediately after formalin injection while the animal still anesthetized

using Biolase epic X Semi-conductor diode laser of 940 nm. Irradiation delivered by deep tissue pain hand piece covered with diaphragm of double layer of tin foil and central opening with 1 cm diameter in direct contact with the target area in right angle with a spot size Diameter of 10mm and area of 0.7857 cm<sup>2</sup> (table 2).

### Measurement of nociceptive response

Following the TMJ formalin injections as well as the treatment procedures, the animals recovered from the anesthesia were returned to the test chamber for a 45 min observation period. The recording time was divided into blocks of 3 min. and was quantified by the time (seconds) that the rats spent rubbing the orofacial region asymmetrically with the ipsilateral fore or hindpaw. The occurrence of flinches with the head in an intermittent and reflexive way, characterized by high-frequency shakes of the head, was expressed as one score <sup>1</sup>, the counts were made by three examiners and the different nociceptive behaviors were evaluated together by their sum.

### Statistical analysis

Data were analyzed using SigmaStat for Windows version 4.0 build 4.0.0.37, Systat, USA. And the figures were made using Microsoft office 2016, and were analyzed using Normality Test (Shapiro-Wilk) and one-way analysis of variance (ANOVA), and to isolate the group or groups that differ from the others All Pairwise Multiple Comparison Procedures (Tukey Test) were used, value less than 0.05 in the probability level was considered to indicate statistical significance.

## RESULTS AND DISCUSSION

Behavioral nociceptive changes induced by formalin injection into the TMJ of rat characterized by rubbing of the TMJ region and flinching of head was counted by their sum separately and together. Normality Test (Shapiro-Wilk) Passed in the three tests (flinching, rubbing and sum of both) as shown in figure (1) and the p value was <0.001 which indicate that the differences in median values among experimental groups are greater than would be expected by chance. Using Tukey Test revealed significant increase ( $p < 0.001$ ) in all tested parameters in positive control group (formalin injection without treatment) in comparing to negative control group (normal saline injection). The diclofenac injection

10mg/kg via intraperitoneal injection one-hour prior to formalin injection significantly reduced flinching ( $p = 0.019$ ), rubbing ( $p < 0.001$ ) and when analyzed together the p value was 0.001). LLLT with fluencies of ~171 J/cm<sup>2</sup> significantly reduced flinching ( $p = 0.048$ ) and rubbing ( $p < 0.001$ ) but with no significant reduction when analyzed together. Non-significant differences were noticed between laser treated group and diclofenac treated group when analyzed separately and together; flinching ( $p = 1$ ), rubbing ( $p = 0.857$ ) and in both ( $p = 0.743$ ) Regarding LLLT group with ~74 J/cm<sup>2</sup> results showed significant decrease in nociceptive behavioral changes when analyzed separately and together ( $p < 0.001$ ). As with LLLT with ~171 J/cm<sup>2</sup> Non-significant differences were noticed between laser treated group and diclofenac treated group; when analyzed separately and together; flinching ( $p = 0.706$ ), rubbing ( $p = 1$ ) and in both ( $p = 0.997$ ). Understanding the scientific mechanisms of TMJ disorders have been evolved through the past years but the challenge of pain control has not been solved yet. The use of medications such as NSAIDs is still the primary treatment which carry many well-known side effects. Thus the development of safer and effective pain control for TMD pain is scientifically and clinically relevant. LLLT with different wavelengths and different energies had been used to manage pain in many types of TMD and other body joints. The results of this study showed that 940 nm LLLT with energy density 171 J/cm<sup>2</sup> and 74 J/cm<sup>2</sup> used in this study effectively reduced pain provoked by formalin injection in TMJ and the results of 74 J/cm<sup>2</sup> energy density had the superiority in pain reduction over 171J/cm<sup>2</sup>. And this findings were in agreement with Barretto et al., who used diode laser with wavelength 780nm <sup>1</sup> and with Zeredo et al., who used laser irradiation with 2940nm. When the results of laser treated groups with energy density 171J/cm<sup>2</sup> and 74 J/cm<sup>2</sup> compared with diclofenac treated group, no statistical differences were found revealing that LLLT with wavelength 940 nm have the same efficiency of diclofenac as analgesic and pain control agent. this result had agreement with Zeredo et al., who reported non-significant difference between LLLT group with wavelength 2940 and diclofenac treated group but with disagreement with Barretto et al who revealed significantly reduction in nociceptive response using 780nm LLLT comparing to diclofenac treated group <sup>1</sup>.

**Table 1. Experimental groups**

Group no	Intra Peritoneal injection one hour prior	TMJ injection	Laser irradiation power density (J/cm <sup>2</sup> )
Group 1 negative control	0.2 mL saline solution (0.9%)	Saline	0
Group 2 positive control	0.2 mL saline solution (0.9%),	formalin	0
Group 3 diclofenac treated	diclofenac sodium 10 mg/kg	formalin	0
Group 4 laser treated with 171 J/cm <sup>2</sup>	0.2 mL saline solution (0.9%),	formalin	171
Group 5 laser treated with 74 J/cm <sup>2</sup>	0.2 mL saline solution (0.9%),	formalin	74

**Table 2. Laser parameters**

parameters	Experimental group treated with LLLT 171J/cm <sup>2</sup>	Experimental group treated with LLLT 74J/cm <sup>2</sup>
Power mode	Continuous	Continuous
Wavelength	940±10	940±10
Power set on device	4 watt	1.6 watt
Power output	~1.5 watt	~0.650 watt
Spot size	Diameter 10mm, area 0.7857 cm <sup>2</sup>	Diameter 10mm, area 0.7857 cm <sup>2</sup>
Power density	~1.91 watt/cm <sup>2</sup>	0.83 watt/cm <sup>2</sup>
Irradiation time	90 second	90 second
Energy density	171J/cm <sup>2</sup>	74J/cm <sup>2</sup>
Hand piece angle	90°	90°

## CONCLUSION

This study was done to assess anti nociceptive and analgesic effectiveness of 940 nm low level diode laser using two energy density 171 and 74 J/cm<sup>2</sup> by formalin test which is a valid well documented technique to assess analgesic, and comparing the results with control groups and diclofenac pretreated group. The results showed that LLLT significantly reduced the nociceptive responses induced by formalin. It was concluded that LLLT with energy density 74J/ cm<sup>2</sup> had very good anti nociceptive effect.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Department of oral diagnosis,

college of dentistry, university of Baghdad, Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Hypertension Screening in Adults under Thirty in Babylon Community

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## ABSTRACT

A descriptive study was carried from 7th February 2018 to 3th May 2018 which is implement on non-probability samples of 340 patients with hypertension in age under thirty years' old at primary health care centers'. The aims of the study to identify the demographics data of the sample and to know the early Hypertension screening for adult under thirty years old and to indicated the relationship between the demographics data and early Hypertension screening. The instrument used to assess early hypertension screening in adults under thirty years' old, the questionnaire consists of seven parts, the demographic data, behavioral data, the patient history, the medical history, The Physical Examination, Presentation Consists of Symptoms, and Signe. The analyses were conducted by SPSS version 23, test of ANOVAa (Analysis of Variance) and Regression. The most prominent findings of the study are physical examination statistical analysis also indicates a negative association between BMI and blood pressure among the participants, most were suffering from headache, dyspnea and nocturia current proof backings the use of way of life adjustments to control blood pressure.

**Keyword:** Community, Hypertension, Babylon, Patients.

## INTRODUCTION

Hypertension is a noteworthy modifiable hazard factor for cardiovascular mortality. It is likewise a worldwide wellbeing concern, influencing roughly 20% of the grown-up populace in many nations. Hypertension is in charge of 20% to half of all cardiovascular mortality and dismalness, which adds to expanded social insurance costs . Hypertension is its very own sickness substance. It stays noiseless being asymptomatic amid its clinical course. Due to its asymptomatic appearance, it does gigantic mischief to the body as target organ harm, as a consequence of the WHO has named it the " silent killer <sup>1</sup>. Hypertension known as a worldwide general wellbeing challenge, is a condition in which the vessels have increased blood pressure continuously. It might prompt heart attacks, stroke, kidney failure, visual impairment, burst of veins and subjective

weakness <sup>2</sup>. Raised blood pressure is evaluated to have caused 9.4 million passing's and 7% of malady trouble – as estimated in DALYs – in 2010. In the event that left uncontrolled, high blood pressure reason stroke, myocardial localized necrosis, cardiovascular fail, dementia, kidney fail and visual impairment (Report World Health Organization 2014). There is solid logical confirmation of the medical advantages of bringing down blood pressure through populace wide and individual (behavioral and pharmacological) mediations. The worldwide pervasiveness of raised blood pressure (characterized as systolic or potentially diastolic pulse equivalent to or over 140/90 mmHg) in grown-ups matured 18 years and through was about 22% out of 2014 (Report World Health Organization 2014). One of the way of life alteration systems is normal physical exercise. In this manner, one of the key designs is to expand the pervasiveness of direct serious physical action to 150 min for every week by 10% for people over the age of 18 years <sup>3</sup>. Characterized by the World Health Organization as a blood pressure  $\geq 140/90$  mmHg, hypertension is a noteworthy known hazard factor for ceaseless conditions, for example, cardiovascular ailment, hemorrhagic stroke, and renal

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failure<sup>4</sup>.

## METHODOLOGY

### The study design

A descriptive study was carried on primary health care centers. The study is conducted to assessment of early Hypertension screening in adults under thirty years old in Al Hilla City from 7<sup>th</sup> February 2018 to 3<sup>th</sup> May 2018.

### The study Sample

Non the probability “purposive” sample of (340) the patient with hypertension were selected out early detection of hypertension and type 2 diabetes mellitus unity of the Health Care Centers in the city of Hilla for the current study and enjoy services the Primary Health.

### The Study tool

We used a standard questionnaire to collect information from the Department of Public Health, the department of non -communicable diseases, and conducted some changes according to the study. It consists of seven parts.

### Methods of data collection

From 15 February to 18 March 2018, after obtaining permission from the primary health care sector, data from patients with hypertension were collected during the age of less than 30 years through the early detection program for hypertension and diabetes. Data collection in the larger room is the number of reviewers who have reviewed the centers and found that they have high blood pressure during the period from 2015 to 2017 the average time to collect information in each health center hours to 3 hours depending on the number of patients' files in each health center.

### Statistical Data analysis

Information of the present examinations is broken down during the utilization of Statistical Package of Social Sciences (SPSS) version 23, The accompanying statistical data analysis approaches are utilized as part of the request to break down and assess the consequences of the investigation:

### The data analysis descriptive:

This process was implemented during the assurance

of

### A. Percentage and Frequency

percentage

### B. Regression

### C. Analysis of Variance (ANOVAa)

## RESULTS AND DISCUSSION

Table 1 participant characteristics are shown 340 subjects, age 20 to 29 years, participated in the screening program; 79.4% (270 of 340) were female and 20.6% (70 of 340) were male. The majority of participants 57.6% (196 of 340) had received a primary and most participants were house wife 73.2% (249 of 340). Table 2 shows the behavioral data of the study participants. most of the patients were nonsmoker 294 of 340 the percentage (86.5%) participants and patients' smoker cigarettes per day 49 Of 340 the percentage (13.5%) participants, physical activity of participants during work and traveling was the highest percentage medium (70.6%), physical activity of participants during rest was the highest percentage hard (55.6%), most of the participants were using vegetable oils in nutrition percentage (97.6%), The highest percentage of participants were the number of fruit and vegetable meals per day percentage (88.5%). Table 3 shows patient history of the study participants. Highest percentage hypertension (79.1%) of client's health history and percentage hypertension (61.8%) of family health history and participants not under treatment (54.7%) and under treatment (45.3%) percentage. The findings of the present study show that the majority of the studies patients with hypertension are in the age group (25-29) years. This result is almost similar to that of Kini et al. (2016) Southern India whose findings indicate that the majority of the studied subjects were (25-30) years. Another study Yan et al. (2015) in rural Zambia the age standardized pervasiveness of hypertension was high at more than one-fourth of adults aged  $\geq 25$  years, another study Nyuyki et al. (2017) study in East and Adamawa regions of Cameroon, the majority (65.1%) were aged 20–39 years, Tabi Arrey (2016) (39.5%) were between 20 and 29 years. Liu et al. (2017) in the Tujia-Nationality Settlement of China, Youngsters experience intense pressure with respect to any adjustments in the economy, which is a principle factor of numerous unending sicknesses. Regarding the

gender of the majority of the study sample, (79.4%) were female while male was (20.6%). Similar to the findings of a previous study Kayima et al. (2015) study in Uganda's capital city, Africa and their results indicated. The majority of the participants (69%) were female another study Nyuyki et al. (2017) study in East and Adamawa regions of Cameroon, were mostly made of women (68.2%). Concerning with educational status, the findings of the present study reveal that most of studied subjects (57.6%) were primary, this result is supported by study of Dyal (2016) Guyana in South America who studied the majority of participants (67%) had received only a primary school level of education or less, another study Joshi et al. (2014) urban slum of Kibera in Nairobi which revealed that Literacy was high (87%), first or secondary level of educational attainment and Tabi Arrey (2016) 35.9% had primary education. Regarding to occupational status the majority of sample (73.2%) were house wife, this results is supported by Awoke et al. (2012) in Gondar city North-West from Addis Ababa, the Ethiopian capital the majority of sample (35.3%) were housewives, that result is expected because of the nature of the Iraqi society most housewives without profession. The key finding of the present study showed that majority of the study sample were no smoking because most participants were female that result is expected because of the nature of the Iraqi society most woman no smoking this results is supported by Abd Al-Badri et al. (2017) in Iraq STEPS study Iraq (2015) demonstrated that two out of ten Iraqi grown-ups were present smokers, and by far most of those (95%) were day by day smokers. The predominance of current smoking was 38% among men, while it was 1.9% among ladies. Regarding to the physical activity the finding of the present study show that majority of the study sample were medium, this results is supported by Nomasonto et al. (2017) in South Africa urban areas Soweto, exhibited by not participating in customary physical exercise, which thus, brought about uncontrolled BP and cardiovascular entanglements from hypertension. More ought to be done to instruct, propel and engage patients with the important information, aptitudes and the qualities in encouraging their own standard physical exercise keeping in mind the end goal to enhance their own nature of wellbeing. Concerning nutrition (type of the oil using in the food) and (number of meals of fruits and vegetables) the finding of the present study shows that majority of the study sample were vegetable oil in the daily, this results is supported by Angaw et al. (2015)

in Addis Ababa, Ethiopia, Majority part (93.6%) 582 of the participant eat fruit one to three days for every week and (80.2%) 501 of the members announced their vegetable utilization one to three times each week and another studies Alsayyad et al. (2007) in the Kingdom of Bahrain, The everyday admission of vegetables among respondents was higher than the day by day admission of intake of fruits (62.9% and 49.6% individually). In the present study there is a Clients health history the finding study shows that majority of the study sample (79.1%) were have hypertension, this results is supported by Ranasinghe et al. (2015) in Sri Lankan, was present in (48.0%) of patients with hypertension.

**Table 1. The distribution of the study sample by their demographical data.**

Age(years)	Frequency(F)	Percent(%)
20-24	124	36.5
25-29	216	63.5
Total	340	100.0
Gender	Frequency(F)	Percent(%)
Female	270	79.4
male	70	20.6
Total	340	100.0
Educational status	Frequency(F)	Percent(%)
Not read and write	14	4.1
Read and write	6	1.8
Primary	196	57.6
Intermediate	72	21.2
Secondary	37	10.9
Collage / Diploma	15	4.4
Total	340	100.0
Occupational status	Frequency(F)	Percent(%)
government employee	11	3.2
Government Employee (Private Sector)	7	2.1
owner benefit	13	3.8
Daily worker	42	12.4
Student free	15	4.4
House wife	249	73.2
Unemployed	3	.9
Total	340	100.0

**Table 2. The distribution of the study sample by their behavioral data**

Smoking	Frequency(F)	Percent(%)
No	294	86.5
Yes	46	13.5
Total	340	100.0
how many cigarettes per day	Frequency(F)	Percent(%)
No Smoking	294	86.5
Less one Packet/day	28	8.2
One Packet/day	11	3.2
More than one Packet/day	7	2.1
Total	340	100.0
Physical activity during working	Frequency(F)	Percent(%)
hard	76	22.4
medium	240	70.6
little	24	7.1
Total	340	100.0
physical activity during rest	Frequency(F)	Percent(%)
hard	189	55.6
medium	102	30.0
little	49	14.4
Total	340	100.0
Nutrition (type of the oil using in the food)	Frequency(F)	Percent(%)
vegetable oil	332	97.6
vegetable margarine	8	2.4
Total	340	100.0

**Table 3. The distribution of the study sample by their patient history**

Clients health history	Frequency(F)	Percent(%)
No History	18	5.3
Hypertension	269	79.1
Ischemic heart disease	20	5.9
Diabetes mellitus	13	3.8
Cerebrovascular disease	10	2.9
High cholesterol	10	2.9
Total	340	100.0
Family health history	Frequency(F)	Percent(%)
No History	67	19.7
Hypertension	210	61.8
Ischemic heart disease	13	3.8

Diabetes mellitus	10	2.9
Cerebrovascular disease	18	5.3
High cholesterol	22	6.5
Total	340	100.0
Have you under treatment?	Frequency(F)	Percent(%)
No	186	54.7
Yes	154	45.3
Total	340	100.0

### CONCLUSION

The main conclusion of this study is assessment of early Hypertension screening in adults under thirty years' old. The majority of hypertension were female and their ages between (25-29) years. Assessment of early Hypertension screening during analysis data base in the program related of patient detection of hypertension. Behavioral data were found to be no affected between smoking and hypertension. Patient history was found to be no affected family and client history and hypertension. Physical examination statistical analysis also indicates a negative association between BMI and blood pressure among the participants. Symptoms most were suffering from headache, dyspnea and nocturia current proof backings the use of way of life adjustments to control blood pressure. These alterations incorporate the control of all conceivable related factors with a specific end goal to optimal blood pressure.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Community Health Nursing, Faculty of Nursing, University of Babylon, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Hypertensive Patients' Practices Regarding Lifestyle Changes in AL- Amarah City at South of Iraq

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## ABSTRACT

The study aims to assess hypertensive patient's practices regarding lifestyle changes and to find out the relationship between patients practices and certain variables; age, gender, marital status, educational status, number years of diagnosis with hypertension, history of family member with hypertension source of information & Employment. A descriptive study was carried out in medical wards of Al-sadder teaching hospital at south of Iraq. A non-probability sample of (100) hypertensive patients (male & female), who were admitting in medical wards, the data was collected through the use of instrument. Direct interview technique was used to collect data from hypertensive patients. Descriptive statistical analysis procedures (frequency, percentage, mean of score) and inferential analysis procedures (chi-Square) were used for the data analysis. The results of the study indicate that the majority of items have low mean score (less than 1.66) for practice. There is a significant relationship between patients' practice regarding hypertension and some socio-demographic characteristics (level of education, Number Years of diagnosis with hypertension, History of Family member with hypertension). From the results it is concluded that the patient have inadequate or deficit in some aspects related lifestyle change regarding hypertension disease.

**Keyword:** Hypertensive, Risk factors, Public health

## INTRODUCTION

Universally, hypertension is a major public health problem. Identification of risk factors for hypertension supports intervention policies to minimize the disease morbidity and mortality. Hypertension is the second most common reason for an outpatient physician visit in the United States, accounting for approximately 30 million visits a year <sup>1</sup>. Hypertension disease is a silent killer, and many people with hypertension are not aware that they have the condition. Hypertension disease is influenced by many risk factors, which are connected to the lifestyle. Global modifiable risk factors of hypertension are either preventable or controllable either by health education or health promotion programs. Identifying risk factors for hypertension leads to specific preventive interventions that are favorably affect public health in all countries <sup>2</sup>. Iraq is experiencing urbanization and modernization which cause changes in diet and physical activity particularly in the cities including. Like many other developing countries, as a result of

increased longevity and improvement in the standard of living as well as the influence of the western lifestyle such as cigarette smoking, hypertension has assumed a major public health dilemma (Researcher). Lifestyle modifications were including; weight control, limitation of alcohol consumption, increased physical activity, increased fruit and vegetable consumption, reduced total fat and saturated fat intake, and smoking cessation <sup>3</sup>. Also dietary approach to control hypertension, (DASH) eating plan which are effectively lower hypertension should be encouraged for these patients. It emphasizes fruits, vegetables, and low-fat dairy products and reduces in fat and cholesterol, other dietary factors, such as a greater intake of protein or monounsaturated fatty acids, may also reduce blood pressure <sup>4-7</sup>. Furthermore, hypertension is one of the leading causes of premature death worldwide, accounting for 7.6 million deaths in 2001. The number of adults with hypertension in 2025 was predicted to increase by 60% to a total of 1.56 billion adults <sup>8</sup>. Hypertension is the most common

chronic disease with sudden onset, and it is called the “silent killer” because it progressively and permanently damages organs. Hypertension causes several heart, brain and kidney diseases, resulting in severe and life-threatening complications, as well as death<sup>9-12</sup>. Global burden of hypertension by Kearney et al, 2005 projected that the number of adults with hypertension will increase by 60% to a total of 1.56 billion (1.54 billion–1.58 billion) in 2025. Most of this rise can be attributed to an expected increase in the number of people with hypertension in economically developing regions, where by between 2000 and 2025, the worldwide prevalence of hypertension was predicted to increase by 9% in men and 13% in women because of projected changes in the age distribution of the population. Specifically, a larger proportion of the world population is expected to be older by 2025(Alphonse,2012). The present study was conducted to develop an instrument for measuring the knowledge level and practices of iraqi adults concerning hypertension and to establish the instrument’s validity and reliability.

## MATERIALS AND METHOD

A descriptive study was carried out at medical wards in Al-sader teaching hospital. The study started from November 11<sup>th</sup>, 2017 to January 20<sup>th</sup>, 2018. A non-probability sample of (100) hypertensive patients (male & female), who were admitting in medical wards, The data was collected through the use of instrument, which consists of two parts. Part (1), demographic data form, consists of (8) items and part(2), consist from (11) items dealing with hypertensive patient practices toward lifestyle changes. Direct interview technique was used to collect data from hypertensive patients. The validity of the instrument was determined through presenting it to (5) specialist’s experts and its reliability was determined through a pilot study which was carried out through the period November 11<sup>th</sup>, 2017 to December 20<sup>th</sup>, 2017. Descriptive statistical analysis procedures (frequency, percentage, mean of score) and inferential analysis procedures (chi-Square) were used for the data analysis.

## RESULTS AND DISCUSSION

The results of table (1) show that the majority of age group of the study sample are within (56-60) years (27%). The above table also shows that the majority of participants are female (55%). Also, regarding to the

subjects level of education, the results show that more than half of them No read & write (52%). In addition, majority of them was married (71%). More than of the half of the samples has (1-5) years of diagnosis with hypertension (53%). In regarding to the subjects Family history member with hypertension, the majority of the study sample (70%) have positive history. In the above table the results show that the Sources of information’s regarding disease from health care workers(92%). Finally, concerning the Employment, the majority of study sample (51%) was housewife. Table(2) reveals that there is low mean of scores for all items related to Patients practices regarding life style changes except items (2,5,10) which show moderate mean of score and item (9) is of high mean of score, with average mean score of (1.66). Table (3) indicates that there was a significant relationship between patients’ practices regarding hypertension and their level of education at ( $P < 0.05$ ), when analyzed by chi-square test. Table (4) indicates that there was a significant relationship between patients’ practices regarding hypertension and their Number Years of diagnosis with hypertension. at ( $P < 0.05$ ), when analyzed by chi-square test. Table (5) indicates that there was a significant relationship between patients’ practices and History of Family member with hypertension. at ( $P < 0.05$ ), when analyzed by chi-square test. The highest proportion (27%) of them are within age group (56-60)yrs, and (15%) within age group (60yrs & above), which indicate that approximately (42%) of studied samples are within age group (56 & above)yrs. This result disagrees with Awotidebe, et al., 2014, who showed that the majority (70%) of the his study sample were within age group (55 & above)yrs. Through the data analysis distribution of demographic variables, table (1) reveals that the most of the samples are female (55%). Result of this study disagree to study done by Malik, (2015) which revealed those (60%) of hypertensive patients were males. Regarding the subject of the educational levels, approximately (52%) of the study sample are illiteracy. This finding disagree with Seham ,(2015)who found that the (10%) of sample were illiteracy. Concerning Marital status, the majority of participants (71%) were married. this result comes with (Seham, 2015) who demonstrate that the (70%) were married. Regarding Number Years of diagnosis with hypertension, (53%) of the study sample have (1-5)yrs since diagnosis. This result disagrees with Awotidebe ,(2014) who found that the (20%) of hypertensive patient less than 5 years. Concerning History of Family

member with hypertension, (70%) of the sample have positive history. This result comes in agreement with (Metintas. 2009), who reported that (71%) of the study sample have family history. Regarding Sources of information of disease The findings indicate that the (92%) of study sample have source from health care workers, this result disagree with Ahmed , (2013) who found that 61% of source of information from television and internet. Finally, the majority of study sample (52) housewife, this result disagree with (Shankar,2014) who found that the majority of his sample was Retired. Table (2) reveals that there is low mean of scores for all items related to Patients practices regarding life style changes except items (2, 5, 10) which show moderate mean of score and item (9) is of high mean of score, with average mean score of (1.606), this result disagree with Williams and Hopper (2015) who recommended to important life style changes for controlling hypertension. Table (3) indicates that there was a significant relationship

between patients’ practices regarding hypertension and their level of education at ( $P < 0.05$ ), when analyzed by chi-square test & this result agree with Shankar, (2015) who demonstrate that the patient practice increasing with level of education. Table (4) indicates that there was a significant relationship between patients’ practices regarding hypertension and their Number Years of diagnosis with hypertension. at ( $P < 0.05$ ), when analyzed by chi-square test. This result agree with Smeltzer et. al, (2010) who demonstrate that the patient practice increase with number of years. Table (5) indicates that there was a significant relationship between patients’ practices and History of Family member with hypertension. at ( $P < 0.05$ ), when analyzed by chi-square test. History of family member with hypertension play major role in practice of patient, this result agree with (Susan,2007) who demonstrate that the practice of patient may increase when the family members suffering from the same disease.

**Table 1. Distribution of (100) patients by their demographic characteristics**

No.	Variables	(n=100)	F	%
1-	Age (year)	30-35	7	7.0
		36-40	9	9.0
		41-45	9	9.0
		46-50	18	18.0
		51-55	15	15.0
		56-60	27	27.0
		61 & more	15	15.0
		Total	100	100.0
2-	Gender	Male	45	45.0
		Female	55	55.0
		Total	100	100.0

**Cont... Table 1. Distribution of (100) patients by their demographic characteristics**

3-	Level of education	Literacy	52	52.0
		Primary school graduate	27	27.0
		Secondary school graduate	12	12.0
		College graduate	9	9.0
		Total	100	100.0
4	Marital status	Single	2	2.0
		Married	71	71.0
		Speread	25	25.0
		Divorced	2	2.0
		Total	100	100.0

**Table 2. Patients practices regarding life style changes**

No	Items	Always		Sometime		Never		M.S.	Severity
		F	%	F	%	F	%		
1	Eating food contain low sodium	15	15.0	29	29.0	56	56.0	1.59	Low
2	Eating food contain low fat	22	22.0	23	23.0	55	55.0	1.68	moderate
3	Avoidance of stress	1	1.0	21	21.0	78	78.0	1.23	Low
4	Exercises practices regularly	6	6.0	27	27.0	67	67.0	1.39	Low
5	Taking enough rest when you feel tired	22	22.0	40	40.0	38	38.0	1.84	moderate
6	Avoidance of smoking	14	14.0	14	14.0	72	72.0	1.32	Low
7	Avoidance of sweetmeats	6	6.0	47	47.0	47	47.0	1.39	Low
8	Check your weight regularly	0	0	0	0	100	100	1.00	Low
9	Increase fruits and vegetables intake	80	80.0	18	18.0	2	2.0	2.78	High
10	Like to eat fish instate of beef	52	52.0	26	26.0	22	22.0	2.30	moderate
11	Eating food that cooking with low cholesterol	30	30.0	2	2.0	68	68.0	1.62	Low
	Total							1.66	moderate

**Table 3. Association between the patients’ practicese and their level of education.**

Level of educational low		patients’ practices		Total
		Moderate		
Literacy	F	20	32	52
	%	20.0%	32.0%	52.0%
Primary school graduate	F	15	12	27
	%	15.0%	12.0%	27.0%
Secondary school graduate	F	3	9	12
	%	3.0%	9.0%	12.0%
College graduate	F	4	5	9
	%	4.0%	5.0%	9.0%
Total	F	42	58	100
	%	42.0%	58.0%	100.0%

$\chi^2_{obs.} = 10.994$   $\chi^2_{crit.} = 7.834$   $df=3$   $p\text{ value}=0.04$   $P < 0.05$

**Table 4. Association between the patients’ practices and their Number Years of diagnosis with hypertension.**

Number Years of diagnosis with hypertension. low		patients’ knowledge		Total
		Moderate		
1-5 years	F	38	15	53
	%	38.0%	15.0%	53.0%
6 -10 years	F	23	5	28
	%	23.0%	5.0%	28.0%
11 – and more	F	16	3	19
	%	16.0%	3.0%	19.0%
Total	F	77	23	100
	%	77.0%	23.0%	100.0%

$\chi^2_{obs.} = 4.432$   $\chi^2_{crit.} = 3.543$   $df=2$   $p\text{ value}=0.03$   $P < 0.05$

**Table 5. Association between the patients’ practices and their History of Family member with hypertension**

History of Family member with hypertension low		patients’ practices		Total
		Moderate		
yes	F	27	43	70
	%	27.0%	43.0%	70.0%
No	F	15	15	30
	%	15.0%	15.0%	30.0%
Total	F	42	58	100
	%	42.0%	58.0%	100.0%

$\chi^2_{obs.} = 2.231$   $\chi^2_{crit.} = 2.123$   $df=2$   $p\text{ value}=0.04$   $P < 0.05$

## CONCLUSION

The results of the study show that the more than half of the study sample is female. Most of study sample are within age group (56-60)yrs . The majority of study sample had literacy. Majority of patients (71%) were married. Majority of patients have History of Family member with hypertension (70%). The highest percentage from those who have Sources of information regarding disease from health care worker. The majority of items have low M.S (less than 1.66) regarding knowledge and practice. There is a significant relationship between patients' practice regarding hypertension and some socio-demographic characteristics (level of education, Number Years of diagnosis with hypertension, History of Family member with hypertension).

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Adult Nursing Department, College of Nursing, University of Misan, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Impact of Domestic Violence upon Juvenile Delinquent at Correctional Institutions in Baghdad City

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## ABSTRACT

A descriptive analytical study was design utilized to assess the level of domestic violence among juvenile delinquents .The study was carried out through the period from 27 December 2016 to 12 September 2017. The study instruments include 3 parts the first one contained Juvenile Delinquent socio - demographic characteristics, second Part include items related to violence,the thired part is comprised of 75 items which concerned with the Psychological security. The data collection was carried out from period from 22th of February 2017 to March 30th 2017 in Correctional Institutions for Juvenile Delinquent. The data were analyzed by using spss through the application of descriptive statistics analyze that include, frequency, percentage, mean and the infrenrtial statistics analysis such as (chi- square). The finding of the study have revealed that that; (46%) of samples are from group (18-20) years old, (35.0%) of the juvenile delinquents have moderate level of psychological security, the highest percentage (17.0%) of the sample are females, with high level of Psychological Security, (29.0%) of the juvenile delinquents have high level of physical violence.(46.0%) of the juvenile delinquents have high level of emotional violence.

**Keywords:** Domestic, Juvenile Delinquent, Violence, Baghdad city.

## INTRODUCTION

The family is the first brick in the building of man and the community, Family is fundamental component of society and the key element for human growth and development, and it plays important role in the family and in shaping its behavior in various stages of life <sup>1</sup>. Delinquency refers to the behavior which is not within the range of the culturally permissible, either at home, in the school, or in the community. The delinquent children creates problems in schools, destructive, quarrelsome and socially immature. They seek undesirable companions or be isolated become socially maladjusted, and drop out of schools <sup>2</sup>. Children are especially vulnerable to the effects of domestic violence because they are still mentally and emotionally developing. The long-term effects of domestic violence can last a lifetime, and victims who experience abuse as children often carry the trauma into adulthood. Physical abuse, sexual

violence, and emotional violence are psychologically damaging to children. It is common for these victims to become terrified of their parents and their home. They begin to fear the people and places that are supposed to protect them. It is critical to notice the signs of domestic violence before it continues or escalates <sup>3-5</sup>. Despite its importance, few studies in Iraq have been conducted on the prevalence of children's exposure to domestic violence. And we conducted because children are the future of the peoples, and their contribution in building the future. Objectives of the study: To assess the level of domestic violence among juvenile delinquent . To find out the relationships between psychological security and socio-demographic characteristics of juvenile delinquents.

## METHODOLOGY

A descriptive analytical study was design utilized to assess the level of domestic violence among juvenile delinquents, the sample consisted of (100) Juvenile Delinquent who were found in Correctional Institutions in Baghdad city (67 male) delinquent from Al-Gaiffer

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Correctional Institution and (33 female) delinquent from Al-Karada Correctional Institution. This sample were selected according to criteria of the study. The study was carried out through the period from in which the period of the study was from 27 December 2016 to 12 September 2017. A questionnaire was constructed by the researcher for the purpose of the study it consist of two parts:

### **Socio-demographic information**

This part deal with the Juvenile Delinquent socio - demographic characteristics which included: 5 items concerned with gender, age, residence, birth order, level of education.

### **Items related to Domestic Violence**

**Domestic Violence** This part is comprised of 54 items which concerned with the juvenile delinquent violence and measured by using three levels likert rating scale, the score was 3 for always ; 2 for some times and 1 for never. The researcher tell the participant to choose the item that apply to it completely from each of the statements.

### **Data analysis**

A numerical value was given to each rating point, 1 was given for never, 2 for sometimes, and 3 for always. Data were analyzed through application of descriptive statistics analysis which include; frequency, percentage, mean and the inferential data analysis approach (Pearson Correlation coefficient, Standard deviation, Chi-square, T-test). Data were analyzed through the use of statistical package for social sciences (SPSS).

## **RESULTS AND DISCUSSION**

Table 1 shows that; the highest percentage of Juvenile Delinquents (67.0%) is male, while (33.0%) female. And (46%) of samples are from group (18-20) years old, (79%) are Urban, (40%) are third in birth order and (31%) educational level are primary school graduate. Regarding gender, the table reveals that the highest percentage (21.0%) of the sample are females, with high level of the domestic violence; while (30.0%) of the sample are males having low level of the domestic violence; the lowest percentage (3.0%) of the sample are females having low level of the domestic violence; while (15.0%) of the sample are males having high levels of the domestic violence. The table also appears

that most of the study sample (18.0%) having low levels of the domestic violence, they are from age group (18-20 years); the lowest percentage (7.0%) of the sample have low levels of the domestic violence, they are of age as in (15-17 years). Residential area reveals that the highest percentages (29.0%) of the sample having high and (35.0%) are from (Urban area); the lowest percentage (5.0%) of the sample having moderate levels of the domestic violence is from (Rural area). Also it is apparent that the highest percentages (13.0%) of the sample having low levels of the domestic violence are from (third sequence); the lowest percentage (3.0%) of the sample having low levels of the domestic violence is from (four and more). Concerning level of education, the table shows that the highest percentages (14.0%) of the sample having high levels of the domestic violence are from group (read and write); the lowest percentage (2.0%) of the sample having moderate and (2.0%) of the sample having high level of the domestic violence is from group (preparative). The table indicates that there are high significant differences between Females and Males in Gender group and domestic violence, P- value is 0.00. Table 4 reveals that there is: high significant relationship between domestic violence and Gender, P- value is 0.00. According to Socio-demographic Characteristics of Juvenile Delinquents shows that (46%) their age group (18-20) years this result disagree with the findings of Al-Najjar (2012)who mention that the age of participant ranged from 14 to 17 years. This reason which interprets this finding is that the adolescents below 17 seems in lower risk; because the children may get an effective and direct family supervision while older children above the age of 17 years may expose to the risk of delinquency. The study results show that the majority of the sample (79%) were living in urban area, these findings coincide with the findings of Hamoo (2012) who found the majority of the sample (71%) were living in urban residential area. Related to the Juvenile Delinquents' birth order, the results show that mostly of them 40.0% were (third sequence). This result may be because the third child had low attention and supervision from the family. According to the Juvenile Delinquents' education levels, the study has revealed that the majority of the Juvenile Delinquents 31.0% have primary school graduate. Hamoo (2012) reported that the majority of the study 59% have primary school graduate which is agreement with the present findings. Exposure to the domestic violence in the community or at school was reported by of the whole sample studied. The study

has revealed that 33.0% have low level of domestic violence, 31.0% have moderate level, and 36.0% have high level of domestic violence. Significantly more girls than boys were exposed to the father's violence against the mother, this might be accounted for by culture of our society. Vameqi et al. (2010) attributed the finding that girls had been exposed to violence approximately twice as much as boys to the greater presence of girls

at home. The findings of this study have revealed that there are high significant differences of the scores of females and males for gender group in the domestic violence variables at p-value (0.01). The study found significant relationships between domestic violence and some demographic characteristics such as gender (0.01). Ghraibeh (2004) showed a high degree of sense of security among students and the lack of differences in this class which is attributable to gender.

**Table 1. Socio-demographic Characteristics of Juvenile Delinquents**

No.	Characteristics	F	%	
	Gender:	Male	67	67%
		Female	33	33%
	Age:	12 – 14 years	29	29%
		15 – 17 years	25	25%
		18 – 20 years	46	46%
		Total	100	100%
	Residence:	Urban	79	79%
		Rural	21	21%
		Total	100	100%
	Birth order:	First	20	20%
		Second	21	21%
		Third	40	40%
		Fourth & more	19	19%
		Total	100	100%
	Education:	Doesn't read & write	11	11%
		Read & write	28	28%
		Primary school	31	31%
		Intermediate	22	22%
		Secondary school	8	8%
		Total	100	100%

**Table 2. Distribution in the Levels of Domestic Violence Regarding the Demographic Characteristics**

Demographics f		Levels of Total Violence					
		Low		Moderate		High	
		%	f	%	f	%	f
Gender	Female	3	3.0%	9	9.0%	21	21.0%
	Male	30	30.0%	22	22.0%	15	15.0%
	Total	33	33.0%	31	31.0%	36	36.0%
Age	12-14 years	8	8.0%	9	9.0%	12	12.0%
	15-17 years	7	7.0%	9	9.0%	9	9.0%
	18-20 years	18	18.0%	13	13.0%	15	15.0%
	Total	33	33.0%	31	31.0%	36	36.0%

**Cont... Table 2. Distribution in the Levels of Domestic Violence Regarding the Demographic Characteristics**

Environment	Urban	24	24.0%	26	26.0%	29	29.0%
	Rural	9	9.0%	5	5.0%	7	7.0%
	Total	33	33.0%	31	31.0%	36	36.0%
Sequence	First	6	6.0%	6	6.0%	8	8.0%
	Second	9	9.0%	5	5.0%	7	7.0%
	Third	15	15.0%	13	13.0%	12	12.0%
	Four and more	3	3.0%	7	7.0%	9	9.0%
	Total	33	33.0%	31	31.0%	36	36.0%
Level of education	Don't read and write	3	3.0%	4	4.0%	4	4.0%
	Read and write	5	5.0%	9	9.0%	14	14.0%
	Primary	10	10.0%	10	10.0%	11	11.0%
	Medium	11	11.0%	6	6.0%	5	5.0%
	Preparative	4	4.0%	2	2.0%	2	2.0%
	Total	33	33.0%	31	31.0%	36	36.0%

**Table 3. The Differences between Mean of Scores of Domestic Violence in Females and Males for Gender Group**

Variables	Gender				Independent t-test	
	Female		Male		T	p
	Mean	St. d.	mean	St. d.		
Domestic of Violence	2.55	0.666	2.78	0.794	4.793	0.01

**Table 4. Association between Domestic Violence; and Demographic Characteristics**

Demographic Characteristics	No.	df.	Psychological Security	
			X <sup>2</sup>	Sig.
Gender	100	1	19.20	0.01
Age		2	1.66	0.79
Environment		1	1.27	0.52
Sequence		3	4.43	0.61
Level of Education		4	7.88	0.44

Based on Chi-square test: Highly Sig. At P<0.01; and Non Sig. At P>0.05

**CONCLUSION**

All juvenile delinquents have violence in different levels. All juvenile delinquents have psychological security problems in different levels. The prevalence of violence and psychological security in different

levels is found more in the younger age (18-20 years) psychological security of the juvenile delinquents. It is confirmed that significant differences are between Females and Males in Gender group with violence and psychological security. Psychological security have a

high significant relationship with domestic violence.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the College of Nursing, University of Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Impact of Education Program Regarding Antipsychotics-related Side Effects upon Knowledge of Nurses working in Psychiatric Teaching Hospitals of Baghdad City

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## ABSTRACT

**Objectives:** To assess nurse knowledge's regarding side effects of antipsychotics medications. To evaluate of nurses knowledge's regarding side effects of antipsychotics medications before and after training sessions. Study was conducted at Al-Rashad Psychiatric teaching hospital) starting from 18<sup>th</sup> of February 2018 to 1<sup>st</sup> of December 2018. A random sample of 50 nurses, 25 nurse working in Al-Rashad Psychiatric teaching hospital (study group) and 25 nurses working in Ibn- Rushd Psychiatric teaching hospital control group). The study shows male-nurse are more than female-nurse, highest percentage of them within 30-39 years old (36.0%) have 1-5 years of experience in general wards, (42.0%) of them have 1-5 years of experience in psychiatric wards, majority of nurses (80.0%) have not participated in any training course regarding side-effects antipsychotics medications, and nearly half of them with diploma level. Also the study found there are significant differences between pre-test assessments with post -1 test and post -2 tests. A significant increase in knowledge's level over time for the Study group.

**Keywords:** Nurse Staff, Knowledge, Side effects, Antipsychotics.

## INTRODUCTION

Now antipsychotic medications are the cornerstone for treatment patients with psychotic disorders <sup>(1)</sup>. Patients with psychiatric disorder have high level of mortality rates compared with general population<sup>2</sup>. Often they suffer from several health problems like disease of cardiovascular, diabetes, and obesity <sup>3</sup>. Anti-psychotic medications used in treated schizophrenic patients, it decreasing relapses and need for admissions to hospitals by suppressing symptoms of psychotic and make their live more stable <sup>4-6</sup>. Both generation of antipsychotic blockage of dopamine receptor in the human brain, Horacek and other researchers (2006) indicated that several types of old generation of antipsychotics act with specific receptors <sup>7</sup>. Antipsychotics medications as all effects on nervous system by block receptors of dopamine that found in the human body, there are five subcategories of dopamine receptors include (D1, D2, D3, D4, and D5) mental illness have been associated with D2, D3, and D4, typical antipsychotic block dopamine from D2, D3, to D4. this cause many side

effects, however, extrapyramidal appear from block D2, while atypical medications block two receptors first relatively weak blockage of D2, therefore showed less side effects particularly (extrapyramidal) and block serotonin receptors<sup>8</sup>. During therapy with antipsychotic body patients experience increase in body mass index, high waist circumference, and metabolic abnormalities <sup>9</sup>. Parkinsonism is side effects commonly occur in old age patients usually develop in days to few months after start antipsychotic medications, it characterized by movement disorders like bradykinesia, tremor, rigidity of muscle, and lips tremor "rabbit syndrome"<sup>10</sup>. Prolactin is a human hormone, pituitary gland is responsible to secretion this hormone, it has same structure of growth hormone and most commonly causes of increased level of prolactin hormone is when patients treating by the antipsychotics medication, most studies revealed that menstrual disturbance like amenorrhoea or polymenorrhoea develop after taking antipsychotics and can reach to 40-50% of women under treatment <sup>13</sup>. There is relationship between taking antipsychotic medications and weight gain particularly atypical

antipsychotics<sup>14</sup>. It is known that when patients taking antipsychotic medication they have risk to experience sudden death<sup>15, 16</sup>. Due to prolongation of the QTc wave<sup>17</sup>. Sexual dysfunction is a side effect of different antidepressant medication<sup>19</sup>. Antipsychotics also cause Sexual dysfunction<sup>20</sup>.

## METHODOLOGY

Experimental design was carried out during the period 18th of February 2018 to 1st of December 2018. Random sample comprised of (50) nurses working in psychiatric hospitals was divided into study group consisted of (25) nurses working in Al-Rashad psychiatric hospital were exposed to the educational program and control group consisted (25) nurses were not received the training sessions. Criteria for selection nurses who was working at psychiatric hospitals.

- Nurses who spend more than one year of experience or more in work at psychiatric hospitals.

- Nurses who working only in the morning shift.

- Nurses from both gender (male and female).

The educational nursing program was designed according to the purposes of the study, to provide knowledge for nurse staff mainly related to antipsychotic medication. Instrument of the study was developed by the researcher to achieve the objectives of this study. It was consisted of two parts.

Part I: Demographic characteristics of the nurses.

Part II: Nurses' knowledge toward antipsychotics medications.

Tests for nurses carried out during the morning shift. It was consisted of (15) items and divided into side effects of antipsychotics for two generations, typical and atypical. Knowledge was assessed for pre education sessions and after education sessions immediately, also re-assessing was done after three months for study group. Nurses in control group were assessing their knowledge at the same times of study group.

### Statistical Analysis

The data of this study were analyzed through the application by two. A descriptive statistical approach (Frequency, Percentage) and an Inferential statistical approach by applied Pair-wise Comparisons (multiple

comparisons: Bonferroni).

## RESULTS AND DISCUSSION

The results show that the male-nurse participants (58.0%) are more than female-nurse participants (42.0%); the study reveals also that the highest percentage of the participants is within the thirties of age (32.0 %); 36.0% of the nurses participated have one to five years of experience in General Wards but 42.0% of them have one to five years of experience in psychiatric wards; 80.0% of them have not participated in any training course regarding antipsychotics medications and finally, about half of the nurses joined in the study are with Diploma level. Table 2 shows that the majority of nurses participated is with Low level of Side Effects-related knowledge (80.0%); 20.0% of the sample is with Fair level of side effects-related knowledge and no one from them is with Good level of side effects-related knowledge.

Table (3) shows that participants of control group have low level of *side effects-related* knowledge; 88.0% (n= 22) in Phase one; 76.0% (n= 19) in Phase two; and 64.0% (n= 16) in Phase three. While, participants of study group have also low level of side effects-related knowledge but with different percentages; 72.0% (n= 18) in Phase one; but 0.0% (n= 0) in Phase two; 20.0% (n= 5) in Phase three. The table shows also those participants of study group with fair level of side effects-related knowledge have increased from Phase one 12.0% (n= 3) and Phase two 76.0% (n= 19) and then slightly declined to 52.0% (n= 13). Table (4) Shows the results of applying "Multiple Comparison" among all repeated measurement pairs of "Side effects-related Knowledge" for the sample at pre, post-1 and post-2 periods, which indicating that "there is significant different at P<0.01 between the initial period of pre time and post 1 period, significant different at P<0.01 between the initial period of pre time and post 2 period, and significant difference at P<0.03 had been reported between the post 1 and post 2 period.

### Demographical characteristics of the study sample.

According to the study results of table (1) show that the male-nurse participants (58.0%) are more than female-nurse participants (42.0%); this result was supported by many Iraqi studies, they found that male-nurse working in psychiatric wards at Baghdad

psychiatric hospitals are more than female nurses <sup>21, 22</sup>. Regarding to age of the sample the study reveals that the highest percentage of the participants is within the thirties of age (30-39 years old); this result was supported by Al-Ameri, he found in his study young participants were more than half, this result may explained these ages have more ability to work at psychiatric wards <sup>23</sup>. Concerning experience in hospital 136.0% of the nurses participated have one to five years of experience in general wards but 42.0% of them have one to five years of experience in psychiatric wards; this result similar to study done by Gasanganwa , he state that majority (63%) of nurse have (0-5 years) experience in psychiatric wards <sup>24</sup>. Also Iraqi found the majority of nurses in psychiatric hospitals at Baghdad city have 5 year experiences or less <sup>22</sup>. Regarding to training course the result reveal that majority of them (80.0%) have not participated in any training course regarding antipsychotics medications, this results supported by Araki, he found most of nurse not attended in training or workshop about antipsychotics medications; this result may explained lack of qualified nurse staff (continuous nursing education) to give knowledge regarding antipsychotics medications <sup>25</sup>.

Concerning level of education about half of the nurses joined in the study are with diploma level. This result supported by study done at Baghdad city in 2017 found that high percent of nurse-staff working in psychiatric wards at Baghdad city are with diploma <sup>21</sup>.

**Knowledge of Nurses about side effects of Antipsychotic Medications Before and after program.**

**Table 1. Demographic characteristics of the nurses.**

Gender			Training		
Gender	f	%		f	%
Male	29	58.0	Yes	10	20.0
Female	21	42.0	No	40	80.0
Total	50	100.0%	Total	50	100.0%
Age			Level of Education		
year	f	%	Level	f	%
20-29	7	14.0	Secondary	23	46.0
30-39	16	32.0	Institute	11	22.0
40-49	11	22.0	College	16	32.0

Results of tables (1) distribution of the study sample regarding to the their levels of side effects-related knowledge, this results similar to study conducted by Hemingway and others aims of study was to evaluated experiences of nurse staff competence for medications, they documented that 46% of nurses' knowledge about adverse effects of antipsychotics medications was lack <sup>26</sup>. Nurses with insufficient of knowledge about pharmacology has been reported in many studies like <sup>27, 28</sup>. According to results of table (2) distribution in levels of side effects -related knowledge according to control group and study group for three phases, Shows that participants of control group have higher percentage with low level of knowledge during three time periods and participants of study group have increased in levels of side effects -related knowledge from phase one to phase three. This results supported by Hanafi and others they made comparison of knowledge of the nurse staff before and after implementation of educational program to evaluate knowledge over time among participants they demonstrated that knowledge of nurse staff increased after implementation of educational program <sup>29</sup>.

**Assessing Effectiveness Of the Programme on the Levels of Side Effects-Related Knowledge**

(Tables 3 and figure1) shows there is significant changes and highly improvements during different time periods, this results supported by Hajebi and other researcher , they found that nurse staff before training was less than the knowledge after training, also they stated that education is very effective towards pharmacovigilance in enhancing awareness's level of participants <sup>30</sup>.

**Cont... Table 1. Demographic characteristics of the nurses.**

50-59	13	26.0	Total	50	100.0%
≥60	3	6.0			
Total	50	100.0			
<b>Career in General Wards</b>			<b>Career in Psychiatric Wards</b>		
Year	f	%	Year	f	%
1-5 years	18	36.0	1-5 years	21	42.0
6-10 years	11	22.0	6-10 years	17	34.0
11-15 years	9	18.0	11-15 years	9	18.0
≥16	12	24.0	≥16	3	6.0
Total	50	100.0%	Total	50	100.0%

**Table 2. Distribution of the sample regarding to the levels of Side Effects-related Knowledge**

Side Effects	No.	Levels of Side Effects-related Knowledge							
		Low		Fair		Good		Total	
		f	%	f	%	f	%	f	%
		40	80.0%	10	20.0%	0	0.0%	50	100.0%

**Table 3. Distribution in levels of Side Effects-related Knowledge according to Control group and Study group for three Phases**

Levels of Side Effects-related Knowledge s									
Phase	Levels	Low		Fair		Good		Total	
	Group	f	%	f	%	f	%	f	%
One	Control	22	88.0%	3	12.0%	0	0.0%	25	100.0%
	Study	18	72.0%	7	28.0%	0	0.0%	25	100.0%
	Total	40	80.0%	10	20.0%	0	0.0%	50	100.0%
Two	Control	19	76.0%	6	24.0%	0	0.0%	25	100.0%
	Study	0	0.0%	19	76.0%	6	24.0%	25	100.0%
	Total	19	38.0%	25	50.0%	6	24.0%	50	100.0%
Three	Control	16	64.0%	9	36.0%	0	0.0%	25	100.0%
	Study	5	20.0%	13	52.0%	7	28.0%	25	100.0%
	Total	21	42.0%	22	44.0%	7	28.0%	50	100.0%

**Table 4. Differences within the three Phases regarding Side effects-related Knowledge by using Post hoc tests.**

Pair-wise Comparisons (multiple comparisons: Bonferroni)				
(I) Side effects	(J) Side effects	Mean Difference (I-J)	Std. Error	Sig.
1	2	-0.540	0.063	0.01
	3	-0.520	0.097	0.01
2	1	0.540	0.063	0.01
	3	0.020	0.087	0.01
3	1	0.520	0.097	0.01
	2	-0.020	0.087	0.01

**CONCLUSION**

Significant increase in knowledge’s level of nurses over time for the Study group.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Psychiatric and Mental health Nursing / Ministry of Health, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Microbiological Quality of Milk, Cheese, Yogurt and ICE Cream in Baghdad City Markets

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## ABSTRACT

282 samples of milk, yogurt, cheese and ice cream were collected from different areas from Baghdad markets. All samples were subjected to standard microbiological methods. All samples were tested according to the Iraqi microbiological limits guidelines' for total counts, coliform and fecal coli form, *staphylococcus aureus*, *Salmonella* species, mould and yeast, *Listeria monocytogenes* were tested in cheese only. The results showed that all samples were free of *Salmonella* and fecal coliform. All cheese samples were free of *Listeria monocytogenes* and 79% of milk 75% of cheese 70% of yogurt and only 48% of ice cream samples were failed to meet the legal requirements in terms of overall hygienic quality.

**Keywords:** Milk, Cheese, Yogurt, Ice cream Bacteria, Contamination.

## INTRODUCTION

Animal products, including milk, play an important role in human nutrition, as it is rich in protein, vitamins and minerals. Milk and dairy products are considered essential to the general health<sup>1</sup>, as it contributes to building strong bones and maintaining the weight<sup>2</sup>, as well as it contained all nutritional groups that produces all the important elements for building a healthy body and for all ages<sup>3</sup>. The chemical composition of the milk is considered a perfect medium for the growth of many microorganisms. Milk has a protein level of 3.5%, carbohydrates 4.7% and fat 3%, as well it contains a good level of minerals, vitamins and have pH between 6.4-6.8%<sup>4,5</sup>. Food products derived from animals are susceptible for *Salmonella*; the bacteria can grow and multiply in milk and its products<sup>6,7</sup>. *Escherichia coli* is one the species of coliform, which has been studies to investigate contamination through faeces<sup>8</sup>. The digestive system of humans and animals are the main source of these organisms. The existence of these bacteria in milk and its products shows that the conditions of producing and storing it are not hygienic<sup>9,10</sup>. Food poisoning or foodborne illness is the result of eating contaminated,

spoiled or toxic food<sup>15</sup>. Most food poisoning is caused by bacteria the most common types of it *Staphylococcus*, *Salmonella*, *Clostridium* and *Campylobacter*<sup>16</sup>. Many of the microbiological hazards associated with dairy products such as butter, cheese and yoghurt are derived from the raw milk. Pathogen like *Staphylococcus aureus* may be part of the resident micro flora of the living animal, where as other pathogens such as *Escherichia coli* 0157:H7 or *Salmonella* spp. and *Brucella* spp.<sup>16</sup>. The aim of this study is to evaluate the contamination levels of microorganisms in milk, yogurt, cheese, and ice cream as well as the validity of these products for human consumption according to the Iraq standards.

## MATERIALS AND METHOD

### Collection of samples

282 samples of milk, cheese, yogurt and ice cream were collected from local markets in Baghdad city: Mansour, Shulaa and Dora (Karkh), Karada and Baghdad Gideda (Rasafa). The samples collecting periods was between October 2017 and February 2018 and in regular way. 100 ml for milk, a 100 g for each cheese, yogurt and ice cream were collected in sterilized conditions in sealed and sterilized bags, and then samples were transported to the laboratory in icebox and stored in fridge at temperature (4°C) until the analysis. The samples were prepared according to the microbiological standards methods<sup>18</sup>. Plate count agar

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were used for numeration of bacteria in milk, cheese and yogurt samples

As recommended in the American public health association (APHA) <sup>19</sup>.

#### Total coliform and faecal coliform count

Violet Red Bile Agar plate was used, and the method was done according to the Iraqi standards 3/2270 <sup>20</sup>.

#### Staphylococcus aureus count

The below plates were used according to the methods in the methods in the international standards organization.

ISO-6888 <sup>21</sup>.

- Brain heart infusion
- Baird parker agar
- Coagulase rabbit plasma

#### Detection of Salmonella

- The used of media according to the ISO-6479 <sup>22</sup>.
- Buffered peptone water.
- Muller-Kauffmann-Tetrathionate broth base.
- Rappoport-Vassilidis Enrichment broth.
- Xylose lysine deoxy cholate (XLD).
- Salmonella-Shigella Agar.

Also used the API 20 and polyvalent O and H for agglutination.

#### Mould and Yeasts

Used of yeast extract/ dextrose oxytetracycline/ Agra as shown in ISO-6611 <sup>23</sup>.

#### 3.7 Detection of Listeria monocytogenes

Used of Listeria enrichment broth, Agar listeria ottaviani and agasti listeria monocytogenes differential agar base and Listeria selective agar Oxide. <sup>24</sup>

## RESULTS AND DISCUSSION

The results show that milk and its products contain many microorganisms. The total plate count in the table shows the number of the microorganisms samples that

where growth happened. The samples of milk, cheese and yogurt were different in terms of the total number of bacteria, there were 36% samples of milk that contained a number of bacteria  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/ml, whereas in 39.3% samples, there were  $1.2 \times 10^2 - 1.5 \times 10^3$  cfu/ml and 24.7% samples contained  $1 \times 10^1 - 1.1 \times 10^2$  cfu/ml. In cheese, in 61.3% of samples the total number of bacteria was  $1 \times 10^1 - 1.1 \times 10^2$  cfu/g or less, 32% samples contained  $1.2 \times 10^2 - 1.5 \times 10^3$  cfu/g number of bacteria, while in 6.7% samples the number was  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/g bacteria or more. As for yogurt, the samples that contained bacterial number of  $1.2 \times 10^2 - 1.5 \times 10^3$  cfu/g were 51.4%. 2.6% samples of yogurt contained bacterial  $1 \times 10^1 - 1.1 \times 10^2$  cfu/g or less, whereas 20% samples contained  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/g or more. While for ice cream the 12.5%, 31.2% and 56.3% samples contained  $1 \times 10^1 - 1.1 \times 10^2$  cfu/g,  $1.2 \times 10^2 - 1.5 \times 10^3$  cfu/g,  $1 \times 10^3$  and  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/g respectively. We notice from the table (2) that 5.6% samples of milk contain a number of *Staphylococcus* of  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/ml, and 42.5% samples of milk contain  $1.2 \times 10^2 - 9.7 \times 10^2$  cfu/ml of bacteria, whereas 52.5% samples contained  $1 \times 10^1 - 1.1 \times 10^2$  cfu/ml of staphylococcus. Cheese, on the other hand, only 2.7% of the samples contained  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/g of *Staphylococcus*. In 84% samples  $1 \times 10^1 - 1.1 \times 10^2$  cfu/g and in 13.3% samples  $1.2 \times 10^2 - 9.7 \times 10^2$  cfu/g of *Staphylococcus*. In yogurt samples, 7.4% samples contained a number of staphylococcus  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/g and in 74.3% samples it contained  $1 \times 10^1 - 1.1 \times 10^2$  cfu/g or less and in 18.6% samples, the number was  $1.2 \times 10^2 - 9.7 \times 10^2$  cfu/g. While for ice cream 54.2% samples contain  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/g, 31.2% samples contain  $1.2 \times 10^2 - 9.7 \times 10^2$  cfu/g and only 14.6% samples contain  $1 \times 10^1 - 1.1 \times 10^2$  cfu/g. The number of coliform bacteria shows in 75.3% samples of milk as  $1 \times 10^1 - 9.3 \times 10^1$  cfu/ml, in 21.3% samples  $9.5 \times 10^1 - 2.2 \times 10^2$  cfu/ml and only 3.4% samples contain  $2.4 \times 10^2 - 1 \times 10^3$  cfu/ml coliform. The results also show that 5.3% samples of cheese contained a number of coliform bacteria  $9.5 \times 10^1 - 2.2 \times 10^2$  cfu/g and no samples contain more coliform than it. whereas 94.7% samples showed  $1 \times 10^1 - 9.3 \times 10^1$  cfu/g. Yogurt results shows 65.7% samples containing  $1 \times 10^1 - 9.3 \times 10^1$  cfu/g of coliform bacteria, in 21.4% samples, there was a number of  $9.5 \times 10^1 - 2.2 \times 10^2$  cfu/g whereas 12.9% samples contained coliform bacteria of  $2.4 \times 10^2 - 1 \times 10^3$  cfu/g or more. Ice cream have 56.2% samples contain  $2.4 \times 10^2 - 1 \times 10^3$ , 29.2% samples contain  $9.5 \times 10^1 - 2.2 \times 10^2$  cfu/g and only 14.6% samples contain  $1 \times 10^1 - 9.3 \times 10^1$

cfu/g. *Salmonella* and faecal coliform bacterial were not found in all of the milk, yogurt and cheese and ice cream samples. All samples of cheese were free of *L. monocytogenes*. The number of fungi shows in 92.1% samples of milk as  $1 \times 10^1$  cfu/ml or less, in 4.5% samples  $0.2 \times 10^1 - 0.7 \times 10^1$  cfu/ml and only 3.4% samples contain  $2.2 \times 10^2 - 9.3 \times 10^2$  cfu/ml coliform. The results also show that 94.7% samples of cheese contained a number of fungi  $1 \times 10^1$  cfu/g or less, 5.3% samples contain  $0.2 \times 10^1 - 0.7 \times 10^1$  cfu/g and no samples have  $2.2 \times 10^2 - 9.3 \times 10^2$  cfu/g fungi. Whereas, Yogurt results shows 80% samples containing  $1 \times 10^1$  cfu/g or less of fungi, there was a number of  $0.2 \times 10^1 - 0.7 \times 10^1$  cfu/g whereas 11.4% samples contained fungi of  $2.2 \times 10^2 - 9.3 \times 10^2$  cfu/g. Ice cream have 52.1% samples contain  $1 \times 10^1$  cfu/g, 27.1% samples contain  $0.2 \times 10^1 - 0.7 \times 10^1$  cfu/g and only 20.8% samples contain  $2.2 \times 10^2 - 9.3 \times 10^2$  cfu/g. Table (5) shows that 88.7% of milk samples were valid for human consumption whereas 11.2% samples were unfit for human consumption 94.7% samples of cheese fit and 5.3% were unfit for human consumption. 80% of yoghurt were fit while 20% were unfit and 75% samples of ice cream were fit and 25% were unfit for human consumption.

Although microbiological testing is just one component of the food safety system and does not guarantee 100% product safety<sup>22</sup>. However, one must understand that a microbiological testing cannot determine 100% safety from pathogens, as tests are done using samples, which are only a portion from the food products<sup>23</sup>. To ensure the optimum food quality, the manufacturers must also establish prerequisite programs including, Hazard Analysis Critical Control Point (HACCP), Good Manufacturing Practices (GMP)<sup>24</sup>. Milk and milk products have great nutritional values and hence, their consumption is increasing worldwide. Due to its highly nutritious nature of the milk and dairy products, it serves as an excellent growth medium for a wide range of microbes. Microbial contamination of milk and dairy products is a universal problem<sup>17</sup>. Our results indicated that (36%) of milk had total counts between  $1.6 \times 10^3 - 1.1 \times 10^5$  which were more what found by Banik and others for pasteurized milk in Bangladesh<sup>25</sup> and less the results of Al Fattly in local and imported milk in one of the Iraqi governments<sup>5</sup>. For the cheese our results indicated that 6.7% of samples contain  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/gm, 2.7% contained  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/gm of *S.aureus*, all cheese samples had

less than  $2.4 \times 10^2$  cfu/gm,  $2.2 \times 10^2$  cfu/gm of coliform and fungi respectively, while all cheese samples were free of *Salmonella* and *L. monocytogenes*. Only 5.3% of cheese sample were not reached the Iraqi standards limits. Comparing these results with Makino 2005, FDA 2010 were different than what found 15%-30% of cheese had high fatality rate of *L. monocytogenes*<sup>26</sup>, and less that found in Hungary by Verga 14%, and 10% of cheese samples failed to reach regulatory standards of bacteria<sup>28</sup> and more than the 0.4% of all food borne outbreaks by contaminated cheese in Europe<sup>29</sup>. The upper limits of microorganisms in yoghurt show that 20% of samples had  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/gm. total count, 7.4% samples contain  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/gm. of *S.aureus*, 12.9% samples contain  $2.4 \times 10^2 - 1 \times 10^3$  cfu/gm. if coliform while 11.4% contain  $2.2 \times 10^2 - 9.3 \times 10^2$  of fungi. The hygienic quality of samples indicated that 20% were failed to reach the acceptable levels of the Iraqi microbiological limits in dairy products. The results were different than what found by Agu and others who mentioned that of 20 samples of yoghurt recorded growth in range of  $3.2 \times 10^5 - 9 \times 10^5$  cfu/ml, *Bacillus* sp., *Staphylococcus*, *Klebsilla* sp. and *Pseudomonas* sp. were the bacteria isolated<sup>30</sup>. While Den and others show that total bacterial count of yoghurt samples were in range of  $3 \times 10^3 - 10^5$  and  $2 \times 10^4 - 28.4 \times 10^5$ , *Bacillus* sp. were obtained from all samples, *Aspergillus* sp. was isolated of all samples, *Mucor* sp. was isolated from 6 samples of *Penicillium* sp. was isolated from samples<sup>31</sup>. The upper microbiological limits of ice cream samples indicated that 56.3% of samples contain  $1.6 \times 10^3 - 1.1 \times 10^5$  cfu/gm. of total counts, 5.2% contain  $9.9 \times 10^2 - 8.4 \times 10^3$  cfu/gm of *S.aureus*. 56.2% contain  $2.4 \times 10^2 - 1 \times 10^3$  cfu/gm of coliform, 20.8% of samples contain fungi in range  $2.2 \times 10^2 - 9.3 \times 10^2$  while 25% of samples failed to reach the Iraqi microbiological limits.

**Table 1. Total plate count for milk, cheese and yogurt samples.**

Sample	$1 \times 10^1 - 1.1 \times 10^2$	%	$1.2 \times 10^2 - 1.5 \times 10^3$	%	$1.6 \times 10^3 - 1.1 \times 10^5$	%
Milk	22	24.7	35	39.3	32	36
Cheese	46	61.3	24	32	5	6.7
Yogurt	20	28.6	36	51.4	14	20
Ice cream	6	12.5	15	31.2	27	56.3

**Table 2. Shows the number of *Staphylococcus* bacterial number in milk, cheese yogurt and ice cream.**

Sample	$1 \times 10^1 - 1.1 \times 10^2$	%	$1.2 \times 10^2 - 9.7 \times 10^2$	%	$9.9 \times 10^2 - 8.4 \times 10^3$	%
Milk	45	52.5	39	42.5	5	5.6
Cheese	63	84	10	13.3	2	2.7
Yogurt	52	74.3	13	18.6	5	7.4
Ice cream	7	14.6	15	31.2	26	54.2

**Table 3. Coliform number in the milk, cheese, yogurt and ice cream samples**

Sample	$1 \times 10^1 - 9.3 \times 10^1$	%	$9.5 \times 10^1 - 2.2 \times 10^2$	%	$2.4 \times 10^2 - 1 \times 10^3$	%
Milk	67	75.3	19	21.3	3	3.4
Cheese	71	94.7	4	5.3	0	0
Yogurt	46	65.7	15	21.4	9	12.9
Ice cream	7	14.6	14	29.2	27	56.2

**Table 4. Shows the number of fungi in milk, cheese, yogurt and ice cream.**

Sample	$1 \times 10^1$ or less	%	$0.2 \times 10^1 - 0.7 \times 10^1$	%	$2.2 \times 10^2 - 9.3 \times 10^2$	%
Milk	82	92.1	4	4.5	3	3.4
Cheese	71	94.7	4	5.3	0	0
Yogurt	56	80	6	8.6	8	11.4
Ice cream	25	52.1	13	27.1	10	20.8

**Table 5. The number of milk, cheese, yogurt and ice cream samples failed to meet the legal requirements in terms of hygienic quality**

	Samples	Valid samples	%	Failed samples	%
Milk	89	79	88.7	10	11.2
Cheese	75	71	94.7	4	5.3
Yogurt	70	56	80	14	20
Ice cream	48	36	75	12	25

## CONCLUSION

We concluded that the safety of milk and its products in the Iraqi markets is not guaranteed safe. This requires further monitoring, control and raising

awareness for both government and community. Presence of pathogenic bacteria in the dairy products especially in yoghurt and ice cream which reflects the probable unhygienic and unsanitary condition during processing, handling and distribution system. Proper

training on good manufacturing practices (GMP) and use of the modern technologies in dairy industries can reduce introduction of contaminants during production and establish the total quality management (TQM), and hence assurance public health safety.

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Department of Biology, College of Education for Pure Science (Ibn Al-Haitham), University of Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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# The Relation between Lymphopenia and Mortality Rate in Elderly COPD Patients

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## ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) become the third most common cause of death and fifth most frequent cause of chronic disability by 2020. It is mainly caused by cigarette smoking, but the reasons why only a proportion (10%–20%) of smokers develops progressive airflow limitation is currently unknown. The disease is characterized by a chronic inflammatory process predominantly in the small airways and lung parenchyma, with increased numbers of macrophages, neutrophils, and T lymphocytes. This inflammation in the small airways is associated with fibrosis and increases with the severity of airflow limitation. Objectives: Is Low relative lymphocyte count was associated with higher mortality in elderly patients with severe COPD? Relative lymphopenia has a homogeneous and strong effect on mortality across the whole follow-up period, but the inherent mechanisms remain to be clarified. This study demonstrates that relative lymphopenia is associated with a poor prognosis in elderly patients with severe COPD. This finding seems worthy of attention because lymphocyte count is a simple, reproducible, widely available and inexpensive prognostic tool.

**Keywords:** *Chronic obstructive pulmonary disease, COPD, lymphocyte count, relative lymphopenia.*

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a disease characterized by progressive destruction of lung tissue resulting in a decline in pulmonary function<sup>1</sup>. The pathogenesis of COPD is complex. It is generally accepted that the inflammatory response associated with prolonged exposure to noxious gases like tobacco smoke plays an important role. The pulmonary inflammatory response is accompanied by a chronic low grade systemic inflammatory response<sup>2</sup>. The course of disease progression in patients with COPD is very heterogeneous<sup>3</sup>, and this could be due to differences in the level of inflammation. One widely used method of prognosis assessment is the BODE index, which compiles a panel of known predictors of mortality among COPD patients, i.e. low body mass index (BMI),

low forced expiratory volume in 1 second (FEV1), level of dyspnea and exercise capacity, into an index which is associated with increased risk of mortality<sup>4</sup>. Chronic obstructive pulmonary disease (COPD) is a frequent cause of death in elderly patients. Older age, reduced gas exchange and airflow obstruction, right atrial overload and ventricular overload and hypertrophy and selected comorbidities are the main negative prognostic indicators as they could account for early death in these patients<sup>5-7</sup>. Incalzi et al.<sup>6</sup> identified electrocardiographic signs (S1S2S3 pattern or right atrial overload (RAO)) as able to predict survival rates in patients with COPD. Variables reflecting either inflammation or immune depression emerged as possible prognostic markers in patients with COPD. The increase in leukocyte count in peripheral blood shows a statistical trend towards the prediction of long-term all-cause mortality risk in COPD patients but it did not reach a statistical significance in previous studies<sup>8,9</sup>. A low relative lymphocyte count is a physiological adaptation of the immune system to increasing age, it may account for the frailty of elderly people compared with younger individuals<sup>10,12</sup>. As patients with COPD may show a further decrease in

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lymphocyte count<sup>13,14</sup>, elderly individuals with COPD may have a combined reduction in lymphocytes due to both age and characteristics of the pulmonary disease. COPD is a global public health concern and is currently the third leading cause of death worldwide. It is a common, complex, and heterogeneous condition, which is responsible for considerable and growing morbidity, mortality, and health care expenses worldwide.<sup>15,16</sup> Exacerbations of COPD indicate instability or worsening of the patient's clinical status and progression of the disease and have been associated with the development of complications, an increased risk of subsequent exacerbations, a worsening of coexisting conditions, reduced health status and physical activity, deterioration of lung function, and an increased risk of death.<sup>17</sup>

### **T Lymphocytes in COPD**

T lymphocytes were first reported to be increased in patients with COPD by Finkelstein and colleagues, who showed a correlation between the number of T lymphocytes/mm<sup>3</sup> of lung and the extent of emphysema<sup>18</sup>. It was later shown that both CD4+ (T helper) and CD8+ (suppressor/cytotoxic) T cells were increased in the airways and lung parenchyma of patients with COPD, with a predominance of CD8+ cells<sup>19,20</sup>. This is in contrast to the findings in asthma, in which there is a predominance of CD4+ cells, which are predominantly of the T helper 2 (Th2) pattern, with increased expression of interleukin (IL)-4, IL-5, and IL-13, and which are associated with an increased number of eosinophils. In smokers who develop COPD there appears to be activation of adaptive immunity, with the infiltration of CD8+ and CD4+ cells in the alveolar walls and small airways and—in patients with the most severe disease—the presence of lymphoid follicles that contain a core of B lymphocytes surrounded by T cells<sup>21</sup>. This activation presumably follows on from the initial and then sustained innate immune response characterized by increased numbers of macrophages and neutrophils; it may involve the migration of dendritic cells from the epithelium to the local lymph nodes and presentation of antigenic substances to T cells, resulting in clonal expansion of CD4+ and, to an even greater extent, CD8+ cells.

### **RESULTS AND DISCUSSION**

The T cell inflammatory response appears in mild COPD but increases markedly with disease severity. It is possible that the initial immune response becomes

self-perpetuating because of endogenous autoantigens resulting from inflammatory and oxidative lung injury. There are also antigens in tobacco, but the inflammatory response appears to become independent of smoking status, and there is intense inflammation even in patients, who stopped smoking many years previously. Another possibility is that this chronic immune response is driven, or at least maintained, by chronic infection of the respiratory tract often seen in patients with severe disease, in which there is increased colonization of the lower airways. These infections could act as co-stimulators or by antigenic mimicry or as polyclonal activators they could provide a persisting antigenic stimulus and maintain the inflammatory process. Further studies on T cell receptor usage and expression of surface markers may give further clues as to the driving mechanisms for the increased Th1 and Tc1 cells in COPD. The mounting evidence implicating T cells, and thus an adaptive immune response, as an important component of the inflammation in COPD is overwhelming. A better understanding of the immune mechanisms involved in COPD is important, since it might lead us to new and more effective therapeutic approaches to this important disease. Immunosenescence has been linked to various clinical observations on geriatric patients. These include an increased frequency of malignancies and certain infections, the presence of autoantibodies and homogeneous immunoproteins, and decreased immune function as assessed by delayed cutaneous hypersensitivity, in vitro response of lymphocytes to mitogens, and a decline in specific antibody formation.<sup>24</sup> In this study we describe another aspect of immunodeficiency, that is, a decline in the absolute number of peripheral blood lymphocytes in elderly men that is associated with subsequent mortality. The linking of lymphocyte counts to mortality parallels the findings in "disease" states. For example, Reiscor<sup>25</sup> found an inverse correlation between cancer curability and the total number of peripheral blood lymphocytes. This correlation is also found with advanced solid neoplasms,<sup>26</sup> reast carcinoma,<sup>26</sup> ladder cancer,<sup>28</sup> and metastatic stomach cancer. = Lymphopenia appears to indicate a poor prognostic significance in systemic lupus erythematosus," sarcoidosis,<sup>29</sup>. There are several points to be made regarding the significance of our demonstration of an association between decreased lymphocyte counts and subsequent mortality. The first is that the change in the lymphocyte count is not a classic age-associated finding, i.e., there is not an incremental

change with advancing age. Relative lymphocyte count was significantly related to survival in elderly patients with moderate to severe COPD. Lehtonen et al. found that a reduction in both B and T cells could predict mortality in very old people with severe chronic illnesses<sup>10</sup>. The differences in survival at 1 and 3 years between groups with and without relative lymphopenia were similar, with the excess deaths in those with low relative lymphocyte count mostly due to very early events. Analysis of the causes of death shows that worsening of cardiopulmonary failure was responsible for most of the early deaths, whereas late mortality was related mainly to cardiovascular or cerebrovascular disease and cancer (Table 1). As a sign of impaired immunity, lymphopenia should carry a higher risk of infections, which are the main cause of fatal COPD exacerbations and, thus, should be related mainly to early mortality<sup>30</sup>. The significant difference in both early and late mortality between patients with and without lymphopenia suggests that reduced lymphocyte count qualifies as a comprehensive indicator of health status rather than as a pure immunologic marker. The very high mortality in the six months after discharge from a rehabilitation unit suggests that COPD should not be considered as a stable condition even if clinical judgment is consistent with such a diagnosis. Thus, careful supervision of patients with COPD seems desirable in order promptly to recognize and treat impending cardiopulmonary failure. There are contradictory results regarding lymphocyte number and function in senescence<sup>31</sup>. Rea et al. demonstrated a 10% decrease in both B and T cell number and percentage of absolute lymphocyte count in elderly subjects<sup>32</sup>. According to B cells, the relative reduction in B cells can provoke alterations in the production of specific antibodies. As B cells can switch immunoglobulins among the different types and in agreement with specific actions toward the pathogenic agents, the reduction in B cell count can negatively affect outcome in elderly patients<sup>33</sup>. Furthermore, T cells can promote the production of cytokines able to enhance the response to pathogens from different actors in the immune system, as well as the switch of immunoglobulins and the promotion of B cell growth and reproduction<sup>35</sup>. All of these data demonstrate that a deficit in either the B or T cell population or both could increase the risk of infection and, thus, morbidity and mortality in elderly patients. Lehtonen et al. suggested that, in very old people, both T and B cell function are significantly reduced and that there are major changes

in lymphocyte subsets<sup>10</sup>. The mechanisms leading to the reduction in lymphocyte count and immunological impairment are still far from clear. Aging and COPD are associated with psychological stress<sup>31</sup>. However, the stringent criteria used to diagnose congestive heart failure and the results of survival analysis for patients without congestive heart failure support the reliability of the current conclusions. Nevertheless, the proposed prognostic model should be tested in a population with only moderate COPD in order to limit further the potential confounding effect of congestive heart failure.

**Table 1. Causes of early (0–6 months from discharge) and late (> 6 months from discharge) mortality**

Cause of death	n Early death	n Late death
Progressive pulmonary failure	44	12
Acute myocardial infarction	11	20
Stroke	8	13
Cancer	0	9
Sudden death	1	3
Others	2	3

**CONCLUSION**

Chronic obstructive pulmonary disease (COPD) is a disease characterized by progressive destruction of lung tissue resulting in a decline in pulmonary function. Chronic obstructive pulmonary disease (COPD) is a frequent cause of death in elderly patients. The link between lymphocyte count and death indicates that there are physiologic processes in the body which are not age-or disease-related but which occur when there is physiologic stress. These processes may be hormonal, in which case a triggering event that may cause death may also raise steroid hormone levels leading to lymphopenia. Certainly we have no evidence that a lower lymphocyte count itself is related directly to the cause of death.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Ministry of Public Health,

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# Tongue Print Features Extraction By Gabor Filters Family

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## ABSTRACT

Nowadays, with the fast evolution of technology, information has been transmitted over public networks and the internet which made the important information need to be secure. Many security applications or techniques are provided secure communication over public networks. One of these techniques is the tongue print. The important task in computer vision and object recognition is Efficient and effective image extraction ROI. The tongue body Extraction from digital images is important for automated tongue identifies. Before the feature extraction process, is needed to extract the tongue from the image, so it is possible to develop an application that can extract the tongue image from an opened mouth image. This research presented a survey on the tongue image segmentation technologies by Double Geo-vector flow (DGF). Also, this paper has proposed a method of tongue segmentation by extract ROI by using a specific window with fixed size and then the resulted segment region (i.e., ROI) will be used to extract the features in step of extraction features. Gabor filters family is used to extract feature and the results will be obtained from this technique.

**Keywords:** ROI, DGF, Windowing, Gabor filters.

## INTRODUCTION

One of the most important diagnosis is Diagnosis of the tongue. On the basis of physiological and Behavioral characters, Traditional Chinese Medicine (TCM) methods, very competitive as a method to identifying or verify the identity of an individual <sup>1</sup>.

Recently, development of automated tongue segmentation technologies has significant research interests, which is hard due to the complexity of the pathological tongue, interference of the lips and variance of the tongue shape <sup>2</sup>. In the TCM system, after person's tongue images have been collected with a digital device (such as a digital camera) the tongue body must be first segmented automatically. Traditional segmentation methods are forced difficult to segment an object from the image which is disclosing central part of the face (mouth area). Because not only tongue but also teeth, lips, mouth itself, and others object are the objects of the mouth area. The trouble with this image segmentation is how to find the tongue among other objects in that

mouth area<sup>3</sup>. Recently, several studies have been suggested aimed at solve these troubles, examples of these Double Geo-Vector Flow (DGF) which mixture of the Gradient vector flow (GVF) and the geodesic flow. But there is problem suffers from it this approach suffer, the parameters of the different tongue classes must vary to adapt to the color contrast between the body of the tongue and the skin of the face. In addition, for some individual images, the active contours were initialized incorrectly for the evolution of C2G2FSnake<sup>5</sup>. For this reason another method was used in this paper: extracting the region of interest (RoI) from the original tongue images. Planning for an objective approach and quantitative model for automatic tongue segmentation in the computerized tongue diagnosis system is the motive behind this study. This leads us to present a survey on DGF and because the desired results are not obtained from the study, the segmentation technique based on the extraction of the region of interest (ROI) will be implemented and then extract the feature using the Gabor filters family and review the results obtained from the technique. the remainder of this paper is sort as follows: Section 2 Explain DGF method; Section 3 discuss and demonstrates the implementation of ROI segmentation method, section 4 feature extraction based on Gabor filters family and reviews the results obtained

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from practical implementation, and Section 5 presents the conclusions.

### **Extraction Region of Interest (ROI) By Double Geo-Vector Flow (DGF)**

Double Geo-Vector Flow (DGF) is a mixture of the geodesic flow and the Gradient vector flow (GVF). It's a novel computerized tongue image segmentation method. Latest studies have focused mainly on the active contour model (ACM), or "Snake", which develops a curve by Minimize the specific energy function<sup>[4]</sup>. The tongue images were captured in a locked darkroom that protected against light which is shaky from outside and the camera position was adaptable and flexible, therefore avoiding color distortion caused by light interference. The database of a clinical tongue image has been collected already by Shanghai University of TCM.

#### **The main steps of DGF method**

Step1: a saliency window was adopted to refine the clinical tongue image.

step2: to initialize active contour, taking benefit of the prior knowledge of the tongue image

Step3: utilizing four specific points (two angular points, tongue tip and root) on the face.

Step4: the image region divide into two parts (the binary upper part and the level set matrix for the under part) depending on the row of the angular points.

Step4: inside the contour initialize Level set functions with negative constant and positive outside for the upper flow.

Step5: The DGF is Proposed to detect the tongue edge and segment the tongue region in the image (in the upper part evaluate the Geo-GVF, and in the under part the geodesic flow was evaluated). The tongue region in the clinical image was detected before the initialization of the active contour; the saliency object detector is used which is proposed by Fenget al.<sup>6</sup>. In particular, the algorithm personalized to detected two windows with the highest saliencies and the one with the smaller size was adopt for the tongue body segmentation. Sets the active contour based on the image of the refined tongue, depending on the feature points extracted from the image<sup>7</sup>. As illustrated in Fig.2, the contour of the under half of the image was built on a three-point special

basis: two angular points and the tongue tip. The upper half contour was substituted by straight lines, and to guarantee that the contour was inside the tongue body, another point (tongue root) was added. Automatically the angular points were detected by the Harris detector while by edge detectors the tongue tip and the root were located. The geodesic curve would shrink to the real boundary, When the selected tip point was below the real tongue tip. Once the trend is assured, the curve will not stop until it reaches the real boundary. It swelled for the upper half contour, while shrank for the under part<sup>5</sup>. According to the row of angular points the whole region is divided into two parts. In the upper part (the curve became stuck or over-learned at some local minimum points, and the binary images adopted and completely solved the problem. For the under part (initialized the level set function with a negative constant inside the contour, and a positive value outside the contour) to keep the geodesic curve shrinking to the real boundary<sup>5</sup>.

#### **Extraction Region of Interest by Windowing**

DGF method suffers from a problem for different tongue color sets the parameters must change to adjust to the color contrast between the facial skin and the tongue body, and this takes is consuming time, especially if it's a huge dataset. Also, the active contours were initialized wrongly, for some special images, for the evolution of C2G2FSnake, and this problem cannot be solved that is why we have moved to another way: extracting the region of interest by windowing (WROI). Many intelligence applications need to detect potential targets or Region of Interest (ROI) in digital images. These profits can then be used to show additional analysis to identify and recognize targets<sup>8</sup>. In the preprocessing of a tongue print identification system, localization and segmentation of ROI is the main task. The aim of extraction ROI is to decide which part of the image is fit for the center of tongue body, keeping the valuable information in the ROI and removing the useless information in the background. The important rule in the extraction of ROI, that ROI should be automatically extraction for all tongue images in dataset. Perfect ROI extractions of tongue image will greatly reduce the computation complexity of any subsequent processing importantly; improve the performance of the tongue print identification system<sup>9</sup>. The main steps of our proposed extraction WROI are:

Binarization: Convert RGB image to binary image.

Morphological operation: Fill the holes and remove pepper and salt noise by applying the median filter.

Region detection: 1. Detect the upper part of the tongue.

2. Detect the side part of the tongue.

Cropping: Remove the unnecessary part of the image.

Windowing: Take a window from the center of the image.

To detect the area of the tongue, region detection process is used in our proposed WROI, the binary image will be reversed i.e., to turn black to white and vice versa and that led to twist the dark area that lies between the top tongue and upper lip to white. Identify the begin of the tongue from the upper part by using the different points, that is obtained from translating a white area to a dark area. Also to detect the side parts using the different points (that obtained from moving from a white area to a dark area from the left side and moving from a dark area to a white area from the right). If the tongue area is defined, the outside area will be eliminated, and then specified points and cropped the area of the tongue which only to be used to extract ROI. The image resulted from the cropping process is used in our proposed WROI method. The size of the window is 128x128 and its position will be located in the middle of the cropped image vertically either on it is closer to the upper half horizontally, because we cut the image and the beginning of image is the beginning of the tongue.

**Feature Extraction based on Gabor Filters Family**

Gabor filters are a great tool to extract texture features and are a complex exponential modulated by a Gaussian

function in the spatial domain <sup>10</sup>. The following family of two-dimensional (2-D) Gabor functions is used <sup>11</sup> to model the spatial summation properties of simple cells:

$$g_{\zeta,\eta,\lambda,\theta} = \exp(-) \cos () \dots\dots\dots(1)$$

$$= (- \zeta) \cos \theta - (- \eta) \sin \theta \dots\dots\dots(2)$$

$$= (- \zeta) \sin \theta - (- \eta) \cos \theta \dots\dots\dots(3)$$

Where the arguments and specify the position of a lightimpulse in the visual field and  $\zeta,\eta,\lambda,\theta$  and are parameters as follows. The pair( $\zeta,\eta$ ) , which has the same domain  $\Omega$  as the Pair () , determinesthe center of a receptive fieldin image coordinates. The standard deviation of the Gaussian factor determines the (linear) size of the receptive field. The consistency and method of irregular deviation of the receiving field segment is determined by the, parameter  $\gamma$ , called the spatial aspect ratio.It has been found to vary in a limited range of  $0.23 < \gamma < 0.92$ . The value  $\gamma =0.5$  is used in our simulation and, since this value is constant, the parameter  $\gamma$  is not used to index a receptive field function.

The magnitudes of the Gabor filters responses are represented by three Moments

$$\mu(W,\theta,)=\dots\dots\dots(4)$$

$$\text{std}(W,\theta,= \dots(5)$$

$$\text{Energy} = \dots\dots(6)$$

A family of Gabor kernels, different central frequencies and orientations can be obtained, which can then be used to extract features from an image. The feature vector is constructed using mean -  $\mu(W, \theta, \sigma_x, \sigma_y)$ , standard deviation -  $\text{std}(W, \theta, \sigma_x, \sigma_y)$  and energy as feature components (Table 1).

**Table1. Features extraction by using a Gabor filter.**

Wavelength	Orientation	Mean	Std	Energy
2	45	38.02293034	4.49547446	1.3282e+08
2	90	608.6530546	152.3416067	3.5667e+10
2	135	76.98666441	20.92444683	5.7665e+08
2	180	636.8014988	309.55345481	4.5422e+10
8	45	38.02286413	4.35266405	1.3270e+08
8	90	608.6567598	143.16753498	3.5421e+10
8	135	77.11555898	23.80113464	5.9011e+08
8	180	640.4272024	342.25746277	4.7773e+10

## CONCLUSION

In this paper, The first method has suffered from the problems already mentioned, so a new way was applied to get better performance which is WROI. A window with size 128x128 was taken from the tongue based on the beginning of the tongue from the dark region and the parts that are located above this region were excluded. Thus, a fixed window with a fixed size was taken for all the images and used them directly into the extraction features. Gabor filters family method was used to extract features from images to tongue identification. Tongue dataset was used that consists of 29 images to estimate the performance of tongue identification method. In the future study the proposed system will be evaluated on another tongue dataset.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Al-Mustansiriyah University, College of Science, dept. Computer Science, Iraq and all experiments were carried out in accordance with approved guidelines.

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# VTE Risk in Postmenopausal Women Receiving Oral and Non-Oral Hormone Therapy Systematic Review and Meta-Analysis

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## ABSTRACT

Hormone replacement therapy can improve the quality of life for women with hypo-oestrogenic symptoms. Many women are still prescribed oestrogen therapy to treat postmenopausal symptoms. Venous thromboembolism (VTE), either deep vein thrombosis or pulmonary embolism, is a main harmful effect of HT among postmenopausal women. We aim to evaluate the risk of VTE in postmenopausal women using hormonal therapy either oral or non-oral types. Systematic review of MEDLINE, Cochrane CENTRAL, EMBASE, and ClinicalTrials.gov according to PRISMA guidelines. 22 studies were included in the meta-analyses (9 case-control studies, 9 cohort studies, and 4 randomized controlled trials). VTE risk was not increased with non-oral HT, including users of estrogens and estrogens plus progestins (OR 0.97 [0.9-1.06]), non-oral estrogen therapy (ET)-only (OR 0.95 [0.81-1.10]), and non-oral combined estrogen-progestin therapy (OR 0.92 [0.77-1.09]). The comparison of non-oral vs. oral HT showed increased VTE risk with oral HT (OR 1.66 [1.39-1.98]). Increase the risk of VTE in postmenopausal women who using oral HT versus non oral HT.

**Keywords:** *Venous thromboembolism, VTE, hormonal therapy, HT, postmenopausal women.*

## INTRODUCTION

After menopause, many women suffer from postmenopausal symptoms associated with the decline of endogenous estrogens levels due to the cessation of ovary activity. Postmenopausal hormone therapy (HT) has been introduced in the 50% for correcting climacteric symptoms, vaginal dryness and depression. Initially, HT exclusively consisted of an estrogenic compound and in 70%, progestogens were added to estrogens to reduce the increased risk of endometrial hyperplasia and cancer associated with estrogens therapy (ET)<sup>1</sup>. Venous thromboembolism (VTE), either deep vein thrombosis or pulmonary embolism, is a main harmful effect of HT among postmenopausal women<sup>2-4</sup>. Indeed, oral estrogens increase the VTE risk while non-oral estrogens

appear to be safe with respect to thrombotic risk<sup>4,7</sup>. More recently, the type of progestogens has also emerged as another important determinant of the thrombotic risk among HT users<sup>5-7</sup>. Hormone replacement therapy is also effective for preventing osteoporotic fractures among current users.<sup>10</sup> In contrast; harmful effects of hormone replacement therapy include breast cancer and venous thromboembolism.<sup>11</sup> Furthermore, randomized controlled trials showed that hormone replacement therapy might increase the risk of coronary heart disease and stroke.<sup>12</sup> Venous thromboembolism is a serious and potentially fatal event. This including thrombosis of the deep veins of the legs and embolism to the pulmonary arteries. Venous thromboembolism is uncommon in the general population<sup>13,14</sup>. However, the risk is increased in persons with previous venous thromboembolism<sup>15</sup>, recent surgical procedures<sup>16,17</sup>, immobilization, fracture of a lower extremity<sup>18,19</sup>, cancer, and inherited coagulation disorders<sup>20,21</sup>. Use of oral hormonal therapy increases risk for venous thromboembolism<sup>13,14</sup>. The biological potency of the estrogens generally used in postmenopausal hormone therapy is about one-

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fourth to one-fifth that of the estrogens in modern oral contraceptives. Until recently, there has been little evidence that low-dose estrogen therapy is associated with increased risk for venous thromboembolism<sup>17-20</sup>.

## MATERIALS AND METHOD

This study was performed in accordance with Cochrane Collaboration guidelines and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)<sup>21</sup>. The review protocol and all data used in the analyses are available in the text, tables, and figures.

### Eligibility criteria, search strategy, and study selection

We gathered data from clinical trials and from case-control and cohort studies designed to assess venous thromboembolism (VTE) (pulmonary embolism and/or deep vein thrombosis) in postmenopausal women using oral or non-oral HT. Non-users of HT were considered as control groups. For clinical trials and cohort studies, only works including postmenopausal women with no previous VTE were selected. For multiple articles on the same sample, we selected the article containing the most complete information. Eligibility assessment was performed independently in an unblinded, standardized manner by two reviewers, and inconsistencies were settled by a third reviewer. The Estrogens ThromboEmbolism Risk (ESTHER) study was the first one to show the safety advantage of transdermal versus oral estrogens with respect to VTE risk<sup>22,23</sup>. This finding was confirmed in several large-scale studies, including the E3N cohort study<sup>24</sup>, the analysis of the General Practitioner Research Database from the UK<sup>25</sup>, the Million Women and the Mega studies<sup>26,27</sup>. In addition, most of these studies have highlighted the important role of concomitant progestogens in determining VTE risk among HT users. These data have been summarized in systematic reviews and quantitative assessments of VTE risk in HT users<sup>28-30</sup>.

### Statistical analysis

Statistical methods have been described<sup>29,30</sup>. Briefly, log-transformed risk ratios (RRs) were pooled using random-effect models<sup>31</sup>. Between-study heterogeneity was assessed with the Cochran's test, and the I<sup>2</sup> statistic was used as a measure of the degree of inconsistency in the study results<sup>32</sup>. A value of 0%

indicates no observed heterogeneity, and larger values show increasing heterogeneity. Stratified analysis was conducted based on the route of estrogen administration, hormonal regimen (opposed and unopposed estrogen) and molecules of progestogens.

## RESULTS AND DISCUSSION

### Study selection

Figure 1 provides details of the study selection. The initial search identified 836 articles. After title and abstract screening and exclusion of duplicates, 43 potentially eligible studies were retrieved for full text review. Of these 43 articles, 21 were excluded: 13 did not report on the outcome of interest (VTE) and eight included women with cardiovascular disease or previous VTE. Therefore, 22 studies were included in the Meta analyses. Of these, nine were case-control studies investigating the occurrence of VTE in postmenopausal women using oral or non-oral HT as compared to controls. Nine cohort studies were also included. In these studies, postmenopausal women who were not using HT were compared to postmenopausal women using oral or non-oral HT. Finally, four randomized controlled trials (RCTs) were included. These RCTs assessed the risk of VTE with oral HT, but not with non-oral HT<sup>32</sup>.

### Description of the studies

Table 2 summarizes the characteristics of the nine case-control studies. Table 3 describes the nine cohort studies and the four RCTs included in the meta-analyses. VTE was defined as any thromboembolic outcome (pulmonary embolism and/or deep vein thrombosis) in women without previous events. Most studies with mean age ranging from 48 to 65.9 years and were performed in European countries, Canada, and the United States. NOS scores for the included studies ranged from 5 to 8 (Table 1). In two RCTs, only women without previous VTE events were included. The other two RCTs were large trials, WHI I and WHI II<sup>25</sup>. This was also the case for non-oral HT (17 $\beta$  estradiol in all cases): separate analyses were not performed for patches or gel, and risk was not analyzed according to dose. Thus, for the present purposes, all oral formulation types were included in a broad oral HT group. The same was true for non-oral HT, i.e., all doses and presentations were analyzed as a single non-oral HT group. Nine of the 22 studies<sup>22-27</sup> provided data regarding subgroups of users or non-users of progestins. Seven studies compared never-HT users

with past HT users (oral route only). Six of them did not report changes in VTE risk when never users and past users were compared. One study reported a slight, but significant increase in risk of VTE in past HT users (relative risk [RR] 1.11 95%CI 1.04- 1.19)<sup>25</sup>. That study<sup>25</sup> also stratified the past user group according to time since therapy discontinuation, and showed increased VTE risk compared to never users in past HT users who had discontinued oral HT for  $\leq 4$  months (RR past users: 1.43 [95%CI 1.23-1.66]; RR never users: 1.27 [95%CI 1.11-1.45]). However, the study reported that more than 4 months of oral HT discontinuation rendered past user VTE risk similar to that of never users (RR 0.98 [95%CI 0.87-1.11]).

### Data synthesis and meta-analyses

Meta-analyses were performed to evaluate: risk of any VTE event in postmenopausal women using HT considering administration route (oral vs. non-oral HT).

#### Non-oral HT vs. oral HT

Twelve studies were analyzed [23, ], including case control studies, cohort studies, and RCTs (Fig. 2), for a total of 113,059 women using non-oral HT and 281,018 using oral HT. VTE risk was increased with oral HT (OR 1.66 [1.39-1.98], I<sup>2</sup> 58%).

### Interpretation

This updated meta-analysis confirms the lower VTE risk among transdermal versus oral estrogen users and highlights important differences between progestogen molecules. While no change in VTE risk could be detected in users of transdermal estrogen combined with progesterone, there was a clear rise in VTE risk related to nomegestrol acetate or promegestone among transdermal estrogen users as well as to MPA among oral estrogen users. Recent observational studies have suggested that postmenopausal hormone therapy causes a twofold to fourfold increase in risk for idiopathic deep venous thrombosis and pulmonary embolism. However, these findings may be biased if women taking estrogen are more likely to be evaluated for nonspecific symptoms suggestive of venous thromboembolism. There were a lot of randomized trials done about the effect of HT on the risk of VTE. The Heart and Estrogen/progestin Replacement Study (HERS) was large randomized trial to examine the effect of postmenopausal hormone therapy on risk for venous thromboembolism. This is

a randomized, blinded, placebo controlled trial of the effect of daily conjugated equine estrogen, 0.625 mg, plus medroxyprogesterone acetate, 2.5 mg, on the rate of new coronary events in 2763 postmenopausal women with established coronary heart disease. One of the specified secondary outcomes of this trial was venous thromboembolism. An increased risk for venous thromboembolism among women assigned to hormone therapy was noted by the HERS Data and Safety Monitoring Board. The Board instructed the HERS investigators to inform participants and the scientific community of this risk and to institute measures to reduce risk. At a mean follow-up of 3.3 years, the HERS investigators notified participants to discontinue study medication in situations associated with increased risk for venous thromboembolism, such as surgery, hospitalization, fracture, and cancer, and published a letter noting the increased risk. Eight women in the hormone group and 1 woman in the placebo group developed VTE. The incidence rate of recurrent VTE was 8.5 per 100 patient-years in the HT group and 1.1 in the placebo group. Compared with placebo, HT resulted in doubling of the VTE risk. VTE risk was slightly increased in women receiving HT compared with the placebo group. There was a significantly increased VTE risk in the CEE group during the first 2 years. WISDOM (the Women's International Study of Long Duration Oestrogen after Menopause) was a multicenter, randomized, double-blind, placebo-controlled trial designed to assess the long term risks and benefits of HT. There was a significant increase in the number of VTE events. All these randomized trials have confirmed an increase in the VTE risk among HT users. Such a consistency between both approaches strongly suggests that findings based on observational studies provide an unbiased estimate of true effects of HT on the VTE risk. There were other studies that focused on the effect of transdermal HT (non-oral HT) on the risk of VTE. E3N (Etude Epidemiologique de l'Education Nationale study) is a French prospective cohort study including 80,000 healthy postmenopausal women without contraindication to HT<sup>25</sup>. Results showed that oral but not transdermal estrogens alone were associated with an increased VTE risk. MWS (the Million Women Study) is a population-based prospective study that recruited 1.3 million UK women through National Health Service<sup>26</sup>. During 3.3 million woman-years of follow-up, 2,200 postmenopausal women had an incidence of VTE. In contrast to oral estrogens, there was no increased VTE

risk among women using transdermal estrogen alone or transdermal estrogen plus progestogen when compared with nonusers. MEGA (the Multiple Environmental and Genetic Assessment of Risk Factors for Venous Thrombosis case-control study) included 2,550 women aged over 50 years, 1,082 patients with a first VT and 1,468 controls<sup>26</sup>. Oral but not transdermal estrogen use increased the VTE risk.

### CONCLUSION

Transdermal estrogen combined with micronized progesterone appears to be the safest option with respect to VTE risk among postmenopausal women requiring HT. The most recent clinical guides recommend this HT regimen for women at high VTE risk. More research and action are needed to increase awareness of hormone-related VTE. Improving individual risk stratification and a personalized approach to HT are a major challenge for future work.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Ministry of Public Health, Maysan Health Department, Maysan governorate, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Effectiveness of an Education Program on Life-Style of Patients with Myocardial Infarction in Al Nasiriyah Hospitals

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## ABSTRACT

This study was carried out to evaluate the effect of education program on the lifestyle of patients with MI. A quantitative quasi experimental study design is carried out at AL-Hussein Teaching Hospital and An Nasiriyah Heart Center in AL-Nasiriyah City, from December, 2017 through, November, 2018. A non-probability (Purposive sample) of (100) patients diagnosed with myocardial infarction divided into two group (50) patients as control group and (50) patients as study group. The data were collected through the use of questionnaire designed by researcher, which comprised of (4) parts: Part I: related to the Socio-demographic characteristics, Part II: Assessment modifiable risk factors regarding lifestyle modification, Part III: Assessment of knowledge regarding lifestyle modification and Part IV: Assessment of compliance regarding lifestyle modification by direct interview technique with the patients. Reliability of the questionnaire is determined through a pilot study and the validity through a panel of experts. The descriptive and inferential statistical procedures were used for analysis of data. The results also showed that there was a non-significant relationship between socio-demographic characteristics variables and patient's knowledge and compliance with life-style modification in pretest stage and posttest of study group by P value < 0.05.

**KEYWORDS:** Effectiveness, Education Program, Life-Style.

## INTRODUCTION

Cardiovascular disease (CVD) is now one of most dominant reason of death in the world. In the nineteenth century, malnutrition and infectious diseases were the causes of greatest deaths and morbidities. Today, CVD accounts for approximately 30% of totally deaths in over 35 years old. According to statistical of 2008 mortality, more than 2200 Americans died due to CVD every day <sup>1</sup>. Cardiovascular disease is the primary reason of death in various developed countries. In 2000, CVD is accountable for more than 1.9 million of death in the European Union, 4.35 million deaths in Europe, responsible for 43% of all deaths in male and 55% of all

deaths in female. CVD is developing and has become the leading reason of death in developing countries <sup>2</sup>. Furthermore numerous risk factors have been linked to the development of CVD including; poor dietary habits, overweight and obesity, hypertension, insulin resistance or diabetes mellitus, alcohol consumption, smoking, poor physical activity levels, and dyslipidemia. Of relevance, many of these risk factors are related and reversible through a healthy diet and increased physical activity. Given that childhood obesity increases the risk of becoming obese in adulthood, and that obesity at any age is associated with numerous co-morbidities such as, type 2 diabetes, CVD risk, hypertension, asthma, depression, certain cancers, and sleep apnea, reversing current trends in obesity prevalence which seems vital <sup>3</sup>. Acute myocardial infarction (MI) is the most dominant type of cardiovascular disease in adults. For this reason, it is important for nurses to become familiar with various manifestations of coronary artery conditions and methods for assessing, preventing, and treating these disorder <sup>4</sup>. Acute myocardial infarction (MI) or

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heart attack refers to the ischemic necrosis of cardiac myocytes which occurs due to the lack or reduction of blood supply. This disease is life threatening and influences the physical, psychological and social aspects of the patient's life. The prevalence of this disease is increasing throughout the world<sup>5</sup>. Choosing a healthy lifestyle along with a balanced diet reduce the rate of MI and the need to surgery and angioplasty<sup>7-9</sup>. Educational program for life style modification could be one of the important and basic steps to reach objective. Educational program for life style modification is one of the models planned by Ahmadi for patients suffering from chronic coronary vascular disease. The aim was to establish and maintain a dynamic, flexible, and continuous care relationship between the nurse and the patient for improving the lifestyle of the patients<sup>10,11</sup>.

## MATERIAL AND METHOD

A quantitative research approach has been used for this study. The quasi-experimental design conducted on patients with myocardial infarction towards education program with application of pre-post- test approach for the study group and control group in assessing their knowledge and the application of education program for the study group. It carried out in order to achieve the initial stated objectives. The study was started from December, 2017 through, February, 2019, mission to carry out the study. A non-probability (purposive) sample of (100) patients was selected. All the patients diagnosed with myocardial infarction and they had a medical records and they review cardiac outpatient clinics of the following hospitals: AL Hussein Teaching Hospital and An Nasiriya Heart Center. The sample was divided into two groups each one contained (50) patients. One group did not expose to the educational program was considered as the control group. The other fifty patient who were participated in the program considered as the study group. The study group was exposed to an education program about knowledge and compliance toward lifestyle modification. To accomplish the study, the researcher constructed the questionnaire based on the review of previous related literature and related studies. The study instrument comprised of (4) parts: Part I: It consists of (9) items, related to the Socio-demographic characteristics of these patients which include age, gender, occupational status, level of education, marital status, monthly income, residential area, chronic diseases and family history. Part II: Assessment modifiable risk factors regarding lifestyle modification:

It consists of (5) sections, related to the Coronary Artery Disease risk factors of these patients which include: Section 1: Smoking, Section 2: Alcohol Consumption, Section 3: Anthropometric Measures: which include: Body weight. (Kg), Body height. (cm), Body mass index (BMI), Section 4: Blood pressure measured manually and Section 5: Biochemical Measures: Collecting blood samples from each participant for analyzing the following tests: Cholesterol, Triglyceride, High-density cholesterol (HDL, Low-density cholesterol (LDL) and Fasting Blood sugar (FBS). Part III: Assessment of knowledge regarding lifestyle modification: It consists of 26 questions (information on myocardial infarction (MI) two items, risk factors 11 items, treatment one items and lifestyle modification 12 items. Part IV: Assessment of compliance regarding lifestyle modification: it consisted four domains include: physical activity domain measured through (3) items, food style domain this domain was measured through (6) items of food style, Treatment Domain: This domain was measured through (10) items, Stress Management Domain: This domain was measured through (12) items. The high score of food style domain obtained, it means higher modification by patients, for each patient took about (30 - 45) minutes. Validity of the program and the study instruments are determined by the panel of (26) experts, who had more than five years' experience in their fields in order to achieve study objectives. Reliability of the questionnaire was determined through the use of test and re-test approach on (10) patients. The results showed very high level of stability and internal consistency of principle parts concerning item's responses' of the questionnaire, all those were calculated by using the major statistical parameter: Alpha Cronbach, revealed that the person correlation coefficient is (0.73). Data were analyzed through the use of SPSS application version 0.22. Descriptive data analysis including Frequency, Percentage, Mean of score (M.S) with their Standard Deviation (S.D). Percentile Grand Mean of Score (PGMS), Percentile Global Mean of Score (PGLMS), and Relative Sufficiency (RS %). Inferential data analysis includes Pearson Correlation Coefficient, Mann-Whitney test, Wilcoxon Sign Rank test, McNemar test, Analysis of Covariance (ANCOVA).

## RESULTS AND DISCUSSION

Respect to subjects of studied (SDCv.), results shows that studied groups recorded no significant differences at  $P > 0.05$ , and that is reflecting validity

of the selected subjects due to their similarity status in light of that variables, as well as preceding results indicating that two studied groups are thrown from the same population in light of (SDCv.), and that are more reliable for this study, since any meaningful deviation between studied groups should be interpreted due to effectiveness of applying the suggested program. Respect to subjects of studied (Chronic Diseases) parameters between studied groups, results shows that no significant differences at  $P>0.05$  are accounted, and that is reflecting validity of the selection subjects due to their similarity status in light of that parameters, as well as preceding results indicating that two studied groups are thrown from the same population in light of that variables, and that are more reliable for this study, since any meaningful deviation between the studied groups should be interpreted due to effectiveness of applying the suggested program. On the subjects of studied groups concerning knowledge regarding lifestyle modification regarding lifestyle items in the studied groups, results shows that no significant differences at  $P>0.05$  are accounted in controlled group, For summarizes preceding results it could be conclude that educational program in charged of knowledge and compliance of patients, with education needs toward life-style modification recorded positive and meaningful effects for helpful of patients with myocardial infarction. On the subjects of studied

groups concerning stress management, results shows that no significant differences at  $P>0.05$  are accounted in controlled group, and that is reflecting significance of studying subjects, while has assigned highly significant different at  $P<0.01$  in study group compared along pre - post periods, since several patients who has participated with the suggested program have changed their responses from felling stress always score to sometimes score. This result supported by a study carried out at (2014) indicated that the demographic characteristics of the patients were matched for age, sex and family income <sup>18</sup>. Through data analysis of Chronic Diseases parameters between studied groups as presented in table (1), the present study reported no significant differences recorded in the studied groups at  $P>0.05$ , and that reflecting validity of the selected subjects due to their similarity status in light of that variable. This results agreed with the conducted study on patient evaluation of a post myocardial infarction teaching programme about life style modification administered by nurses. Information included a detailed programme of exercises during convalescence, attitude towards diet, smoking, stress management, compliance of medication. The study indicated that between 76% and 91% of patient considered the presentation necessary and there was significant improvement in their understanding of lifestyle modification<sup>12</sup>.

**Table 1. Distribution of the studied groups according to (SDCv.) with comparisons significant**

SDCv.	Classes	Control		Study		C.S. (*) P-value
		No.	%	No.	%	
Age Groups	< 45	7	14	3	6	C.C.=0.236 P=0.314 (NS)
	45 – 49	2	4	5	10	
	50 – 54	11	22	6	12	
	55 – 59	9	18	13	26	
	60 – 64	11	22	15	30	
	≥ 65	10	20	8	16	
	Total	50	100	50	100	
Gender	Male	32	64	34	68	C.C.=0.042 P=0.673 (NS)
	Female	18	36	16	32	
	Total	50	100	50	100	

**Cont.. Table 1. Distribution of the studied groups according to (SDCv.) with comparisons significant**

Level of Education	Read & write	25	50	20	40	C.C.=0.136 P=0.865 (NS)
	Primary	11	22	13	26	
	Intermediate	4	8	7	14	
	Secondary	3	6	4	8	
	High Institute	3	6	2	4	
	Post graduate	4	8	4	8	
	Total	50	100	50	100	
Marital status	Married	42	84	42	84	C.C.=0.103 P=0.783 (NS)
	Divorced	1	2	1	2	
	Widowed	7	14	6	12	
	Separated	0	0	1	2	
	Total	50	100	50	100	

**Table 2. Distribution of the studied groups according to Chronic Diseases with comparisons significant**

Chronic Diseases Parameters	Classes	Control		Study		C.S. (*) P-value
		No.	%	No.	%	
Do you have any of the following diseases?	High blood pressure	18	36	23	46	C.C.=0.188 P=0.298 (NS)
	Diabetic Mellitus	1	2	1	2	
	High blood pressure & Diabetic mellitus	28	56	26	52	
	No Chronic Disease	3	6	0	0	
	Total	50	100	50	100	
Do you have any of your family members (mother, father, brother, and sister) any of the following diseases?	High blood pressure	30	60	23	46	C.C.=0.161 P=0.446 (NS)
	Diabetic Mellitus	6	12	9	18	
	High blood pressure & Diabetic mellitus	10	20	15	30	
	No Chronic Disease	4	8	3	6	
	Total	50	100	50	100	

**Table 3. Distribution of the studied groups according to Studied Sub & Main Domains with comparisons significant**

Studied Sub & Main Domains	Groups		Control			Study			C.S. C X S Diff.
	Periods	No.	Pre			Post			
			PGMS	PGSD	C.S.	PGMS	PGSD	C.S.	
Assessment of knowledge regarding lifestyle modification among patients with myocardial infarction	Pre	50	41.00	15.95	P=0.021 S	43.00	12.05	P=0.000 HS	P=0.000 HS
	Post	50	47.31	14.21		79.62	11.37		
The First Domain - Physical Activity	Pre	50	65.67	13.64	P=0.749 NS	59.67	21.84	P=0.016 S	P=0.041 S
	Post	50	66.33	12.37		69.67	16.39		
The second Domain - Style Food	Pre	50	51.13	8.29	P=0.731 NS	51.40	7.26	P=0.000 HS	P=0.000 HS
	Post	50	50.73	6.43		69.47	9.39		
Third Domain – Treatment	Pre	50	42.60	19.78	P=0.052 NS	45.80	16.05	P=0.000 HS	P=0.000 HS
	Post	50	49.60	22.40		77.60	11.88		
Fourth Domain - Stress Management	Pre	50	67.00	22.93	P=0.564 NS	65.00	23.15	P=0.001 HS	P=0.063 NS
	Post	50	65.00	23.15		54.00	13.70		
Assessment of compliance regarding lifestyle modification among patients with myocardial infarction	Pre	50	56.60	7.64	P=0.073 NS	55.47	7.68	P=0.000 HS	P=0.000 HS
	Post	50	57.92	7.07		67.69	5.76		

**Table 4. Relationships (Analysis of Covariance) concerning Knowledge & Compliance Regarding to Life Style Modification in the study group according to SDCv.**

Groups	Source	Type III Sum of Squares	d.f.	Mean Square	F Statistic	Sig. Levels	C.S. (*)
Study	Intercept	20498.3	1	20498.3	401.6	0.000	HS
	Gender	25.3100	1	25.310	0.496	0.487	NS
	Age Group	31.1	5	6.21	0.122	0.986	NS
	Education Levels	138.5	5	27.70	0.543	0.742	NS
	Marital Status	198.1	3	66.04	1.294	0.296	NS
	Occupation	136.6	4	34.154	0.669	0.619	NS
	Monthly Income	41.4	2	20.68	0.405	0.671	NS
	Residency	5	1	5.256	0.103	0.751	NS
	Error	1447.7	33	51.04	R-Squared = 0.429		
	Total	317202	50				

## CONCLUSIONS

On subject of knowledge regarding lifestyle modification, it could be extrapolated that applying suggested educational program had extremely positively reforming myocardial infarction patients, since initial of their knowledge are weak assessed commonly, and program had achieved patients with respect their knowledge to a borderline of very good assessed, either for those who had weak or acceptable assessed before applying the program. Respect to assess of compliance regarding lifestyle modification concerning "Physical Activity", "Style Food", "Treatment" and "Stress management" among patients with myocardial infarction, it could be extrapolated that apply suggested educational program had extremely positively reforming myocardial infarction patients, since initial of their compliance are weak assessed commonly, and program had achieved patients to a borderline of good assessed, either for those who had weak or acceptable assessed before applying the program.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Adult Nursing Department, College of Nursing / University of Thiqr / Iraq and all experiments were carried out in accordance with approved guidelines.

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# Effectiveness of *Punica Granatum* and *Propolis*: A New Dressing Method in Management of Diabetic Foot Ulceration

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## ABSTRACT

*Propolis* is a substance collected by honey bees from a plant's buds and exudates and consists mainly of resins, balsams, beeswax, essential oils, pollen and other organic compounds. *Propolis*, due to its antibacterial, antifungal and healing properties, has been extensively used in the health industry worldwide. *Punica granatum* is rich in phenolic compounds and is an important source of hydrolysable tannins, ellagitannins and allergic acid. In addition to the tannins, *pomegranates* also contain flavonoids, including flavones, flavone's and anthocyanin's. A Pre-Test / Post-Test Control Quazi Experimental Design is carried out through the present study in order to determine the effectiveness of the *punica granatum* and *propolis* extracts in healing diabetic foot ulceration. The period of the study last from October, 2017 to September, 2018. As the study hypothesis is formulated to predict a positive effect of the *Punica granatum* and the *Propolis* extract on the healing of the diabetic foot ulceration. So, based on the study findings, this effect is proved; and there is no sufficient evidence to accept the null hypothesis, otherwise the alternative hypothesis is accepted. It is concluded that it is significant to use the *punica granatum* and *propolis* extracts in management of diabetic foot ulcerations.

**Keyword:** *Punica Granatum* , *Propolis* , Management of diabetic foot ulceration

## INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both <sup>1</sup>. In addition, diabetes is one of the most public health disorder common <sup>2</sup>. There are around 4.6% about 285 millions of diabetic patients in 2010 in the world, and 422 million adults have diabetes and 1.5 million deaths patients because diabetes <sup>3</sup>. The international diabetes federation(IDF) estimated the global prevalence to be 151 million in 2000, 194 million in 2003,246 million in 2006, 285 million in 2009, 366 million in 2011, 382 million in 2013, and 415 million in 2015 <sup>4</sup>. Diabetic foot ulcers are characterized by an inability to self-repair in a timely and orderly manner, and occur as a consequence of the interaction of several contributory factors. These contributory factors may be schematically divided into intrinsic (neuropathy, peripheral vascular disease, and diabetes severity) and extrinsic (wound infection, callus formation, and excessive pressure to the site) <sup>5</sup>. The foot ulcer is a leading cause of hospital admissions for

people with diabetes in the developed world and is a major morbidity associated with diabetes, often leading to pain, suffering, and a poor quality of life for patients <sup>6</sup>. Diabetic foot ulcers (DFUs) are estimated to occur in 15% of all patients with diabetes and precede 84% of all diabetes-related lower leg amputations <sup>7</sup>. Foot problems are caused by neuropathy, poor circulation or a combination of both the loss of feeling that comes with neuropathy is especially dangerous, as you may not be aware of cuts, blisters and bruises the loss of sensation can change the way you walk or can damage bones, and joints delays in treatment can lead to serious problems poor blood circulation means that less oxygen and fewer white blood cells that fight infection can get to a wound. It also means that antibiotic treatments that travel through the bloodstream are not so effective because they cannot get to the tissue in proper concentration <sup>8</sup>. *Propolis* dressing enhances phagocytes, through providing substrates of glycolysis which is the major mechanism of energy production in the macrophage in addition its acidity (PH below 4) assist in the antibacterial action

<sup>9</sup>. *Propolis* reduces odor often associated with diabetic foot wounds the objectives of diabetic foot management not only to create optimum local condition for healing or reduce of malodor, pain, frequency of dressing change, deterioration of the wound but also hemodynamic improvement of the patients<sup>10</sup>.

## MATERIALS AND METHODS

### Design of the Study

A Pre-Test / Post-Test Control Quazi Experimental Design is carried out through the present study in order to determine the effectiveness of the *Punica granatum* and *Propolis* Extracts in healing of diabetic foot ulceration. The period of the study is from October, 2017 to September, 2018.

### Study Setting

The study is conducted in Al-Najaf City/Al-Najaf Al-Ashraf Health Directorate (NAHD) / Al-Najaf Center for Diabetes and Endocrine(NCDE).

### Sample of the Study

A non-Probability purposive sample of (60) Diabetic patients, those who visit Al-Sadder Medical City / Al-Najaf Center for Diabetes and Endocrine/ diabetic foot care unit for treatment or follow up or both, are included in the study sample. The selected patients divided into three groups with an equal number for each group (20 diabetic patients for each group). The first group is the control group, including the patients not included in the study intervention, and they still receive the classical intervention. The second group include the diabetic patients treated with the *Punica granatum* extract. Besides, the third group include the diabetic patients treated with the *Propolis* extract.

### Inclusion Criteria

The patients selected based on the following criteria:

Diabetic patients who are diagnosed medical as they have diabetic foot ulceration.

The age of the all participants is 36 years old and older.

They are Iraqis.

Conscious and alert patients, free from any change in the level of consciousness.

### Exclusion Criteria:

Patients with a psychiatric disorder.

Patients are receiving drugs that lead to delay of wound healing such as corticosteroids, immunosuppressive and cytotoxic drugs.

Patients with foot gangrene that needed amputation.

Patients with osteomyelitis that needed antibiotic therapy.

Patients with inappropriate adherence to follow up (missing follow-up more than two times).

### The Study Instrument

An assessment tool is developed by the researcher to determine the effectiveness of the *Punica granatum* and *Propolis* Extracts in healing of diabetic foot ulceration. The final instrument consists of (3) parts:

Part 1: Demographic Data

Part 2: Medical Information

Part 3: Characteristics of the diabetic foot ulceration for patients

### Validity of the Study Instrument

The validity of an instrument concerns its ability to gather the data that it is intended to gather. Face validity for the early developed questionnaire is determined through the use of panel of experts to investigate clarity, relevancy, and adequacy of the questionnaire to measure the concepts of interest.

## RESULTS AND DISCUSSION

The study results show that there is a non-significant differences in the diabetic foot ulceration depth and width between the pre-test and post-test periods among the control group patients after they receive a classical treatment modality. While there is a high significant differences in the diabetic foot ulceration depth and width between the pre-test and post-test periods after treatment with Punica Granatum extract. This result is supported with the Nasiri, *et al.*, (2017) in their study the healing of wounds treated with creams containing 5% and 10% *P. granatum* flower extract was faster than that of wounds treated with the other agents. Also there is a high significant differences in the diabetic foot

ulceration depth and width between the pre-test and post-test periods after treatment with Propolis extract. Furthermore, the study results indicate that there is a reduction in the ulceration depth and width after the application of the Punica Granatum and Propolis extracts. *Punica granatum* peel extract was evaluated for its wound-healing activity in rats using an excision wound model Nayak, (2013). The authors have shown that the extract-treated animals were found to epithelialize faster

when compared to respective controls and exhibited a 95% reduction in the wound area. These extracts were also investigated for healing effects on deep second-degree burns in rats Ma, (2015). The major reduction present in patients treated with Propolis compared with those patients treated with *Punica granatum* extract or the control group patients (i. e. the study intervention is an effective in management of diabetic foot ulceration compared with the classical treatment modalities).

**Table 1. Study Sample Demographic Data**

Demographic Data	Rating And Intervals	Control Group		Punica Granatum Group		Propolis Group	
		Freq.	%	Freq.	%	Freq.	%
Age / years	35 - 39	0	0	2	10	0	0
	40 - 44	2	10	3	15	0	0
	45 - 49	5	25	4	20	6	30
	50+	13	65	11	55	14	70
Total		20	100	20	100	20	100
Gender	Male	13	65	11	55	12	60
	Female	7	35	9	45	8	40
Total		20	100	20	100	20	100
Residence	Rural	7	35	6	30	5	25
	Urban	13	65	14	70	15	75
Total		20	100	20	100	20	100
Occupational status	Unemployed	9	45	10	50	8	40
	Employed	11	55	10	50	12	60
Total		20	100	20	100	20	100
Marital status	Married	18	90	15	75	16	80
	Widowed	2	10	0	0	4	20
	Divorced	0	0	5	25	0	0
Total		20	100	20	100	20	100
Education levels	Don't Able To Read And Write	6	30	0	0	3	15
	Able To Read And Write	1	5	5	25	7	35
	Primary School Graduated	6	30	7	35	5	25
	Secondary School Graduated	5	25	6	30	3	15
	College Graduated	2	10	2	10	2	10

**Table 2. Study Sample Clinical Data**

Clinical Data	Rating And Intervals	Control Group		Punica Granatum Group		Propolis Group	
		Freq.	%	Freq.	%	Freq.	%
Type of DM	Type1	8	40	4	20	7	35
	Type2	12	60	16	80	13	65
Total		20	100	20	100	20	100
Duration of the disease / years	1-2	3	15	4	20	4	20
	3 - 4	11	55	7	35	10	50
	5+	6	30	9	45	6	30
Total		20	100	20	100	20	100
Treatment type	Insulin	5	25	3	15	4	20
	Oral hypoglycemic agent	2	10	1	5	0	0
	Both	13	65	16	80	16	80
Total		20	100	20	100	20	100
Adherence to therapeutic recommendations	Yes	16	80	14	70	12	60
	No	4	20	6	30	8	40
Total		20	100	20	100	20	100
Complications	Neuropathy	18	90	15	75	19	95
	Retinopathy	2	10	5	25	1	5
Total		20	100	20	100	20	100
Use of Herbal	Yes	8	40	10	50	6	30
	No	12	60	10	50	14	70
Total		20	100	20	100	20	100
Suffering from Chronic disease	Yes	16	80	18	90	15	75
	No	4	20	2	10	5	25
Total		20	100	20	100	20	100

**Table 3. Assessment of Diabetic Foot Ulceration**

Diabetic Foot Ulceration Characteristics	Rating	Control Group		Punica Granatum Group		Propolis Group	
		Freq.	%	Freq.	%	Freq.	%
Site of ulcer	Heal of feet	10	50	5	25	9	45
	Big toe	6	30	11	55	8	40
	Dorsum of the feet	4	20	4	20	3	15

**Cont... Table 3. Assessment of Diabetic Foot Ulceration**

Total		20	100	20	100	20	100
Affected foot	Left	13	65	14	70	11	55
	Right	7	35	6	30	9	45
Total		20	100	20	100	20	100
Grade of ulcer	Superficial (skin)	7	35	9	45	7	35
	Partial(skin, subcutaneous )	11	55	11	55	10	50
	Deep(skin, subcutaneous, bone)	2	10	0	0	3	15
Total		20	100	20	100	20	100
Odor of ulcer	None	3	15	7	35	5	25
	Only at dressing	15	75	12	60	10	50
	Fill the room	2	10	1	5	5	25
Total		20	100	20	100	20	100
Exudates(color)	Serous	6	30	7	35	4	20
	Sanguineous	5	25	8	40	6	30
	Purulent	9	45	5	25	10	50
Total		20	100	20	100	20	100
Ulcer pain(frequency)	None	5	25	6	30	2	10
	Only when dressing	11	55	11	55	10	50
	Tenderness	1	5	3	15	2	10
	At any time	3	15	0	0	6	30
Total		20	100	20	100	20	100

**Table 4. Mean Differences of the Diabetic Foot Ulceration among Patients in Control Group (n 20)**

Ulceration Characteristics	Periods Of Measurement	Mean	Std. Deviation	T-Value*	D.F.	P-Value
Ulceration Depth	Pre-Test	2.1150	.94661	.842	19	.410 NS
	Post-test	1.9650	1.05794			
Ulceration Width	Pre-Test	4.1350	1.82563	1.133	19	.271 NS
	Post-test	3.6600	1.97521			

**Table 5. Mean Differences of the Diabetic Foot Ulceration among Patients treated with Punica Granatum Extract (n 20)**

Ulceration Character-istics	Periods Of Measurement	Mean	Std. Devia-tion	T-Value*	D.F.	P-Value
Ulceration Depth	Pre-Test	1.775	.772	9.248	19	.001 HS
	Post-test	.305	.483			
Ulceration Width	Pre-Test	3.635	1.543	13.308	19	.001 HS
	Post-test	.800	.979			

**Table 6. Mean Differences of the Diabetic Foot Ulceration among Patients treated with *Propolis* Extract (n 20)**

Ulceration Characteristics	Periods Of Measurement	Mean	Std. Deviation	T-Value*	D.F.	P-Value
Ulceration Depth	Pre-Test	2.02	1.01	9.219	19	.001 HS
	Post-test	.07	.14			
Ulceration Width	Pre-Test	5.22	2.50	9.661	19	.001 HS
	Post-test	.16	.38			

**CONCLUSION**

According to the study findings and discussion, the study concluded the following: As the study hypothesis is formulated to predict a positive effect of the *Punica Granatum* and the *Propolis* extract on the healing of the diabetic foot ulceration. So, and based on the study findings this effect is proved, as well as there is no enough evidence to accept the null hypothesis, otherwise the alternative hypothesis is accepted. The study confirms that the NIDDM is the common type of the diabetes mellitus. The diabetes mellitus more common occurs in male compared with female. Urban residents are more prone to suffer from diabetes mellitus compared with rural residents. Neuropathy is the common diabetic complications. *Punica Granatum* and *Propolis* are an effective extract to manage the diabetic foot ulceration among diabetes mellitus patients. *Propolis* extract characterized by an effective healing facilitate extract compared with the *Punica Granatum* extract.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Department of Adult Nursing, Al-Najaf Al-Ashraf Health Directorate, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Causes of Sudden Death in Athletes Referred from 2011 to 2017 to the Laboratory Diagnostic Center of Tehran Legal Medicine Organization

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## ABSTRACT

**Introduction and Objective:** According to the World Health Organization (WHO), sudden death is “death occurring less than 24 hours from the onset of symptoms.” It has different causes. Since there is very little information in Iran on the causes of sudden death during sport, this study aimed to investigate the causes of sudden death during sport in cadavers referred to the Tehran Legal Medicine Organization.

**Materials and Method:** In this descriptive retrospective study performed cross-sectionally, all cases of sudden death referred to the Tehran Legal Medicine Organization from 2011 to 2017 were examined. The information about age, gender, and cause of death was extracted and analyzed. The pathology slides of the selected cadavers were read again. Data were extracted based on the variables. The statistical sample included 60 cadavers (54 males and 6 females) divided into two groups of under and over 35 years.

**Findings:** Hypertrophic cardiomyopathy (HCM) was the cause of sudden death in 22 out of 60 cases (37%), of which 18 were under 35 years (43%) and 4 were over 35 years (22%). Ischemic atherosclerosis was the second diagnosis in 18 cases (30%), of which 6 were under 35 years (14%) and 12 were over 35 years (67%). Mitral valve prolapse was found in 4 cases (7%) under 35 years. Myocarditis was observed in 2 cases (3%) under 35 years. Cerebral and coronary artery anomalies were observed similarly in 2 cases (3%) under 35 years. Myocardial dysplasia was found in 2 cases (3%) over 35 years, tamponade in 2 cases (3%) under 35 years and 2 cases (3%) over 35 years, and left ventricular hypertrophy in 4 cases (22%) over 35 years.

**Discussion and Conclusion:** It seems that male gender can be considered a risk factor for sudden death. Congenital heart defects and hypertrophic cardiomyopathy are the most common causes of sudden death in athletes under 35 years, and severe coronary atherosclerosis is the most common cause of sudden death in athletes over 35 years. These findings are consistent with the findings of other studies.

Taking cardiovascular diseases and their risk factors more seriously as well as taking effective preventive measures to reduce their incidence can play a significant role in reducing the incidence of sudden death.

**Keywords:** Sudden death, athletes, hypertrophic cardiomyopathy, atherosclerosis

## INTRODUCTION

Sudden death is an unexpected death without any evidence of injury or trauma that occurs suddenly in

individuals who appear to be physically healthy and not expected to die.<sup>1</sup>

Historically speaking, the first sudden cardiac death occurred in 490 BC when Pheidippides, a Greek soldier, died immediately after completing the historic run from Marathon to Athens to deliver the message of the Greek victory over Persia. In recent years, sudden deaths of a number of world-class athletes such as Marco Pantani, an Italian cyclist winning the Tour de France (2004),

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Marc-Vivien Foé, a Cameroonian footballer (2003), Flo Hyman, Olympic volleyball champion (1986), and Majid Pasha Moghaddam, the member of Iran national basketball team, has attracted public attention to these painful, uncommon occurrences.<sup>2,3</sup> Studies show that over three-quarters of sudden death cases in athletes is associated with cardiovascular disorders.<sup>4</sup> Although it seems that most cases of sudden death have the clinical manifestations and symptoms of cardiovascular events, 50% of them are observed in males with no previously known cardiovascular disease.<sup>5</sup> Moreover, despite the reduced mortality rate of this complication, the rate of sudden death still remains high.

Although none of the human body systems can be ruled out in causing sudden death, the most common cause is cardiac dysfunction during sport activities or underlying abnormal structure, which are often preventable.<sup>6,7</sup>

## METHODOLOGY

Based on the available information at the secretariat of Kahrizak laboratory diagnostic center, the records of the cadavers referred to this center died from sudden death were analyzed. After that, 60 records that met the inclusion criteria of the present study were extracted from the archive and then reviewed. The data of these records were extracted, and if pathology slides of the samples of cadavers sent to the central laboratory were required, the data were reviewed again.

The inclusion criteria were sudden death occurring

during or within one hour following sport in professional or non-professional athletes. Given the limited number of samples, descriptive design of the study, and no need to perform comparisons, simple tables and charts were used to describe the data collected from observations and measurements.

## FINDINGS

Based on the identity documents of 60 cadavers studied, 18 cases (30%) were over 35 years and 42 cases (70%) were under 35 years; 54 cases (90%) were male and 6 cases (10%) were female.

The next variable was classification by the type of sport activity during lifetime and before death. This information was available in the medical history of cadavers in legal medicine records.

Chart 1. Number of sudden deaths by the type of sport activity

Of 60 cadavers examined, 16, 10, 8, 8, 6, 4, 4, and 4 cases were playing football, basketball, sports for all, track and field, bodybuilding, volleyball, cycling, and school games, respectively.

Cause of death variable: Table 1 represents the ultimate diagnosis of the cause of sudden death in the examined cadavers. In 60 records, the causes of sudden death have been separately identified in cases over and under 35 years.

**Table 1. Cardiac pathology of the cadavers**

Cardiac pathology	Over 35 years	Under 35 years	Male	Female	Total
Hypertrophic cardiomyopathy	4	18	21	1	22
Ischemic atherosclerosis	12	6	15	3	18
Mitral valve prolapse	0	4	4	0	4
Myocarditis	0	2	1	1	2
Coronary artery anomaly	0	2	2	0	2
cerebrovascular anomaly	0	2	2	0	2
Myocardial dysplasia	2	0	1	1	2
Tamponade	2	2	4	0	4
Left ventricular hypertrophy	4	0	4	0	4
Sum total	24	36	54	6	60

**Cardiac pathology:** Hypertrophic cardiomyopathy was observed in 22 (37%) out of 60 cases, of which 18 cases were under 35 years (43%) and 4 cases (22%) were over 35 years. Ischemic atherosclerosis was found in 18 cases (30%), of which 6 (14%) cases were under 35 years and 12 cases (67%) over 35 years. Mitral valve prolapse was diagnosed in 4 cases (7%) observed only in cases under 35 years. Myocarditis was observed in 2 cases (3%) under 35 years. Coronary artery anomaly and cerebrovascular anomaly were similarly observed in 2 cases (3%) under 35 years. Myocardial dysplasia was found in 2 cases (3%) over 35 years. Tamponade was observed in 2 cases (3%) under 35 years and 2 cases (3%) over 35 years. Left ventricular hypertrophy was observed in 4 cases (22%) over 35 years.

**Table 2. Pulmonary pathology of the cadavers**

Pulmonary pathology	Over 35 years	Under 35 years	Total
Spongy	9	36	45
Congestion and edema	5	4	9
Edema	1	0	1
Atelectasis	1	0	1
Anthracosis	2	2	4
Total	18	42	60

**Pulmonary pathology (Table 2):** Natural spongy structure of the lungs was observed in 45 out of 60 cases (75%), of which 36 cases (86%) were under 35 years and 9 cases (50%) were over 35 years. Pulmonary congestion and edema were found in 9 cases (15%), of which 4 cases (9%) were under 35 years and 5 cases (28%) were over 35 years. Pulmonary edema was observed in only one case (2%) over 35 years (6%). Atelectasis was only found in one case (2%) over 35 years (6%). Anthracosis was observed in 4 cases (7%), of which 2 cases (5%) were under 35 years and 2 cases (11%) were over 35 years.

**RESULTS AND DISCUSSION**

In this study, the samples were divided into two groups, namely under 35 years and over 35 years, which is of significant importance in the identification of specific diseases leading to death. The results of the present study showed that the most common causes of

sudden death during the period 2011-2017 in athletes under and over 35 years referred to the laboratory diagnostic center of the Tehran Legal Medicine Organization are hypertrophic cardiomyopathy and ischemic atherosclerosis, respectively. According to the information presented in Table 1, apart from deaths caused by accident or trauma, the cause of sudden death in individuals doing sports and physical activities is mostly heart diseases.

In athletes over 35 years, sudden death is usually caused by myocardial infarction and coronary artery disease. The risk of sudden death caused by vigorous physical activity is higher among people with coronary heart disease and lower among those who regularly exercise. Due to its positive impacts on risk factors and internal factors, regular and appropriate physical activity plays a significant role in human health.<sup>3</sup>

In young athletes who are unaware of their cardiac health, sudden death of cardiac origins is always considered a life-threatening risk factor for vigorous physical activity. The most common diseases of this type include cardiomyopathy and diseases affecting heart rate and transmission system, such as arrhythmogenic heart diseases.<sup>3,8</sup>

Robert *et al.* conducted a case study at the institute for criminal investigations in France on the cause of sudden death in adolescent athletes. They reported that arrhythmogenic right ventricular cardiomyopathy (ARVC), which is a genetic disorder leading to adipose tissue replacement in the right ventricle wall and finally fatal arrhythmia in heart rate, is one of the major causes of sudden death in this group of people.<sup>9</sup>

In another study on the cause of death in athletes, Pilicho *et al.* reported that in 9 out of 80 cases, ARVC was the cause of death.<sup>10</sup> In a scientific report, Michael *et al.* found that in 11 out of 75 cases, ARVC was the cause of sudden death in athletes. In another scientific report, Edward *et al.* found that in 3 out of 47 cases whose death records were investigated, ARVC was the cause of sudden death.<sup>11</sup>

Marron *et al.* conducted a study on 29 athletes aged 13-30 years who had died suddenly and unexpectedly. The samples of their study were active in 11 sports for 2-18 years, and football and basketball were the most common sports. All cases of death, except for one that occurred 12 hours later, were sudden. At the time

of sudden death, 22 cases were competing or playing sports, 2 cases were finishing playing sports, and 5 cases were resting. The main problem observed in 28 out of 29 cases was cardiovascular disease, which was the definitive cause of death in 23 cases. In addition, it was a probable cause of death in 5 cases, not a definitive one.<sup>8,12</sup>

Moreover, the study by Marron *et al.* showed that hypertrophic cardiomyopathy was the most common cardiovascular disorder, which was observed in 14 cases. Left ventricular hypertrophy with no cause and 420-530 grams of weight gain was observed in 5 cases.<sup>13</sup> Coronary artery anomaly was observed in 5 cases, of which left coronary artery anomalously originated from the right sinus of Valsalva in 4 cases and coronary artery had not developed in the fifth case. Coronary artery disease was clearly observed in 3 cases aged 24, 26, and 28 years, and aortic rupture and mediastinal hemorrhage were observed in 2 cases. The ascending aorta was obviously abnormal (10 cm) in two cases, and microscopic evidence indicated a decrease in the amount of elastic fibers. Hypertrophic cardiomyopathy together with anomalous origin of the left coronary artery were observed in one athlete. Except for 3 cases with coronary artery disease, all cardiovascular disorders were congenital.<sup>8,9</sup>

Another study was conducted on 23 cases of sudden death in cadavers over 35 years. The samples exercised for 6-28 years and ran an average of 105 miles per week. Their deaths occurred suddenly while running or a little after that. A total of 3 cases had chest pain 2-4 hours before death, and 2 cases died in sleep. Severe atherosclerosis was observed in 21 cases, and evidence of healed myocardial infarction was observed in 9 cases. Acute myocardial infarction was observed in 7 cases, and 3 cases had a history of both myocardial infarction and acute myocardial infarction.<sup>14,15</sup> Unlike the previous study, 80% of the cases in this study had a certain disease only in one or two large coronary arteries. This might be due to the fact that the samples in this study were relatively younger. Therefore, in studies on sudden death in young athletes, structural cardiovascular abnormalities were observed in most cases. These abnormalities were usually congenital; however, they were reported to have acquired causes in some cases. The results of the present study are consistent with the results of other studies.

## CONCLUSION

Causes of sudden death: Given the important factor of age, the causes of sudden cardiac death are divided into two groups.

Congenital heart defects and hypertrophic cardiomyopathy are the most common causes of sudden death in athletes under 35 years, and severe coronary atherosclerosis is the most common cause of sudden death in athletes over 35 years. These findings are consistent with the findings of other studies.

**Conflict of Interests:** Nil.

**Ethical Considerations:** Ethical matters e.g. plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been totally observed by the authors.

**Ethics Clearance:** Not required as it is a review article.

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# Comparison of Blood Lead Levels Between Oral and Inhalation Opium Addicts and its Relationship with Hematological Parameters

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## ABSTRACT

**Background and objectives:** The current study aimed at comparing the level of blood Pb in oral and inhalation opium addicts and its relationship with hematological parameters.

**Materials and method:** For this purpose, a total of 166 patients (83 addicts as the case and 83 non-addicts as the control groups) were enrolled in the study. A venous blood sample was taken from all the subjects in order to determine the serum level of Pb, iron (Fe), and other hematological parameters. In addition, the clinical and demographic status of the subjects were recorded and analyzed using appropriate statistical methods.

**Results:** Among the enrolled patients, 48 were oral and 35 were the inhalation opium consumers. Oral and inhalation opium addict groups had higher levels of blood Pb compared with the control group ( $F = 131.13$ ,  $P < 0.001$ ). There was no significant difference between oral and inhalation addict groups ( $P > 0.05$ ). More investigations showed a negative relationship between the blood levels of Pb, and those of Fe, hemoglobin (HB), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and positive relationship with red cell distribution width (RDW) ( $P > 0.05$ ).

**Conclusion:** The results showed that the serum level of Pb was associated with those of Fe and Hb in opium addicts in comparison with the controls. These changes had a significant effect on other hematological parameters in the case group in comparison with the control group. However, there was no significant relationship between different forms of opium use.

**Keywords:** Anemia, blood lead level, opium dependent, Addict, hematological parameters

## INTRODUCTION

In recent years, more attention is drawn to the excretion of Lead (Pb) in air, water, and soil through diesel combustion and uncontrolled industrial resources<sup>(1-3)</sup>. Lead contamination can cause a set of aggressive reactions in the affected people<sup>(4, 5)</sup>. Lead poisoning is

a medical condition due to increased level of blood Pb<sup>(6)</sup>. Lead may cause irreversible neurological disorders. In addition, it can cause renal diseases, reproductive toxicity, and vascular diseases<sup>(5, 7, 8)</sup>.

The normal range of blood Pb level is different throughout the world<sup>(9)</sup>; therefore, determining the blood Pb level and its associated hematological parameters in each region are of great importance. Recent evidence shows that Pb poisoning is common among opium addicts<sup>(10)</sup>. Impurity of opium distributed in Middle-Eastern countries, such as Iran, is relatively high<sup>(10)</sup>.

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<sup>11</sup>). This is very important in terms of legal and clinical toxicology (4) and leads to increased mortality in Iran (<sup>12</sup>). Studies in Iran show a relatively high impurity content of Pb in opium used by addicts. The studies reported that smugglers and vendors add Pb to opium to make it heavier just for profit (<sup>10-12</sup>). Patel et al., also reported cases of Pb poisoning in drug users (<sup>13</sup>).

The International Agency for Research on Cancer (IARC) classified mineral Pb in the group of compounds that are probably carcinogenic to humans (<sup>1, 14, 15</sup>); therefore, determination of Pb content in the environment and biological samples, especially serum, is very important. The current study aimed at comparing the level of blood Pb in opium addicts (oral and inhaled) and healthy (control) groups; then, the association of blood Pb level with iron (Fe) and other hematological parameters was investigated.

## MATERIALS AND METHOD

The current study was conducted at Bu-Ali-Sina Hospital, Qazvin, Iran, from April 2016 to April 2017. Using systematic random sampling, out of 163 oral and inhalation drug addicts, 83 patients were enrolled in the study. The study was conducted in accordance with the research priorities of Qazvin University of Medical Sciences and the protocol of the study was approved by the Ethics Committee of the university. Inclusion criteria were signing the written consent form. In addition, all individuals under occupational exposure to Pb were excluded (industries such as ammunition, battery-making, bronze sculptures, metal welds, porcelain, military equipment, intravenous pumps, embryo monitors, and surgical equipment). In addition, 83 non-addict subjects were enrolled to compare the disorders with the general population. For more homogeneity of subjects, the control group was selected from those referring to the same hospital on the same date. All patients were interviewed and their demographic characteristics as well as type of opium consumption were recorded in a questionnaire.

Then, the blood sample was taken from all subjects in the two groups. Each venous blood sample was collected via intravenous punch and divided into three tubes. The first tube contained ethylenediaminetetraacetic acid (EDTA) used to determine the hematological parameters including red blood cells (RBC), hemoglobin (HB), hematocrit (HCT), mean corpuscular volume

(MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW) using Celttac autoanalyzer.

The second tube contained lithium heparin to determine the Pb amount. For this purpose, samples were stored at -20°C until Pb decomposition. Samples of both case and control groups were diluted with Triton 100X (dilution factor was 5). The samples were analyzed using the graphite furnace atomic absorption spectroscopy (GF-AAS) SpectrAA 220 (Varian Co., Australia). In this method, the graphite furnace is heated electrically and slowly; then, the main compounds are evaporated until forming atomic compounds. A hollow cathode lamp (Varian Company) is embedded in the employed GF-AAS apparatus used as a source of radiation at 283 nm. There are several methods to measure the level of blood Pb, but this method was used due to its high sensitivity above ppb (parts-per-billion, 10<sup>-9</sup>); its high sensitivity is attributed to forming atomic compounds in a short interval.

The third tube was used to measure the blood Fe level with MINDVAY BS-800 apparatus using Pars Azmoon kits (Iran) by photometric method, using ferene.

Data were expressed as frequency and percentage for categorical variables, and as mean and standard deviation (SD) for continuous variables. Independent *t* test and analysis of variance (ANOVA) were used to compare continuous variables. The post hoc tests were also used where needed. Chi-square test was used to compare the categorical variables. Pearson correlation coefficient was used to determine the correlation between blood level of Pb, and those of Fe and other hematological parameters. P-value <0.05 was considered as the level of significance.

## RESULTS

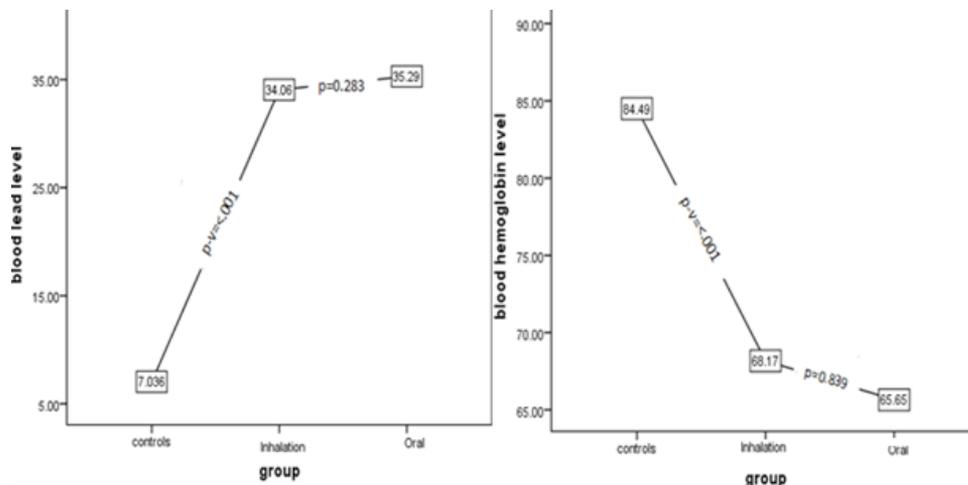
All participants in the current study were male. The drug consumed by the case group participants was opium; 48 subjects were oral consumers and 35 others used the drug through inhalation. A total of 83 patients completed the tests and questionnaires. On the other hand, 83 others completed the executive questionnaires. Demographic characteristics and EDTA consumption in the control, as well as oral inhalation addicts groups are shown in Table 1. According to this table, there were no significant differences regarding age, body mass index

(BMI), occupational status, educational level, place residence, marital status, and EDTA consumption among the three groups.

**Table 1 - Demographic Characteristics and EDTA Consumption in the Study Groups**

Variable	Control group (n=83)	Inhalation group (n=35)	Oral group (n=48)	P-value
Age, yr (mean±SD)	50.62±9.39	51.08±13.37	50±13.31	0.91
BMI, kg/m <sup>2</sup>	23.80±4.26	23.70±4.51	22.91±4.83	
Occupational status, n (%)				0.832
Jobless	17(25.5%)	8(22.9%)	12(25%)	
Employed	66(79.5%)	27(77.1%)	36(75%)	
Educational level, n (%)				0.352
Under diploma	61(73.5%)	23(65.7%)	29(60.4%)	
Diploma	14(16.9%)	5(14.3%)	12(25%)	
Higher educations	8(9.6%)	7(20%)	7(14.6%)	
Place of residence, n (%)				0.125
Rural areas	15(18.1%)	10(28.6%)	16(33.3%)	
Urban areas	68(81.9%)	25(71.4%)	32(66.7%)	
EDTA consumption, n (%)				0.345
Yes	0(0%)	1(2.9%)	1(2.1%)	
No	83(100%)	34(97.1%)	47(97.9%)	
Marital status, n (%)				0.781
Single	33(39.8%)	15(42.9%)	17(35.4%)	
Married	50(60.2%)	20(57.1%)	31(64.6%)	

The results of the analysis of variance (ANOVA) are shown in Figure 1. The level of blood Pb was higher in the oral and inhalation opium addict groups than the control group (F = 131.13, P < 0.001). In terms of Hb level, the oral and inhalation opium addict groups had lower levels of Hb compared with that of the control group (F = 33.99, P < 0.001). There was no significant difference between the two groups of oral and inhalation addicts in terms of the blood levels of Pb and Hb (P > 0.05).



**Figure 1. Comparison of the Three Study Groups in Terms of Pb and Hb Blood Levels**

In Table 2, serum Fe levels and hematological parameters were compared among the three groups. Both oral and inhalation opium addict groups had lower serum Fe levels compared with the control group ( $P < 0.001$ ,  $F = 79.74$ ). There was no significant difference between the oral and inhalation addict groups ( $P = 0.462$ ,  $F = 79.74$ ). In terms of hematological parameters, except for RBC, other variables (HCT, MCV, MCH, MCHC)

were significantly lower in both opium user groups (oral and inhaled) compared with the control group ( $P < 0.001$ ). RDW was significantly higher in opium users than the controls ( $P < 0.001$ ). There were no significant differences between the two oral and inhalation opium addict groups in terms of hematological parameters ( $P > 0.05$ ).

**Table 2. Comparison of Serum Fe Level and Hematological Parameters in the Study Groups**

Variable	Control group (N=83)	Inhaled opium addict group (N=35)	Oral opium addict group (N = 48)	P-value
Fe (µg/dL)	84.49±9.59	68.17±7.94	65.64±9.04	<.00
RBC (M/MCH)	4.33±.47	4.22±.42	4.16±.37	0.089
HCT	44.95±3.77	38.74±3.97	37.95±3.81	<.00
MCV	90.86±4.61	86.25±5.43	84.81±5.92	<.00
MCH	29.90±2.87	24.74±2.97	24.50±2.83	<.00
MCHC	34.01±2.07	32.97±1.90	32.54±2.01	<.00
RDW	13.54±2.85	16.74±3.12	17.08±2.65	<.00

Table 3 shows the association between blood level of Pb, and those of Fe and other hematological parameters in the study groups. According to this table, blood Pb level was negatively correlated with serum Fe, Hb, HCT, MCV, MCH, and MCHCs levels, and positively correlated with RDW level ( $P > 0.05$ ).

**Table 3. Relationship Between Blood Level of Pb, and Those of Fe and Hematological Parameters in the Study Groups**

Variable	Hb	Fe	HCT	MCV	MCH	MCHC	RWD	RBC	
Lead blood level	r-value	-0.563	-0.687	-0.641	-0.458	-0.684	-0.331	0.497	-0.214
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006

**DISCUSSION**

The results showed that blood Pb levels in both opium user groups were significantly higher than that of the control group, and both methods of opium consumption (oral and inhalation) could increase blood Pb levels. However, there was no significant difference between oral consumption and inhalation. The results were consistent with those of the study by Nemati et al.; they also showed that the opium consumption can

significantly increase blood Pb levels <sup>(16)</sup>.

More investigations showed that increased blood Pb levels were significantly associated with decreased Hb and Fe blood levels. The results were in line with those of a study by Schwartz et al.; they reported that people with blood Pb level of 30 µg/dL were at risk for Hb deficiency and hemolytic anemia <sup>(17)</sup>. Other studies also reported a varying relationship between blood Pb and Hb levels <sup>(18, 19)</sup>. Contrary to the current study

results, a study by Nemati et al., showed no significant association between increased blood Pb levels and decreased level of Hb<sup>(16)</sup>. Perhaps one of the reasons for the controversy between studies is the difference in blood Pb concentrations. In the current study, blood Pb levels in the subjects that inhaled or took opium orally were about 35 µg/dL, which was higher than that of Nemati et al. According to Acgah, the biological index for blood Pb level is higher than 30 µg/dL. This moderate level is expected in people exposed to 0.05 mg/m<sup>3</sup> of TLV<sup>(5)</sup>. Although the results of various studies cannot be considered as a causal link between increased Pb and decreased Hb and Fe levels, a possible explanation for Fe deficiency is the increase of Pb absorption in the bowel<sup>(20)</sup>. In a study conducted in Canada, there was a significant relationship between Fe deficiency and high blood Fe levels<sup>(21)</sup>.

Several *in vivo* studies show that Pb has an inhibitory effect on the enzymes of heme synthesis pathway. There is a theory in this regard that lack of heme in Pb poisoning is results from lack of Fe<sup>+3</sup> reduction to Fe<sup>+2</sup>, and this process is very important for heme synthesis. These changes include increase of delta-aminolevulinic acid (ALA) synthase and inhibition of ALA dehydrase<sup>(22, 23)</sup>.

In addition to the abovementioned results, the findings of the present study showed that the levels of HCT, MCV, MCH, and MCHC reduced in both oral and inhalation opium addict groups compared with those of the control group. However, RDW level was higher in both addict groups compared with that of the control group. In addition, more investigations revealed that higher levels of blood Pb are associated with decreased HCT, MCV, MCH, MCHC, and increased RDW levels. Evidence suggests that RDW elevation is a high-risk factor indicating abnormal production of RBC and makes the patient prone to oxidative stresses<sup>(24)</sup>. These correlations show that all of these factors can be due to increased Pb absorption and reduced Fe levels. Studies show that Pb is a hazardous element for Fe metabolism. Lead can be absorbed instead of Fe through competitive inhibition. In addition, Pb can interfere with important steps of Fe metabolism<sup>(5, 8)</sup>.

One of the strengths of the current study was the lack of difference among the three study groups in terms of demographic characteristics and EDTA consumption. This factor makes the intergroup comparisons more

realistic. In the current study, the daily amount of opium use was not considered and the reason was unreliable responses of individuals to this quantity, and it is a limitation to the current study.

## CONCLUSION

The results showed a significant correlation between the blood level of Pb and those of Fe and Hb in opium addict groups in comparison with those of the control group. These changes had a significant effect on the hematological parameters of addict groups compared with the control group. However, there was no significant relationship between the types of opium use in the current study; therefore, it is essential to take preventive measures using a reaction-based system in order to limit exposure to Pb and narcotics and improve the infrastructures for better management of such diseases, and ultimately evaluate the effects of such interventions.

**Conflict of Interest:** There is no conflict of interest to be declared.

**Ethics Committee:** The protocol of the study was approved by the Ethics Committee of the university (IR.QUMS.REC.1395.437). Inclusion criteria were signing the written consent form

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# Comparison between the beneficial Effects of Low Level Laser Therapy (Diode Laser) and Transcutaneous Electrical Nerve Stimulation in Recovery of Patients with Bell's palsy

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## ABSTRACT

Idiopathic facial paralysis or Bell's palsy (BP) is type of facial weakness (paralysis); it fairly common disorder predominantly adult age group prevalent, affects facial nerves and muscles; resulting paralysis or dropping of one side of the face. Diode or low-level laser therapy (LLLT) may have helped reduce the inflammation of the facial nerve early intervention with LLLT and appeared to improve facial paralysis no reported adverse effects. One-hundred and twenty (120) subjects were participated in this study; they were divided into three classes; Class one / Forty (40) Bell's palsy patients were treated by low level laser therapy (LLLT). Class two/ Forty (40) Bell's palsy patients were treated by transcutaneous electrical nerve stimulation (TENS). Class three / forty (40) healthy control subjects (volunteers) with no signs and symptoms of any systemic diseases, with matching ages and genders with BP patients, those patients diagnosed based on House-Brachmann Scale (HBS). A highly significant difference was observed between LLLT group patients and TENS group patients regarding Bell's palsy classification after treatment ( $p < 0.001$ ), healing (recovery) proportion was significantly higher among LLLT group patients (75%) after treatment.

**Keywords:** Bell's palsy, facial massage, laser applications.

## INTRODUCTION

The facial paresis or Bell's palsy (BP) is an idiopathic, acute peripheral nerve palsy including the seventh cranial nerve (facial nerve), which supplies all facial muscles, and the parasympathetic fibers which also involved in the facial nerve to supply the salivary and lacrimal glands, as well as limited sensory fibers supplying the anterior two-third of the tongue for taste function<sup>1</sup>. Hato *et al.*, (2007)<sup>2</sup> showed Sir Charles Bell was the first described the onset in 1821. It is occurs unilateral side of the face, also is no sexual predilection. Bell's palsy has been described in the patients of all age groups, with peak incidence showed in the 40 years old of age<sup>3</sup>. Different etiological conditions have been described for Bell's palsy, which is mostly considered as idiopathic condition. Various causes that have been

suspected include autoimmunity condition, viral agents, as a part of acute subclinical diabetic polyneuropathy and vascular events or conditions<sup>4</sup>. Campbell & Brundage, (2002)<sup>5</sup> noted low humidity, dry indoor air, cold temperatures, ultraviolet radiation, and confections of the upper respiratory tract have been implicated as possible triggers of this disease by causing reactivation of latent herpes simplex virus. The management is concentrated by reduction of inflammation in facial nerve and the prevention of corneal complications. Mehta, 2009 stated that the preferred management of Bell's palsy includes treatment groups such as (pharmacological) medication treatment, physiotherapy for retraining facial neuromuscular and surgical interference. Holand, (2004)<sup>6</sup> showed the transcutaneous electrical nerve stimulation (TENS), is a non-invasive, drug free method of the treatment, is a portable battery powered stimulator and if used early is an acceptable tool for recovery. The advantage of TENS was explained by facilitation of re-innervation through electrical stimulation (Targan *et al.*, 2000)<sup>7</sup>.

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## MATERIALS AND METHOD

One-hundred and ten (110) subjects were participated in this study; they were divided into two groups:-

**Group one:** Eighty (80) Bell's palsy patients included in this study. These patients were divided into two groups according to the type of treatment; LLLT and TENS. Diagnosis of patients with Bell's palsy based on House- Brachmann Scale / grading (HBS, 1996) as shown in table 1; this diagnosis was done by neuromedicine / neurosurgery specialists.

**Group two:** Forty (40) healthy control subjects (volunteers) with no signs and symptoms of any systemic diseases, with matched ages and genders with BP patients. All samples collection was done in Babylon Health Directorate; specifically Merjan Medical City, Babylon Center of Physical Therapy and Rehabilitation and Al-Hilla Teaching Hospital during the period from May 2017 to March 2018. Other excluded statuses involved were: recurrent attacks of Bell's palsy, diabetes, hypertension, sensory loss of the face, ischemic heart disease, stroke and other central nervous system pathology<sup>8</sup>. The age ranges of those patients were (twenty- seventy) years old. All subjects were examined clinically (extra and intra - orally). Each subject fulfilled a case sheet and approved consent was taken from each subject to participation in this study. The clinical assessment of patients with Bell's palsy was accomplished according to the following scale).

## RESULTS AND DISCUSSION

The age range of patients with Bell's palsy was (20-70) years, the mean  $\pm$  S.D for patients with Bell's palsy were (43.6  $\pm$  15.6). For the healthy control subjects the age range was (20 -70) years with mean  $\pm$  S.D was (45.4 $\pm$  15.9). Statistical analysis using t – test showed no significant differences between the age of patients and control subjects as shown in table (2). Statistical analysis using t – test showed no significant differences between the gender, age range and ration between male and female of BP patients and healthy control subjects as shown in table (2). Bell's palsy patients in both groups (LLLT and TENS) were distributed according to duration months) from diagnosis till improved or maintaining facial movements, into: (1-2 months), (2-3 months) and (3-4 months); the percentage in all Bell's palsy patients were 28.75% (No. 23 with 1-2 month),

36.25% (No. 29 with 2-3), 35% (No. 28 with 3-4 months), All these findings as shown in table (3). The Grading of the disease according to House- Brachmann Scale (HBS, 1996) scale before beginning of treatment; six grades (scales) of patients with Bell's palsy, the number of patients with grade III was 10; five number for each LLLT and TENS, percentage was 12.5%. Number of Bell's palsy with grade IV was 22;eleven number for LLLT and TENS , percentage was 27.5% while the number of BP patients with grade V was 48; twenty four number for each group of patients , and percentage was 60% and zero results of grades I, II, VI. All these results were shown in table (4). The results in this study showed healing proportion was higher among LLLT therapy patients after treatment as compared to TENS therapy group patients was (75%). A highly significant difference was noted among LLLT group regarding Bell's palsy patients after treatment; five patients with grade III before treatment changed to grade I, eleven number of BP patients with grade IV after treatment became grade I (five number of patients) and four of them with grade II, while 24 of those patients with grade V before treatment; 20 of them became grade I, all these changes shown in table (5). Regarding patient group with TENS therapy, healing proportion was very slow, these results after treatment showed in table (6). Healing proportion in this group of patients was no significant when compared to LLLT therapy. Five number of BP patient with grade III before TENS treatment changed to four of them with grade III and one only with grade II. Eleven number of them with grade IV before treatment; 4 of them still in IV, 5 of them became III and 2 of them changed to II, while 24 of BP patients with grade V before TENS treatment; 9 of them still in grade V, 6 of them became grade IV and finally 9 of them were in grade III. All these findings as shown in table (6). These results matched the results of<sup>9, 10</sup>; when they showed that Bell's palsy is a disease without gender or seasonal predilection. It is equally affected men and women regarding age distribution. The highest occurrence of Bell's palsy is reported to be between 15-45 years of age. This disease is less common in patients under the age of 15 and above the age of 60. Eviston *et al.*, 2015,<sup>11</sup> agreed with this study; they also showed that patients with Bell's palsy are not interested in age, gender and seasonal variations. These results agreed with Bjordal *et al.*, 2006<sup>12</sup> they stated the benefit of low level laser in the involved patients are cell repair, started reduction of inflammation that resulted from spasm,

edema and compression with any possible entrapment in the facial nerve. The recommended laser therapy lead to increase anti-inflammatory effects including growth factors and cytokine such as basic fibroblast growth factor (bFGF), platelet- derived growth factor (PDGF), and transforming growth factor-beta (TGF- $\beta$ ) , and reducing the pro-inflammatory cytokines levels, such as interlekin-1, alpha (1L-1 $\alpha$ ), 1L-1 beta (1L-1 $\beta$ ). Low level laser therapy helped the healing and the improvement conditions due to the reduction of facial nerve inflammation by mitochondrial stimulation that increased adenosine triphosphate formation (ATP) production and inflammatory cytokines inhibition<sup>13</sup>. Nerve stimulation increases the concentration of ATP in the synaptic cleft, which can act as a neurotransmitter or as a presynaptic neuromodulator<sup>14</sup>. Also, Peplow *et al.*, 2010<sup>15</sup> noted that laser irradiation lead to dilation in blood vessels, and resulting swelling, inflammation reduction also the light laser has inhibitory effects of prostaglandins, cytokines levels and cyclooxygenase (Cox) 2 that accelerates cell proliferation, tissue repair and collagen synthesis. Dias *et al.*, 2011 showed the

effect of laser light on neuromuscular and functional recovery as well as on matrix metalloproteinase (MMP) activity, also the same study noted the low level laser therapy stimulated the oxidative metabolism and give the indication of matrix remodeling process, with expressing of MMP of the masseter muscles. These data could be used to explain the role of LLLT in treating BP. The aim of electrical stimulation (ES) was preserving muscle bulk especially in complete paralysis but the ES gave to patients with Bell's palsy with psychological effects due to discomfort action and harmful application on the facial muscles<sup>16</sup>. Mysiw and Jackson, 2000 also showed that complete facial degeneration, faradic stimulation or TENS would not induce facial muscle contraction unless possibly a very high intensity was used, which may be intolerable. Targan *et al.*, (2000)<sup>7</sup> stated that the improvement of function in partial denervation of facial muscles; due to TENS, and this better improvement in the function of remaining innervated facial muscles, and the improvement by TENS need high pulse duration to induce the contraction of denervated muscles.

**Table 1. Van Swearingen and Brach (HSB), 1996 grading of Bell's palsy.**

Grade	Description	Characteristic
I	Normal	Normal facial function in all nerve branches
II	Mild dysfunction	Gross: slight weakness on close inspection; may have very slight synkinesis. At rest: normal symmetry and tone Motion—Forehead: moderate to good function; eye: complete closure with minimum effort; mouth: slight asymmetry
III	Moderate dysfunction	Gross: obvious but not disfiguring difference between two sides; noticeable but not severe synkinesis, contracture and/or hemifacial spasm. At rest: normal asymmetry and tone. Motion—Forehead: slight to moderate movement; eye: complete closure with effort; mouth: slightly weak with maximum effort
IV	Moderately severe	Gross: obvious weakness and/or disfiguring asymmetry. At rest: normal asymmetry and tone. Motion—Forehead: none; eye: incomplete closure; mouth: asymmetric with maximum effort
V	Severe dysfunction	Gross: only barely perceptible motion. At rest: asymmetry. Motion—Forehead: none; eye: incomplete closure; mouth: slight movement
VI	Total paralysis	No movement

**Table 2. Ages and genders distribution between BP patients and healthy control subjects.**

Age / Year	Bell's palsy Patients (No. 80)	Control Subjects (No. 40)	p- value
Range	20 - 70	20 - 70	1.0
Mean ± S.D	43.6 ± 15.6	45.4± 15.9	0.5 <sup>NS</sup>
Female	34 (42%)	16 (40%)	0.7
Males	46 (57%)	24 (60%)	
Males / females ratio	1:3	1:5	0.4 <sup>NS</sup>

**Table 3. Distribution patients with Bell's palsy according to duration of disease.**

Duration of disease	No. of patients	Percentage %	S.D
(1-2) Months	23	28.75%	± 23.129
(2-3) Months	29	36.25%	± 24.442
(3-4) Month	28	35%	± 24.438
	80	100%	

**Table 4. The number and percentage of patients with Bell's palsy according to grading of the disease before treatment.**

Grade	BP patients (80)	Percentage %	LLLT patients (40)	TENS patients (40)
Grade I	-			-
Grade II	-			-
Grade III	10	12.5%	5	5
Grade IV	22	27.5%	11	11
Grade V	48	60%	24	24
Grade VI	-			-
Total			80	

**Table 5. Distribution grades of patients with Bell's palsy after LLLT therapy.**

Grades	Grades before LLLT treatment	Grades after LLLT treatment	% Percentage
Grade I		30	75%
Grade II		10	25%
Grade III	5	0	-
Grade IV	11	0	-

**Cont... Table 5. Distribution grades of patients with Bell's palsy after LLLT therapy.**

Grade V	24	0	-
Grade VI		0	-
40 Total			Healing proportion (75%)

**Table 6. Distribution grades of patients with Bell's palsy after TENS therapy with.**

Grade After treatment	No. of patients before TENS treatment	No. of patients After TENS treatment	%
Grade I			-
Grade II		3	7.5%
Grade III	5	18	45%
Grade IV	11	10	25%
Grade V	24	9	22.5%
Grade VI		-	-
Total	40		

## CONCLUSION

Early intervention with LLLT appeared improvement of facial paralysis with no adverse effects reported, and this study showed LLLT was benefit more than other types of management and significant results than TENS in which its application leads to discomfort to patients with BP, and is indistinguishable from spontaneous recovery.

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Department of oral diagnosis, College of Dentistry, University of Baghdad, Baghdad city, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Exploring the Concept of Spirituality among Patients with Chronic Illnesses: A Conventional Content Analysis

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## ABSTRACT

**Background:** Spirituality is a complex multidimensional concept, a global phenomenon, and a main aspect of human existence. It promotes coping with problems and facilitates recovery from illnesses.

**Objectives:** This study aimed to explore the concept of spirituality among patients with chronic illnesses.

**Method:** This qualitative study was done using conventional content analysis. Participants (16 patients) were selected by purposive sampling in Medical hospitals in Iran. Data collection was performed through face-to-face semi-structured interviews and was continued until data saturation. The data were analyzed through conventional content analysis.

**Results:** Participants' experiences of spirituality were grouped into the following four main categories: spiritual relationships; reliance on God; belief in divine foreordination and patience and thankfulness.

**Conclusion:** Spirituality among patients with chronic illnesses is to establish relationships with God, others, and self, rely on God, believe in His foreordination, tolerate difficulties with patience, and be thankful to God. Nurses can use spirituality to improve patient outcomes.

**Keywords:** Spirituality, Chronic illness, Relationship, Concept, Content analysis

## INTRODUCTION

The prevalence of chronic illnesses has significantly increased in recent decades due to increased life expectancy, lifestyle changes, and medical and technological advances<sup>[1]</sup>. The prevalence of chronic illnesses is increasing in all countries, including England, Canada, Australia, China, and Iran<sup>[2]</sup>.

Spirituality is a complex multidimensional concept, a global phenomenon, and a key component of human existence<sup>[3]</sup>. It has significant relationships with different aspects of health, so that without spirituality, people

may experience physical, psychological, or social dysfunction<sup>[4]</sup>. Spirituality facilitates recovery, boosts self-esteem, enhances life satisfaction, creates a sense of meaningfulness in life, and improves hopefulness and psychological comfort<sup>[5]</sup>. Most of new health-related theories and models include a spiritual component<sup>[6]</sup>.

Despite the long history of spirituality in research articles, and due to the fact that spirituality is a subjective concept<sup>[7, 8]</sup>, there are controversies over its definition, components, and roles<sup>[9]</sup>. Such controversies are due to the facts that spirituality is a subjective concept and hence, its definitions have been provided based on the immediate context, paradigm, and ideology<sup>[10]</sup>.

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## METHOD

### Design and Participants

This qualitative study was done using conventional

content analysis. Content analysis is a systematic method for the detailed description of phenomena and results in valid inferences from data and new knowledge and insight. It is the most appropriate for exploring experiences and attitudes<sup>[1]</sup>.

Study participants were sixteen patients with chronic illnesses (cardiovascular, renal, neurologic, respiratory, and rheumatoid diseases and diabetes mellitus). Sampling was performed purposively and with maximum variation in terms of participants' gender, age, education level and underlying chronic illness. Patients were selected from the internal medicine, neurologic, and dialysis care wards in medical hospitals.

#### Data collection

Data were collected from May 2015 to March 2016 through face-to-face semi-structured interviews to data saturation. Interview questions were, "In your opinion, what does spirituality mean?" and "What are the components of spirituality?" Interviews were held in quiet hospital rooms in duration from 32 to 51 minutes and recorded digitally. Immediately after each interview, it was transcribed and then typed word by word.

#### Data analysis

The conventional content analysis approach suggested by Graneheim and Lundman was used for data analysis. Data was reviewed several times in order to obtain an accurate understanding about its content. Then, meaning units were identified and condensed. The condensed units were labeled with appropriate codes and the codes were categorized into subcategories based on their similarities and differences; subcategories were labeled based on the codes. Subcategories were also categorized into main categories based on their similarities and differences. Finally, appropriate labels were attached to the main categories based on their subcategories, condensed units, and meaning units.

#### Data Trustworthiness

Credibility of the findings was ensured through member checking and prolonged engagement with the study subject matter and data collection. Dependability was established through member checking, peer checking, and debriefing. For establishing confirmability, we attempted to create a written description of all research activities to provide others with the opportunity to trace our activities. Transferability was ensured

through maximum variation sampling.

#### Ethical considerations

The protocol of this study was approved by the Ethics Committee and the Institutional Review Board of Tarbiat Modares University, Tehran, Iran (approval codes: IR.TMU.REC.1394.79 and 52D3742, respectively). Participants were informed about the aim of the study, the advantages of participation in the study, the anonymous handling of the study data, and the voluntariness of participation. Informed consent was obtained from all participants.

## RESULTS

Participants were mostly female and age range 25–72 years. Participants' experiences of spirituality were grouped into four main categories, namely spiritual relationships, reliance on God, belief in divine foreordination, and patience and thankfulness (Table 1).

#### Spiritual relationship

Spiritual relationship, contained the three subcategories of relationship with God, relationship with others, and relationship with self.

##### *Relationship with God*

Participants noted that they attempted to relate with God through continuously remembering and praying to Him and reciting the Holy Quran. Such activities gave them a sense of meaningfulness in life. They also highlighted that the problems associated with their chronic illnesses did not prevent them from remembering and praying to God.

"I cannot do household activities but I pray to God and feel calm" (P. 4).

##### *Relationship with others*

Participants also attempted to establish friendly relationships with their family members, other patients, and their neighbors and asked God to bless them.

"My children perform all my daily activities. I hope God is satisfied with them. I always pray to God for them and ask Him to fulfill their needs" (P. 1).

##### *Relationship with self*

When they felt gloomy, study participants attempted

to restore calm and psychological balance through crying and self-talk.

“I need to calm myself and avoid getting upset at my children’s neglectfulness towards me. I need to forget their unkind conduct” (P. 7).

#### Reliance on God

The second main aspect of spirituality among patients with chronic illnesses was reliance on God. Reliance was to trust in God’s will and actions and to believe in His help and support for those who obey Him. The three subcategories of this category were accurate purposefulness, hopefulness, and reliance-based practice.

#### *Accurate purposefulness*

Accurate purposefulness in life had helped our participants rely on God and surrender themselves and their actions to His will.

“I rely on God in life and in dealing with problems” (P. 4).

#### *Hopefulness*

Belief in God and reliance on Him had brought hope to the life of our participants.

“I rely on God and believe that there is just a short way remaining to my recovery” (P. 1).

#### *Reliance-based practice*

Our participants based their practice and actions on their reliance on God and His help and support. They noted that they could not successfully perform their activities without God’s help and support.

“My doctor recommended surgical operation. I believed that the results of the operation would depend on God’s will; thus, I went to the operating room: (P. 8).

#### Belief in divine foreordination

Most participants believed in God’s foreordination and its effects on their lives. The two subcategories of this category were belief in divine expediency and acceptance of divine foreordination.

#### *Belief in divine expediency*

Belief in divine expediency is the belief that God

has considered the bests for every person and that God’s considerations, even illnesses, are based on His comprehensive knowledge and have some good reasons. Our participants considered their health and illnesses as God’s choices for them and believed that all actions of God are knowledge-based and are beneficial to human beings.

“Whatever He knows is expedient and is beneficial to me. My recovery depends on His expediency” (P. 4).

#### *Acceptance of divine foreordination*

Belief in divine expediency had helped our participants accept and be satisfied with whatever happened to them. Such acceptance and satisfaction empowered them to perform their activities with confidence and calmness.

“We easily cope with problems, don’t preoccupy with them, and don’t say “Why me?” We believe that all God’s actions are based on His expediency” (P. 9).

#### Patience and thankfulness

The fourth category of the study was patience and thankfulness. Patience was complaint-free toleration of difficulties and problems, calmness maintenance when facing them, and thankfulness to God.

#### *Complaint-free toleration*

Submission and obedience to God enhance people’s spiritual capacity, so that they can accept difficulties and deal with them with patience, calmness, and even happiness.

“I’m not unhappy with my illness. It is God’s will and He will give me the necessary patience” (P. 9).

#### *Maintaining calmness while dealing with difficulties*

Complaint-free toleration and acceptance of difficulties had helped participants maintain their calmness while dealing with difficulties. Calmness, in turn, helped them better tolerate the difficulties associated with their illnesses.

“I experience many difficulties due to my illness; however, I forget all of them” (P. 11).

#### *Satisfaction with the status quo*

Satisfaction with the status quo despite experiencing

illness-related difficulties guides patients towards achieving inner peace and stability and being thankful to God for whatever He foreordains for them.

“I’m not unhappy for what has happened to me and for my illness. I’m satisfied with whatever God gives me and I’m thankful to Him” (P. 2).

**DISCUSSION**

Findings revealed that spirituality is multidimensional and includes the four dimensions of spiritual relationships, reliance on God, belief in divine foreordination, and patience and thankfulness.

Relationship with God, others, and self is one of the main dimensions of spirituality among patients with chronic illnesses. An earlier study also reported relationships with God, others, self, and nature as aspects of spirituality<sup>[12]</sup>. a study reported spirituality as a set of values, attitudes, and hopes which are related to a supreme being<sup>[13]</sup>. Another study considered relationship with a supreme being as a main component of spiritual health<sup>[14]</sup>. Relationship with such a supreme being motivates, enables, and empowers people for life<sup>[15]</sup>, improves their quality of life, strengthens their interpersonal support, reduces their health-related problems, and facilitates their recovery from illnesses<sup>[16]</sup>. Moreover, this relationship improves stamina, gives meaning to life, and boosts mental energy<sup>[17]</sup>.

Reliance on God was another main aspect of spirituality in the present study. Reliance is to confide in God and His ability to well manage affairs and to surrender affairs to Him. Reliance on God is one of the outcomes of obedience to Him. It is based on the notion that God is sufficient for those who are obedient to him<sup>[18]</sup> and can consider the bests for them<sup>[19]</sup>. Our findings showed three main aspects for reliance on God, namely accurate purposefulness, hopefulness, and reliance-based practice. Purposefulness can be associated with hopefulness. People with firm religious beliefs confide in God, know that He does not leave them alone, and hence, hopefully continue their lives even in the absence of effective support systems<sup>[20]</sup>. Strong faith in God enables people to effectively cope with difficulties and thereby, improves their health and well-being and boosts their hope for future<sup>[21]</sup>.

Melkus & Gaston also believes that in the care plans for chronic patients, such as diabetics, should be given

special attention to spirituality and religion. Because spirituality and religious provide some ways for the person to achieve the mental, emotional and personal well-being and empowerment<sup>[22]</sup>.

Belief in divine foreordination was the third main aspect of spirituality among patients with chronic illnesses in the present study. The two subcategories of belief in divine foreordination were belief in divine expediency and acceptance of divine foreordination. People who believe in divine expediency and base their lives on God’s satisfaction instead of personal interests will receive support from God<sup>[23]</sup>.

In the study of Karin Jor, it is noted that most patients are worshiped for reasons: 1-disease-centered prayer, (2) assurance-centered prayer, (3) God-centered prayer, (4) other-centered prayer, and (5) lamentations<sup>[24]</sup>. While it has been pointed in this study that they are worshiping God for the sake of God’s satisfaction.

The last main category of the study was patience and thankfulness with the three subcategories of complaint-free toleration, maintaining calmness while dealing with difficulties, and satisfaction with the status quo. This category was in fact the outcome of the third category. In other words, people who believe in divine foreordination and accept it are satisfied with what God brings to them and hence, patiently accept it without making serious complaints. An earlier study also indicated that the main components of patience were to avoid getting anxious and making complaints and to maintain calmness in difficulties<sup>[25]</sup>. Patience is a key indicator and a key predictor of spiritual health, People with good spiritual health believe in God’s help and support for them and hence, rely on Him <sup>[26]</sup>, feel greatly clam and satisfied, are thankful to God<sup>[24]</sup>, and are able to effectively cope with their problems<sup>[16]</sup>.

**Table 1. The main categories and subcategories of spirituality**

Subcategories	Main categories
Relationship with God	Spiritual relationships
Relationship with others	
Relationship with self	
Purposefulness	Reliance on God
Hopefulness	
Reliance-based practice	

**Cont... Table 1. The main categories and subcategories of spirituality**

Belief in divine expediency	Belief in divine foreordination
Acceptance of divine foreordination	
Complaint-free toleration	Patience and thankfulness
Maintaining calmness while dealing with difficulties	
Satisfaction with the status quo	

### CONCLUSION

This study concludes that spirituality among patients with chronic illnesses is to establish relationships with God, others, and self, rely on God, believe in His foreordination, tolerate difficulties with patience, and be thankful to God. Such spirituality will be associated with satisfaction, calmness, purposefulness, and meaningfulness in life. Of course, spirituality is context-bound and is greatly affected by the immediate sociocultural context; thus, studies in different contexts are needed to explore the different aspects and outcomes of spirituality. Such studies will provide nurses with better understanding about the concept of spirituality and will enable them to use it for improving patient outcomes.

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# The Effect of Hot- and Cold-natured Foods on the Vital Signs in the Human

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## ABSTRACT

**Introduction:** Based on Iranian traditional medicine, foods are classified under two groups: hot-natured and cold-natured. The present study, therefore, undertakes to determine the effects of hot- and cold-natured foods on the vital signs in the human.

**Method:** The study was quasi-experimental and the participants in the experiment were 60 students, in Gonabad University of Medical Sciences, who had, during summer semester, been selected and depending on their temperament placed into three sample groups at duration 3 weeks, each of them having their own dietary program: one to be served with hot-natured foods for their meals, one with cold-natured foods, and the one as reference group with mixed undifferentiated foods. The blood pressure, heart rate, respiratory rate and body temperature were measured pre- and post-intervention. Due to the normality of the data distribution, the gathered data were analyzed using SPSS software program (Ver. 19) and paired T-test and ANOVA in a meaningful level of  $p < 0.05$ .

**Results:** According to ANOVA, the students of the three groups showed no significant differences in demographic characteristics and medical examinations pre- and post-intervention ( $P > 0.05$ ). The systolic ( $p = 0.031$ ) and diastolic ( $p = 0.020$ ) pressures significantly decreased in hot-natured group and the heart rate significantly increased ( $p = 0.001$ ). The vital signs indicated no significant differences between the three groups pre- and post-intervention ( $p > 0.05$ ).

**Conclusion:** Consumption of hot-natured foods for three weeks decreases the systolic and diastolic pressures and increases the heart rate.

**Keywords:** Hot- and cold-natured foods; Vital signs; Human

## INTRODUCTION

Hemodynamic is an important part of cardiovascular physiology which promotes blood circulation through cardiovascular system. Sufficient circulation is a

necessary condition for supplying adequate oxygen and nutrients to the tissues. Blood pressure is the force imposed by blood to the vessel wall surface area. Blood pressure is formed of two components of systolic blood pressure and diastolic blood pressure. Maximum pressure imposed by blood to the vessel wall is called systolic blood pressure. Minimum pressure imposed by blood to the vessel wall is called diastolic blood pressure. Pressure is influenced by cardiac output and vascular resistance. Effective factors on blood pressure changes include age, stress, familial history of hypertension,

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medications and diet.<sup>1,2,3</sup> Pulse is another vital sign which results from pulse transmission in arteries. Factors such as exercise, sleep, anxiety, stress, illness, medicines, and changes in temperature and body ions can alter the number of pulses. When controlling the pulse, attention should be paid to the amount, volume, rhythm, and pressure of pulse.<sup>1,4,5</sup> Transfer of oxygen from atmospheric air to cellular environment and transfer of carbon dioxide from cellular environment into atmospheric air is called respiration. Effective factors on the number of respiration include activity, pain, stress, smoking, body condition, medications, brain damage and lung diseases.<sup>1,2,4</sup> Body temperature is another vital sign which indicates the difference in heat generated by metabolic processes and the amount of heat lost. Effective factors on body temperature regulation include age, food and drink, body metabolism, exercise and physical activity, ambient temperature, vascular changes in the skin and hormones.<sup>1,2</sup>

Cardiovascular diseases, obesity, hypertension, anemia, osteoporosis, and diabetes are the most important common diseases which occur due to malnutrition.<sup>6</sup> In modern society, malnutrition is one of the most important causes of mortality and disability. Proper nutrition is considered as one of the tools for controlling most diseases. Diet modification can be effective in preventing many of these diseases.<sup>7</sup>

In traditional Iranian medicine, main elements of the living organisms are fire, air, water and soil. Warmth, coldness, moisture and drought are basic qualities; each of the above elements is composed of two qualities. Fire is warm and dry; air is warm and moist; water is cold and moist and soil is cold and dry. One or two qualities are dominant in a person; this dominant quality is called temperament.<sup>8,9</sup> The notion of warmth and coldness has been accepted not only in Iranian traditional medicine but also in traditional medicine of India, Europe, Arabia, Romania, Greece and China.<sup>10,11</sup> In the traditional medicine school, foods are also composed of ingredients which make them warm or cold, and moist or dry. Humans need to keep their temperament at moderate levels in order to avoid diseases.<sup>8</sup> Warm foods rapidly increase body heat, energy and physical, sexual and even mental strength; on the contrary, cold foods slightly reduce body heat and lead to weakness and lethargy.<sup>10,12,13</sup>

Warm and cold nature of foods has been noted in

the ancient literature of Iran, China and India. They categorized foods in terms of their effects and their nature, and they knew food treatments. In different seasons and weather, they treated and adapted themselves by knowing and using the nature of foods.<sup>14</sup> Anthropologists describe the warm-cold concept as an important and universal concept in medicine. A disease develops when body balance is destroyed in excessive warmth or coldness.<sup>10</sup> However, the balance can be regained through food treatment.<sup>15</sup>

If effect of warm and cold diet is proven on function of body systems, it can be a harmless, inexpensive alternative with less psychological and physical complications than medications.<sup>8</sup> Therefore, this study examined the effect of a cold and warm-natured diet on vital signs including blood pressure, pulse, respiration and body temperature.

## MATERIALS AND METHOD

This was a quasi-experimental study on 60 healthy male students aged between 18 and 22 years and studying in the Gonabad University of Medical Sciences. After filling the consent form, students underwent a medical examination. Considering the probable effect of cold and warm foods on vital signs (body temperature, pulse, respiration and blood pressure), these criteria were measured at the beginning and end of the study. The studied samples were recruited among students who were healthy in medical examination in terms of smoking, drug abuse, allergy to medicine or food and underlying disease. This study was approved by the Ethics Committee of Gonabad University of Medical Sciences.

The students were divided into 3 groups: 20 in normal diet group, 20 in warm diet group and 20 in cold diet group, for three weeks. Temperament of students was determined based on their self-report after a briefing workshop on diagnosis of temperament.

In all samples, temperature was measured orally and pulse control was done through radial pulse. A mercuric pressure gauge was used to measure blood pressure and it was tied around the right arm of the subjects. Blood pressure was measured using the Erkameter 3000 mercury barometric device manufactured in Germany; body temperature was measured by the AMARELL mercury thermometer manufactured in Germany. Heart rate was measured from the radial pulse per minute and

the number of respiration was measured by observing the chest in one minute by the researcher. Pulse and respiration rate were also counted in full minute.

Then, each group was settled in a separate dormitory and was fed solely with foods, beverages and fruits specifically determined for that group in separate dining rooms. Warm food items included saffron, walnuts, dates, grape juice, honey, banana, apricots, flixweed, garlic, onions, shallot, peppermint, pastries, raisins, coconut, rock candy, melons, pears, zinger, cinnamon, cardamom, pepper, lamb, cocoa, sesame, eggs, peas, butter, cumin, fig, almonds, celery, chives, quince, carrot, pistachio, black olives, hazelnuts, rooster meat, peanuts, mangoes, pennyroyal, horseradish, parsley, tea, persimmons, basil, yellow chubs, fenugreek, leeks and ostrich meat. Cold foods also included rice, yogurt, dough, milk, cucumber, tomato, pickles, cherries, peaches, watermelons, potatoes, veal, lemons, verjuice, pomegranates, sumac, barberry, spinach, lettuce, pumpkin, cabbage, whey, mushrooms, chicken, cheese, prunes, sour apple, rice milk, sea-buckthorn, beans, lentils, broad bean, mung bean, fish meat, goat meat, starch, barley bread, barley soup, animal brain, eyes, rumen, gizzard, vinegar, qaraqurot, citron, pumpkin seeds, corn, rhubarb, chicory and coriander. Normal

food items included wheat bread, kofta, kookoo sabzi, partridges, porridge, beet leaves, coffee, jujube, and a balanced blend of some hot and cold foods.<sup>12,16</sup>

Different foods were used in different meals and days. Moreover, it was tended to avoid significant difference in mean energy and protein, carbohydrate and fat macronutrients between three groups which were measured by using Food Processor II software.

Data was inserted in SPSS software program (Ver. 19). Kolmogorov-Smirnov test showed that data was normally distributed in each group. Thus, analysis was done by using pairwise t-test and one-way analysis of variance ( $P < 0.05$ ).

## RESULTS

All samples were healthy male students (mean age  $20.67 \pm 1.41$  years; mean weight  $65.27 \pm 9.53$  kg); there was no significant difference between three groups. As shown in Table 1, there was no significant difference between three groups in terms of vital signs before the intervention ( $p > 0.05$ ). Moreover, there was no significant difference between three groups in terms of vital signs after the intervention ( $p > 0.05$ ) (Table 2).

**Table 1: comparison of mean and standard deviation of vital signs before the intervention**

Variable	Normal diet	Warm diet	Cold diet	p-value
Body temperature (°C)	36.89±0.175	36.75±0.394	36.86±0.340	0.336
Systolic BP (mmHg)	115.10±8.61	119.30±7.65	113.25±8.92	0.075
Diastolic BP (mmHg)	75.95±5.83	78.00±5.29	74.45±5.14	0.126
Heart Rate (per min)	71.52±6.83	70.25±5.04	74.95±11.60	0.187
Respiratory Rate (per min)	18.05±1.85	17.80±1.73	17.70±1.30	0.786

One-way ANOVA

**Table 2: comparison of mean and standard deviation of vital signs after the intervention**

Variable	Normal diet	Warm diet	Cold diet	p-value
Body temperature (°C)	36.78±0.253	36.89±0.458	36.71±0.275	0.252
Systolic BP (mmHg)	113.09±11.00	115.00±10.25	116.50±8.44	0.552
Diastolic BP (mmHg)	73.80±5.89	74.25±7.12	77.00±6.36	0.244
Heart Rate (per min)	75.85±8.79	77.60±9.43	74.35±11.40	0.587
Respiratory Rate (per min)	18.80±1.69	19.05±2.13	18.20±2.41	0.423

One-way ANOVA

The results of t-test showed that body temperature increased in the warm group and decreased in other two groups; however, it was not significant ( $p > 0.05$ ). Systolic blood pressure ( $p = 0.031$ ) and diastolic blood pressure ( $p = 0.020$ ) significantly decreased in the warm group, while there was no significant difference between two other groups ( $p > 0.05$ ). Moreover, heart rate increased significantly in the warm group ( $P = 0.001$ ); while, there was no significant difference in two other groups ( $p > 0.05$ ). Respiration rate had higher increase in the warm group than other groups; however, it was not significant ( $p > 0.05$ ).

## DISCUSSION

The results of this study showed that consumption of warm foods reduced systolic and diastolic blood pressure and increased heart rate in humans. A study conducted by Shahabi et al. on comparison of physiological and immunological characteristics of those who have been referred to as cold and warm-tempered in traditional medicine claimed that this classification, which was carried out hundreds of years ago, has a scientific basis and it can be used to diagnose and treat diseases and restore balance to body function. Because body responds to stress through sympathetic nervous system, parasympathetic nerves and adrenocortical glands, stimulation of each of these systems has different effects on balance of body functions (homeostasis). Therefore, activity of these systems is different in body of warm and cold tempered people. The main source of norepinephrine hormone secretion is sympathetic nervous system and the main source of secretion of epinephrine and cortisol hormones is adrenal glands. Warm-tempered people have higher sympathetic nervous system activity and lower adrenal sympathetic activity, adrenal corticosteroid activity, and parasympathetic nervous system activity (vagus nerve) than cold-tempered people.<sup>10,17</sup> Probably one of the reasons for decreasing systolic and diastolic blood pressure in the warm diet group is reduction in adrenal sympathetic activity, and the cause of increased heart rate in this group is also a decrease in activity of parasympathetic nervous system. Increased heart rate is also influenced by thyroid hormones. Thyroid hormones have a direct effect on heart irritability and spike up the heart rate. These hormones also increase blood flow of tissues at heart rate intervals, increase systolic pressure, but decrease diastolic pressure and increase pulse pressure. Eventually, these hormones usually do not

affect mean arterial pressure.<sup>18,19</sup>

Moreover, the results showed that body temperature increased in the group receiving warm foods and decreased in the other two groups; however, these changes were not significant. One of the reasons for increasing body temperature is the increase in base metabolism, which can occur for various reasons. One of the causes of the increase in body temperature in the group receiving warm foods seems to be changes in thyroid hormones. Increasing thyroid hormones can increase the base metabolism by 60 to 100 percent higher than normal. In response to thyroid hormones, activity of the enzyme  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase increases.<sup>4,17</sup> In addition, thyroid hormones causes dilation of vessels of most tissues and, as a result, increases the blood flow. Heart outflow also increases as a result of increased tissue flow. Skin blood flow increases, particularly as a result of increased need for heat dissipation from the body.<sup>4,18</sup> Increasing testosterone also can increase the basal metabolism by up to 15%. This increase in metabolism is probably the indirect result of testosterone effect on protein anabolism, because increasing the amount of proteins (particularly enzymes) increases the activity of all cells.<sup>4,18,19</sup> Moreover, epinephrine secreted from the adrenal medullary can often increase total body metabolism by up to 100% of the normal amount, thereby increasing the activity and excitability of the body. Epinephrine increases other metabolic activities, such as glycogenolysis, in the liver and muscle and releases glucose into the bloodstream.<sup>18</sup>

A limitation of this study was that temperament of students was determined by their self-report, the samples were exclusively students, and warmth and coldness of foods were measured quantitatively, which should be considered in future studies and necessary solutions should be found for these limitations in order to provide a more accurate judgment about these variables. It is suggested to determine temperament by traditional medicine experts and reduce intervention time so that the body does not have the opportunity to compensate, in which case the true effect of warm and cold foods will be better recognized.

## CONCLUSION

Consumption of warm-natured foods by cold-tempered people can reduce systolic and diastolic blood pressure and increase heart rate and body temperature.

However, consumption of cold-natured foods by warm-tempered people and normal foods by normal people does not make a significant change in systolic and diastolic blood pressure and heart rate.

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**Ethical Considerations:** Ethical matters e.g. plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been totally observed by the authors.

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# Detoxifying of Nicotine in Smoker with Consumption of Food Containing CYP 2A6 Enzyme from Beef Liver

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## ABSTRACT

**Background:** the addicted smoking nicotine levels in the blood have an average 12 mg/liter of blood, while the safe limit of nicotine in the blood is 2 mg/liter. Nicotine levels decreased can be done by using the food contains biotransformation enzymes i.e. CYP 2A6. The purpose of this study was to know the decrease in nicotine in the blood of smokers after the feeding of biotransformation enzyme containing nicotine CYP 2A6

**Method:** The research method was an experiment. The number of respondents active smokers 30 people which received rehabilitation at PHC Surabaya Hospital. Samples were taken by random sampling.

**Result:** Based on the results of the study, second inspection after consumption of food which contained enzyme CYP 2A6 from beef liver, there was an increased excretion of cotinine in urine. There were 80% of respondents have increased levels excretion of cotinine in urine.

**Conclusion:** The conclusion of this study was that food which contained nicotine biotransformation enzyme (CYP 2A6) decreased concentration of nicotine in the blood of smokers

**Keywords:** Nicotine, Detoxification, CYP 2A6 enzyme, Cotinine, Biotransformation

## INTRODUCTION

Nicotine is the main cause of addiction in smoking making smokers will continue to smoke<sup>1,2,3</sup>. The more often the smoking then the health impact arising diseases will be even greater. Disease control can be done by reducing and eliminating nicotine from the body of the smoker. The efforts are made by biotransformation of nicotine in the body<sup>4</sup>.

Metabolism of nicotine in the body was various, although the main route of nicotine metabolism is through cotinine (70-80%). Biotransformation of nicotine is undertaken by the enzyme cytochrome P-450

(CYP 2A6) to become cotinine, biotransformation by the enzyme N-flavoprotein can be nicotine oxidase, biotransformation by glucuronate (UGT) becomes cotinine glucuronate so that the consumption of nicotine in the urine be found cotinine, nicotine, nicotine oxidase N-glucuronate and nicotine itself<sup>5,6</sup>.

Biotransformation process nicotine is change by CYP 2A6 is 75% cotinine, 8-10% nicotine glucuronide, nicotine N-oxide is 3-5%. When it's adding around 99.5% so enzymes that play a role in detoxifying nicotine is a Cytochrome P-450 CYP 2A6-, glucuronate, methylation, flavoprotein, and glutathione<sup>7</sup>.

Based on research before, foods contained ingredients for biotransformation such as<sup>8,9</sup>:

a. P 450 (CYP-2A6) cytochrome: vegetables and meat contained iron

Many foods contained iron have easily obtained ingredients. The food spread has ranged from vegetables, fruits, until the meat. Examples of foods that

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contain iron included potato peels, spinach, kale, corn, chard, Beet Greens, fruit apricots, citrus fruits, peanuts, green beans, soybeans, raisins, cereal, eggs, fish, and beef.

b. Flavoprotein : green tea, soy, hemp trunks arbei.

c. Glucuronate: cauliflower, broccoli, cabbage, celery, sprouts, apples, cherries, avocado .

Based on results of the other research, CYP 2A6 enzyme has an important role for change nicotine to cotinine<sup>10</sup>. This research has incorporated also with a relationship of metabolism of nicotine with immunodetectable hepatic CYP 2A6 (within = 31 human livers) and research on immuno-inhibition. Those research more to research experimentation by making use of culture in vitro and in vivo.

Other research also tends to be associated with this type of polymorphism of the enzyme CYP 2A6 such as of CYP2A6 \* 4. These allele types are believed to have ties with the smoking behavior even research according to result of Rao Y. et al research stated that the number of cigarettes that consumed per day with the CYP2A6 \* 4 alleles less on someone who does not have the CYP2A6 \*<sup>11</sup> .

Based on research in Japan, found that in the Japanese and Koreans, the formation of cotinine in the body will be reduced because of this allele (CYP2A6 \* 4) may inhibit the metabolism of nicotine<sup>12</sup>.

Previous research was still associated genetic relationship such as polymorphism CYP 2A6 type with the smoking behavior of the smoker and seldom to explain how to reduce nicotine level in workers blood. But other research stated that decrease levels of nicotine in the body of the smoker can be using a food contains biotransformator enzymes i.e. CYP2A6 with nicotine level in the blood i.e. 2 mg/L in blood (for smoker, nicotine in blood averages 12 mg/liter)<sup>13</sup>. But, this research still requires other research evidence. So, it is needed to research on the relationship of foods consumption containing CYP 2A6 enzyme from the liver of beef with decrease level of nicotine.

The study will assess to know the decrease in nicotine in the blood of smokers after the feeding food containing nicotine biotransformation enzyme (CYP2A6).

## MATERIAL AND METHOD

This study used experiment method. This experiment such as giving food containing P-450 (CYP 2A6) cytochrome.

Research conducted in experimental against smokers. Smokers are fed every day 3 times, i.e., morning, noon and night. Feeding for 6 days. The given food contains cytochrome P-450. Consecutive meals to be provided are: spinach, corn, kale, chard, beet greens, apricots, oranges, peanuts, green beans, soybeans, raisins, cereal, eggs, fish, and beef, green tea, soy, hemp trunks arbei, cauliflower, broccoli, cabbage, celery, sprouts, apples, cherries, avocado. The types of food that are made in the form of vegetables and fish and milk with the same weight on each of the respondents.

Before feeding on day one, firstly, measured the levels of nicotine in the urine. After feeding the sixth-day smokers also measured the levels of nicotine in the urine, and also the nicotine glucuronate, nicotine N-oxides, and cotinine.

The number of respondents as many as 30 people active smokers who got treatment at the rehab place smoker in PHC hospital Surabaya. Samples were taken in random sampling. Independent variables were the mass of the enzyme cytochrome P450 enzymes i.e. biotransformator or PYC 2A6 with units of mg/liter. Dependent variables were nicotine levels and cotinine in the urine with units of mg/l. Nicotine and cotinine in the urine measured by QRMA (Quantum Resonance Magnetic Analyzer). To test the difference in the levels of nicotine and cotinine in the urine before and after the awarding of the food contains biotransformator of nicotine on smokers used t-test are not paired.

## FINDINGS/RESULT

**Table 1 Distribution of Respondent Smoking Habit**

Smoking Habit	Quantity	Percentage
Smoking	20	100 %
No Smoking Habit	0	0 %
<b>Total</b>	<b>20</b>	<b>100.00 %</b>

Based

the

above table shows that all respondents have a smoking habit

**Tabel 2. Distribution of Respondent First Age Smoking**

First Time Smoking	Quantity	Percentage
Elementary school (6-13 years old)	5	25,00 %
Junior high school (14-16 years old)	5	25,00 %
Senior high school (17-19 years old)	8	40,00 %
Recently	1	5,00 %
Other	1	5,00%
<b>Total</b>	<b>20</b>	<b>100.00 %</b>

Based on the table above shows that the distribution of the first age respondents do smoking is since senior high school during of 17-19 years old with the percentage of 40.00%.

**Tabel 3. Distribution of Smoking duration**

Duration smoking	Quantity	Percentage
1-20 years	9	45,00 %
11-20 years	3	15,00 %
>20 years	8	40,00 %
<b>Total</b>	<b>20</b>	<b>100.00 %</b>

Based on the table above shows that most respondents smoking during 1-20 years old with the latest smoking is 2 years old.

**Tabel 4: The Amount Spent on Cigarettes**

The number of cigarettes that is spent every day	Quantity	Percentage
1-10 cigarettes	15	75,00 %
11-20 cigarettes	2	10,00 %
21-30 cigarettes	2	10,00 %
Other	1	5,00 %
<b>Total</b>	<b>20</b>	<b>100.00 %</b>

Based on the above table shows that the majority of the respondents spent smoking as much as 1-10 cigarettes per day with the percentage of 75%

## The Result of Cotinine Examination

**Tabel 5 Result of Before and After Cotinine Examination**

ID Responden	Hasil Pemeriksaan 1	Hasil Pemeriksaan 2
1	529.95	3143
2	1314.73	475
3	2624.88	3484
4	441.61	1690
5	934.35	446
6	520.37	1111
7	2776.52	4224
8	1258.12	2310
9	400.64	3236
10	84.44	469

(Source: Primary Data, 2016)

Table above shows that the results of the examination of the second against respondents after the giving of food contain CYP 2A6 enzyme, glucuronate, and flavoprotein, there is an increase in cotinine level in the urine. There are 8 respondents occurred increased levels of cotinine in the urine while 2 respondents experienced a decrease in the levels of cotinine.

## DISCUSSION

### Smoking Habit

The results showed that 100.00% of the respondents have a habit of smoking. This shows that someone who smoked did not immediately feel the consequences that arise from the harm of smoking. Based on Susenas data in 2001, stated the prevalence of former male smokers and women relative small at such a young age, this can be attributed to the effects of smoking that occurred approximately 20 years. This situation can be seen in people who have quit smoking mostly in the elderly.

### Distribution of Respondent First Age Smoking

Results of the study stated the largest percentage the distribution first age smoking is since senior

high school during 17-19 years old. This suggests that this age is the age of teenagers with high a sense of curiosity is high, including trying to smoke.

Data Riskesdas and Health Research Agencies noted that the trend of the age of smoke rises in the age of the adolescents in the age group 10-14 years and 15-19 years of age. Results of data Riskesdas in the year 2007, 2010 and 2013, shows that the highest number of age start smoking at age group 15-17 years.

According to the Smet explained the age of first smoking generally ranges between 11-13 years. It can be said that someone started smoking at a time when children or teens. In general, according to Kurt Lewin, the smoking behavior is affected by individual factors and environmental factors<sup>14</sup>. Individual factors coming from within a teenager. Teenagers start smoking is associated with the presence of psychosocial crisis during its development namely “ identity search”. In this time the teen feels there is a mismatch between social development with a psychic. Teenagers will know that efforts to find an identity, not all correspond to the environment.

#### **Duration and The Amount Spent on Cigarettes**

A majority of respondents have smoked for a long-range 1-20 years. The reasons respondents liked the smoke can be a pleasant feeling of smoking, reducing anxiety, anger, and agitation. While the distribution of cigarettes spent 10-20 pieces per day. This shows that smoking can cause addiction and create a habit for users.

#### **The Result of Cotinine Examination**

Results of the study stated the presence of increased levels of cotinine in the urine of second inspection results against respondents after the giving of food contain CYP 2A6 enzyme, 8 respondents occurred increased levels of cotinine with a percentage of 80%. This shows that the nicotine has been converted into a form of cotinine have been expelled through the urine. Cotinine issued through the urine can reduce the levels of nicotine in the body of the respondents, so the level of dependency against nicotine can be reduced.

While the test of Paired t-test produces showed that significance  $0.028 < 0,005$ , then  $H_0$  is rejected. So,

there is relation between decline nicotine level in the blood against the giving of food containing CYP 2A6 enzyme.

### **CONCLUSION**

The characteristics of the respondents such as smoking habit, first age smoking, duration and amount spent of cigarettes affects a decrease of concentration of nicotine in the blood of smokers after feeding food containing nicotine biotransformator enzyme (CYP 2A6), and there is a relation between decrease concentration of nicotine in the blood of smokers after feeding food containing nicotine biotransformator enzyme CYP 2A6

### **RECOMMENDATION**

Further research is needed, especially in involving the nicotine detoxification by using food that is nutritious. Awareness is also needed for a healthy living mainly by involving family support nearby to reduce the consumption of cigarettes and cultivate a nutritious food ingredient.

**Conflict of Interest:** All authors have no conflicts of interest to declare.

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# Acute Bronchitis: General Health Survey Prospective Study

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## ABSTRACT

The purpose of this study is to study of acute bronchitis in Hillah City-Iraq and to identify factors that are, and are not, associated with these practices. A total of 127 patients fit this criterion, and were included in the study. Factors such as patient age, gender, residential area, chief complaint (cough, shortness of breath, sinus pain, chest pain and fever), heart rate, respiratory rate and medications prescribed during the visit were obtained from the database. During the study period, there were 127 cases of acute bronchitis. Distribution of acute bronchitis according to respiratory rate and gender that there were 97(76.38%) [male: 77(79.38%) and female: 20(20.62%)] less 20 and 30(23.62%) [male: 22(73.33%) and female: 8(26.67%)]. Also acute bronchitis cases had been distributed according to heart rate (more 100 and less 100) were 47(74.60%), 52(81.25%) respectively in male and 16(25.39%), 12(18.75%) respectively in female.

**Keywords:** Acute bronchitis, Chief complaint, Heart rate, Respiratory rate, Smoking status.

## INTRODUCTION

Acute bronchitis is thought to reflect an inflammatory response to infections of the epithelium of the bronchi<sup>1-6</sup>. Epithelial-cell desquamation and denuding of the airway to the level of the basement membrane in association with the presence of a lymphocytic cellular infiltrate have been demonstrated after influenza A trachea-bronchitis; microscopical examination has shown thickening of the bronchial and tracheal mucosa corresponding to the inflamed areas. Bacterial species commonly implicated in community-acquired pneumonias are isolated from the sputum in a minority of patients with acute bronchitis. However, the role of these species in the disease or its attendant symptoms remains unclear, because bronchial biopsies have not shown bacterial invasion<sup>7-10</sup>. In some cases, atypical bacteria are important causes, including *Bordetella pertussis*, *Chlamydothila* (Chlamydia) *pneumoniae*, and *Mycoplasma pneumoniae*. Some data

have suggested that *B. pertussis* may underlie 13 to 32% of cases of cough lasting 6 days or longer, although in a recent prospective study, *B. pertussis* comprised only 1% of cases of acute bronchitis<sup>11</sup>. Acute bronchitis is a self-limited inflammatory disorder of the upper airways that affects approximately 5% of people in the United States each year<sup>12</sup>. Many studies report that antibiotics are frequently prescribed for URIs despite evidence that they provide little to no benefit to the patients<sup>13,14</sup>. Cough is the primary symptom of acute bronchitis. By definition, adults with acute bronchitis present with a cough illness of less than 3 weeks' duration. Although localized symptoms (such as nasal congestion, runny nose, sore throat) associated with non-specific respiratory infections (colds) may be present with acute bronchitis, systemic symptoms such as fever, myalgia, nausea, malaise, and dyspnea are typically absent<sup>15</sup>. However, it is not uncommon for individuals with acute bronchitis to experience bronchospasm and wheezing, especially if there is an underlying history of asthma. Cough control is the goal of symptom management for acute bronchitis<sup>1</sup>; however, there is currently no "best" treatment strategy to facilitate this. Although multiple pharmacologic preparations are available for the treatment of cough, there is a dearth of published research literature related to support them. In addition, results from the available studies have been mixed and/or have shown treatments

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to be minimally effective<sup>16-19</sup>. Historically, Infectious bronchitis virus has been known as a respiratory pathogen. Later, other clinical manifestations and postmortem signs associated with IBV have been reported. Clinical data support that antibiotics do not significantly change the course of acute bronchitis, and may provide only minimal benefit compared with the risk of antibiotic use itself. In children, however acute cough can last an average of 25 days<sup>20</sup>. Nonetheless, cough guidelines define acute cough lasting as long as up to eight weeks – under some circumstances, i.e., if elicited by adenovirus, mycoplasma pneumoniae or Bordetella pertussis infection<sup>21-23</sup>. Some people are using the definition of subacute cough<sup>24</sup>, lasting 3–8 weeks. Although antibiotics are not recommended for routine use in patients with bronchitis, they may be considered in certain situations<sup>25</sup>. When pertussis is suspected as the etiology of cough, initiation of a macrolide antibiotic is recommended as soon as possible to reduce transmission; however, antibiotics do not reduce duration of symptoms.

## MATERIALS AND METHOD

This is a prospective study conducted via structured chart data extraction of all patients presenting to the Hillah teaching hospital Marjan Hospital in Hillah city-Iraq from October 1, 2016 through March 31, 2017 with a primary diagnosis of acute bronchitis. This diagnosis was defined by attending and resident physician entry of acute bronchitis into the patient's electronic medical chart on discharge from the ED. A total of 127 patients fit this criterion, and were included in the study. Factors such as patient age, gender, residential area, chief complaint (cough, shortness of breath, sinus pain, chest pain and fever), heart rate, respiratory rate and medications prescribed during the visit were obtained from the database. Severity of substance abuse was not reported. Frequencies, percentages, means, and associated SDs were used to describe the patient population. P-Values < 0.05 were considered significant. Data were analyzed with SPSS, version 17.0 (SPSS, Inc., Chicago, IL).

## RESULTS AND DISCUSSION

Acute bronchitis cases had been distributed according to heart rate (more 100 and less 100) were 47(74.60%), 52(81.25%) respectively in male and 16(25.39%), 12(18.75%) respectively in female **Table 1**. Distribution of acute bronchitis according to respiratory rate and gender that there were 97(76.38%) [male: 77(79.38%) and female: 20(20.62%)] less 20 and 30(23.62%) [male: 22(73.33%) and female: 8(26.67%)] **Table 2-5**. The disorder affects approximately 5% of adults annually, with a higher incidence observed during the winter and fall than in the summer and spring. In the United States, acute bronchitis is the ninth most common illness among outpatients, as reported by physicians<sup>28</sup>. Acute bronchitis should be differentiated from acute inflammation of the small airways asthma or bronchiolitis which typically presents as progressive cough accompanied by wheezing, tachypnea, respiratory distress, and hypoxemia. It should also be distinguished from bronchiectasis, a distinct phenomenon associated with permanent dilatation of bronchi and chronic cough. Additional diagnostic tests are usually not warranted in the absence of signs and symptoms of pneumonia, pertussis, or influenza<sup>29,30</sup>. There are numerous medicinal herbs for bronchitis that can be used as a treatment and relief. The main goal of these herbs is to restore the movement to the cilia (the tiny hairs that operate as filters in the bronchial tubes) and reduce the inflammation and swelling in the bronchial tubes<sup>31-40</sup>. Echinacea (*Echinacea pupurea or angustifolia*): a lymphatic herb that stimulates the body's innate ability to fight off acute illness by increasing white blood cell count, and killer T-cells. Anti-microbial are a group of plants that work in several ways. They can inhibit the proliferation of a virus or bacteria, and stimulate the body's innate ability to recover. *Zingerber offician*: stimulates blood flow, warming and stimulating expectorant, anti-viral action. *Thymus vulgaris*: anti-bacterial, damp coughs, colds, flu, digestive complications associated with viral or bacterial infections, mild expectorant. *Plantago major*: demulcent, speeds healing of mucus membranes, anti-inflammatory<sup>41-48</sup>.

**Table 1. Acute bronchitis according to Gender and Age.**

Gender	Age						Total
	1-10	11-20	21-30	31-40	41-50	51-60	
Male	22(73.33%)	23(88.46%)	26(47.29%)	18(78.26%)	5(62.50%)	5(100%)	99(77.95%)
Female	8(26.67%)	3(11.54%)	9(25.71%)	5(21.74%)	3(37.50%)	0(0.0%)	28(22.05%)
<b>Total</b>	<b>30(23.62%)</b>	<b>26(20.47%)</b>	<b>35(27.56%)</b>	<b>23(18.11%)</b>	<b>8(6.29%)</b>	<b>5(3.94%)</b>	<b>127</b>

**Table 2. Acute bronchitis according to Gender and Chief complaint.**

Gender	Chief complaint			Total
	Shortness of breathing	Fever	Cough	
Male	8(72.72%)	4(100%)	87(77.68%)	99(77.95%)
Female	3(27.27%)	0(0.0%)	25(22.32%)	28(22.05%)
<b>Total</b>	<b>11(8.66%)</b>	<b>4(3.15%)</b>	<b>112(88.19%)</b>	<b>127</b>

**Table 3. Acute bronchitis according to gender and smoking status.**

Gender	Smoking status			Total
	Smoking		No	
	Ex	Current		
Male	11(91.67%)	14(87.50%)	74(74.74%)	99(77.95%)
Female	1(8.33%)	2(12.50%)	25(25.25%)	28(22.05%)
<b>Total</b>	<b>12(9.45%)</b>	<b>16(12.59%)</b>	<b>99(77.95%)</b>	<b>127</b>

**Table 4. Acute bronchitis according to Heart rate and gender.**

Gender	Heart rate		Total
	More 100	Less 100	
Male	47(74.60%)	52(81.25%)	99(77.95%)
Female	16(25.39%)	12(18.75%)	28(22.05%)
<b>Total</b>	<b>63(49.61%)</b>	<b>64(50.39%)</b>	<b>127</b>

**Table 5. Acute bronchitis according to respiratory rate and gender.**

Gender	Respiratory rate		Total
	More 20	Less 20	
Male	77(79.38%)	22(73.33%)	99(77.95%)
Female	20(20.62%)	8(26.67%)	28(22.05%)
<b>Total</b>	<b>97(76.38%)</b>	<b>30(23.62%)</b>	<b>127</b>

### CONCLUSION

Our study included all patients with a primary diagnosis of acute bronchitis during our specified time period. The best defense against acute bronchitis is to quit. Smoking damages your bronchial tree and puts you at risk for infection. Smoking also slows down the healing process.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:**None to declare.

**Ethical Clearance:** All protocols were approved under the Emergency Department of Merjan Hospital of Hillah City, Iraq.

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# Diagnosis of *Trauma Mechanism* and Study of Fractures According to Various Characteristics

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## ABSTRACT

The highest numbers of fractures cases were in the age group of 21-30 years, that was 39(33.05%) followed by 11-20 years 31(26.27%). Distribution of fractures according to age groups (1-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90) and hospital stay (More day and Less day), that there were [5(5.15%), 23(23.71%), 34(35.05%), 14(14.43%), 5(5.15%), 6(6.19%), 6(6.19%), 2(2.06%), and 2(2.06%)] respectively according to age groups in fracture cases (hospital stay: More day), and recorded [2(9.52%), 8(38.09%), 3(14.29%), 1(4.76%), 2(9.52%), 2(9.52%), 2(9.52%), 1(9.52%), and 0(0.00%) respectively according to age groups in fracture cases (hospital stay: Less day). Distribution of fractures according to age groups and location Hand, Leg, Femur, Pelvic, Facial, and Back. Distribution of fracture cases according to male, female and age during twelve months (January, February, march, April, June, July, August, September, October, November and December).

**Keywords:** Fractures, Trauma, Hospital stay, Location, Causes.

## INTRODUCTION

Patient related factors and site of fracture play an important role in planning the management of fracture pain. Studies have shown the use of various agents during fracture reduction<sup>1-7</sup>. They include pethidine alone, combination of pethidine and diazepam, tramadol, ketamine, propofol and fentanyl. Vitamin D is an essential nutrient that can behave as a hormone that is obtained through diet and cutaneous synthesis by ultraviolet B radiation. Fracture reduction procedures cause considerable patient discomfort. Effective management of fracture pain and anxiety reduces patient distress and allows successful management of the fracture. Ibuprofen was the commonly prescribed analgesic in children. This could be due to its efficacy

and safety<sup>8-14</sup>. Vitamin D is essential for bone development and remodeling, as demonstrated by a direct correlation with rickets in children. Furthermore, a significant correlation has also been shown with adequate vitamin D and appropriate bone mass density. The incidence of maxillofacial injuries is on the rise due to the increase in the number of motor vehicle accidents. Pain is one of the most common symptoms of fracture and one of the most common reason for visit to emergency<sup>15-23</sup>. Hence, assessment of pain severity and its effective management particularly on its acute presentation, is important. Adequate pain relief is also necessary for successful closed reduction of fractures. Various options available for pain management include opioids, nonsteroidal anti-inflammatory drugs, nerve block, epidural injections and muscle relaxants. Alternatively, agents like propofol, ketamine, fentanyl may be used to manage distress associated with fracture reduction. Physician's judgement along with the need of the patient influences selection of option to decrease pain and anxiety during conservative management of fractures.

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**MATERIALS AND METHOD**

We documented distribution of fracture cases by age groups (1-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90), hospital stay (More day and Less day), location (Hand, Leg, Femur, Pelvic, Facial, and Back) and causes (Aggression, Sport, Car, Fall, Bicycle, Motorcycle, and Workplace). The retrospective study

group consisted of all the fracture cases reporting to emergency department of Hillah teaching hospital in the study period from 1st January 2010 to 30th December 2016. The data were summarized using percentages. Interpretation of the collected data was done by using appropriate statistical methods like percentage and proportions.

**Table 1. Distribution of fractures cases according to age groups and gender male/female.**

Age	Male	Female	Total
1-10 year	7(6.03%)	0(0.00%)	7(5.93%)
11-20 year	31(26.72%)	0(0.00%)	31(26.27%)
21-30 year	39(33.62%)	0(0.00%)	39(33.05%)
31-40 year	14(12.07%)	1(50.00%)	15(12.71%)
41-50 year	6(5.17%)	1(50.00%)	7(5.93%)
51-60 year	8(6.89%)	0(0.00%)	8(6.78%)
61-70 year	8(6.89%)	0(0.00%)	8(6.78%)
71-80 year	2(1.72%)	0(0.00%)	2(1.69%)
81-90 year	1(0.86%)	0(0.00%)	1(0.85%)
<b>Total</b>	<b>116(98.31%)</b>	<b>2(1.69%)</b>	<b>118</b>

**Table 2. Distribution of fractures according to age groups and hospital stay.**

Age	More day	Less day	Total
1-10 year	5(5.15%)	2(9.52%)	7(5.93%)
11-20 year	23(23.71%)	8(38.09%)	31(26.27%)
21-30 year	34(35.05%)	3(14.29%)	37(31.36%)
31-40 year	14(14.43%)	1(4.76%)	15(12.71%)
41-50 year	5(5.15%)	2(9.52%)	7(5.93%)
51-60 year	6(6.19%)	2(9.52%)	8(6.78%)
61-70 year	6(6.19%)	2(9.52%)	8(6.78%)
71-80 year	2(2.06%)	1(9.52%)	3(2.54%)
81-90 year	2(2.06%)	0(0.00%)	2(1.69%)
<b>Total</b>	<b>97(82.20%)</b>	<b>21(17.79%)</b>	<b>118</b>

**Table 3. Distribution of fractures according to age groups and location.**

Age	Hand	Leg	Femur	Pelvic	Facial	Back	Total
1-10 year	2(6.06%)	5(7.3%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	7(5.93%)
11-20 year	10(30.30%)	15(21.7%)	2(33.3%)	2(40.0%)	1(50%)	0(0.0%)	30(25.42%)
21-30 year	13(39.39%)	22(31.9%)	2(33.3%)	0(0.0%)	0(0.0%)	1(100%)	38(32.20%)

**Cont... Table 3. Distribution of fractures according to age groups and location.**

31-40 year	4(12.12%)	10(14.5%)	0(0.0%)	0(0.0%)	1(50%)	0(0.0%)	15(12.71%)
41-50 year	0(0.00%)	7(10.14%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	7(5.93%)
51-60 year	1(3.03%)	5(7.25%)	1(16.7%)	1(20%)	0(0.0%)	0(0.0%)	8(6.78%)
61-70 year	2(6.06%)	2(2.9%)	1(16.7%)	1(20%)	0(0.0%)	0(0.0%)	6(5.08%)
71-80 year	1(3.03%)	1(1.4%)	0(0.0%)	1(20%)	0(0.0%)	0(0.0%)	3(2.54%)
81-90 year	0(0.00%)	2(2.9%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	2(1.69%)
<b>Total</b>	<b>33(27.9%)</b>	<b>69(58.47%)</b>	<b>6(5.1%)</b>	<b>5(4.2%)</b>	<b>3(2.5%)</b>	<b>1(0.8%)</b>	<b>118</b>

**Table 4. Distribution of fractures according to age groups and causes.**

Age (year)	Aggression	Sport	Car	Fall	Bicycle	Motorcycle	Workplace	Total
1-10	0(0.0%)	0(0.0%)	4(10.6%)	2(7.7%)	1(4.5%)	0(0.0%)	0(0.0%)	7(5.93%)
11-20	3(27.3%)	4(50%)	7(17.9%)	6(23.1%)	9(40.9%)	0(0.0%)	2(25%)	31(26.27%)
21-30	5(45.5%)	3(37.5%)	10(25.6%)	5(19.2%)	6(27.3%)	1(25%)	3(37.5%)	33(27.97%)
31-40	2(18.2%)	1(12.5%)	11(28.2%)	1(3.8%)	3(13.6%)	0(0.0%)	1(12.5%)	19(16.10%)
41-50	1(9.1%)	0(0.0%)	1(2.6%)	3(11.5%)	0(0.0%)	1(25%)	1(12.5%)	7(5.93%)
51-60	0(0.0%)	0(0.0%)	2(5.1%)	2(7.7%)	3(13.6%)	1(25%)	0(0.0%)	8(6.78%)
61-70	0(0.0%)	0(0.0%)	2(5.1%)	4(15.4%)	0(0.0%)	1(25%)	1(12.5%)	8(6.78%)
71-80	0(0.0%)	0(0.0%)	1(2.6%)	2(7.7%)	0(0.0%)	0(0.0%)	0(0.0%)	3(2.54%)
81-90	0(0.0%)	0(0.0%)	1(2.6%)	1(3.8%)	0(0.0%)	0(0.0%)	0(0.0%)	2(1.69%)
Total	11(%)	8(%)	39(%)	26(%)	22(%)	4(%)	8(%)	118

## RESULTS AND DISCUSSION

In our study a total of 118 cases were included who admitted in the Hillah Teaching Hospital from 1st October 2016 to 30th March 2017. **Table 1** shows that there were 116(98.31%) male and 2(1.69%) female. The highest numbers of fractures cases were in the age group of 21-30 years, that was 39(33.05%) followed by 11-20 years 31(26.27%). Distribution of fractures according to age groups (1-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90) and hospital stay (More day and Less day), that there were [5(5.15%), 23(23.71%), 34(35.05%), 14(14.43%), 5(5.15%), 6(6.19%), 6(6.19%), 2(2.06%), and 2(2.06%)] respectively according to age groups in fracture cases (hospital stay: More day), and recorded [2(9.52%), 8(38.09%), 3(14.29%), 1(4.76%), 2(9.52%), 2(9.52%),

2(9.52%), 1(9.52%), and 0(0.00%) respectively according to age groups in fracture cases (hospital stay: Less day) **Table 2**. In **Table 3** shows distribution of fractures according to age groups and location (Hand, Leg, Femur, Pelvic, Facial, and Back) were 2(6.06%), 10(30.30%), 13(39.39%), 4(12.12%), 0(0.00%), 1(3.03%), 2(6.06%), 1(3.03%), 0(0.00%) respectively according to age groups in fracture cases (Location: Hand), and recorded 5(7.3%), 15(21.7%), 22(31.9%), 10(14.5%), 7(10.14%), 5(7.25%), 2(2.9%), 1(1.4%), 2(2.9%) respectively according to age groups in fracture cases (Location: Leg), and recorded 0(0.0%), 2(33.3%), 2(33.3%), 0(0.0%), 0(0.0%), 1(16.7%), 1(16.7%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Location: Femur), and recorded 0(0.0%), 2(40.0%), 0(0.0%), 0(0.0%), 0(0.0%), 1(20%), 1(20%), 1(20%), 0(0.0%) respectively according to age groups in

fracture cases (Location: Pelvic), and recorded 0(0.0%), 1(50%), 0(0.0%), 1(50%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Location: Facial), and recorded 0(0.0%), 0(0.0%), 1(100%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Location: Back). In **Table 4** shows distribution of fractures according to age groups and causes (Aggression, Sport, Car, Fall, Bicycle, Motorcycle, and Workplace) were 0(0.0%), 3(27.3%), 5(45.5%), 2(18.2%), 1(9.1%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Causes: Aggression), and recorded 0(0.0%), 4(50%), 3(37.5%), 1(12.5%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Causes: Sport), and recorded 4(10.6%), 7(17.9%), 10(25.6%), 11(28.2%), 1(2.6%), 2(5.1%), 2(5.1%), 1(2.6%), 1(2.6%) respectively according to age groups in fracture cases (Causes: Cars), and recorded 2(7.7%), 6(23.1%), 5(19.2%), 1(3.8%), 3(11.5%), 2(7.7%), 4(15.4%), 2(7.7%), 1(3.8%) respectively according to age groups in fracture cases (Causes: Fall), and recorded 1(4.5%), 9(40.9%), 6(27.3%), 3(13.6%), 0(0.0%), 3(13.6%), 0(0.0%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Causes: Bicycle), and recorded 0(0.0%), 0(0.0%), 1(25%), 0(0.0%), 1(25%), 1(25%), 1(25%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Causes: Motorcycle), and recorded 0(0.0%), 2(25%), 3(37.5%), 1(12.5%), 1(12.5%), 0(0.0%), 1(12.5%), 1(12.5%), 0(0.0%), 0(0.0%) respectively according to age groups in fracture cases (Causes: Workplace). The natural process of healing a fracture starts when the injured bone and surrounding tissues bleed, forming a fracture hematoma<sup>24-33</sup>. The blood coagulates to form a blood clot situated between the broken fragments. A bone fracture may be the result of high force impact or stress, or a minimal trauma injury as a result of certain medical conditions that weaken the bones, such as osteoporosis, bone cancer, or osteogenesis imperfecta, where the fracture is then properly termed a pathologic fracture<sup>33</sup>. Osteoporosis is a heterogeneous cluster of abnormal processes characterized by the net loss of bone. It results in a decrease in total mineralized bone without a decrease in the ratio of bone mineral to the organic matrix. As a result, there is a decrease in the overall amount of bone. This mineralization of the collagen matrix stiffens it and transforms it into bone. In fact,

bone is a mineralized collagen matrix; if the mineral is dissolved out of bone, it becomes rubbery. Healing bone callus on average, is sufficiently mineralized to show up on X-ray within 6 weeks in adults and less in children. Treatment of bone fractures are broadly classified as surgical or conservative, the latter basically referring to any non-surgical procedure, such as pain management, immobilization or other non-surgical stabilization. A similar classification is open versus closed treatment, in which open treatment refers to any treatment in which the fracture site is opened surgically, regardless of whether the fracture is an open or closed fracture. During the early menopausal years in women, there is a dramatic reduction in circulating estrogen. As a result, there is an increase in the rate of bone resorption, but not reformation. This creates an imbalance and sets the stage for osteoporosis. Although bone loss in women slows after the early postmenopausal years, loss continues through the latter decades of life, and in very old age the rate of loss increases again. In addition to hormonal changes, age-related bone loss is also due to reduced ability to utilize calcium, decreased vitamin D supply due to lower production and reduced absorption, and decreased activation of vitamin D by the kidneys. Today, it is estimated that about 80% of individuals in the developing countries still rely on traditional medicine-based largely on plants and animals for their primary health care<sup>48-53</sup>.

## CONCLUSION

RTA still remains the main etiological factor of maxillofacial fractures. Inadequate enforcement of obligatory wearing of crash helmet is probably responsible in our scenario. Various studies note a decrease in maxillofacial injuries caused by RTA by preventive measures such as compulsory wearing of seat belts, crash helmets, enforcement of law regarding drunken driving and use of mobile phones while driving.

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** In this research, all protocols were approved under the Emergency Department of Hillah Teaching Hospital of Hillah city, Iraq.

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# Evaluation of Noncardiac Chest Pain (NCCP) in Iranian Patients with Nonerosive Reflux Disease (NERD) based on 24-Hour Multichannel Intraluminal Impedance-pH (MII-PH) Monitoring Tests

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## ABSTRACT

**Background/Aims:** The noncardiac chest pain (NCCP) remains a challenge in diagnosis and management. This symptom has a different etiology but suggests that gastroesophageal disease is the most common of NCCP.

**Method:** This study was conducted on 715 participants aged 11 to 63 years, with the chief complaint of regurgitation and NCCP. The esophageal manometry and multichannel intraluminal impedance-pH (MII-PH) monitoring tests were performed based on off proton pump inhibitors therapy in all patients.

**Results:** The NCCP was more prevalent in males (61.5%) than in females (38.5%) and more prevalent in patients younger than 50 years (69.1%). The mean DeMeester score value was higher in NCCP group (45.5±10.8). Of the patients with NCCP, 41.4% showed a pathological esophageal acid exposure time (EAET). Moreover, acid (24.7%), gas (45.8%) and mixed reflux episodes (55.6%) were more prevalent in patients with NCCP in supine position than those with regurgitation.

**Conclusions:** The present study revealed that acid, gas, and mixed reflux episodes were more prevalent in patients with noncardiac chest pain (NCCP) than those with regurgitation, mostly in supine position, however, the differences were not significant between the 2 groups ( $p>0.05$ ). Furthermore, NCCP was more prevalent in males and patients younger than 50 years.

**Keywords:** NCCP, NERD, Regurgitation, MII-pH,

## INTRODUCTION

Noncardiac chest pain (NCCP) is defined as recurrent angina-like or retrosternal chest pain without any cardiovascular problems. It is associated with

morbidity and affects the quality of life of patients. The prevalence of NCCP in several population-based studies in the United States has been reported to be 23% to 25%.<sup>1</sup> Although the precise cause or origin of NCCP is not fully understood, it is suggested that GERD is the most common cause of NCCP, especially acid reflux patterns.<sup>2,3</sup> Traditionally, symptoms of gastroesophageal reflux disease (GERD) are divided into typical (heartburn and acid regurgitation) and atypical (chest pain) symptoms.<sup>4,5</sup> NCCP can be due to esophageal chest pain (ECP) or non-esophageal chest pain (NECP). The clinical diagnosis of ECP is based on several modalities, such as esophageal high-resolution manometry (HRM), and 24-hour multichannel intraluminal impedance-

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pH (MII-PH) monitoring tests.<sup>1,6</sup> Recent studies have found that acid, gas, and mixed reflux episodes in MII-PH monitoring studies are associated with ECF.<sup>7</sup> DeMeester et al. reported that 46% of patients with NCCP have acid reflux and some researchers suggested that weakly acid and non-acid reflux can also cause NCCP.<sup>7,8</sup> The present study was conducted to evaluate some monomeric criteria and reflux characteristics in Iranian patients with nonerosive reflux disease, who had noncardiac chest pain (NCCP), and patients with regurgitation.

## MATERIALS AND METHOD

### *Patients:*

The study population was selected from gastroesophageal reflux disease (GERD) patients, who were admitted to Firoozgar hospital in Tehran, Iran. According to the GERD questionnaires, 1084 patients, who had GERD symptoms (regurgitation and noncardiac chest pain) for at least 3 *months* with no underlying diseases, were initially selected. The patients had regurgitation and noncardiac chest pain at least twice a week. All the patients provided informed consent and accepted to complete a standard GERD questionnaire. Diagnosis was based on questionnaires and esophagogastroduodenoscopy (EGD) (Fujinon ED-53 DEP) results. Of the patients, 69.2% (750/1084) appeared normal in EGD, named non-erosive gastroesophageal disease (NERD). Finally, this case-control study was conducted on 715 patients with NERD, aged 11 to 63 years. The case group consisted of 275 NERD patients with noncardiac chest pain (NCCP), and the control group included 440 NUD patients with regurgitation symptom. The exclusion criteria were as follow: The case and control groups had no history of documented ulcer, large hiatal hernia, esophageal varices, history of malignant diseases, previous foregut surgery, cardiovascular diseases, pregnancy, breastfeeding, psychiatric illness, and history of alcohol or drug abuse. Also, achalasia finding in barium swallows or EGD esophageal manometry was excluded. GERD symptoms (regurgitation and NCCP) and negative esophagitis in EGD were included. Body mass index (BMI) was calculated by weight in kilogram in fasting state divided by square of height in meters. Smoking was recorded as positive or negative, and esophageal manometry and esophageal multichannel intraluminal impedance-pH (MII-pH) monitoring tests

were performed for all patients.

### *Esophageal Multichannel Intraluminal Impedance-pH (MII-PH) Monitoring:*

Esophageal multichannel intraluminal impedance-pH (MII-pH) monitoring was performed on an outpatient basis using an ambulatory MII-pH system (manufactured by Mui Scientific, Ontario, CA). The MII-PH catheter (Unisensor AG, Bahnstr, Switzerland), with 6 impedance electrodes and 1 pH sensor (K6011-EI-0632), was inserted transnasally. Impedance measuring sites were located in the distal esophagus at 3, 5, 7, and 9 cm and 2 impedance measuring sites in the proximal esophagus at 15 and 17 cm above the LES. One antimony pH sensor was located 5 cm above the LES. MII-PH data were recorded for at least 23 hours. The location of the LES was determined by high-resolution manometry (HRM). The patients were asked to discontinue PPIs for at least 2 weeks and H<sub>2</sub>-antagonist, prokinetic agents, and antacid for at least 3 days prior to MII-PH study. They were also asked to avoid eating fruit juice and acidic beverages during the examination. The esophageal acid exposure of time (EAET) provided a quantitative measure of the time when esophageal pH remained below 4 in the distal esophagus. A total EAET of >4.0% was used to define elevated acid exposure. The HRM, using 23-channel silicone-customized water-perfused catheter (manufactured by Mui Scientific, Ontario, CA), were performed. Before each procedure, transducers were calibrated to 0 and 100 mmHg using externally applied pressure. These studies were conducted with the patients in the supine position after at least a 6-hour fast. The catheter used was a 23-channel silicone-customized water-perfused catheter, with an outside diameter of 3.8 mm (manufactured by Mui Scientific, Ontario, CA). The catheters had 1 distal channel for gastric recording, 5 channels 1 cm apart for the LES pressure, and 16 proximal channels, each 2 cm apart. Microlumina was perfused with a pneumohydraulic perfusion system (MMS software) at a water perfusion rate of 0.15 mL/min. Pressure data were acquired and presented using a software specially designed for high-resolution manometry (MMS v 8.23). The HRM assembly was passed transnasally. The LES was detected via the stationary pull-through method. Then, 10 swallows of 5 mL ambient temperature water spaced more than 20s apart were recorded. The pressure topography metrics were utilized in the Chicago Classification Version

3. Based on this consensus, integrated relaxation pressure 4 (IRP4) defined the lowest mean of abnormal esophagogastric junction pressure for 4 contiguous or non-contiguous seconds of relaxation. The distal contractile integral (DCI) is calculated by amplitude  $\times$  duration  $\times$  length (mmHg-s-cm) of the distal esophageal contraction greater than 20 mmHg from the proximal to distal pressure troughs. The distal latency (DL) is measured from the upper esophageal sphincter relaxation to the CDP. The contractile deceleration point (CDP) represents the inflexion point in the contractile front propagation.<sup>6</sup>

### Data Analysis

Analysis of the impedance signals included the total number of reflux episodes as regards to pH and its composition. Liquid reflux was defined as a sequential decrease in impedance to a minimum of 50% of the baseline value. Gas reflux was defined as a rapid (3kOhm/s) increase in impedance. Mixed reflux was defined as gas reflux that occurred during or immediately preceding liquid reflux. Acid reflux is defined as a reflux event associated with a drop in esophageal pH  $<4$ , weakly acid is associated with a pH drop between 4 and 7, and nonacid is a reflux event associated with a pH drop  $<7$ . The meal periods were excluded from the analysis.

### STATISTICAL ANALYSIS

Data were entered into SPSS Version 20 after encoding for each participant. Age was reported as mean  $\pm$  standard deviation. Statistical significance was compared between the symptom categories using either the Mantel-Haenszel chi square test with Yates correction or Fisher's exact probability test. A *p*-value less than 0.05 was considered statistically significant.

### RESULTS

This case-control study was conducted on 715 patients out of the total of 750 patients with nonerosive gastroesophageal reflux disease (NERD), who were selected based on the results of a GERD questionnaires and esophagogastroduodenoscopy (EGD). The case group included 275 NERD patients with noncardiac chest pain (NCCP); of them, 106 (38.5%) were female,

with an average age of  $40.8 \pm 9.8$  years (12-63) years. The control group consisted of 440 NERD patients with regurgitation; of them, 266 (60.5%) were female, with an average age of  $39.8 \pm 8.5$  (11-63) years. The overall frequency of NCCP and regurgitation in patients with NERD was 36.7% (275/750) and 58.6% (440/750), respectively. In contrast to regurgitation group, NCCP was more prevalent in males than in females, and this symptom was more prevalent in patients younger than 50 years. Mean integrated relaxation pressure 4 (IRP4), distal contractile integral (DCI), and distal latency (DL) values were comparable between the 2 groups. Mean DeMeester score value was significantly lower in regurgitation (control) group (Table 1). Of the 275 patients in NCCP (Case) group, 41.4% (114/275) showed a pathological EAET (mean: 13.7%, range: 4.4%-19.5%), whereas of the 440 regurgitation (control) group, 34.5% (152/440) showed a pathological EAET (mean: 12.9%, range: 3.9%-18.3%), but the differences between the 2 groups were not significant ( $p = 0.27$ ). The frequency of upright and supine position of acid reflux in NCCP patients was 24.4% (67/275) and 24.7% (68/275), respectively. Although acid reflux was more frequent in patients with NCCP than those with regurgitation in supine position [22.9% (101/440)], the difference was not significant between the 2 groups ( $p = 0.26$ ). The frequency of upright and supine position of mixed reflux in NCCP patients was 38.5% (106/275) and 55.6% (153/275), respectively. Mixed reflux was more frequent in patients with NCCP than in those with regurgitation in supine position [51.0% (224/440)], but the difference was not significant between the 2 groups ( $p > 0.05$ ). Also, gas reflux was more frequent in patients with NCCP than those with regurgitation in supine position [45.8% (126/275) vs. 38.2% (168/440),  $p = 0.27$ ]. The prevalence of weakly acid reflux in patients with NCCP was less than those with regurgitation in both positions. The prevalence of liquid reflux in supine position was lower in NCCP group than in regurgitation group [9.8% (27/275) vs. 12.7% (56/440)], however, the difference was not significant between the 2 groups ( $p = 0.43$ ). The prevalence of non-acid reflux in both positions was lower in NCCP group compared to regurgitation group (Table 2).

**Table1- Demographic Information and Prevalence of Manometry Findings and DeMeester Score in 440 Patients with Regurgitation and 275 Patients with Noncardiac Chest Pain**

Findings	Regurgitation (n=440)	NCCP (n=275)	P-Value
Sex			
Female (%)	266(60.5)	106(38.5)	0.45
Male (%)	174(39.5)	169(61.5)	
Age			
Mean±SD, year	39.8±8.5	40.8±9.8	-
Range, year	11-63	12-63	
Age(years)			
<50(%)	303(68.8)	190(69.1)	0.26
>50(%)	137(31.2)	85(30.9)	0.26
BMI(Kg/m <sup>2</sup> ),(Range)	22.3(18.5-45.4)	23.4(17.8-46.2)	0.24
Smoking	5352(11.8)	28(10.2)	0.25
Manometry criteria			
IRP4 (mmHg,Mean±SD)	7.1±1.1	8.5±1.9	0.23
DCI (mmg.s.cm,Mean±SD)	835.7±125.6	882.5±116.4	0.23
DL (s, Mean±SD)	6.5	6.4	0.27
DeMeester score (Mean±SD)	15.2±9.3	45.5±10.8	0.0009

NCCP, Noncardiac chest pain; SD, Standard deviation BMI, Body mass index; IRP4,Integrated relaxation pressure 4; DCI, Distal contractile integration; DL, Distal latency

**Table2- Prevalence of the EAET and Reflux Episodes as Regards to pH and Its Compositions Based on Body Position of 440 Patients with Regurgitation and 275 Patients With Noncardiac Chest Pain by MII-pH Monitoring**

Findings	Regurgitation n(%)	NCCP n(%)	P-Value
EAET	152(34.5)	114(41.4)	0.27
Acid reflux episodes			
Upright	108(24.5)	67(24.4)	0.45
Supine	101(22.9)	68(24.7)	0.26
Weakly acid reflux episodes			
Upright	148(33.6)	63(22.9)	0.43
Supine	172(39.1)	86(31.3)	0.43
Non- acid reflux episodes			
Upright	20(4.5)	12(4.4)	0.26
Supine	24(5.5)	8(2.9)	0.76
Liquid reflux episodes			
Upright	16(3.6)	11(4.0)	0.26
Supine	56(12.7)	27(9.8)	0.43
Mixed reflux episodes			
Upright	204(46.4)	106(38.5)	0.43
Supine	224(51.0)	153(55.6)	0.26
Gas reflux episodes			
Upright	188(42.7)	95(34.5)	0.43
Supine	168(38.2)	126(45.8)	0.27

NCCP, Noncardiac chest pain; EAET, Esophagea acid reflux time; n, Number

## DISCUSSION

This was the first Iranian case-control study on esophageal pH monitoring to examine the esophageal manometric criteria and esophageal multichannel intraluminal impedance-pH (MII-PH) monitoring to assess reflux episodes in patients with noncardiac chest pain (NCCP) and those with regurgitation based on body position and off proton pump inhibitors (PPI) therapy. This study found that NCCP was more prevalent in males than in females, which was in contrast to gastroesophageal reflux disease (GERD).<sup>1,5</sup> Moreover, it was found that NCCP was more prevalent in patients younger than 50 years.<sup>2,5</sup> This study further revealed that the mean integrated relaxation pressure<sup>4</sup> (IRP<sup>4</sup>), distal contractile integral (DCI), and distal latency (DL) values were not significantly different between the 2 groups. In this study, it was also revealed that the Mean DeMeester score value in NCCP group was higher than that of the regurgitation group, perhaps due to high acid reflux episodes. Furthermore, acid, gas, and mixed reflux episodes were found to be prevalent in both NCCP and regurgitation groups than non-acid reflux episodes; and lastly, it was found that acid, gas, and mixed reflux episodes were more prevalent in patients with NCCP than in patients with regurgitation,<sup>7</sup> however, this prevalence was not significantly different between the 2 groups. Noncardiac chest pain is a challenging symptom in patients, who refer to primary care centers and gastroenterologists. The prevalence of NCCP is different in different countries, and this may be due to NCCP definition and type of method used to assess the symptom. Also, NCCP diagnosis requires the use of multiple diagnostic tests to exclude other conditions. NCCP is defined as a recurrent chest or substernal pain that is indistinguishable from ischemic heart pain after a reasonable workup has excluded a cardiac cause. It is associated with morbidity and affects the quality of life of patients. When chest pain occurs in a GERD related and non-GERD related patients, especially in females, the cardiologists' first priority is to exclude any acute life-threatening cardiovascular condition (1). The Rome III Committee does not specifically address NCCP, but this criterion was used to diagnose a subtype of NCCP, which is called "functional chest pain". Although it has been presumed to have an esophageal origin, it is known as non-GERD related NCCP.<sup>1</sup> accepted as a symptom to diagnosis GERD. Although the exact causes and mechanisms of NCCP with esophageal

origin have not been understood, the main underlying mechanisms were suggested for responsible symptoms including gastroesophageal reflux disease (GERD), esophageal dysmotility, visceral hyperalgesia, and psychiatric disturbances.<sup>1</sup> No study could show the exact influence of primary esophageal motility, such as esophageal spasm and hypercontractile esophagus in the pathogenesis of ECF.<sup>4,7</sup> However, it was suggested that esophageal hypersensitivity, rather than a primary motor dysfunction, affects the pathogenesis of these symptoms. Some studies showed that acid or other gastric contents reflux in the esophagus activate the transient receptor potential (TRP) cation channels on esophageal mucosa, such as Vanilloid TRP (TRPV1 and TRPV2) and acid-sensing ion channel.<sup>1,8,9</sup> The present study had some limitations. First, NCCP had overlap symptoms with other causes of functional chest pain and cardiac chest pain, despite all the full cardiovascular workups. Second, using double-probe pH monitoring to diagnose proximal esophageal reflux may have different results. Third, neither of our patients had accepted MII/pH monitoring tests, and only some of the patients on long-term PPI therapy, who referred to the Motility Disorders Laboratory of Firoozgar hospital previously, met our exclusion criteria.

## CONCLUSIONS

The present study revealed that acid, gas, and mixed reflux were more prevalent in patients with noncardiac chest pain (NCCP) than in patients with regurgitation, mostly in supine position. There were no significant differences between NCCP and regurgitation groups ( $P > 0.05$ ). The mean DeMeester score value was significantly lower in regurgitation (control) group. NCCP was more prevalent in males than in females, and it was more prevalent in patients younger than 50 years. Mean integrated relaxation pressure<sup>4</sup> (IRP<sup>4</sup>), distal contractile integral (DCI), and distal latency (DL) values were nearly equal in the 2 groups. However, further studies are necessary to develop the pain origin and effectiveness of therapeutic modalities, especially those that would not response to acid suppression therapy.

**Conflict of Interests:** None

**Ethical Clearance:** This work was approved (code: 656 and acceptance ethical number: IR.IUMS.REC.1394.656) and supported by the Research Center

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# Evaluation and Study of Recrystallization on Polymorph of Dexamethasone by Using GC-MS and FT-IR Spectroscopy

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## ABSTRACT

Polymorphism is the phenomena where drug exists in more than one crystalline form. Though polymorphs are chemically identical, they exhibit different physicochemical properties like solubility which further affect the biological properties of drugs. The purpose of this work was to study the effect of solvents of different polarity and processing conditions on crystallization and physicochemical properties of Dexamethasone. The crystals were prepared from different polarity of solvents and processing conditions like deep freezing, low temperature cooling (4C°) and room temperature. The Fourier Transform Infra-Red and Microscopy studies were carried out to check for polymorphism in drug. The result indicate that crystal obtained from different solvents and processing conditions exhibited different physicochemical properties. FT-IR gave an indication of difference in the spectra. The crystals with different properties can be obtained by changing solvent polarity and processing conditions.

**Keywords:** Polymorphism; crystallization; Dexamethasone; FT-IR; GC-MS

## INTRODUCTION

In design of dosage forms crystalline materials are often employed. Some may exist in different crystalline forms. There are varieties of reasons for such changes in space lattice of crystal. It largely depends on how the crystallization of drug is conducted, the nature of solvent(s) used, the processing conditions such as temperature, pressure, cooling rate, agitation, use of the co-solvents, presence of other solutes and ions. Many pharmaceutical solids exhibit polymorphism, which is frequently defined as the ability of a substance to exist as two or more crystalline phases that have different arrangements and/or conformations of the molecules in the Crystal lattice<sup>1-3</sup>. Use of different solvents

alters crystal habit, which may alter dissolution rate<sup>4,5</sup>. Properties such as dissolution rate, powder flow, and compressibility, which are of pharmaceutical interest, can differ for different habits of the same drug<sup>6-11</sup>. Dexamethasone, a steroid anti-inflammatory drug, has been shown to reduce the severity of the inflammatory response when delivered locally<sup>12-18</sup>. Dexamethasone has been incorporated into bioresorbable systems for several uses: DM-containing systems were developed and studied for intraocular application in the treatment of inflammation following cataract surgery<sup>19-25</sup>, DM-containing microspheres and tablets were investigated for treatment of inflammatory bowel disease<sup>26-30</sup>. Local DM release was also used for vascular applications. For example, microspheres and nanoparticles were used for local delivery of DM to the arterial wall in order to reduce neointimal formation after balloon angioplasty<sup>31</sup>. DM was also released from an intravascular eluting stent in order to prevent restenosis<sup>32</sup>. Synonyms: Desamethasone; 9 $\alpha$ -Fluoro-16 $\alpha$ -methylprednisolone. Proprietary names: Aeroseb-Dex; Decaderm; Decadron (elixir and tablets); Decalix; Decaspray; Dexacortisyl; Dexalocal; Dexasone (tablets); Dexone;

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Dezone (tablets); Fortecortin (tablets); Hexadrol (tablets); Maxidex; Millicorten; Miral; Oradexon (tablets). It is an ingredient of Maxitrol. (11 $\beta$ ,16 $\alpha$ )-9-Fluoro-11,17,21-trihydroxy-16-methylpregna-1,4-diene-3,20-dione C<sub>22</sub>H<sub>29</sub>FO<sub>5</sub>=392.5 CAS—50-02-2. Dexamethasone is a synthetic glucocorticoid and is an isomer of betamethasone. A white crystalline powder. M.p. 268° to 271°, with decomposition. A solution in dioxan is dextrorotatory. Practically insoluble in water; soluble 1 in 42 of ethanol and 1 in 165 of chloroform; soluble in acetone; sparingly soluble in methanol; very slightly soluble in ether. Crystallization from a solution is widely used for the purification of drugs during their final stages of manufacture. The crystallization technique can change such crystal properties as habit, polymorphism, and crystal size. The extent of these changes depends on the crystallization conditions, such as the presence of impurities, type of solvent, and cooling rate<sup>32</sup>. Solubility, crystallinity, and the crystal properties of an active pharmaceutical ingredient (API) play a critical role in the value chain of pharmaceutical development, manufacturing, and formulation<sup>33</sup>. X-ray powder diffraction can also be used to provide unequivocal proof of polymorphism<sup>34</sup>. Other methods, including microscopy, thermal analysis (e.g., differential scanning calorimetry (DSC), thermal gravimetric analysis, and hot-stage microscopy), and spectroscopy (e.g., infrared (IR), Raman, solid-state nuclear magnetic resonance) are helpful to characterize polymorphic forms<sup>34</sup>. Synonym. Dexamethasone 21-acetate. Proprietary names. Decadron-LA; Dexacen-La-8; Dexasone L.A.; Fortecortin (suspension for injection). C<sub>24</sub>H<sub>31</sub>FO<sub>6</sub>=434.5. CAS—1177-87-3 (anhydrous); 55812-90-3 (monohydrate). A white powder. M.p. about 225°, with decomposition. Practically insoluble in water; soluble 1 in 40 of ethanol, 1 in 25 of dehydrated alcohol, 1 in 33 of chloroform, and 1 in 1000 of ether; freely soluble in acetone and methanol. Synonym. Dexamethasone 21-isonicotinate. Proprietary names. Auxison(e). It is an ingredient of Dexa-Rhinaspray. C<sub>28</sub>H<sub>32</sub>FNO<sub>6</sub>=497.6. CAS—2265-64-7. Crystals. M.p. 250° to 252°. Synonym. Sodium 9 $\alpha$ -fluoro-16 $\alpha$ -methylprednisolone 21-phosphate. Proprietary names. Dalaron; Decadron (injection); Decasone; Dexacen-4; Dexasone (injection); Dezone (injection); Fortecortin (injection); Hexadrol (injection); Novadex; Oradexon (injection); Savacort-D; Turbinaire Decadron. The objectives of present work were to study the effect of solvents of different polarity and processing conditions

on the crystallization of Dexamethasone, optimize the experimental conditions for obtaining polymorphs and characterize the crystal habit and study behavior of these crystals.

## MATERIALS AND METHOD

### Preparation of Crystals

The particle shape and size of the crystals were studied using an optical microscope (Olympus model BX60, Japan) and a scanning electron microscope (Jeol model JSM T200, Tokyo, Japan). The specimens were mounted on a metal stub with double-sided adhesive tape and coated under vacuum with gold in an argon atmosphere prior to observation. For all crystals, the length and the width of a minimum of 100 crystals were determined, and their distributions were reported.

### Deep freezing technique

In deep freezing method, the containers were always closed with stoppers. Occasional agitation was used to verify the crystals. The nuclei were separated and acted as seeds for further crystal growth. The crystals from the solution were separated, dried at room temperature and stored in dessicator.

### Low temperature cooling technique

The low temperature cooling method was used by keeping the saturated solutions of drug in different solvents in lower compartment of the freeze at around 8 to 15°C for 8-10 days to complete the nucleation and crystal growth. The crystals from the solution were separated and dried at room temperature for two days and stored in dessicator.

### Room temperature cooling technique

In room temperature cooling (no stress conditions), samples were prepared by keeping the saturated solutions of drug in the solvents at room temperature for 8-10 days to complete nucleation and crystal growth. The crystals from the solution were separated and dried at room temperature for two days.

### Characterization of Crystals

#### Microscopical Observation

Crystal shape was observed under the microscope with 40x magnification and photographs were taken to

compare the crystals with pure drug.

### Fourier Transformed Infra-Red (FT-IR) Spectroscopy

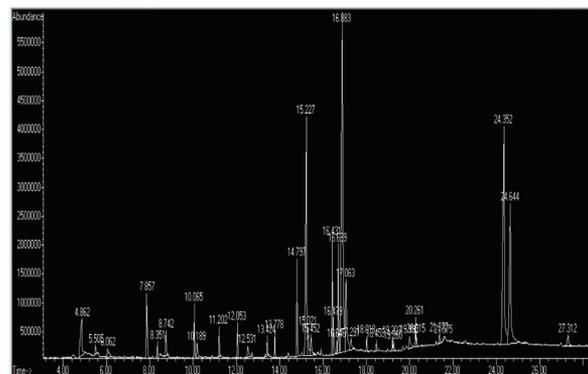
In FT-IR analysis, sample powder was dispersed in KBr powder; pellets were prepared from it and analyzed. FT-IR spectra were obtained by powder diffused reflectance on a FT-IR spectrophotometer (FT-IR 1600 Perkin-Elmer)<sup>35-39</sup>.

### Gas chromatography – mass spectrum analysis

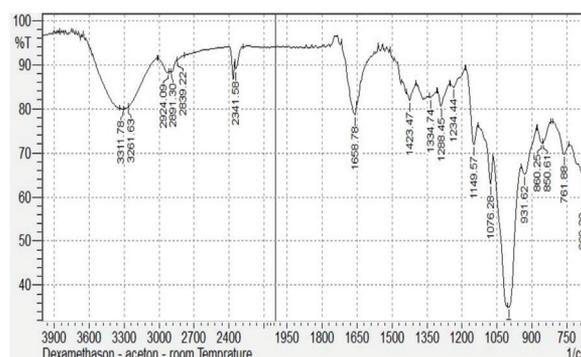
The GC-MS analysis of Dexamethasone the plant extract was made in a (QP 2010 Plus SHIMADZU) instrument under computer control at 70 eV. About 1 $\mu$ L of the methanol extract was injected into the GC-MS using a micro syringe and the scanning was done for 45 minutes. As the compounds were separated, they eluted from the column and entered a detector which was capable of creating an electronic signal whenever a compound was detected. The greater the concentration in the sample, bigger was the signal obtained which was then processed by a computer. The time from when the injection was made (Initial time) to when elution occurred is referred to as the Retention time (RT). While the instrument was run, the computer generated a graph from the signal called Chromatogram. Each of the peaks in the chromatogram represented the signal created when a compound eluted from the Gas chromatography column into the detector.

## RESULTS AND DISCUSSION

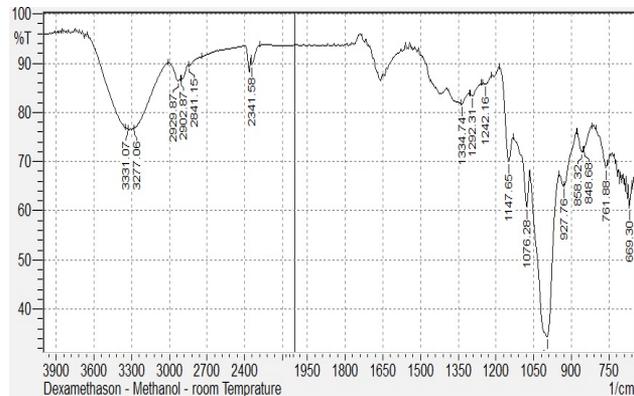
Different techniques for identification of habit and characterization of amorphous or crystalline solids are available. Detection of Dexamethasone by GC-MS **Figures 1**. Dexamethasone drug sample and the crystals obtained from different solvents and processing conditions were observed using magnifying lens and microscopic method (40x). Photographs were taken by CCD camera to draw certain conclusions for morphological characterization. The original drug sample of Dexamethasone and crystals obtained from different processing conditions like room temperature cooling, low temperature cooling and deep freezing techniques were observed by microscopic method.



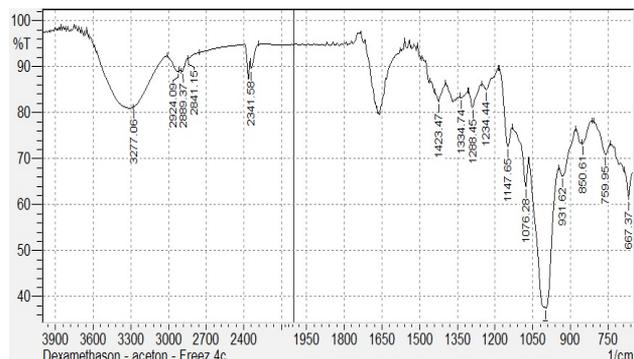
**Figure 1.** GC-MS chromatogram of tablet Dexamethasone



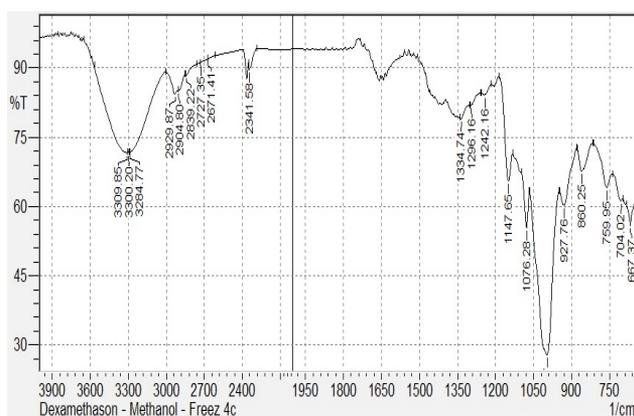
**Figure 2.** FTIR spectra of the crystals of dexamethasone obtained from acetonic solvent at room temperature.



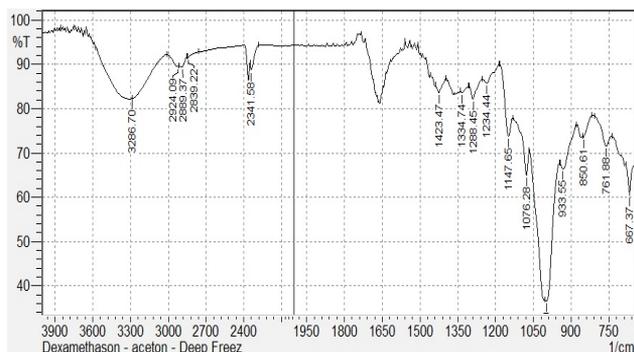
**Figure 3.** FTIR spectra of the crystals of dexamethasone obtained from methanolic solvent at room temperature.



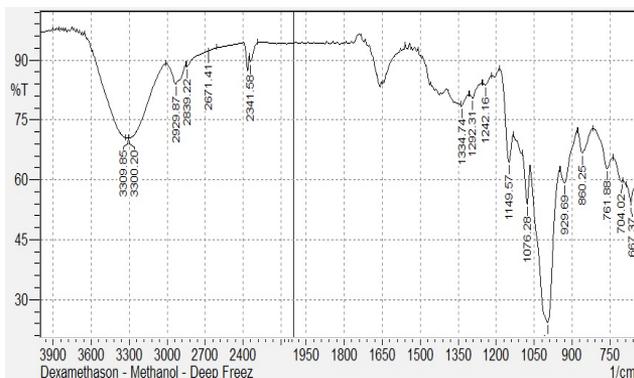
**Figure 4.** FTIR spectra of the crystals of dexamethasone obtained from acetonic solvent at low temperature.



**Figure 5. FTIR spectra of the crystals of dexamethasone obtained from methanolic solvent at low temperature.**



**Figure 6. FTIR spectra of the crystals of dexamethasone obtained from acetic solvent at deep freezing.**



**Figure 7. FTIR spectra of the crystals of dexamethasone obtained from methanolic solvent at deep freezing**

**FT-IR Spectroscopic Analysis:**

The FT-IR spectra were obtained for the selected crystals of Dexamethasone from different solvents and processing conditions and are presented in **Figure 2-6**. The pure drug was used for comparison. The spectral analysis was done in two parts: the first was for the identification of drug using characteristic bands and the second was for identification of polymorphs. From the structure of Dexamethasone the characteristic bands were identified and are given in. it can be inferred that the compound under study was Dexamethasone only. The crystals prepared in this work also showed the

characteristic bands<sup>40-42</sup>. A perusal to indicated that all the crystals of Dexamethasone had no considerable changes in the spectra as compared to that of Dexamethasone pure drug, though all these types of crystals were prepared in different experimental conditions by using different solvents. The IR spectra have failed to show any characteristic band in the finger print region.

**CONCLUSIONS**

The conclusions that have been drawn from the present study include:

The crystals obtained from acetone by deep freezing techniques (D1) showed highest solubility as well as change in the polarity and processing conditions can affect the physicochemical properties of Dexamethasone crystals.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** In this research, all experimental protocols were approved under the Emergency Department of Hillah Teaching Hospital of Hillah city, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Study of Cyproheptadine Polymorphs Present in Tablets Available in Iraqi Pharmaceutical Markets

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## ABSTRACT

Polymorphism is the phenomena where drug exists in more than one crystalline form. Though polymorphs are chemically identical, they exhibit different physicochemical properties like solubility which further affect the biological properties of drugs. The purpose of this work was to study the effect of solvents of different polarity and processing conditions on crystallization and physicochemical properties of Cyproheptadine. The crystals were prepared from different polarity of solvents and processing conditions like deep freezing, low temperature cooling (4°C) and room temperature. The Fourier Transform Infra-Red and Microscopy studies were carried out to check for polymorphism in drug. The result indicate that crystal obtained from different solvents and processing conditions exhibited different physicochemical properties. FT-IR gave an indication of difference in the spectra. The crystals with different properties can be obtained by changing solvent polarity and processing conditions.

**Keywords:** Polymorphism; crystallization; Cyproheptadine; FT-IR; GC-MS

## INTRODUCTION

Many pharmaceutical solids exhibit polymorphism, which is frequently defined as the ability of a substance to exist as two or more crystalline phases that have different arrangements and/or conformations of the molecules in the Crystal lattice<sup>1</sup>. Use of different solvents alters crystal habit, which may alter dissolution rate<sup>2-6</sup>. Properties such as dissolution rate, powder flow, and compressibility, which are of pharmaceutical interest, can differ for different habits of the same drug<sup>7-12</sup>. Absorbed after oral administration and extensively distributed throughout the tissues. Metabolised by aromatic ring hydroxylation, N-demethylation, heterocyclic ring oxidation, and glucuronic acid conjugation; the major metabolite in urine is a quaternary ammonium glucuronide conjugate. About 67 to 77% of a dose is excreted in the urine in

6 days, the remainder being eliminated in the faeces. Of the excreted material, 58 to 65% is conjugated with glucuronic acid, 9 to 11% is conjugated with sulfate, 20 to 26% is excreted as polar material not hydrolysable by glucuronidase or sulfatase, and about 5% is unconjugated. After a single oral dose of 5 mg to 2 subjects, peak plasma concentrations of cyproheptadine metabolites of 0.036 and 0.05 mg/L were attained in 6 to 9 h; unchanged drug was not detected. Toxicity: A 28-year-old man was found dead. The heart blood concentration of cyproheptadine was 0.46 mg/L and ethanol was detected at 0.9 g/L. Cyproheptadine was also detected at concentrations of 8.1 mg/L, 1.8 mg/kg, 7.6 mg/kg, 0.75 mg/L, and 2.3 mg in bile, kidney, liver, urine, and stomach contents, respectively. Twelve to sixteen mg of anhydrous cyproheptadine hydrochloride daily; maximum of 32 mg daily. Crystallization from a solution is widely used for the purification of drugs during their final stages of manufacture. The crystallization technique can change such crystal properties as habit, polymorphism, and crystal size. The extent of these changes depends on the crystallization conditions, such as the presence of impurities, type of solvent, and cooling rate<sup>13</sup>. Solubility, crystallinity, and the crystal

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properties of an active pharmaceutical ingredient (API) play a critical role in the value chain of pharmaceutical development, manufacturing, and formulation<sup>14</sup>. X-ray powder diffraction can also be used to provide unequivocal proof of polymorphism (Antonio et al., 2011). Other methods, including microscopy, thermal analysis (e.g., differential scanning calorimetry (DSC), thermal gravimetric analysis, and hot-stage microscopy), and spectroscopy (e.g., infrared (IR), Raman, solid-state nuclear magnetic resonance) are helpful to characterize polymorphic forms. The objectives of present work were to optimize the experimental conditions for obtaining polymorphs and study the effect of solvents of different polarity and processing conditions on the crystallization of Cyproheptadine.

## MATERIALS AND METHOD

The particle shape and size of the crystals were studied using an optical microscope (Olympus model BX60, Japan) and a scanning electron microscope (Jeol model JSM T200, Tokyo, Japan). The specimens were mounted on a metal stub with double-sided adhesive tape and coated under vacuum with gold in an argon atmosphere prior to observation. For all crystals, the length and the width of a minimum of 100 crystals were determined, and their distributions were reported.

### Three different conditions

In deep freezing method, the containers were always closed with stoppers. Occasional agitation was used to verify the crystals. The nuclei were separated and acted as seeds for further crystal growth. The crystals from the solution were separated, dried at room temperature and stored in dessicator. The low temperature cooling method was used by keeping the saturated solutions of drug in different solvents in lower compartment of the freeze at around 8 to 15°C for 8-10 days to complete the nucleation and crystal growth. The crystals from the solution were separated and dried at room temperature for two days and stored in dessicator. In room temperature cooling (no stress conditions), samples were prepared by keeping the saturated solutions of drug in the solvents at room temperature for 8-10 days to complete nucleation and crystal growth. The crystals from the solution were separated and dried at room temperature for two days.

### Microscopical Observation

Crystal shape was observed under the microscope

with 40x magnification and photographs were taken to compare the crystals with pure drug.

### Fourier Transformed Infra-Red (FT-IR) Spectroscopy

In FT-IR analysis, sample powder was dispersed in KBr powder; pellets were prepared from it and analyzed. FT-IR spectra were obtained by powder diffused reflectance on a FT-IR spectrophotometer (FT-IR 1600 Perkin-Elmer)<sup>14-22</sup>.

### Gas chromatography – mass spectrum analysis

The GC-MS analysis of Cyproheptadine the plant extract was made in a (QP 2010 Plus SHIMADZU) instrument under computer control at 70 eV. About 1µL of the methanol extract was injected into the GC-MS using a micro syringe and the scanning was done for 45 minutes. As the compounds were separated, they eluted from the column and entered a detector which was capable of creating an electronic signal whenever a compound was detected. The greater the concentration in the sample, bigger was the signal obtained which was then processed by a computer. The time from when the injection was made (Initial time) to when elution occurred is referred to as the Retention time (RT). While the instrument was run, the computer generated a graph from the signal called Chromatogram. Each of the peaks in the chromatogram represented the signal created when a compound eluted from the Gas chromatography column into the detector. The X-axis showed the RT and the Y-axis measured the intensity of the signal to quantify the component in the sample injected. As individual compounds eluted from the Gas chromatographic column, they entered the electron ionization (mass spectroscopy) detector, where they were bombarded with a stream of electrons causing them to break apart into fragments. The fragments obtained were actually charged ions with a certain mass. The M/Z (Mass / Charge) ratio obtained was calibrated from the graph obtained, which was called as the Mass spectrum graph which is the fingerprint of a molecule. Before analyzing the extract using Gas Chromatography and Mass Spectroscopy, the temperature of the oven, the flow rate of the gas used and the electron gun were programmed initially. The temperature of the oven was maintained at 100°C. Helium gas was used as a carrier as well as an eluent. The flow rate of helium was set to 1ml per minute. The electron gun of mass detector

liberated electrons having energy of about 70eV. The column employed here for the separation of components was Elite 1(100% dimethyl poly siloxane). The identity of the components in the extracts was assigned by the comparison of their retention indices and mass spectra fragmentation patterns with those stored on the computer library and also with published literatures. Compounds were identified by comparing their spectra to those of the Wiley and NIST/EPA/NIH mass spectral libraries.

## RESULTS AND DISCUSSION

Different techniques for identification of habit and characterization of amorphous or crystalline solids are available. Detection of Cyproheptadine by GC-MS (**Figures 1**). Cyproheptadine drug sample and the crystals obtained from different solvents and processing conditions were observed using magnifying lens and microscopic method (40x). Photographs were taken by CCD camera to draw certain conclusions for

morphological characterization. The original drug sample of Cyproheptadine and crystals obtained from different processing conditions like room temperature cooling, low temperature cooling and deep freezing techniques were observed by microscopic method (**Table 1** and **Figure 2-4**). The spectral analysis was done in two parts: the first was for the identification of drug using characteristic bands and the second was for identification of polymorphs. From the structure of the characteristic bands were identified and are given in **Table 2, 3**. It can be inferred that the compound under study was Cyproheptadine only. The crystals prepared in this work also showed the characteristic bands. A perusal to indicated that all the crystals of Cyproheptadine had no considerable changes in the spectra as compared to that of Cyproheptadine original drug, though all these types of crystals were prepared in different experimental conditions by using different solvents. The IR spectra have failed to show any characteristic band in the finger print region.

**Table 1. FTIR spectra of the crystals of Cyproheptadine obtained from methanolic solvent and processing conditions (Room temperature, Low temperature cooling and Deep freezing) method.**

FTIR wave numbers of recrystallized samples of Cyproheptadine					
Room temperature		Low temperature 4C°		Deep freezing	
Peak	Intensity	Peak	Intensity	Peak	Intensity
711.73	65.948	667.37	64.343	756.10	61.201
759.95	61.653	719.45	65.881	773.46	61.060
777.31	61.293	763.81	61.351	875.68	65.268
873.75	65.566	875.68	65.705	987.55	47.304
987.55	47.508	987.55	47.460	1002.98	53.215
1002.98	51.996	1002.98	52.978	1018.41	51.549
1018.41	50.593	1018.41	51.275	1056.99	47.911
1031.92	48.434	1031.92	48.680	1116.78	59.322
1056.99	48.899	1056.99	48.364	1134.14	61.905
1116.78	59.726	1116.78	59.778	1201.65	79.958
1134.14	62.650	1134.14	62.376	1259.52	85.600
2341.58	86.060	2341.58	85.888	2341.58	86.283
2358.94	83.056	2360.87	82.918	2358.94	83.266
2671.41	91.796	2669.48	91.562	2850.79	88.056
2850.79	88.082	2850.79	86.521	2900.94	85.444
2900.94	85.178	2900.94	83.367	2916.37	86.220
2916.37	86.291	2918.30	84.335	3201.83	80.375
3184.48	80.420	3203.76	77.379	3261.63	79.341
3261.63	79.150	3259.70	76.272	3313.71	80.432
3477.66	88.429	3477.66	86.470	3473.80	88.485
3520.09	89.523	3520.09	87.928	-	-

**Table 2. FTIR spectra of the crystals of Cyproheptadine obtained from ethanolic solvent and processing conditions (Room temperature, Low temperature cooling and Deep freezing) method.**

FTIR wave numbers of recrystallized samples of Cyproheptadine					
Room temperature		Low temperature 4C°		Deep freezing	
Peak	Intensity	Peak	Intensity	Peak	Intensity
667.37	66.808	721.38	69.945	667.37	64.154
763.81	64.054	763.21	66.329	721.38	65.410
875.68	67.891	775.38	66.509	761.88	61.463
987.55	51.942	875.68	70.034	875.68	65.769
1002.98	57.101	987.55	55.042	987.55	48.794
1018.41	54.932	1002.98	59.828	1002.98	53.871
1031.92	52.430	1018.41	58.060	1018.41	51.435
1056.99	52.295	1031.92	55.804	1031.92	49.352
1116.78	63.192	1056.99	55.876	1056.99	49.441
1134.14	65.278	1116.78	65.831	1114.86	60.709
1201.65	81.981	1134.14	67.822	1134.14	63.043
1259.52	86.735	2341.58	87.133	1163.08	77.764
2341.58	86.748	2358.94	84.054	1201.65	80.702
2358.94	83.752	2900.94	88.205	1259.52	85.585
2671.41	92.958	2918.30	89.388	2314.58	86.107
2802.57	91.726	3203.76	83.898	2358.94	82.916
2850.79	89.569	3261.63	83.032	2671.41	92.447
2900.94	86.878	3315.63	84.058	2850.79	88.618
2918.30	88.113	-	-	2900.94	85.765
3182.55	82.395	-	-	2918.30	86.972
3203.76	82.084	-	-	3201.83	80.676
3259.70	81.130	-	-	3261.63	79.656
3313.71	82.184	-	-	3317.56	80.757
3477.66	89.905	-	-	-	-

**Table 3. FTIR spectra of the crystals of Cyproheptadine obtained from acetonic solvent and processing conditions (Room temperature, Low temperature cooling and Deep freezing) method.**

FTIR wave numbers of recrystallized samples of Cyproheptadine					
Room temperature		Low temperature 4C°		Deep freezing	
Peak	Intensity	Peak	Intensity	Peak	Intensity
667.37	64.174	667.37	62.133	667.37	64.582
758.02	61.204	721.38	63.303	723.31	65.802
777.31	61.161	763.81	58.819	763.81	61.586
875.68	65.981	875.68	63.495	875.68	66.076
987.55	48.820	987.55	44.630	987.55	47.991
1002.98	54.168	1002.98	50.249	1002.98	53.566
1018.41	51.694	1018.41	47.991	1018.41	51.459
1031.92	49.266	1031.92	45.493	1031.92	48.988
1056.99	49.315	1056.99	45.649	1056.99	48.878
1114.86	60.533	1114.86	57.195	1116.78	60.173
1134.14	63.171	1134.14	59.971	1134.14	62.799
1163.08	77.723	1163.08	75.869	1163.08	77.917
1201.65	80.408	1201.65	78.581	1201.65	80.449

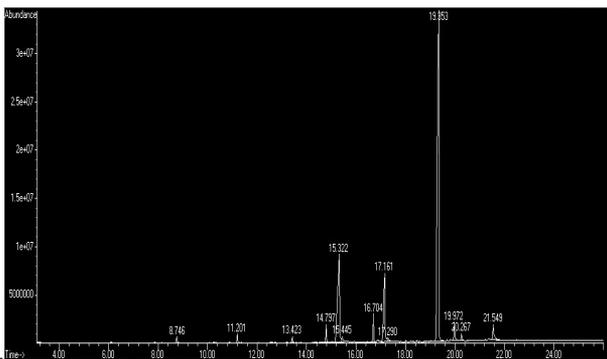


Figure 1. GC-MS chromatogram of tablet Cyproheptadine.

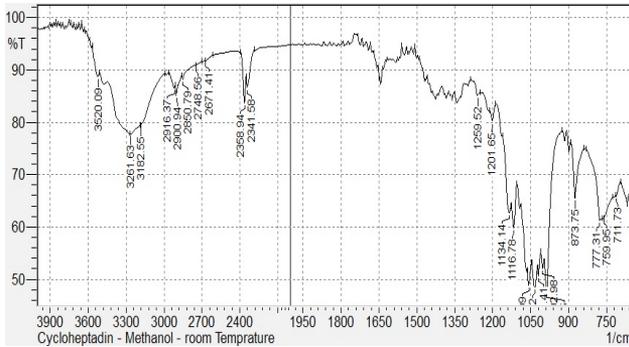


Figure 2. FTIR spectra of the crystals of Cyproheptadine obtained from methanolic solvent at room temperature.

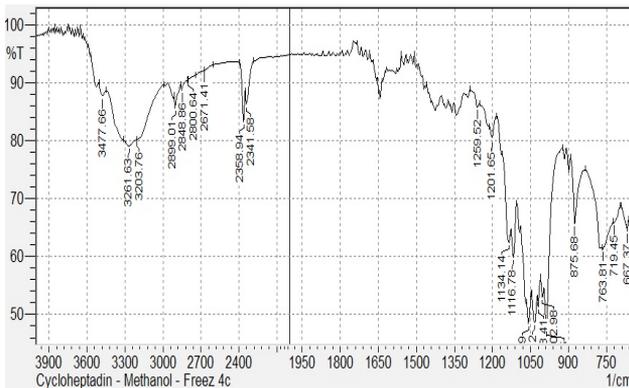


Figure 3. FTIR spectra of the crystals of Cyproheptadine obtained from methanolic solvent at Low temperature 4C°.

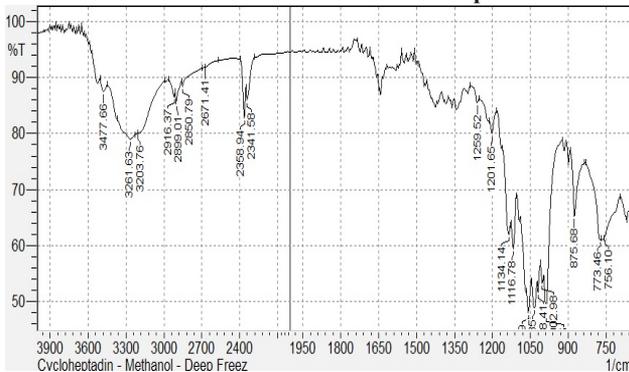


Figure 4. FTIR spectra of the crystals of Cyproheptadine obtained from methanolic solvent at deep freeze.

**CONCLUSIONS**

The conclusions that have been drawn from the

present study include: The crystals obtained from acetone by deep freezing techniques (D1) showed highest solubility as well as change in the polarity and processing conditions can affect the physicochemical properties of Cyproheptadine crystals.

**Financial disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** In this research, all experimental protocols were approved under the Hillah Teaching Hospital of Hillah city, Iraq and all experiments were carried out in accordance with approved guidelines.

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# Severe Injury of Burns: Retrospective Study in a Teaching Hospital-Iraq

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## ABSTRACT

We retrospectively reviewed the characteristics of burn injuries in a Burn Unit-Hillah Teaching Hospital-Iraq from 2010 to 2015. A total of 24950 patients, including 14530 males and 10420 females. Distribution of burn injuries in 2010 according to male, female and age during twelve months (January, February, march, April, June, July, August, September, October, November and December). It were 1070 (18.45%), 1281 (22.09%), 1297 (22.36%), 1429 (24.64%), and 723 (12.47%) in age group [(1-4), (5-14), (15-44), (45-64), and more than 65 years old respectively. In 2011 recorded 529 (25.49%), 513 (24.72%), 484 (23.32%), 393 (18.94%) and 156 (7.52%) in age groups respectively and recorded 178, 157, 192, 176, 166, 108, 108, 122, 178, 228, 210, 252 in January, February, march, April, June, July, August, September, October, November and December respectively. In 2012 recorded total burn injuries 2223. It were 555 (24.97%), 620 (27.89%), 526 (23.66%), 368 (16.55%), and 154 (6.93%) according to age groups respectively and 278, 224, 252, 172, 208, 87, 170, 155, 151, 140, 160, 226 according twelve months respectively. In 2013 found 796(18.17%), 1190 (27.16%), 1362 (31.09%), 737(16.82%), and 296(6.76%) according to age groups respectively and 256, 297, 343, 343, 383, 348, 372, 387, 418, 439, 402, and 393 in twelve months respectively with 3388 total burn injuries. In 2014 found 72(2.1%), 521(15.4%), 834(24.6%), 919(27.1%), 644(19%), 306(9.1%), and 92(2.7%) according to age groups respectively and 556, 475, 646, 564, 390, 53, 36, 53, 114, 155, 201, and 145 in twelve months respectively with 2459 total burn injuries. In 2015 found 23(0.9%), 208(8.5%), 539(21.9%), 864(35.1%), 674(27.4%), 151(6.1%), and 0 (0%) according to age groups respectively and 115, 68, 90, 90, 91, 115, 219, 281, 346, 331, 354, and 359 in twelve months respectively with 2459 total burn injuries. In 2016 found 0(0.0%), 265(5.73%), 916(19.18%), 1586 (34.29%), 1593 (34.5%), and 274(5.92%), according to age groups respectively and 115, 68, 90, 90, 91, 115, 219, 281, 346, 331, 354, 359 in twelve months respectively with 2459 total burn injuries.

**Keywords:** Burn, Death, Gender, Hospital stay, Retrospective, Survival.

## INTRODUCTION

Burn injury is very common and affects approximately one per cent of the general population every year. The vast majority of burn injuries are minor although painful. In contrast, a small number

of individuals receive massive, deep burns that are accompanied by permanent disfigurement or death. The mortality rate remains one of the most important end-point quality control parameters to evaluate a burn care system <sup>1-3</sup>. Traditionally, burn area and patient's age have been employed as the primary predictors of mortality after thermal injury. Other factors identified during the course of hospitalization also may help to predict accurately those patients who are likely to die <sup>18</sup>. Thus, it seems unlikely that mathematical models based solely on these two, or on any other two indices of burn mortality, can fully describe this complex problem <sup>4-7</sup>. During the past 50 years, the mortality rate of burn

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inpatients in our center decreased remarkably from 12.80% in 1958-1968 to 2.03% in 1986-2005. Infection rates of our patients were high with respect to the general population because until coming to our center first interventions had done in unsuitable conditions and their wound dressings had been done improperly<sup>8</sup>. This improvement could be attributed to the establishment of specialized burn care unit, therapeutic improvements in first aid pre-admission, prompt and adequate fluid resuscitation, infection control, early wound excision and closure, nutrition support, organ function protection, and the innovation of new antibiotics<sup>9-12</sup>. Therefore, a retrospective study was conducted to analyze the characteristics of burn deaths at our center and to attempt to identify the most influential factors that may help to improve burn care.

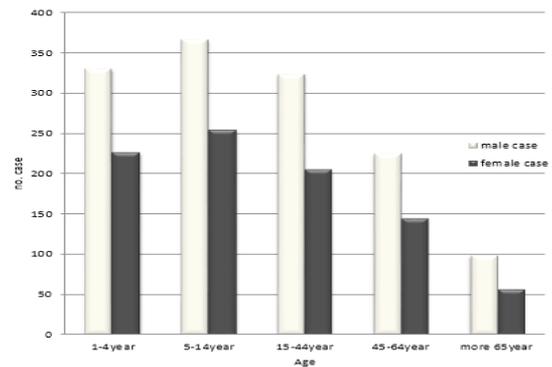
**MATERIALS AND METHOD**

The retrospective study group consisted of all the injuries reporting to emergency department of Hillah teaching hospital in the study period from 1st January 2010 to 30th December 2015. The data were summarized using percentages. Data was analyzed via SPSS (Version 20). Interpretation of the collected data was done by using appropriate statistical methods like percentage and proportions.

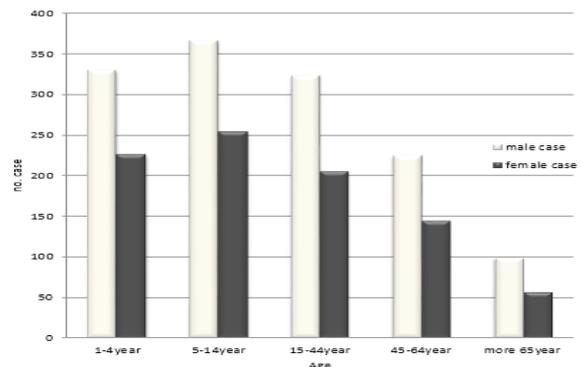
**RESULTS AND DISCUSSION**

Burns can be very severely endanger the health and lives of humans. It maybe cause disability and even psychological trauma in individuals. Such an event can also lead to economic burden on victim’s families and society. The aim of our study is to evaluate epidemiology and outcome of burn patients referring to emergency department. A total of 24950 patients, including 14530 males and 10420 females. show distribution of burn injuries in 2010 according to male, female and age during twelve months (January, February, march, April, June, July, August, September, October, November and December). It were 1070 (18.45%), 1281 (22.09%), 1297 (22.36%), 1429 (24.64%), and 723 (12.47%) in age group [(1-4), (5-14), (15-44), (45-64), and more than 65 years old respectively. In 2011 recorded 529 (25.49%), 513 (24.72%), 484 (23.32%), 393 (18.94%) and 156 (7.52%) in age groups respectively and recorded 178, 157, 192, 176, 166, 108, 108, 122, 178, 228, 210, 252 in January, February, march, April, June, July, August, September, October, November and December

respectively **Figure 1**. In 2012 recorded total burn injuries 2223. It were 555 (24.97%), 620 (27.89%), 526 (23.66%), 368 (16.55%), and 154 (6.93%) according to age groups respectively and 278, 224, 252, 172, 208, 87, 170, 155, 151, 140, 160, 226 according twelve months respectively **Figure 2**. In 2013 found 796(18.17%), 1190 (27.16%), 1362 (31.09%), 737(16.82%), and 296(6.76%) according to age groups respectively and 256, 297, 343, 343, 383, 348, 372, 387, 418, 439, 402, and 393 in twelve months respectively with 3388 total burn injuries **Figure 3**. In 2014 found 72(2.1%), 521(15.4%), 834(24.6%), 919(27.1%), 644(19%), 306(9.1%), and 92(2.7%) according to age groups respectively and 556, 475, 646, 564, 390, 53, 36, 53, 114, 155, 201, and 145 in twelve months respectively with 2459 total burn injuries **Figure 4**. In 2015 found 23(0.9%), 208(8.5%), 539(21.9%), 864(35.1%), 674(27.4%), 151(6.1%), and 0 (0%) according to age groups respectively and 115, 68, 90, 90, 91, 115, 219, 281, 346, 331, 354, and 359 in twelve months respectively with 2459 total burn injuries **Figure 5**. In 2016 found 0(0.0%), 265(5.73%), 916(19.18%), 1586 (34.29%), 1593 (34.5%), and 274(5.92%), according to age groups respectively and 115, 68, 90, 90, 91, 115, 219, 281, 346, 331, 354, 359 in twelve months respectively with 2459 total burn injuries **Figure 6**.



**Figure 1. Distribution of burn injuries during 2011.**



**Figure 2. Distribution of burn injuries during 2012.**

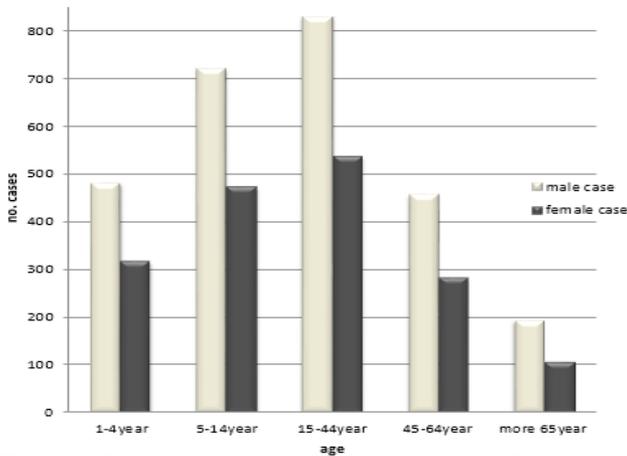


Figure 3. Distribution of burn injuries during 2013.

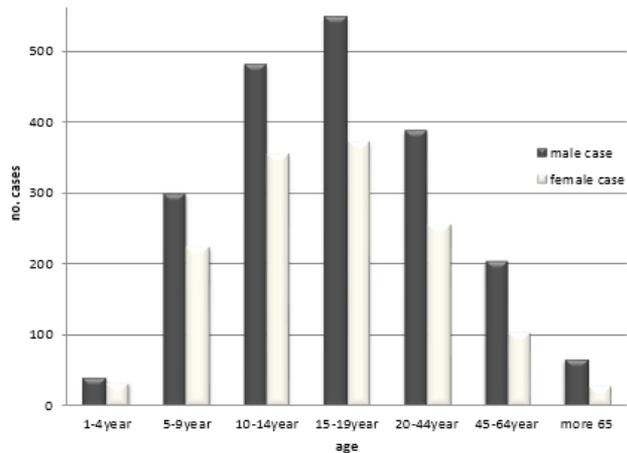


Figure 4. Distribution of burn injuries during 2014.

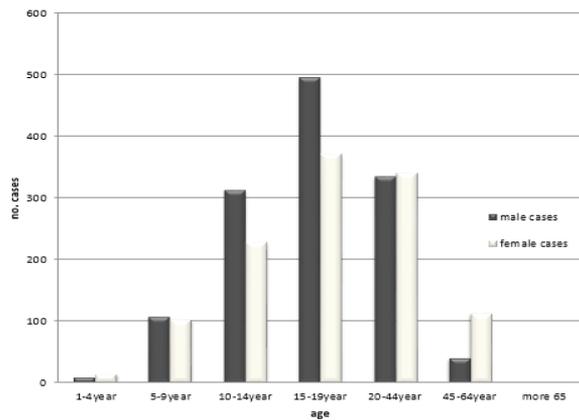


Figure 5. Distribution of burn injuries during 2015.

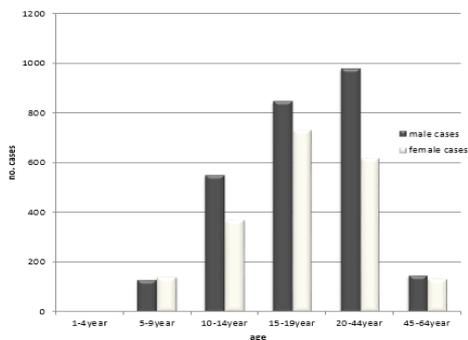


Figure 6. Distribution of burn injuries during 2016.

Alcohol, drug intoxication<sup>13</sup>, sex, inhalation injury, total body, surface area of burn, and total body surface area of burn were suggested in the several studies as hospitalization predictive factors<sup>14, 15</sup>. In addition, the three most common burn sites included the left and right upper extremity, and head and neck similar to other studies. The literatures stated that since persons experienced the burn trauma usually use his hands as a reflex to protect themselves, the most frequently burned sites of patients are hands, arms, face, and legs<sup>16</sup>. The people with severe injury of burns encounter with handicaps and serious psychological implications from burns for the rest of their lives. These burn cases are additional injuries from multiple fragment wounds with a high rate of infection and long periods of hospitalization. Serious burns at the battlefields are superficial burns to exposed skin, most often on the face, neck, forearms, and hands different from burns at civil life<sup>17-22</sup>. The most important treatment for burn wound is silver sulfadiazine 1% cream (SSD) with antibacterial activity<sup>23-28</sup>. SSD may cause side effects such as neutropenia, erythema multiform, crystalluria, methemoglobinemia, and delay wound healing. It is cautioned that SSD cream should not be used for long time on extended wounds. Wound healing process consists of inflammation, reepithelialization, granulation, neovascularization, and wound contraction. Several natural products have been used for the management of burn wounds that could be considered as an alternative source of treatment of burn wounds<sup>29-41</sup>. These products have been offered as more effective and cheaper treatment agents. *Malva sylvestris* (Malvaceae), usually known as common mallow, is a native plant to Europe, North Africa, and Asia. *M. sylvestris* has high mucilage content and polysaccharides that are used for many purposes. This plant has anti-ulcerogenic activity which is probably related to its high mucilage content. The plant flowers are used as a remedy for cut wound, dermal infected wounds, eczema, and inflammatory disease such as gastritis, bronchitis, and rheumatism and is recommended for acne and skin care there properties of this plant were reported to be diuretic, laxative, spasmolytic, lenitive, choleric, and antioxidant effects<sup>41</sup>.

### CONCLUSION

This study revealed the most frequent burns are encountered in the age group of 1-4 years, percentage of <10%, second degree, upper extremities, indoor, and scalding from hot liquids. The treatment of the

burns is a difficult, expensive, and a multidisciplinary team process, which can only be performed properly in specialized burn centers. These problems should be considered in a multidisciplinary manner and every organization either official or civil must have a role in this mission.

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** In this research, all experimental protocols were approved under the Emergency Department of Hillah Teaching Hospital of Hillah city, Iraq and all experiments were carried out in accordance with approved guidelines.

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