ISSN-0973-9122 (Print) • ISSN-0973-9130 (Electronic)

Volume 17 / Number 1 / January-March 2023

Indian Journal of Forensic Medicine & Toxicology

Website: www.ijfmt.com

Official Organ of Indian Association of Medico-Legal Experts (Regd.)

Indian Journal of Forensic Medicine & Toxicology

"Indian Journal of Forensic Medicine & Toxicology" is peer reviewed quarterly journal. It deals with Forensic Medicine, Forensic Science, Toxicology, DNA fingerprinting, sexual medicine and environment medicine. It has been assigned International standard serial No. p-0973-9122 and e- 0973-9130. The Journal has been assigned RNI No. DELENG/2008/21789. The journal is covered by EMBASE (Excerpta Medica Database). The journal is also abstracted in Chemical Abstracts (CAS) database (USA. The journal is also covered by EBSCO (USA) database. It is now offical publication of Indian Association of Medico-Legal Experts (Regd.).

Print-ISSN:0973-9122 Electronic - ISSN: 0973-9130

Website: www.ijfmt.com

Published at

Institute of Medico-legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Indian Journal of Forensic Medicine & Toxicology

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Volume 17, Number 1 **January-March 2023**

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18883

Forensic Odontology: Science, Skills and Future Prospects

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How to cite this article: Alisha Chugh, Shalini Kapoor, Amit Bhardwaj et. al. Forensic Odontology: Science, Skills and Future Prospects. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Forensic odontology is a growing field with a lot of room for advancement. It has established itself as a necessary science in medical and legal problems, as well as in the identification of the deceased. Even if a person is skeletonized, degraded, burned, or dismembered, dental tissues are frequently retained. Using dental tissues, many methods have been devised to establish a person's age, sex, and ethnicity. In forensic dental identification, data gathering methods and auxiliary technology have experienced substantial changes. This article gives an overview of the changing trends in traditional approaches as well as new forensic odontology ideas.

Keywords: Forensic Odontology, age estimation, dental profiling, human identification, digital forensics.

Introduction

The Role of the forensic anthropologist focuses on applying detailed knowledge of the development, morphology, and variation of the human body as an aid to establishing, confirming, or indeed refuting personal identification.

Forensic science or criminalistics is the application of scientific processes or abilities to investigate an offence or check evidence that may be submitted in the court of law. Physical changes, surgical interventions such as scars and prostheses, signs of trauma, and persistent hard and soft tissue diseases that can leave unique macroscopic and microscopic lesions on surviving tissue are all secondary features. These additional criteria can be useful when seeking to identify a person and a combination of the above can be quite useful when confirming identification.[1]

Human dental identification occurs for a variety of reasons, the most common of which is when the body has been disfigured, such as in the case of a violent crime victim, a fire, a road traffic accident, or a workplace accident. Forensic odontology plays a crucial part in this procedure.[2] Through dental records, a dentist can assist those involved in criminal investigations by recognizing crime victims and tragedy.[3] Forensic dentistry is indeed a relatively new field of forensic science that involves using dental sciences to identify deceased people by comparing pre- and post-mortem data.[4] Although forensic odontology offers a new ray of hope in support of forensic medicine, this field in India, is still in its infancy.[5]

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American Academy of Forensic Sciences Classification[2]

Forensic anthropology is the study of human remains for the medicolegal aim of determining identification, and centres on a thorough understanding of the human body's growth, development and response patterns.

Criminalistics is concerned with the examination and comparison of evidence in criminal investigations, such as biological evidence, trace evidence, impression evidence, etc.

Digital forensics is a field of forensic science that deals with the recovery and study of material discovered in digital devices, which is frequently in relation to digital crimes using mobile devices and computer crime.

Forensic odontology is a discipline of dentistry concerned with the right handling and inspection of dental evidence, as well as the proper appraisal and presentation of dental results in order to aid in the administration of justice.

Forensic psychiatry is a subspecialty of psychiatry in which scientific and clinical expertise is applied to legal issues in civil, criminal, correctional, regulatory, or legislative contexts, as well as in specialised clinical consultations in areas like risk assessment or employment.

Forensic Anthropologists role focuses on applying detailed knowledge of the development, morphology, and variation of the human body as an aid to establishing, confirming, or indeed refuting personal identification.

According to American Board of Forensic Odontology[6]

Positive identification: Occurs when the antemortem and postmortem data match in sufficient detail and there are no inexplicable inconsistencies.

Possible identification: The antemortem and postmortem data are compatible, but it is unable to prove identity definitively.

Insufficient evidence: The information supplied is insufficient to draw a conclusion.

Exclusion: The data from the antemortem and postmortem examinations are plainly inconsistent.

Dental Records and its Significance (AM/PM RECORDS)

All subjective and objective information about the patient's chief complaint, illness history, clinical examination, dental charts, treatment, and subsequent follow-up(s) should be legally documented. Any charting inaccuracy might render the record useless.[7] Radiographs, including skull and panoramic radiographs, computed tomography, study and treatment casts, impressions, clinical photographs are also included in the dental record.[8]

Computerized digitalized electronic medical records represent a significant advancement in the preservation of study-related documents. Accurate dental records are a key aspect in determining an individual's identity.[9] In numerous European nations, the registration of dental data is required. To erase a patient's record, permission from the state's legislation is necessary.[10] Despite its numerous benefits, many Indian dentists do not keep dental records, or if they do, they are of low quality. According to a recent research by Astekar et al., just 38% of dentists in Rajasthan were keeping dental records.[11] Another research by Preethi et al. revealed that 21 percent of dental practitioners in Chennai did not keep any kind of dental record.[12]

In the event of a large-scale disaster, the "Disaster Victim Register (DVR)" protocol is necessary. AM forms (yellow coloured) and PM forms (pink coloured) should be filled out separately for subsequent comparison of the dental record. [13] The "DVI System International" software programme, developed by Plass Data helps to identify the victim manifest by accumulating electronic versions of AM data from every suspected victim's family and related family members, doctors, and dentists.[14] Dostalova et al. described a novel electronic imaging system called Dental Cross that is equivalent to dental records for positive identification.[15]

In instances like the World Trade Center tragedy, WinID3 has proven to be useful in reviewing and comparing AM and PM dental record information. Adobe Photoshop and Mideo Systems case PACS[16] can be used to superimpose and compare the digital form of a radiograph and an image. Two methods are commonly used to identify teeth. To begin, prior dental records of the individual suspected of being deceased are reviewed, and dental traits of the deceased person are compared and confirmed. If there are no previous records, a PM dental profile is performed to provide hints to restrict the search for AM materials required to identify the dead person.[17]

PM Dental Profiling

PM dental profile is used to narrow down the population group to which the dead is most likely to belong, which may aid in the discovery of AM dental data. When AM dental records are unavailable, the dentist does this procedure. This procedure may be used to gain information about the dead person's age,[18] ancestral background, sex, socioeconomic position, employment, habitual behaviours, and dental/systemic diseases. [19]

Identification by dental methods is critical since teeth are more resistant to deterioration than any other bodily tissue. As other methods of identification become less common, dental identification becomes more important because dental structures and restorations are sometimes the only elements of the body that are not damaged.The administration, inspection, appraisal, and presentation of dental evidence in civil and criminal procedures, as well as research, are all part of forensic odontology. [20,21]

Examination of Teeth

Teeth can withstand even the most severe climatic conditions, such as fire, making them a credible source for identification. Individual dentitions are like fingerprints, with variations in form, colour, location, age, etc.[22]

Age Estimation

Two types of dental ageing techniques exist.[23]

1) Developmental alterations: These are changes to the human dentition that occur when the teeth develop and emerge into the mouth cavity.

2) Degenerative changes: These happen after the teeth have erupted and are starting to wear down.

1) Developmental Changes[24]

a) FORMATION OF HARD TISSUE: Each tooth is rated according to its developmental stage, and the results are compared to values corresponding to a certain age.

b) Dental Expanding: To determine the age of an unknown individual, we can compare the subject's postmortem radiographs to the Schour and Massler eruption criteria.

c) The Third Molar Explosion: Third molar emergence usually occurs between the ages of 17 and 19. This tooth has a wide range of development; it may be fully grown yet impacted, or it may be totally missing.

d) Measurement of the Dentistry: This method was used as an alternative to the qualitative assessment, which involved measuring the length of the teeth.

2) Degenerative Changes[25]

Age estimation is the important part in forensic odontology.

Figure No. 1 Degenerative change sequence

Sex Determination[24]

In natural catastrophes, chemical and nuclear bomb explosion scenarios, sex determination is a highly significant branch of forensic odontology that plays a vital role in identifying unknown persons. There are four ways to do it:

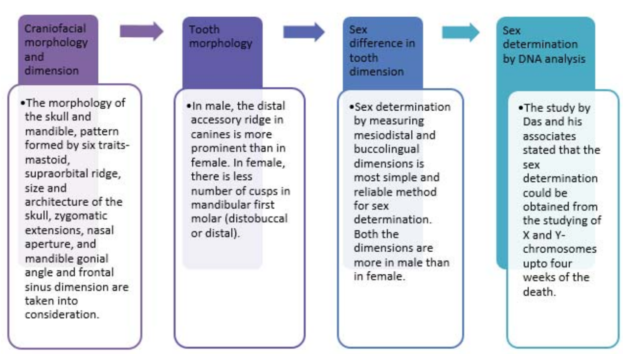

Figure 2: Sex determination methods

Bite Mark Analysis

The flexibility of the tissue, position of the bite mark, biting force, victim's age are all variables that must be determined in bite mark analysis. This task is divided into two stages: bite mark recognition and biting mark analysis. Measuring the size of the tooth of the suspect and comparing it with bite mark can be done with metric analysis. [26] Dr. Ashith B Acharya, a forensic odontologist, used bite mark analysis to help solve the Delhi gang rape case (2012)

Chelioscopy and Rugoscopy[27]

The study of lip prints is known as chelioscopy. Because of its malleable nature, it is not as dependable as fingerprints, despite being unique to each individual. Susuki and Tsuchihasi divided lip prints into five types based on groove pattern (1970): complete straight, branched, intersected, reticular and undifferentiated grooves.

Lip Prints in Forensics

Lip prints are frequently discovered in cases of sexual assaults, burglaries, murders and other crimes. Following are the aspects that can be determined using lip prints.[28]

2. Personal identification: The lip prints are unique and if found at the crime scene can play a significant role.

3. Race determination: On the basis of thickness of lips, 4 groups can be identified:[29]

- Thin lips
- Medium lips
- Thick lips
- Mix lips

3. Sex determination: Lip prints have been used in a variety of investigations to determine sex. According to a study done by Vahanwala et al, some patterns are often frequent in one of the sexes:

- Type II is dominant in males in the 2nd quadrant that is upper lip (left side)
- Individuals with all quadrants having unlike patterns are commonly found in males whereas having same patterns in all four quadrants are seen in females.
- Lip prints are studied in postmortem cases and important in identification of corpses.[30]

Case studies where lip prints proved to be useful:

- Cheiloscopy proven to be useful in solving a burglary case in Poland in 1966.[31]
- Lip prints were discovered in a grocery store burglary case in 1988.[32]

Rugoscopy is the study of the patterns of the palatal rugae. Rugae patterns are classified as "branches and unification" depending on the length of origin, according to Thomas and Kotze in 1983.[33]

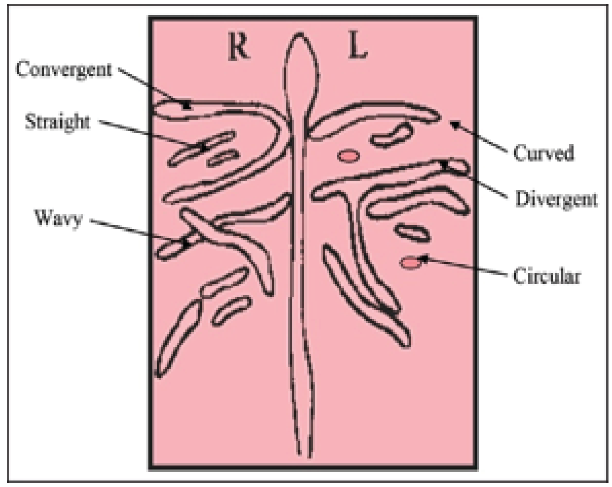

Figure No. 3 Palatal rugae pattern

Tongue Prints[34]

The tongue is a vital organ that provides both geometric shape and physiological texture information. Analysis of form and texture reveals noticeable distinctions between individuals, highlighting the tongue's individuality and making it a useful tool in personal identification.

A comprehensive study for identification can be performed by taking an imprint of the dorsal surface and lingual lateral margins with neo-colloid impression material that can be immediately placed from the level of the oral commissures up to the lingual tip. (Figure 4)

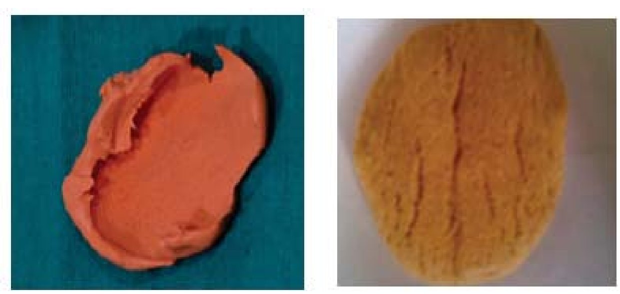

Figure 4: Impression of tongue along with the poured replica in dental stone

Dental Implants in Forensic Identification[35]

Dental implants are increasingly being employed in dental identification. Recent advancements such as implant recognition software, radiographic recognition of dental implants, and batch number evaluation assist the forensic odontologist in identifying the victims.

Radiographic recognition of dental implants

Intraoral radiography, 3D imaging, CT, and panoramic images are some of the modalities available for detecting dental implants in the deceased.

Identification of dental implants through the use of implant recognition software (IRS)

IRS works on the idea of gathering positive data and storing it in a stand-alone database, with the possibility of an implant system being recognised through a series of inquiries. This programme may be used to identify bodies after single murders or after widespread tragedies.

Future Prospects[36]

Dental identification is a well-established procedure that has been tested and validated. 3-D imaging, face and dental scanning, and the rising usage of "selfie" photographs are all possibilities for addressing these challenges. In a number of countries, there is talk of inclusion of this course in the Bachelor of Dental Surgery (BDS) curriculum, as dental practitioners need have a thorough understanding of forensics in order to handle medico-legal matters in their future practises. It seems logical to teach individuals at the postgraduate level, when there is a better chance of reaching some sort of consensus on what themes and protocols should be covered.

Conclusion

Every dentist must be aware of the necessity of forensic dentistry in order to properly document results and assist investigative and legal agencies. In mass catastrophes such as earthquakes, floods, etc. dental records are extremely significant in the positive identification of fatalities. It also aids in the identification of victims in conflicts and terrorist attacks. As a result, it is the dentist's societal obligation to keep a safe and accurate dental record of every patient. Forensic odontology is one of the branches of forensic medicine, which has established itself as a significant and necessary service in medicolegal situations in the pursuit of justice.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Not needed (Review article)

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18884

Sex Determination from Hand Dimensions in a South Indian Population

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How to cite this article: J. S. Arun Kumar, A. Karthikeyan, Mohamed Asardueen S. Sex Determination from Hand Dimensions in a South Indian Population. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

The aim of this research was to generate a standard formula for estimating sex in the South Indian population from hand anthropometric measurements. Sex is one most important and foremost criteria in establishing the identity of an individual. The present study comprised a sample of 300 healthy individuals (150 males and 150 females). The databases for Hand Length, Hand Breadth and Hand index were analysed using IBM SPSS (Statistical Package for Social Sciences, Version 20.0) computer software. The issue of sex discrimination can be very complicated in cases of intersex, bodies in an advanced state of putrefaction, mutilated & fragmentary remains in which it is common to recover dismembered & peripheral parts of the body. It was realized that anthropometric measurements of the hand have been a very useful tool in sexual identification. Hand length and hand breadth show statistically significant male – female differences at $p < 0.0001$. Hand Breadth was found as best predictor of sex in comparison with hand length. Sectioning point confirms that cut-off point below and equal to 44 is suggestive of male hand whereas those above 44 were considered as female hand.

Keywords: Sexual determination, Forensic identification, Sectioning point, Hand length, Hand breadth, Hand index, Mass disaster.

Introduction

Identification can be complete or partial. Complete identification means absolute fixation of the individuality of a person. Complete identification is possible, only when all facts about the individual are available. Whereas in partial identification, only certain facts like race, age, sex, stature etc. are determined while other characteristics are not known.[1] Sex and Stature are two key components of partial identification. They provide one important aspect of an individual's physiognomy. Dimensions of various parts of the body show sexual dimorphism also.[2] However, different population group exhibits variation in their body proportions as they are affected by race, diet, genetics of a person, geographical location and climatic conditions.[3] As a result of it, results of a study conducted on one population group cannot be applied to other population group. Even

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the results of a study conducted on one generation of a population cannot be applied to the next generation as they are affected by secular changes in physical growth.[4]

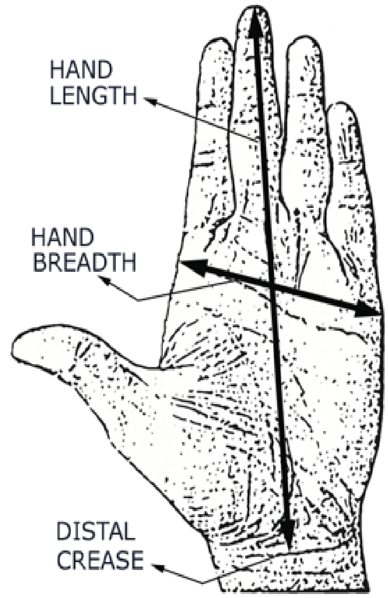
As very few studies of this kind have been conducted in the population of and around perambalur region of Tamilnadu, there was always a need for the study to derive formulae for determining sex from the anthropometric measurements of hand, with this view, the present study was carried out to evaluate sexual dimorphism in hand index calculated from hand dimensions in healthy individuals at Dhanalakshmi Srinivasan Medical College & Hospital, Perambalur, Tamilnadu.

Aims and Objectives

- To investigate sexual dimorphism using Hand Length, Hand Breadth and Hand Index.
- To assess the usefulness of the Hand index (Hand breadth X 100/Hand length) to determine sex.
- To assess bilateral variations for the above-mentioned parameters.
- To compare the results of this study with other workers.

Material and Method

Ethical approval was taken from the Institutional Ethics Committee, Dhanalakshmi Srinivasan Medical College & Hospital, Perambalur, Tamilnadu. (vide letter no. IECHS /IRCHS /DSMCH /Cert /009, dated: 17.10.2019). the research study was based on 300 healthy individuals (150 males and 150 females) devoid of any deformity, injury, fracture or surgical proceedings of either hand were randomly selected from the Perambalur district of Tamilnadu. The age of the subjects ranges from 18 to 70 years because, at this age range, maximum growth of the hand was achieved. A database of Hand Length and Hand Breadth was obtained from each subject as anthropometric measurements with the help of a standard anthropometric instrument i.e. sliding caliper. Informed consent was obtained from each subject prior to the study.



Hand Length & Hand Breadth: Hand of the subject was kept straight and flat on the table. All fingers were kept extended and adducted. Thumb was kept extended and abducted. Hand length was measured from a palmer aspect of the hand as a straight distance between the midpoint of the distal transverse crease of the wrist joint and the tip of the middle finger.

Hand Breadth was measured from a palmer aspect of the hand as a straight distance between the most laterally placed point on the head (Lower epiphyses) of the 2^{nd} metacarpal to the most medially placed point on the head (Lower epiphyses) of the 5^{th} metacarpal.

Hand Index: Hand Index was calculated from Hand Length & Hand Breadth as below.

$$\text{Hand index} = \frac{\text{Hand Breadth}}{\text{Hand Length}} \times 100$$

The data was analyzed statistically software like **Statistical Package for the Social Sciences (SPSS)-Version 20 and Microsoft Excel.**

The mean, standard deviation and standard error were derived for each of the above measurements in both the sexes. The paired T-test was applied to determine the statistical significance of differences in measurements like Hand length, Hand Breadth and Hand Index. Male-female differences for the variables were observed using the student's t-test at $p<0.05$ as a level of significance. The sex determination point or sectioning point was derived for the hand index which is often described as the cut-off point. Percentage accuracy of sex determination was also performed on the basis of sectioning points for all the hand dimensions and ratios in the entire population.

$$\text{Sectioning point }(\text{S.P}) = \frac{(\text{Mean Male Value} + \text{Mean Female Value})}{2}$$

Results

Hand Length

Descriptive statistics for Hand Length for both males & females are depicted in Table 1. In males, the average Right-Hand length was 18.11 ± 1.01 varying from 15.3 cm to 21 cm and the average left-Hand length was 17.98 ± 1.04 varying from 14.4 cm to 20.6 cm. In Females, the average Right-Hand length was 16.81 ± 0.93 varying from 14.9 cm to 19.8 cm and the average left-Hand length was 16.74 ± 0.98 varying from 14.7 cm to 19.6 cm. Male-female differences were found statistically significant at $p < 0.001$ for both right and left hand however non-significant for the difference between right and left hand in both sexes. It is observed that Hand Length was significantly larger in males about 1.2 cm as compared to females thus sexual dimorphism exists on the basis of hand length.

Table 1: Descriptive statistics: Hand Length (cm) in Males & females.

Parameter	Min.	Max.	Mean ± SD
Male (n =150)			
RHL	15.3	21	18.11 ± 1.01
LHL	14.4	20.6	17.98 ± 1.04
Female (n =150)			
RHL	14.9	19.8	16.81 ± 0.93
LHL	14.7	19.6	16.74 ± 0.98

RHL – Right-Hand Length, LHL - Left Hand Length, S.D. – Standard Deviation

Hand Breadth

Descriptive statistics for Hand breadth for both males & females are depicted in Table 2. In males, the average Right-Hand breadth was 8.18 ± 0.51 varying from 7 cm to 9.8 cm and the average left-Hand breadth was 8.09 ± 0.56 varying from 6.5 cm to 9.5 cm. In Females, the average Right-Hand breadth was 7.35 ± 0.47 varying from 6.4 cm to 9 cm and the average left-Hand breadth was 7.26 ± 0.57 varying from 6.2 cm to 9.1 cm. Male-female differences were found statistically significant at $p < 0.001$ for both right and left hand however non-significant for the difference between right and left hand in both sexes. It is observed that Hand breadth was significantly larger in males about 0.8 cm as compared to females thus sexual dimorphism exists on the basis of hand breadth.

Table 2: Descriptive statistics: Hand Breadth (cm) in Males & females.

Parameter	Min.	Max.	Mean ± SD
Male (n =150)			
RHB	7	9.8	8.18 ± 0.51
LHB	6.5	9.5	8.09 ± 0.56
Female (n =150)			
RHB	6.4	9	7.35 ± 0.47
LHB	6.2	9.1	7.26 ± 0.57

RHB – Right-Hand Breadth, LHB - Left Hand Breadth, S.D. – Standard Deviation

Hand Index

Descriptive statistics for Hand Index for both males & females are depicted in Table 3. In males, the average Right-Hand Index was 45.21 ± 2.16 varying from 38.1 cm to 49.73 cm and the average left-Hand Index was 45.03 ± 2.66 varying from 35.33 cm to 52.73 cm. In Females, the average Right-Hand Index was 43.73 ± 1.89 varying from 38.64 cm to 47.59 cm and the average left-Hand Index was 43.38 ± 2.73 varying from 38.07 cm to 50.34 cm. Male-female differences were found statistically significant at $p < 0.001$ for both right and left hand however non-significant for the difference between right and left hand in both sexes.

Table 3: Descriptive statistics: Hand Index (cm) in Males & females.

Parameter	Min.	Max.	Mean ± SD
Male (n =150)			
RHI	38.10	49.73	45.21 ± 2.16
LHI	35.33	52.73	45.03 ± 2.66
Female (n =150)			
RHI	38.64	47.59	43.73 ± 1.89
LHI	38.07	50.34	43.38 ± 2.73

RHI – Right-Hand Index, LHI - Left Hand Index, S.D. – Standard Deviation

Percentage accuracy of sex determination based on sectioning point analysis

Percentage accuracy of sex determination based on S.P analysis in the entire population is shown in (Table 4). Sectioning point or cut-off was calculated based on average hand index for both sexes. In hand length, 17.46 for right hand and 17.36 for left hand were derived as the sectioning point to determine sexual dimorphism. It accurately determines sex in 83% males and 75% females for the right hand and 77% males and 73% females for left hand. In hand breadth, 7.76 for right hand and 7.67 for left hand were derived as the sectioning point to determine sexual dimorphism. It accurately determines sex in 89% males and 84% females for the right hand and 84% males and 77.3% females for left hand. Thus, Hand dimension can identify sex with higher accuracy and hand breadth seems to be best discriminator of sex in comparison with hand length. In hand index, 44.47 for right hand and 44.20 for left hand were derived as the sectioning point to determine sexual dimorphism. It accurately determines sex in 59.3% males and 60% females for the right hand and 66% males and 66.6% females for left hand. Thus, index below and equal to 44 is suggestive of male hand whereas those above 44 were considered as female hand.

Table 4: Percentage accuracy of sex determination based on S.P analysis in the entire population (n = 300)

Variables	Right Hand			Left Hand		
	S. P.	Male	Female	S. P.	Male	Female
HL	17.46	83.3	74.6	17.36	77.33	72.66
HB	7.76	89	84	7.67	84	77.33
HI	44.47	59.3	60	44.20	66	66.6

Table 5: Comparative of the hand dimension mean for Sex determination for various population.

Population	Sex	Side	HL	HB	HI	References
North Indian Population	Male	Right	19.9	8.0	40.4	(Kanchan & Rastogi, 2009)[5]
		Left	19.9	7.9	40.0	
	Female	Right	17.9	7.2	40.1	
		Left	17.9	7.1	39.5	
Mauritius Population	Male	Right	18.9	8.5	44.02	(Agnihotri, Purwar, & Jeebun, 2005)[6]
		Left	18.9	8.4	45.05	
	Female	Right	17.2	7.5	42.65	
		Left	17.2	7.4	43.79	
Rajasthan Population	Male	Right	19.3	8.3	43.1	(Sangeeta Dey,*, A. K. Kapoor, 2015)[7]
		Left	19.2	8.2	42.6	
	Female	Right	17.5	7.6	43.5	
		Left	17.3	7.5	43.2	

Upper Egyptians	Male	Right	19.5	8.1	41.8	(Aboul-Hagag, Mohamed, Hilal, & Mohamed, 2011)
		Left	19.5	8.1	41.8	
	Female	Right	18.1	7.1	39.5	
		Left	18.1	7.1	39.5	
Present Study	Male	Right	18.1	8.1	45.2	-----
		Left	17.9	8.1	45.0	
	Female	Right	16.8	7.3	43.7	
		Left	16.7	7.2	43.3	

Discussion

Sex determination of unknown fragmentary evidence was a challenge for forensic experts however they compete with the challenge by inventing newer methodology for determining sex. With the advancement of modern technology such as determination of sex with DNA analysis has simplified forensic investigation to a greater extent. But many at times it cannot fulfils the expectations to identify mutilated or fragmentary remains, again it cannot be employed in all the cases due to time consumption and limited expenditure. Thus, anthropometry is still most commonly employed for identification of humans. In our study hand length and hand breadth was determined as sex indicators and an attempt was made to discriminate sexes on the basis of hand dimension indicators.

In males, it was observed that Hand Length was significantly larger in males about 1.2 cm as compared to females thus sexual dimorphism exists on the basis of hand length. Whereas it is observed that Hand breadth was significantly larger in males about 0.8 cm as compared to females thus sexual dimorphism exists on the basis of hand breadth. Male-female differences were found statistically significant at $p < 0.001$ for both right and left hand however non-significant for the difference between right and left hand in both sexes. Even though these measurements i.e. Hand length and Hand breadth are dependent to body size of the individual thus hand index was derived in the present research as it is independent and not related to the stature as well as age and more reliable to determine sex of human remains.

In males the average hand index was 45.12, whereas in females, the average hand index was 43.55. Male-female differences were found statistically significant at $p < 0.001$ for both right and left hand however non-significant for the difference between right and left hand in both sexes.

Sectioning point was derived as a cut off point on the basis of hand index for determine sexual dimorphism. The results demonstrate that cut-off point of below and equal to 44 is suggestive of male hand whereas those above 44 were considered as female hand. Aboul-Hagag, et al. in their study of determination of sex from hand indices in upper Egyptians derived cut-off point of 40.55 to discriminate between sex.

Sectioning point analysis also able to percentage of accuracy of various hand dimensions for determine sex. Hand length accurately determines sex in 83% males and 75 % females for the right hand and 77% males and 73 % females for left hand. In hand breadth, accurately determines sex in 89 % males and 84% females for the right hand and 84 % males and 77.3 % females for left hand. Thus, Hand dimension can identify sex with higher accuracy and hand breadth seems to be best discriminator of sex in comparison with hand length.

Conclusion

This study has its implication in mass disasters and in criminal cases where an isolated hand was recovered from the scene, which needs a forensic identification. Similar studies on the said topic need to be carried out for a proper database and for future references.

Source of Funding: Self

Conflict of Interest: Nil.

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18885

Retrospective Study of Pattern and Medicolegal aspects of Sexual Offence Cases reported at a Government Tertiary Care Hospital in Tamil Nadu

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How to cite this article: S. Saravanan, K. Priyatharsini, R. Sangeetha. Retrospective Study of Pattern and Medicolegal aspects of Sexual Offence Cases reported at a Government Tertiary care hospital in Tamil Nadu. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: Women and off late children are being more vulnerable group for sexual assault which causes severe and irreparable damage to the physical and more so to the mental health of the victims. As per the recent data, woman faces a rape attempt every two hours and a case of assault with intent to outrage the women's modesty is reported every six minutes.

Aim: To analyze the pattern, social aspects and medico legal implications of sexual offence cases reported to a government medical college hospital in South India.

Methodology: A retrospective record based study by analyzing the data of the past three years was conducted in the department of forensic medicine and toxicology at Tanjore Medical College and Hospital (TN). A total of 185 sexual assault victims data were analysed in our study. Data of the subjects related to their age, marital status, time of the assault, accompanying trauma and the report of the medical examination which were recorded in the register were noted and analysed. All the data regarding accused which were entered in the register were also noted.

Results: The minimum age of the rape victim was 6 years and the maximum age was 60 years with a mean age of 17.5 years. The mean age of the accused was 27.7 years. Majority (89.7%) of the rape victims was known but not relative for the accused. Majority of the victims educational status was higher secondary. Penovaginal was the most commonest type of sexual assault conducted on the victims and the commonest place of crime was the residence of the accused. Injury to the hymen is the most common type of physical injury occurred among the victims. The average time interval between the rape incidence and the first medical examination was 24 days.

Conclusion: Wide spread education and awareness regarding sex and moral values is the need of the hour which is to be taught both at college and at school level. The government and the society have to work unitedly to end sexual abuse on females

Keywords: sexual assault, rape victims, accused, hymen injury.

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Introduction

The exponential rise in the rate of sexual assault worldwide is a major public health problem. As per World Health Organisation (WHO) the Sexual Violence is defined as: "any sexual act, attempt to obtain a sexual act, unwanted sexual comments/ advances and acts to traffic, or otherwise directed against a person's sexuality, using harassment, threats of harm, or physical force, by any person regardless of relationship to the victim on any setting, including but not limited to home and work.[1]Sexual assault is being considered as an outrageous crime. Most of the survivors of rape in India are humiliated and discriminated in the community. They victims would face the embarrassment in their own homes, police stations and sometimes even in the hospital where they undergo invasive medical tests which would often end up doing little beyond harming their case later in their legal process.[2] Women and off late children are being more vulnerable group to this type of crime.[3] Sexual offences often in the form of sexual violence, mostly causes severe and irreparable damage to the physical and more so to the mental health of the victims. Impact on mental health is considered more serious than that of physical injury to the victim in the form of mental depression, social isolation etc.[4]

As per the world statistical data on rape crime the lifetime prevalence of rape and attempted rape worldwide has been reported to be shockingly high which is ranging between 20 and 30%, while gender-based violence in general against women affects over 35%.[5]In the entire world the highest rate of rape was reported in South Africa (114.9/1,00,000), followed by Sweden (66.5/1,00,000) then in United States (28.6/1,00,000) and least in Japan (1.2/1,00,000).[6]

In India as per NCRB (National Crime Record Bureau) 2019 data the rate of rape cases was highest in Rajasthan at 15.9 (per lakh population), followed by Kerala (11.1) and Haryana (10.9). The latest NCRB report further reveals that a woman is raped every 16 minutes in India, while a dowry death occurs every hour. It further reiterates that a woman becomes a victim of acid attack almost every two days and a woman is being gang-raped and murdered every 30 hours in India. A woman faces a rape attempt every two hours and a case of assault with intent to outrage the women's modesty is reported every six minutes.[7]

Sexual assault is a serious human right violation. It is one of the most prevalent and fast growing violent crime affecting most of the developed and developing nations of the world. Genital and non-genital injuries are inevitable physical consequences of rape. The documentation of all genito-anal injuries along with injuries in other parts of the body has to be recorded in the medico legal examination.[8] However; there are still many misconceptions about the likelihood of sustaining injuries after the rape, which can potentially have a negative impact on justice.As such in India very few studies had been conducted on sexual offences, as this being considered as a more sensitive issue, so the present study was aimed to analyze the pattern, social aspects and medico legal implications of sexual offence cases reported to a government medical college hospital in South India.

Methodology

A retrospective record based study was conducted in the department of forensic medicine and toxicology at Tanjore Medical College and Hospital (TN). The study was started after getting approval from the Institutional Ethics Committee. Retrospectively past three years record data was used for recruiting the study subjects. All the patients were asked to give informed consent which was filled by themselves and in case of minor or mentally unstable it was signed by parent/guardian. A total of 193 sexual assault victims were registered in the record of the past three years. Data of the subjects related to their age, marital status, time of the assault, accompanying trauma and the report of the medical examination which were recorded in the register were noted and analysed. All the data regarding accused which were entered in the register were also noted. A thorough examination of external and internal genitalia was done with the victim being made to lie in lithotomy position. Any injuries if present were recorded with respect to size, shape, type, location and probable time since injury. Any injury to the hymen, vaginal wall and posterior fornix were also recorded. Of the 193 subjects only 185 sexual assault victims data were analysed in our study as in the remaining subjects some of the above said data were missing and few patients refused for giving informed consent. All data were entered and analysed using SPSS version 24. Mean and standard deviation was derived for all parametric variables and percentage was calculated for the frequency variables. Chi-square test was used for deriving the statistical inference.

Results

This retrospective data analysis was done on sexual assault victim by collecting the data from the sexual assault register for a period of one year at a government teaching college hospital in TamilNadu. The data shows that the minimum age of the rape victim was 6 years and the maximum age was 60 years with a mean age of 17.5 years. Among accused the minimum age was 14 years and the maximum age was 62 years with a mean age of 27.7 years (table 1). Considering the mean age of the victim it can be inferred that adolescent females are more at risk for being a victim for sexual assault and early and late twenties is the commonest age group for male accused. Majority (89.7%) of the rape victims was known but not relative for the accused and only 2.7% of the victim were totally unknown to the accused (fig 1). As majority of the victim are teen aged the educational status of those victims were either high school, middle or primary schooling, whereas among accused majority of them had educational level only upto primary schooling, which shows that literacy level is inversely proportional for being a rape accused. Among the various types of sexual assault that was committed on the rape victim the most common was penovaginal followed by molestation and oral sex (table 2). The most common place where the rape was committed was the residence of the accused followed by agricultural farm land near the victims place and the house of the victim. In 92% of the case it was a forced rape and in the remaining 8% it was found to be a consented attempt, but all the consented victims age was found to be below 13 years. Among the victims 5 females were found to be mentally retarded and 3 were physically disabled. A complete physical and genital examination was conducted on all the victims and the most common finding was hymen torn and only in 14% of the victims the hymen was intact and in nearly 15% of the victims there was extragenital injuries which were most commonly seen in thigh areas and chest region. Among the entire rape victims three were murdered after rape (table 3). The average time interval between the rape incidence and the first medical examination was 24 days the minimum was less than a day which was made only in 2% of the entire rape victims and the maximum was 1 year and 3 months. In most of the victims the first medical examination was conducted between one week and 6 months, the reason could be as majority of the rape victims being teen aged they might of thought of hiding it due to fear and insecurity (table 4). To assess the association between age group and type of sex that was conducted on the rape victim, it was seen that oral sex being more commonly performed on females less than 10 years of age and more than 50 years of age whereas penovaginal type of sexual assault was most commonly conducted on females in the age group of 10 – 20 years and this type of association was found to be statistically significant.

Table 1: Distribution of the victim and accused according to their age group.

Age group	Victim	Mean ± SD	Accused	Mean ± SD
<10	10 (5.4%)	17.5 ± 6.9	0	27.7 ± 10.9
10 – 20	151 (81.6%)		41 (22.1%)	
21 – 30	17 (9.1%)		98 (52.9%)	
31 – 40	4 (2.1%)		29 (15.6%)	
41 – 50	1 (0.5%)		10 (5.4%)	
>50	2 (1%)		4 (2.1%)	
Total	185 (100%)		185 (100%)	

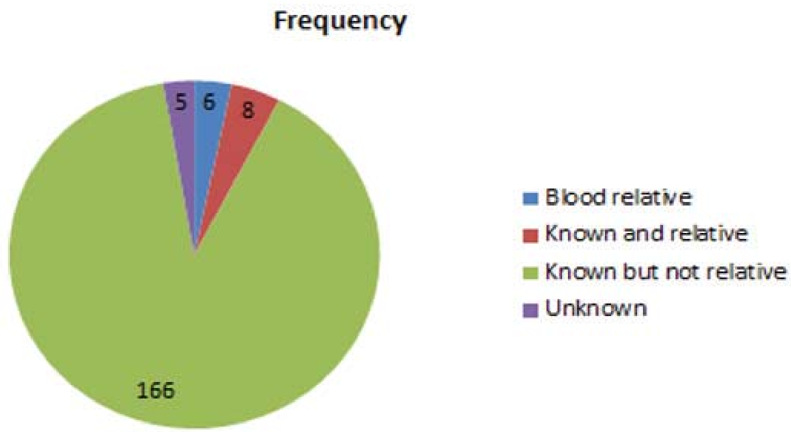

Fig 1: Pie chart showing the frequencies of relation of the accused to the victim

Table 2: Type of sexual assault made on the victim

Type of sexual assault	Frequency	Percentage
Oral sex	7	3.7%
Molestation	20	10.8%
Penovaginal	158	85.4%
Total	185	100%

Table 3: Distribution of the study subjects based on the type of injury

Type of injury	Frequency	Percentage
Hymen intact	26	14%
Hymen torn	126	68.1%
Extragenital injuries but hymen intact	21	11.3%
Extragenital injuries but hymen torn	6	3.2%
Male victim with chest injuries	3	1.6%
Murdered	3	1.6%
Total	185	100%

Table 4: Time interval between the rape incidence and the first medical examination

Time interval	Frequency	Percentage	Mean ± SD
<1 day	4	2.1%	24 ± 6 days
1 day – 1 week	8	4.3%	
1 week – 1 month	78	42.1%	
1 month – 6 months	62	33.5%	
6 months – 1 year	22	11.8%	
>1 year	11	5.9%	
Total	185	100%	

Discussion

In India as such only <50% of the female victims report the sexual assault that was happened to them. Though sexual assault is being considered as a major public health problem in most of the developing countries, still the rate of under reporting of these incidents were very high and the reasons could be social stigma, prejudice with regard to the chances of marriage, being considered promiscuous and responsible for incident, fear of humiliation and shame, embarrassment caused by appearance and cross examination in court, getting their name published in press and media, risk of losing the love and respect of society, friends and that of her husband, if married.[9] More than physical injury these types of incidents would cause emotional disturbances leaving behind a permanent scar in the mind of the victim. In our study the most common age group of the rape victim was between 15 and 20 with a minimum age of 6 and the maximum age was 60 years. These findings reveal that the females in the younger age group are more vulnerable for sexual assault as it is being easy for the accused to rape the younger women as the resistance to defend her is very minimal. Similar type of results were also shown in the study done by Shrikant S. Shingeetal, an African study done by Lackew Z and in a study in Malyasia conducted by Sarkar S.[10-12]From this it can be concluded that the females in the sexually promiscuous age group, i.e. 11 to 30 years are the most prone age group for these types of sexual assault crimes. Moreover, the adolescents females i.e. those between 11 to 18 years are the most vulnerable victims.

In the present study majority of the victims was educated up-to higher secondary (60.5%) and primary school level (20.6%). In this study, majority of victims were Hindu (96.8%). Our findings are are in agreement with the study of Sarkar S C et al and Fimate et al, whereas a study done by Singhal Aparna in Jaipur showed that majority of the victim were educated only up-to primary school level.[12-14] In our study 73% of the victims were unmarried and it is similar to the studies done earlier. Majority (78%) of the victims in our study belong to lower socio-economic group and it is in par with the study done by Sarkar SC et al.[12]

In the present study 97% of the victims knows the accused who were either blood related or neighbour and in most of the studies done earlier had showed that only a very meagre percentage of the assailant were stranger and majority of the victim knows the assailant and even our National statistic on sexual assault shows that in majority of the cases the assailant was a neighbour.[7]In few studies done in Western countries by Okonkwo et al(34.8%), Rigggs et al (39%), Dumont et al (49.2 %) showed strangers as the commonest assailant.[15-17]As mentioned in the previous studies in our study also the commonest type of sexual assault is penovaginal and in more than 90% of the cases it was a forced sex.[13-17] In the present study injury to the hymen (85%) is the commonest injury in the victim and in 15% the hymen was found to be intact, whereas the study done by Shrikant S. Shinge the hymen was intact in 25% of the rape victims and in a study by Lackew et al it was 24% and a similar type of finding was also seen in the study done by Kar etal and SNG etal.[10,11,18,19] In our study we found 15% of the victims had extra-genital injuries which were mostly abrasions in the chest and thigh and it was similar to the studies done by Jain et al, Parveen et al, Grossin et al.[20-22] In our study we found 42% of the victims were brought for medical examination between 1 week and 1 month and 33.5% between 1 month to 6 months and only 6% of the victim were brought for medical examination in less than one week and this finding is almost similar to the study done by Singhal Arpana.[14] In our study the reason for the delay reporting for medical examination by victim was not studied but in most of the studies the reason quoted for the delay could be,assailant having a friendly relationship with the victim and after having mutual sexual activity, there was no immediate lodgement of complaint. FIR was filed when both the parties failed to have mutual settlement. Delay in reporting would create a chance for the assailant to escape from judicial punishment. In a Turkish based study 76% of the victims reported for medical examination within 72 hours after the rape, which led to sentencing in 90% of the cases.[23]In a study done by Sarkar et al, quarter of the victims was brought to the hospital within 5-7 days another study done by Tamuli RP etal, 23% of the victims presented within 72 hours and a study done by DuMontetal found that 40.1% of victims reported within 2-6 hours after incident.[12, 17, 24]

Conclusion

The current study reveals that late adolescents are the commonest age group for being a rape victim and in most of the cases the perpetrators of the crime are known to the victim. The commonest type of sexual assault was found to be penovaginal and the commonest place of crime is assailant residence. Hymen injury is the commonest injury reported among the victim with very minimal incident of extra-genital injuries. In some cases even in consensual relationship may later on be considered as sexual assault when breach of trust results. Another heinous sort of crime is committed on children who are too young to resist or even understand the consequences of the act. Wide spread education and awareness regarding sex and moral values is the need of the hour which is to be taught both at college and at school level. The government and the society have to work unitedly to end sexual abuse on females.

Conflict of Interest: Nil

Source of Funding: Self

Ethical clearance obtained from Institutional Ethical Clearance Committee

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18886

Observational Study of Elderly Suicidal Deaths

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How to cite this article: G. Jhansi Lakshmi, A. Yadaiah, Shetty Srinivas et. al. Observational Study of Elderly Suicidal Deaths. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Suicide is a self-planed and deliberate termination of one's own life**.** Painful experiences suffered during their life lead to varying degrees of depersonalization and alienation. In the course of defending themselves from onslaught of negative stimuli, elderly people establish a desire for hastened death. An Observational study of suicides among elderly age group ≥60 years was conducted in the Department of Forensic Medicine and Toxicology, Osmania Medical College and General Hospital, Hyderabad during the period of 2016 to 2020.Police inquests, hospital records, toxicological reports and suicide letters were collected and studied.The total elderly suicidal deaths during the period of 5 years were 257, more common among 60-64 years aged people. Educated, middle class, joint family and different categories of professional background with physical ailments were common factors in the study. The methods used for suicide ranged from poisoning, hanging, burns to fall from height. The results were analysed and compared with previous research studies and this study matched with results of several other studies. This is possibly due to beginning of dependency and stressful life following their retirements. Suicide is the 3rdleading unnatural cause of death among elderly which is not an impulsive act.Intervention in the aged suicide will be a complex task and should involve changes at different levels of the current aged care system.

Key words: Suicide, Elderly deaths, cause of death, socio-economic status, physical illness, mental illness, dependency, agricultural works, locality, gastro-intestinal diseases and physical ailments

Introduction

The term "suicide[1]" comes from two words- sui (of oneself) and cide (killing of)- and is used to denote self-planed and deliberate termination of one'sown life. The phenomenon of suicide as old as mankind, but still remains an unsolved giant puzzle. The suicide was 3rd leading cause of unnatural death among elderly age group. An Observational study of suicides among elderly age group was conducted in the Department of Forensic Medicine and Toxicology, Osmania Medical College and General Hospital, Hyderabad during the period of 2016 to 2020. The study was started with objectives to study the age and

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sex distribution, suicidal trends, association between illness (Physical and Mental) and suicide; and to suggest strategies to control the suicides among elderly age Group. The details of circumstances leading to suicidal death were collected from the Police inquest reports, hospital records and post-mortem examination reports. People acquire a sense of self in an interpersonal context. Unfortunately, it is this same social milieu in which this delicate sense of self is fractured. Painful experiences suffered in the developmental years lead to varying degrees of depersonalization and alienation. In the course of defending themselves from onslaught of negative stimuli, elder people establish a fundamental ambivalence toward themselves that eventuates in an essential split in the psyche. Both sides of this diversion of mind- the self and the anti-self are the dynamic systems that have their own integrity and boundaries.

Table No. 1 – Distribution of study population according to age.

S. No.	Age range	Number	Percentage
1	60-64 years	98	38.13%
2	65-69 Years	69	26.85%
3	70-79 Years	59	22.96%
4	80-89 Years	31	12.06%
5	90+ Years	2	0.8%
Total		257	100%

Table No. 2 – Distribution of study population according to occupation.

S. No.	Occupation	Number	Percentage
1	Advocate	1	0.3%
2	Agriculture & related works	72	28.01%
3	Business	13	5.05%
4	House wife	69	26.84%
5	Labourers	43	16.73%
6	Driver	6	2.33%
7	Private employee	12	4.66%
8	Watchmen	5	1.94%
9	Retired employee from Govt.	26	10.11%
10	Others	10	3.89%
Total		257	100%

Table No. 3 – Distribution of study population according to type of physical illness.

S. No.	Physical Illness	Number of cases	Percentage
1	Diabetes, Hypertension and its related disorders	11	9.01%
2	GIT Illness	50	40.98%
3	COVID-19 and its related diseases	4	2.45%
4	Chronic Lung Diseas	9	7.37%
5	Cancer	4	3.27%
6	Joint and Spine disease	7	5.73%
7	Kidney disease	11	9.01%

8	Paralysis	8	6.55%
9	Unidentified physical illness	7	5.73%
10	Thyroid disorders	2	1.63%
11	Others	6	4.91%
12	Heart disease	3	2.45%
Total		122	100%

Table No. 4 – Distribution of study population according to method of suicide.

S. No.	Suicide method	Number	Percentage
1	Poisoning	117	45.53%
2	Drowning	6	2.33%
3	Fall from height	12	4.67%
4	Hanging	72	28.02%
5	Railway Deaths	8	3.11%
6	Burns	42	16.34%
Total		257	100%

Materials and Methods

All deceased of elderly age group of ≥ 60 years based on post mortem examinations conducted at mortuary, Osmania general hospital during the period of 2016-2022. Police inquests, hospital records, toxicological reports and suicide letters were studied.

Findings:

The total suicidal deaths of elderly age group people during the period of 5 years (2016-2022) were 257 i.e. 10.21% of total suicidal postmortem examinations performed at mortuary, Osmania general hospital. Out of these, 36weree in first year (2016), 45 were in second year (2017), 46 werein third year (2018), 63 were in fourth year (2019) and 67 were in fifth year (2020).Elderly suicides were more common among 60-64 years aged people i.e. 38.1%, followed by 65-69 years aged i.e. 26.8%, 70-79 years aged i.e. 22.5%, 80- 89 years agedi.e. 12.06% and the least was noted in 90+ years aged people i.e. 0.78%. Among these, 165 were males and 92 were female. It is found that more than half of the deceased i.e. 50.5% were from rural areas and 49.5% were from urban area. Among the study population, 57% were uneducated and 43% educated. It was observed that, 12 people (4.66%) were belonged to the upper class, 157 people (61.08%) were belonged to the middle class and 88 people (34.24 %) were belonged to the lower class groups. Different categories of people were involved in agriculture related works were 72, house wives were 69, labourers were 43, from retired govt. employees were 26, private employees were 12, business people were 13, lawyer was 1 and others were 21. It is observed that more were from joint family i.e. 59% than nuclear family i.e. 40% and least in alone people i.e. 1%. Healthconditions of the deceased were studied and grouped into mental illness and physical illness, 70 were (27.23 %) had history of mental illness, 187 (72.76 %)were had no history of mental illness.While considering other health conditions like Diabetes, Hypertension and its Related Disorders were 11 (9.01 %), GIT Illness were 50 (40.98 %),Heart Disease were 3(2.45 %), Chronic Lung Disease were 9 (7.37 %), Covid-19 And Its Related were 4 (2.45 %), Cancer were 4(3.27 %),Paralysis were 8 (6.55 %), physical illness were122 (47.47 %) and without any physical illness were 135 (52.52 %).Suicidal methods were used by our study population were Acid ingestion - 24 (9.33 %), Burns - 42 (16.34 %), Consumption of rat poison - 2 (0.77 %), Consumption of sanitizer - 1 (0.38 %), Drowning - 6 (2.33 %), Drug overdose - 4 (1.55 %), Hanging - 72 (28.01 %), OP poisoning - 85 (33.07 %), Paraquat poisoning - 1 (0.38 %), Suicidal fall from height - 12 (4.66 %), Suicide on railway track - 8 (3.11 %),

Discussion

The results and observations of the present study is analysed and compared with previous research studies. Duringthe study period of 5 years (2016-2022) it was observed that 257 i.e. 10.21% of total suicidal postmortem examinations performed at mortuary Osmania general hospital. Out of these 257 cases, 36 are in first year (2016), 45 are in second year (2017), 46 are in third year (2018), 63 are in fourth year (2019) and 67 are in fifth year (2020). It is also corresponding with study of Department of Health and Human Services (CDC), in which suicide rates increases with age and are very high among those 65 years and older.It has been found that suicide among elderly was common in individuals aged 60-64 years (38.1%), followed by 65-69 years (26.8%), 70-79 years (22.5%), 80-89 years (12.06%) and least in 90+ years (0.78%). The similar findings were observed by Dr.Vikram Palimar[1], who found suicide among aged 61-65 years, was 48.4%. This is possibly due to beginning of dependency and stressful life following their retirements. In contrast to this in collaborative study by SAMHSA, CDC[14], NIH, and HRSA, HIS,suicide rate increased with increasing age.

It was observed in the present study that the elderly males (64.2%) were more prone for suicide than their counterparts (35.7%) with a male female ration 1.7:1. The similar high rates of suicide among males were reported by Ronald W Maris[2], Abraham VJ[3], Bennet[4], collaborative study and very high rate was reported by Dr.Vikram Palimar[1]. This high rate among males may be due to declining health, depleting wealth and depending tendency on alcohol and drugs.

It has been observed that more than half of the deceased (50.5%) were from rural area, similar to the study by Hude Quan[5] who reported highest rate of suicide in rural population (46.7%). Many of the rural patients reach the urban for area for better treatment and that is the main reason for observing more rural deaths than urban.

It shows that 57% of the individuals were not educated in the present study and the similar findings of high level of low educational status (75%) among elderly suicide reported by Rubernowitz[6].

It shows that more than half of the study group belonged to middle (61%) and quarter of the population belonged to lower class (34%) of the socioeconomic groups. Only 4% belonged to upper class.

It is observed that more than quarter (28%) of our study population belonging to agriculture and agriculture related works, while another quarter (26%) were household works and were dependent, labourers constitute about (16%), about 10% were retired from government services and staying at home and remaining were business and other works (5%).

It has been observed that 59% of the individual were from joint family, 40% were from nuclear families and fraction was staying alone. In their study Ronald W Maris[2], Allan L Berman[2], Quan[4], Cattell HR[7], Kaplan[8] and Sodocks[8] also found the similar observations of suicide among living alone. The reason for high rate of suicide in joint family in this study could be due to social and cultural differences in this part of world, where majority of the families are joint families, in contrast to living alone and nuclear families which are common in western countries.

It has been observed in the present study that the elderly suicide has got multifactorial causation. Among them chronic illness (47%), psychiatric disorders (27%), financial problems (30%), family conflicts (26%), addiction to the substance abuse (9%) were the common factors. These findings are in contrast with Howard Cattell[7], Bennet[4], Hude Quan[5] in which psychiatric illness and mental illness were common. Family conflicts were the commonest factor as 59.53% of the individuals in the present study were from joint family. Chronic illness and physical pain were common due to aging and low socioeconomic status, because of these factors major portion of the elderly had depressive psychiatric disorders secondary to their illness. About 9% of study population was alcohol (Toddy in rural areas) dependent / addicts. In this study one was committed suicide beacuase of not getting toddy during lockdown period. Similar finding were observed by Howard C[9], O Connell H, Chin AV, Cunningham C[10] et, al. Indicating strong correlation between suicide and substance abuse. Gastrointestinal problems including chronic pain abdomen (40%) were most common chronic illness faced by study population. Others include diates mellitus (9%), respiratory problems (7%), osteoarthritis and spine disorders (5.7%), cancers (3.2%), kidney and urinary problems (9%) and liver problems (0.8%). These findings were contrary to findings observed by Howard Cattell[6], and H R Cattell[7]. But high rate of cancer incidence among elderly who committed suicide was found by Haakon H Eilersten[11]. This indicates gastro intestinal problems were neglected by the people than the cardiovascular and diabetes. In addition they are contributing to increase in suicide rates among elderly.

The present study shows that OP poisoning was the commonest method of suicide, followed by hanging and the burns was third most common method. In many studies like Howard C Bennett AT, Collins KA[4], DeMartino RE[12] et, al. gun shot injuries were common, but in present study not a single case of fire arm injuries was reported. Fall from height was the most predominant in the study by Robert C Abrams[13], but in present study shows that only 5.66% of individuals committed suicide by fall from height. Suicide by over dose of drugs was common in study by Rubenowitz[6] but in present study it is only 1.55% only. Poisoning as common suicidal method used by victims in this study could be due to lack of rules and regulations regarding use of pesticides and easy accessibility.

Conclusion

Suicide is the third leading unnatural cause of death among elderly. Suicide rate among elderly males predominated over their counterparts with male: female ratio of 1.7:1. More than half of the victims were rural dwellers. About 57% of the study groups were uneducated. 52% of the individuals belonged to not working/households. Bulk of them belonged to middle and upper lower class. More than 52% of study populations were dependents. About 59% of the elderly suicide victims hailed from joint family and another 25% were having loneliness/ isolated history. Poisoning was the commonest method of committing suicide (43%), followed by hanging (28%), burns (16%), drowning (2.3%) and others (2%). Gastro intestinal problems diseases/ disorders including chronic pain abdomen (40%) were the most common chronic illness faced by study population. This indicates Gastro intestinal problems were neglected by the people than the cardiovascular and diabetes. In addition they are contributing to increase in suicide rates among elderly. It has been observed in the present study that the elderly suicide has got multifactorial causation including, Physical illness (47%), Mental illness (27%), both physical and mental illness by (5.44%),Family and financial problems (19.4%), and addicted to alcohol and financial problems (8.94%), others are miscellaneous. Suicide among older people rarely is an impulsive act. Intervention in the aged suicide will be a complex task and should involve changes at different levels of the current aged care system.

Conflict of Interest: The authors declare that there is no conflict of interest.

Source of Funding: Self funding for this project.

Ethical clearance: Obtained fromOsmania Medical College Ethical Committee.

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18887

An Insight into Forensic Accounting

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How to cite this article: Gurleen Kaur, Debhjit Mukherjee. An Insight into Forensic Accounting. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Forensic accounting comes under the category of relatively new profession that utilizes various methodologies and implementation of various techniques. This field of forensic science is structured and constructed by keeping in mind the world's economy, society and legislation. Withthe increasing number in financial accounting deceptions and frauds in the global economy, forensic accounting has become the field tagged as savior for the safety for the financial administration process of academic, research and commercial institutions. The total combinationof accounting, auditing and investigative skills signify this specific field. Just as forensic sciencehas been implemented to capture the criminals for long, forensic accounting is fast emerging in the arena of corporate accounting frauds to play a similar role. The purpose of this study is to develop an innovative approach of combating economic crime using the forensic accounting techniques by reviewing the previous studies made on this field of forensic science.

Keywords: Forensic Accounting, economy, frauds, global economy, investigative skills, economic crime, forensic science etc.

Introduction

Forensic accounting is the combination of auditing, accounting & investigative technique, whichis used to discover various types of white-collar crimes related to financial frauds. Investigation is the vital part of forensic accounting and only applied when the event or transaction beclouded.It is carried out when laps have been established to determine the reason for the action, includingthe extent of damage if any. It can be referred as a detailed verification and clarification of doubt above a transaction or event. It is the search and exam of events to determine. The hidden unique or complex facts surrounding the event, deliberate search and review of record in accordance with the laid down and agreed policies in order to determine it and why the keeping of record resulted in a gap and the responsible person [3-7].

Literature Studies

Bhasin concluded that forensic accounting in India has come to limelight onlyrecently due to rapid increase in white-collar crimes and the belief that our law enforcement agencies do not have sufficient expertise or the time needed to uncover frauds. A large global accounting firm believes the market is sufficiently large to support an independent unit devoted strictly to 'forensic' accounting. All of the larger accounting firms, as well as, many medium-sized and boutique firms have recently created forensic accounting departments.

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Digabriele surveyed practitioners, academics, and users of forensic accounting services throughout the United States to determine whether there are differences in views of the relevant skills suggested in the practitioner literature. The results indicate that practitioners and academics agree that critical thinking, unstructured problem solving, investigative flexibility, analytical proficiency, and legal knowledge are important skills of forensic accountants.

Dhar & Sarkar concluded that forensic accounting is one of the fastest growing professions. But beyond a cursory glance one recognizes that while the title is new, what the jobintends to achieve is nothing new. The job performed is not unlike what was done in the name ofinvestigation previously. There is one version of how the name 'forensic accountant' developed.

Huber evaluated the feasibility of alternative solutions. It concludes that the most realistic alternative is for government regulation of forensic accounting in the form of legislation at the state level. The least intrusive approach is to limit the use of titles that include the use of any combination of the words "certified/chartered," "financial/ forensic/fraud," and "accountant/auditor/examiner," to those who obtain their certifications from corporations that meet minimum standards set by the state regarding disclosure of legal status, publishing financial statements, qualifications of corporate board of directors and officers, and adoption and enforcement of a Code of Ethics and Standards of Practice.

Modugu & Anyaduba found that there is significant agreement amongst stakeholders on the effectiveness of forensic accounting in fraud control, improving financial reporting and internal control. Accountants should therefore be alert to potential fraud and other illegal activities while performing their duties. They can also be made to provide significant assistance in preventing, investigating and resolving such issues.

Popoola *et al.*, has discussed forensic accountant and auditor capability (i.e., mindset and skills) and forensic accountant and auditor competence (i.e., TPFRA) towards a reduction in fraud in the Malaysian public sector.

Bhasin, studied the potential practitioners, academics and users agree that critical thinking, written, oral communication, legal knowledge, auditing skills, deductive analysis, investigative flexibility, analytical proficiency and structured problem solving are the most important skills for a forensicaccountant.

Atağan & Kavak, concluded that there are many reasons for frauds in companies. Some of these are reasons such as tax evasion, false representation of companies' financial status, loaning big amounts from the banks, raising the price of the company shares. Although measures are taken, they are not enough; because it is the human intelligence both makes the fraud, and improves the deterrence measure against the fraud. New approaches are needed in this context.

Catania, spreaded awareness and conferred recognition to a mostly forgotten individual: Mr. Frank John Wilson, who was quintessential in the developmentof techniques used in the field of forensic accounting

Hitchcock, thoroughly explores fraud and the forensic accounting profession.It details the education, training, and careers of forensic accountants; and why demand for this profession has suddenly spiked. The necessary skills of forensic accountants and why these skillsare valuable is explored; a need for better education and training is also proposed. It also details popular forensic accounting methods and how these may be used to detect fraud. This thesis explains several fraud schemes and famous frauds that were contributors to the growing demand of forensic accountants. The fraud triangle and other contributing factors are explored.

Akinbowale *et al.*, analysed the literature review indicated that one of the drawbacks, which has continued to mitigate the implementation of forensic accounting as a toolfor combating fraud is lack of a suitable framework. This was the major focal point of this work,which produced two simplified conceptual models suitable for effective fraud mitigation.

Rehman & Hashim measured forensic accounting's (FA) impact on sustainable corporate governance (SCG) within Omani public listed companies. Beyond merely cataloging the latest criminal innovations and SCG problems, this paper offers apath forward to overcome the myriad threats that can harm the organization and society. FA and SCG can achieve, anticipate and prevent tomorrow's fraud today before organizations reach the point of no return.

History of Forensic Accounting

Forensic Accounting has taken many great leaps of growth in recent history. The Accounting industry has gradually called for more and more Forensic Accountants. It is predicted that growth of the industry, based on the amount of jobs, will reach 6.7% for the years between 2013 and 2018. Like any other job, Forensic Accounting has evolved with time. The industry has been affected by changes in technology, society, and the economy. Frank Wilson first defined forensic accounting in the 1930s after working on a financial case against American gangster and businessman Al Capone. However, this highly complex accountancy skill might have been around for much longer than its formal definition. In fact, it's thought that forensic accounting has even been around since the time of ancient Egyptians. During Ancient Egypt, accountants were hired to account for the Pharaoh's assets and experts believe that ancient Egyptian methods of accounting have many parallels with today's modern- day forensic accounting. The world of forensic accounting has been developing for the past 70 years. Some credit the beginning of the understanding of fraud as a subject of scientific study to the 1934 work of DonaldCressey and Edwin Southland, who coauthored *Principles of Criminology.* The name Forensic Accounting wasn't even coined until 1946 implying that this specialty careerpath was not especially common. Even the first Forensic Accounting book did not come out until1982. The popularity and need for the services Forensic Accountants provide has steadily and more rapidly grown in the past few decades. In the 1960's the FBI employed over 700 Special Agent Accountants. They have maintained a similar level of employment in their Financial Crimes Section to this day. They investigate cases of financial fraud, crimes over the Internet, money laundering, and many other economic crimes. Six weeks of intense training are required before anyone starts their job with the FBI Financial Crimes team. As most Forensic Accountants must, they testify to any findings in court on a regular basis and are often broken up into investigation and litigation support. However, the two go hand in hand [10].Mr. Frank John Wilson, who was quintessential in the development of techniques used in the field of forensic accounting today is known as the father of forensic accounting[12].

The Concept of Fraud Triangle and Forensic Accounting

According to the dictionary definition of the term "FORENSIC" means belonging to, has application with respect to the court of law and Forensic accounting is sometimes referred to as the use of accounting knowledge and investigative skills for the purpose of ascertaining, recording, evaluating, interpreting, and communicating useful information on complex business issues so as to be able to resolve legal issues [1].The word "FRAUD" comprises of performances of activities including theft, corruption, conspiracy, extortion, bribery etc.So, this term fraud plays the most significant role in the whole forensic accounting field.The three components that make fraud possible are *opportunity*, *attitude*, and *incentives/ pressures*. Incentives and pressures give employees and management a reason to commit fraud. Incentives include financial interests and bonuses that may be contingent on company performance [13].

The Forensic Accounting Process

The forensic accounting process shares similarity with the auditing process. Forensic accounting comprises of the elements of the auditing process. The differences are that the auditors search for the misrepresentation is accidental or intentional. The first steps if the forensic accounting investigation is meet the client and accepts the job. It isvery important to have the required skills for the specific job according to GAAS (Generally accepted auditing standards). After accepting the job, the formation of the initial plan for the investigation is required. The basic plan of the investigation will help the investigator to draw a outline of the case. He will consider the client and its surrounding environment which will also include the non- financial information. The implementation of the analytical procedure will help the investigator for the quick calculations pertaining to financial statement data. Through this process includes ratios such as debt to equity ratio and return on sales. He will pay attention to the internal controls and other deficiencies that make the fraud more likely. Then the detailed plan will be made and implemented. After the development of the detailed investigative plan, the forensic accountant must carry out through out the whole investigation.Gathering and analyzing of the evidence is the next step of the investigative process.The FA will focus heavily on the areas affected by weak internal controls. Observed red flags should be taken under consideration by the FA. It is important to keep all the records of the investigation to maintain the chain custody and for testifying in court along with providing evidences.After analysis of the evidence the report should be formulated along with advice about preventiveand corrective actions to prevent issues.

Analytical Procedures and Ratio Analysis

Analytical procedures are performed by the forensic accountants for the detection of frauds and measuring the amount of exploitation. The most common way for the detection of the fraud is RATIO ANALYSIS. There are 6 categories of ratios in forensic accountancy.

Direct/Transaction Method

The Direct Method of forensic accounting is also known as the Transaction Method. This method involves examining canceled checks and invoices, contracts, agreements and public records andnotices. The accountant will also likely interview management and employees; this gives a better understanding of the accounting process and where there is potential for fraud. Examining all relevant documents ensures that the investigation is conducted thoroughly. The forensic accountant will also prepare a working statement of cash flows to better understand the inflows and outflows of cash; and where there may be suspicious gaps or unknown transactions.

Cash T Method

The Cash T Method is conducted by comparing the amount of cash received to the amount of cash spent. The purpose of this method is to determine if a company or individual had understatedincome. This method is conducted by listing all known sources and uses of cash. It is important to remember that this method only considers cash transactions. All cash receipts are listed as debits; and all cash expenditures are listed as credits. This method is useful when the forensic accountant can accurately determine personal expenses. After determining all cash receipts and expenditures and totaling them together, the forensic accountant can calculate unidentified income by subtracting receipts from expenditures.

Cash Expenditures – Cash Receipts
= Unidentified Income

If this equation results in a zero balance, then there is no unidentified income and it is unlikely that fraud has occurred.

Source and Application of Funds Method

The Source and Application of Funds Method is similar to the Cash T Method. This method examines the amount spent on lifestyle versus assets and investments. This is another useful wayto determine the net income and true worth of an individual or company. This method does not only consider cash transactions; it also considers "changes in assets and liabilities." Sources of cash include "decreases in assets, increases in liabilities or nontaxable receipts" and applicationsof cash include "increases in assets, decreases in liabilities and nondeductible expenses" ("Cash Intensive"). Because beginning and ending account balances are required to perform this method, it is more time-consuming than the Cash T method. It is much easier to apply this method if a statement of assets and liabilities (or a balance sheet) is available 20 for use. After all sources and applications have been identified, total sources are subtracted from total applications to identify any understatement in adjusted gross income.

Cash Applications – Cash Sources
= Understatement of Adjusted Gross Income

Net Worth Method

The Net Worth Method is conducted by subtracting net liabilities from net assets to determine networth.

Assets = Liabilities + Owner's Equity

Net worth is then "compared to reported income over several periods" (Kent). Any strange differences are a red flag to forensic accountants and should be investigated further. Forensic accountants may also calculate the change in net worth over several years to identify any discrepancies (“Cash Intensive”).

Change in Net Worth = Ending Net Worth – Beginning Net Worth

This calculation can be tricky because fair market value is not always equal to GAAP (generallyaccepted accounting principles) value. The appraisal of assets may be subjective; and this may cause discrepancies between book value and true net worth. It is helpful to practice conservatism when using this method. This method is also useful in divorce proceedings. A forensic accountant may compare calculated net worth to reported net worth; large differences may be a sign of fraud.

Bank Deposit Method

The Bank Deposit Method is another way of comparing cash in to cash out. This method “compares the total deposits plus cash expenses minus nontaxable sources of income to the total receipts shown on the return” (“Cash Intensive”). This method is most useful when the taxpayerdeposits all receipts in the bank and the forensic accountant is able to accurately determine expenses.

Net Deposits + Undeposited Cash Expenditures = Total Receipts (“Cash Intensive”)

Net deposits equal all bank deposits minus nontaxable income. Nontaxable income may include pensions, gifts, loans, and any other nontaxable sources of income (regardless of whether deposited). Cash expenditures is calculated by subtracting checks written from total expenditures. Checks written can be determined by subtracting ending bank balances from beginning balancesplus deposits.

Checks Written = Beginning Bank Balances + Deposits – Ending Bank Balances

Benford’s Law

Benford’s Law is “a statistical tool to determine whether the data under study shows any pattern signifying suspicious movement. Benford’s Law may allow a forensic accountant to calculate theprobability of fraud; but Benford’s Law is not used to detect fraud.

Theory of Relative Size Factor

It detects unusual data, which may be due to either simple errors or frauds. It is based on the basic concept that each field in any transaction has a normal range and any data falling outside the range is unusual or an outlier and need to be further investigated. It is measured as the ratio of thelargest number to the second largest number of a given set. Recently auditors are using Computer Assisted Auditing Tools (CAATS) to deal with huge data set and to process complex transactions thereby saving time and improving effectiveness[11].

Applications of Forensic Accounting

Forensic accounting is implemented in preventing and investigations of business fraud. It is implemented for the detection of tax fraud. Misrepresentation of investments, commodities, and stocks is the most common white- collar crime. Forensic accounting is implemented for preventing these felonies.Detection of asset misappropriation or hidden assets. Detection and prevention of partnership and shareholding disputes. Forensic accountancy quantifies economic damages in road accidents and negligence cases. Forensic accountancy reviews insurance policies, coverage issues, claim settlements and calculate the potential losses. Investigates money laundering. Settles martial and family disputes regarding financial factors[11].

Future of Forensic Accountancy in India

In India the formation of Serious Fraud Investigation Office (SIFO) is the landmark creation for the Forensic Accountants. Growing cybercrimes, failure of regulators to track the security scams,series of co-operative banks bursting-all are pinpointing he need of forensic accounting, irrespective of whether we understand the need or not. In the Indian context the Forensic Accountants are the most required in the wake of the growing frauds. The law enforcement officers are the experts of analyzing the fingerprints and the Narcotics but what about the digitalevidence analysis. Very few know about it. It’s a thrill of hunt. Maurice E. Peloubet who coined the term Forensic Accountant in 1946 said that the preparation of financial statements has some but not all of the characteristics of forensic accounting. This statement is enough for the chartered accountants in India to foray in this field. It is new child on the block. Both CBI and CID cops dothe forensic accounting work. Until recently there was no separate community in India. But now movement of India- forensic community is gathering the pace. The growing number of regulator and the administrative agencies will demand the services in the nature of forensic practice. Chartered Accountants are going to find themselves more involved in what is essentially a type of forensic practice. The changing nature of the Accounting and Auditing & assurance standards also confirms this. Nearly 40% of the top 100 American accounting firms are expanding their forensics and fraud services, according to Accounting Today. If this data is of some sense to Indian scenario then the day is not far away when forensic practice will contribute maximum to the total revenue of the Indian CA firm. Far from the humdrum stereotypic accountant your mind might have initially conjured, the forensic accounting professional is more of a private investigator with a financial sixth sense than the bookkeeper with a green eyeshade[11].

Conclusion

The inclining demand in the field of current regulatory, legal and business environment should stimulate accounting programs to emphasize and embrace forensic accounting [9] Financial Fraud is real and has become prevalent in contemporary business environment. This trend needs to be arrested before it is too late. Forensic accounting is the new branch of accounting which has the sole aim of unearthing fraudulent activities within and outside an organization so far as the third party's action is in any way reflective on the activities of that organization [8] Future success for the profession depends, in part, on how the public perceives the ability of CPAs. New efforts in consulting, specialization and understanding global businesspractices and strategies are considered crucial. We go out into the niche market, examining our strengths first. We go where the action is, only then we know we can adequately service our clients and make money doing it[2].

Ethical clearance- For this review, no ethical clearance has to be required.

Source of funding- Self

Conflict of Interest -NIL

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18888

Study of Fingerprint Pattern in Relation to Gender and Blood Grouping amongst the Medical Students of GMC Srinagar

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How to cite this article: Insha Chishti, Ukshan Shah, Farida Noor et. al. Study of Fingerprint Pattern in Relation to Gender and Blood Grouping amongst the Medical Students of GMC Srinagar. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

A study was conducted on MBBS students in GMC Srinagar. A total of 100 students was included in the study of both genders. A proper informed consent was taken from participants. For collection of fingerprint, a tabulated proforma was be used. Black printers ink was used for creating an imprint by rolling the finger on ink and then on paper (rolling method) A cello tape was used to seal the print and a magnifying lens was used for aiding in observation. Imprints from all ten fingers were collected. Information about blood groups was collected from student identity card. In a few cases where the information was not known, blood grouping and Rh typing was confirmed by slide agglutination method using antiserum A, antiserum B and anti serum D. The aim of the study was to find out the correlation between gender, fingerprint and blood grouping in students of GMC. Results: We noted that majority of the subjects belonged to blood group O (37.2%), followed by B+ve(24.5%) and A+ve(23.5. Maximum subjects (97%) were Rh positive. The rest were Rh negative. Females had highest percentage of loops (44%) followed by whorls (41%). Males had the highest percentage of whorls (55.5%) closely followed by loops (39.4%).Blood group O-ve is correlated to fingerprint whorl followed by AB+ve with whorls and B+ve with loops. A+ve is correlated to whorls and O+ve with whorls and B-ve with whorls. Blood group A showed highest whorls (45.4%) followed by loops (41.25%) and arches (10.42%). Also males had predominantly whorls (44.2%) followed by loops (39.4%) and females had predominantly loops(44.29%) followed by whorls (41.7%). the purpose of this study is to correlate the relationship between various patterns of fingerprints, gender and "ABO" blood groups and "Rh" blood types in students of GMC Srinagar. Conclusion: blood group, fingerprint and gender can only be assessed independently to secure identity if an individual.

Keywords: fingerprint, ABO blood grouping, identification, gender.

Introduction

Unique identification has numerous personal, social and legal applications. There are various methods of unique identification i.e anthropometry, cheiloscopy and handwriting.

Several researchers from India and abroad have tried to establish a relationship between the fingerprints and an array of genotypic and phenotypic features in the hope that fingerprints can assist in the correct identification for medico legal reasons.[1]

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The term identity, also called sameness is defined as whatever makes an entity definable and recognizable. The various methods by which identity of a person can be known which includes DNA profiling, Iris imaging, Bite marks, Lip prints, Foot prints, Fingerprints etc. Finger print is the most unique and reliable feature of human body. For years now, it has been considered as primary method of identification of a person. No two fingerprints are alike, even in monozygotic twins.

A blood type (also called a blood group) is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of RBC's. A total of 32 human blood group systems are now recognized by the International Society of Blood Transfusion. The two most important ones are ABO and Rhesus system. The ABO type is further divided into A, B, AB and O groups. The Rh type is divided into Rh positive and Rh negative based on presence of D antigens.[2]

The term dermatoglyphic was coined by Harold Cummins in 1926, which is used for the study of epidermal ridges on the non hairy parts of palm, fingers, toe and soles. He found that the configuration of ridge pattern are determined partly by heredity and partly by accidental or environmental influence, which produce stress and tension in their growth during fetal life. It has been accepted and adopted internationally. It is based on the principle that the individual peculiarities of the patterns formed by the arrangements and distribution of the papillary or epidermal ridges on the fingerprints are absolutely constant and persistent throughout life, from infancy to old age, and the pattern of two hands do not resemble each other. Even the fingerprints of twins are not similar. The pattern of dermal papillae determines the early development of the epidermal ridges. Early in the fetal period, proliferation of the corium forms papillary projections into the epidermis forming papillary ridges. The pattern of papillary ridges in the hands is complete by 11^{th} to 24^{th} weeks of gestation. These features once formed remain permanent throughout the life of an individual except in their dimensions, to commensurate the growth of an individual post nataly.[3]

Blood group system was discovered by Karl Landsteiner. A blood type also called blood group is a classification of blood based on presence or absence of corresponding antigens in plasma. Rhesus system is classified into Rhesus positive and Rhesus negative according to the presence and absence of D antigen.[4]

Some of the earliest works on the use of fingerprints for personal identification were carried out in India more than a century ago. With an ever increasing population and limited resources, the incidence of various types of crimes are increasing, yet tools available for crime detection seem not to be increasing considerably to counteract the erupting challenges. Most of the times fingerprints and blood samples are the only evidences at the place of crime.[5]

Fingerprints are temporary or permanent impressions of the curved lines of skin at the end of a finger that is left on a surface. Each fingerprint has a unique characteristic, mark or pattern that enable us to identify one particular human.[6]

The present study deals with the correlation of fingerprints with blood group. Various studies have been conducted which show the correlation between blood group and fingerprint. So if we obtain blood stain from the crime scene which can be further matched with stain from crime scene which can be further matched with the fingerprint which is already available in the crime branch records so as to catch the accused.

Aim and objectives

1. To find the relationship between fingerprints and ABO blood grouping
2. To identify the relationship between fingerprint and gender of a person

Materials and Methods

A total of 100 students were included in the study of both genders. A proper informed consent was taken from participants.

For collection of fingerprint, a tabulated proforma was be used. Black printers ink was used for creating an imprint by rolling the finger on ink and then on paper (rolling method) A cello tape was used to seal the print and a magnifying lens was used for observation. Imprints from all ten fingers were collected.

Information about blood groups was collected from student identity card. In a few cases where the information was not known, blood grouping and Rh typing was confirmed by slide agglutination method using antiserum A, antiserum B and anti serum D.

Exclusion criteria:

1. Individual with any deformity like permanent scars on fingers which maybe congenital or acquired.
2. Individuals suffering from any chronic skin disease.
3. Individuals with deformed fingerprints or bandaged fingers.

Inclusions criteria:

1. Students of GMC Srinagar of age group 18-25 years.
2. Subjects should be cooperative and readily give valid consent to participate in the study.
3. Participants having fingertips free of disease and deformity.

Results

For the purpose of data collection, we approached a total of 105 students, of which three didn't give consent and two had a deformity and hence were excluded from the study.

Table 1 shows correlation of age with gender. Maximum females being of age 22 (50%) and males 43% at age of 22.

Table no 1: shows correlation of gender with age in participants

Age	female	male	Total
20	3.57	2.17	2.94
21	3.57	21.74	11.76
22	50	43.48	47.06
23	32.14	10.87	22.55
24	5.36	6.52	5.88
25	5.36	15.22	9.88

Table 2 shows prevalence of each blood group in sample size. O+ve being the most prevalent (37.25%) and O –ve being the least common

Table no 2: shows prevalence of different blood groups

Blood group	Percent
A+ve	23.53
AB+ve	9.80
B+ve	24.51
B-ve	1.96
O+ve	37.25
O-ve	2.94

Table no 3 shows prevalence of different fingerprint types. Whorls being the highest(47.99%) and composite the least(2.45%)

Table no 3: shows percentage of different types of fingerprints

N	Percent
Whorl	47.99
Loop	42.1
Arch	7.46
Composite	2.45
Total	100

Table no 4 shows correlation of each blood group with the fingerprint type

Table no 4: shows correlation of blood group with fingerprints

Blood group	whorls	Loop	Arch	composite	Total
A+ve	45.4	41.25	25	7	240
AB+ve	67	26	4	3	100
B+ve	37.3	53.4	5.62	3.61	249

Blood group	whorls	Loop	Arch	composite	Total
B-ve	16	3	1	0	20
O+ve	47	43	8.1	1.5	380
O-ve	83.3	13.3	3.3	0.0	30
Total	47.99%	42.10%	7.46%	2.45%	1019

Person chi2 (15)=59.8853 Pr=0.00

O-ve is correlated to fingerprint whorl followed by AB+ve with whorls and B+ve with loops. A+ve is correlated to whorls and O+ve with whorls and B-ve with whorls.

Discussions

The present study has been conducted on the medical students of GMC Srinagar to correlate fingerprints, gender and ABO typing as to whether the following parameters can be assessed independently to secure the identity of an individual.

In the present study we noted that majority of the subjects belonged to blood group O (37.21%) followed by B +ve (24.5%) and A+ve (23.5%) respectively.

Results are consistent with Sudikshya KC [2017][3] which shows the similar incidence of blood groups as O (96%) followed by B+ve (95%) and A+ve (71%).

Similar results were reported by Bhardwaja et al [2004][7] and Prateek and Pillai[2010][8].

In this study there was significantly higher incidence of Rh positive subjects (97%) as compared to Rh negative which is only 3%. The present study is consistent with Sudikshya KC [2017][3] study.

In the present study, females had higher incidence of Loops (44%) followed by Whorls (41.7%) while in male whorls show higher incidence (55.56%) followed by Loops (39.43%).

Similar to our study, Narahari et al [2006][11] observed the highest frequency of whorls (47.07%) in males and loops (60%) in females among the Khond community of AP.

In present study, it was observed that the percentage of whorls (47.11%) was highest in blood group O+ve and lowest is B-ve (16.1%). Present results were nearly consistent with Shashikala and Ashwini study [2010][10].

While highest incidence of Loops is also seen in O+ve (43.16%), blood group with lowest in B-ve. Our study is slightly consistent with A.A Mehta study[2011][9] who reported highest incidence of Loops in blood group O (61.80%) while least percentage in blood group AB which is contrary to present study.

In present study the incidence of Arches is highest in O+ve and least in O-ve and B-ve. Results are consistent with Sudikshya KC (2017) study as it shows highest incidence of Arches in blood group AB and lowest in blood group A.

In present study, the incidence of Whorls is highest (47.99%) followed by Loops (42.10%) and Arches (7.46%).

Our study shows that majority of blood groups are correlated to fingerprint Whorls out of all blood groups O-ve possesses 83.3% Whorls followed by AB+ve (67), O+ve (47), A+ve (45.4%) and least B-ve (16).

Recommendations

A database of fingerprints and blood grouping should be created for all the criminals especially the ones with persistent criminal record so that these identification tools can be put to their best use as evidence to trace the offender.

Training and workshop of medical and police personnel should be conducted to highlight upon importance of collection of samples of fingerprints and ABO blood grouping in dead bodies and from scene of crime so that trace evidences located at scene of crime can be cross matches to victims accused for legal purpose.

Ethical clearance: The present study was approved by institutional ethical committee GMC Srinagar in 2021.

Conflicts of interest: none

Source of funding: self

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18890

Suicidal Electrocution: A Case Report

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How to cite this article: Ivana Kumicikova, Veronika Rybarova, Lubomir Straka et. al. Suicidal Electrocution: A Case Report. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Most common electricity-related deaths in forensic practice are associated with accidents in domestic or industrial environment. Despite the fact that electricity is a readily available suicidal mean in developed countries, suicides by electrocution are relatively rare. Mostly suppose in individuals working in the electrotechnical industry or at home by “handymen”. An autopsy findings are usually uncharacteristic, accompanied by pulmonary edema, fluid blood, organ congestion (suffocation signs). The passage of electric current through the body is confirmed by specific finding so-called current signs. In many cases, current marks are small, easily overlooked or unrecognizable, which significantly complicates the diagnosis and determination of the cause of death by a forensic pathologist. In some cases, it´s possible to determine the suicidal electrocution only by the investigated circumstances or in cooperation with an expert in the field of electrical engineering. Authors warn of the potential risk that a person may be part of an active electrical circuit at the time of the finding. Knowledge of the victim´s psychiatric and social history is an equally important part. The authors present the case of an 82-year-old man who, in a suicidal manner, constructed a suicide electric circuit in a social services home.

Keywords: crime scene investigation, electricity, electric current, electrocution, suicide

Introduction

Suicide is a violent, unpredictable behavior of an individual. There are many ways of completing a suicide involving a wide range of factors affecting the current person´s psychological status. In forensic practice, suicides committed by electrocution are rare. Incidence is often associated with the occupation and personal skills of individual. Most common place for electrical tragedies, accidental or intentional (suicide or even homicide), is bathroom for its vulnerability to electrical shock. The conducive conditions include moist environment, grounding through metal taps and pipes and a wet, unclothed body. Different mechanisms can cause death in electrocution: ventricular fibrillation, tetanic respiratory spasm, and paralysis of the central nervous system respiratory centers[12]. The autopsy findings in electrocutions are

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otherwise not specific. The fatal electrocution may occur with no skin marks whatsoever, making the diagnosis entirely dependent upon the circumstances of the death. If one requires the presence of burns to make the diagnosis of low-voltage electrocution, one-third to one-half of the cases are likely to be misdiagnosed. That’s why even small injuries of the skin should be sampled for histological and histochemical evaluation[13]. If suicide by electrocution is suspected, it´s certainly worthwhile to take a look at the scene of death.

Herein authors would like to present a typical case of suicidal electrocution using commercially accessible electric cable with implemented switch. The psychological risk factors in this case included deteriorating health state, past occupation as an electrician, solitude in retirement´s home and possible influence of COVID-19 pandemic to the victim. Authors emphasize the importance of crime scene investigation in cooperation with electrotechnical engineer to find out the mechanisms of fatal electrical circuit. The preventive role of forensic medicine is also to clarify the potential risk factors for physicians and personnel in social facilities, which are leading to such fatalities.

Case Report

An 82-year-old-man was found lying dead on a bed in house of social services. His both wrists were wrapped around with duct tape (Fig. 1). On the inner part of both wrists were bare (“naked”) electric wires under the duct tape (Fig. 2). These two electric wires were attached to the body and connected to the electrical switch (Fig. 3). They were electrically active even during the body discovery. In the personal belongings of the deceased, components essential to the creation of the electrical circuit were found. The investigation revealed that the man´s occupation in the past was an electrician. His suicide note was found in his room. His depressive mood and thoughts were expressed there. The motive for suicide was deteriorating health state. External examination revealed on both wrists thermal burn skin lesions from heating of the epidermis and dermis as the current passes (Fig. 4). At autopsy, the morphologic changes were non-specific, they included subpleural hemorrhages, dilated right part of the heart and pulmonary edema due to lethal ventricular fibrillation. Other than the internal findings described above, the autopsy examination showed serious heart disease with coronary artery bypass graft surgery (CABG) and pacemaker implantation. However, the severe sclerotic changes of the coronary arteries did not contribute to the man´s death. Another person’s involvement in the deceased´ death was excluded. The result of toxicological examination was negative. Histological changes of the burned skin corresponded to the second- and third- degree local burns. Histochemical color test confirmed particular electrical conductor (copper and iron).

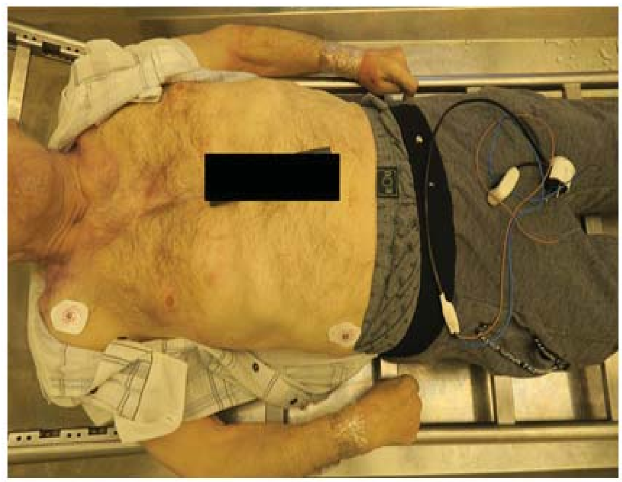

Fig. 1. The body of 82-year-old man with self-made suicidal electrical mechanism.

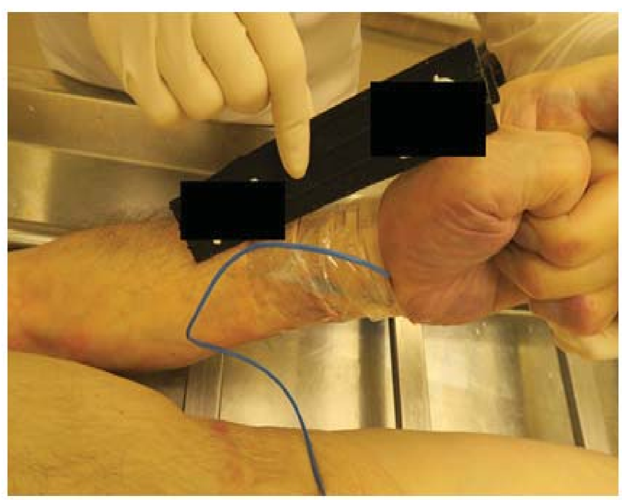

Fig. 2. Detail focus on the inner part of wrist with bare (“naked”) electric wires under the duct tape.

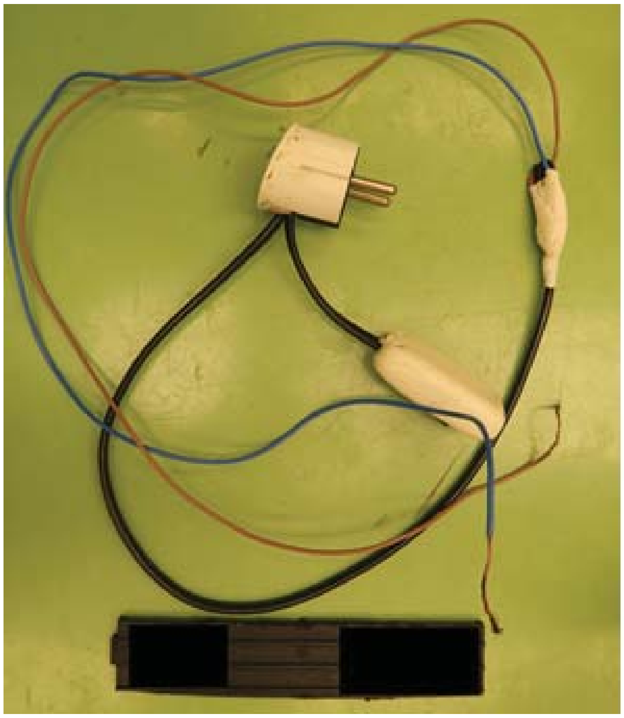

Fig. 3. The self-made suicidal electrical mechanism with electrical switch.

Fig. 4. The thermal burn skin lesions from electrical heating.

Discussion

Suicides have become almost everyday phenomenon in forensic practice. Variables influencing suicide incidence (except gender, age and season) include marital status, residence (urban/rural), employment or occupation[4] as well as coincidence with mental disorders associated with depression and chronic alcoholism[4,5]. Bioclimatological factors also might play a role in initiation and accomplishment of suicide[5]. In general, there is a wide range of factors that affect an individual´s psychological state.

According to the Slovak National Health Information Center, the rate of completed suicides in 2020 was 489, the number of suicides and attempted suicides during last 5 years is declining. The most frequent methods of suicides in Slovakia are hanging and jumps/falls from height, while suicidal electrocutions do not represent preferable suicidal *modus operandi*. The number of attempted suicides by electrocution has not exceeded the limit of 1% of suicides per year in last 10 years[11,7].

Despite suicidal electrocution is rare method, there are some typical characteristics of this kind of self-destruction documented in literature. Individuals committing suicide via direct connection to an electrical outlet are in majority of cases middle-aged male adults[6]. Study conducted in Bulgaria even identified male-to-female ratio 7:1[6]. Direct attachment to an electrical outlet is more common than dropping an electrical appliance into bathtub or pool[2]. In cases of direct contact with electrical outlet in suicidal intent, wires or leads are typically attached to the extremities[8], occasionally elsewhere[2,8]. For instance, where there is some electrical circuit included, the deceased usually has some level of technical knowledge about electricity and might be professionally an electrician or engineer[2]. Afterwards, suicidal electrocution is defined as occupation-related suicide[3], as we described in our case. His occupation must have prompted him to use such method of committing suicide.

Statistics also show that incidence of fatal electrocution is highest in summer months (from June to September)[6,8] which is in accordance with the relationship between duration of sunshine hours and suicide rate[10]. Increased incidence of fatal electrocution in summer months might be in connection with outdoor leisure time or work-related activities, e. g. gardening or swimming. Another theory suggests decreased skin resistance due to increased sweating[9].

Rare incidence of suicidal electrocution may be surprising due to its universal availability in almost every household nowadays and basic level of electricity knowledge. There are some possible explanations of this phenomenon. One of them might be an unpleasant sensoric experience in past (e. g. painful shock or view of electrified body). Another explanation may be that electrocution is linked to notorious electric chair in public opinion[2].

Suicidal electrocutions may be divided in two distinctive groups: in the first group, suicides occur opportunistically by a simplistic contact of the body with the electric current; in this case, there are usually no complicated electronic circuits involved. By contrast, the second group compromises individuals with certain professional background and technical knowledge who may even construct sophisticated electrical traps and use specific electrical gadgets. In such cases, the usage of specific appliances (e.g., timers) or methods for electric effect amplification such as shaving hair in electrocuted region, moistening the skin underneath the electrode are not unusual[14]. The incorporation of the timer into the electronic circuit might also have another explanation - it can be used as a protective mechanism against the injury of individual discovering the body[2]. As the bodies might be electrically active after death, interdisciplinary approach is indispensable, especially examination of the crime scene by electrical professional[14].

The use of the time switch in presented case suggest some level of knowledge and technical background of deceased. Sometimes schematic drawings or notes about circuit[1] may be found at the crime scene.

In forensic medicine, deaths due to electrocution constitutes a specific chapter. Deaths due to the passage of the electric current might not be always recognized in *postmortem* examination[3]. On external examination, entry marks night be easily overlooked or misinterpreted; in addition, autopsy findings resulting from electrocution are rather non-specific[7]. When goodbye note or letter cannot be found at the crime scene, third party involvement should not be excluded. Usage of electricity to kill an individual can be a sophisticated method of murder.

This case report describes typical suicidal electrocution. Old pensioner suffering from deteriorating health, who worked in the past as an electrician. Due to his knowledge, he was able to construct simple electrical circuit with a switch to complete suicide. The body was found with a goodbye letter nearby him.

Conclusion

Death caused by suicidal electrocution are rare in forensic practice. Their rarity and uncharacteristic autopsy findings lead in many cases to difficult determination of diagnosis, occasionally only *per exclusionem*. The cooperation with technical experts at the crime scene is essential for the investigation. Their technical experience/knowledge helps to solve the case correctly. Also, the circumstances and information from relatives can assist to narrow the options. In time of pandemic COVID-19 and outbreak of war in Ukraine, increased psychological care for people in social services homes is important to prevent suicidal thoughts.

Ethical clearance: No ethical clearance required.

Source of funding: Not applicable.

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

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18891

Effect of various level of MDMP-4en-PINACA Orally Gavaged to Wistar rats

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How to cite this article: Nagwan. E. Abbas, Elgamel. A. A., E. H. Abdelgadir. Effect of various level of MDMP-4en-PINACA Orally Gavaged to Wistar rats. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

This research studied effects MDMB-4en-PINACA on white Wistar rats' liver, kidney, and heart, as well as their biological and hematological parameters. For 14 days, 24 male albino rats received orally. First group was the control group; groups 2 and 3 received 5 and 50 mg/kg (bw) MDMB-4en-PINACA. Liver and kidneys deteriorated in treated rats. Small clusters of inflammatory cells, "cytoplasmic degeneration with karyolysis", "venous congestion with hemorrhage" and "edema", and "steatosis deterioration" were among the liver's histological abnormalities. Tubular deterioration increased, as did the appearance of tubular casts, and glomeruli suffered from atrophy followed by an increase in Bowman's gap in renal tissue. Tubular also showed signs of disintegration, including the formation of foam cells that seemed empty in the glomerulus. Myocardial fibers, the central disc nucleus, and endothelial cells were all healthy. The value of HGB, RBC, HCT and MCHC were higher in groups 2&3 and the values of MCV, MCH and WBC were decreased in groups 2&3. The activity of serum AST, ALT, ALP and Creatinine Kinase and the concentrations of total protein, Albumin, Triglyceride, Total Bilirubin, Direct Bilirubin, Urea, and Creatinine in number 2 group and 3 were greater than that of the control. and that of Cholesterol and HDL were lower in groups 2and 3. According to this research, synthetic cannabis' (MDMB-4en-PINACA) negative effects are worse on the liver and kidneys in group 3 than group 2.

Keywords: MDMB-4en-PINACA, designer drug, Forensic Science; Rat; Toxicity; histopathological

Introduction

A "designer drug" is a controlled substance functional or structural analog that is produced to mimic the pharmacological properties of the original substance in an effort to avoid being classified as illegal and/or being detected during standard drug testing [1].

Despite the fact that psychoactive ingredients and the recreational drugs (NPSs) have the potential to produce considerable morbidity and mortality, there is a scarcity of comprehensive data on acute drug/NPS toxicity in Europe [2]. MDMB-4en-PINACA is a "cannabinoid receptor agonist" that is synthesized. Same as the other artificial cannabinoids touted

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as a «legal» alternative to cannabis and controlled artificial cannabinoids. Synthetic cannabinoids, due to their great strength, can provide a significant risk of severe toxicity, which can be deadly in certain situations [3].

MDMB-4en-PINACA (Methyl 3,3-dimethyl-2-(1-(pent-4-en-1-yl)-1H-indazole-3-carboxamido) butanoate) has been reported as a plain solid in its pure form[4], and white powder[5]. It's also been called a tan and a yellow/brown powder[6]. Collected and sized MDMB-4en-PINACA White, yellow, orange and beige granules have been mentioned as samples[3] Contrary to other therapeutically accessible medications, little or no information on the pharmacokinetics and pharmacodynamics of MDMB-4en-PINACA is available to help prescribers. This research aims to determine the sub-acute toxicity of Synthetic Cannabinoid MDMB-4en-PINACA in rats blood samples

2.1 Drug preparation and Animals

MDMB-4en-PINACA was first dissolved in DMSO (to a final concentration of 5%), then utilizing maize oil was converted into final volume. DMSO and maize oil (being vehicle control) were used too. Twenty-four rats were randomized into three experimental groups at random. each of 8 rats. Groups 2 and 3 were given 5 and 50 mg/kg MDMB-4en-PINACA orally. Group 1 served as a control. All test rats had unrestricted access to water and a standardized pelleted meal (Saudi Grains Organization, Riyadh, Saudi Arabia). The temperature and humidity were kept under strict control for the animals' care. The lighting and darkness in the room were adjusted in 12-hour cycles.

All studies were carried out in compliance with the international norms for the treatment of animals in the experimant, as recommended by the Standing Committee for Scientific Research Ethics at Naif Arab University for Security Sciences. Rats were acclimated for a week before to the trial.

2.2. Chemicals and reagents

Blood samples were tested using biochemistry kits manufactured by Roche, Germany.

MDMB-4en-PINACA certified standards (purity 98%) utilized in this investigation were obtained from commercial providers, specifically "Cayman Chemical Company" (Ann Arbor, MI, USA). DMSO was purchased from Biotraxx Cyprus, and Corn oil from the local market. The assay kits (that were important apparatus for the experiment) ought to measure aspartate aminotransferases, alanine aminotransferases, alkaline phosphatase, Total protein, albumin, Cholesterol, Urea, and creatinine were bought from "United Diagnostics Industry".

2.3. Experimental design

OECD 407 standards for subacute toxicity research (14-day consecutive oral dosage) [7]. Rats were randomly split into three groups: Group 1 (G1): (Normal group) control group; groups 2 and 3 received 5 and 50 mg/kg (bw) MDMB-4en-PINACA.

Until the experiment/trail ended rats were checked for mortality at least twice a day. They were studied for clinical indicators, onset, and duration. Before dosage, once weekly throughout treatment, and on sacrifice day, all rats' body weights were recorded. After 2 and 4 weeks of therapy, rats were retro-orbitally bled for hematological and biochemical tests.

2.4. Hematological parameters

Heparinized blood was used to investigate hematological traits including the WBC count, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and Hb concentration (Hematology Analyzer cellular analysis system DXH 600).

Biochemical Parameters

Aspartate aminotransferase (AST), alanine aminotransferases (ALT), alkaline phosphatase (ALP), Creatine Kinase (CK), total protein, albumin, cholesterol, HDL, Triglycerides, urea, creatinine, Total bilirubin and Direct bilirubin were analyzed by using biochemistry Analyzer cobas 6000, Roche.

Histopathology

Death and morbidity were evaluated twice daily until the experiment finished. Clinical indicators, start timing, and duration were noted. Diethyl ether was used to put every group's surviving rats to sleep, and they were all put to death after two weeks. When animals were killed, blood samples were taken. All rats were inspected at necropsy to check for obvious lesions, and samples of the heart, liver, and kidneys were processed for histopathology after being fixed in 10% neutral buffered formalin.

Statistical Analysis

The mean ± standard error mean (SEM) was used to depict the trial outcomes. Student's t-test analyzed experimental data for statistics and correlations. Values of $P \leq 0.05$ qualified as significant. The main tool for assessing the empirical values was SPSS 22 (SPSS, Chicago, IL, USA). [8].

Result

Histopathological changes

After two weeks of treatment, no changes in the control group was observed (group 1). Small clusters of inflammatory cells, cytoplasmic degeneration with karyolysis, vascular constriction with hemorrhage and edema, and steatosis degeneration were among the acute histopathological alterations. Tubular degeneration intensified, as did the existence of tubular casts, and glomeruli damaged from atrophy accompanied by an increase in Bowman's gap in the renal tissue. Cell tubule deterioration was also visible, as was the formation of foam cells that appeared hollow in the glomerulus. Cardiac muscle fibers 14 days after therapy Male rats given low and high dosages of MDMP-4en-PINACA had healthy features such as cardiac fibers, the central disc nucleus, and endothelial cells were showed in figures (1-4).

Hematological changes

Table 1 contains the data. After 2 weeks of therapy, the values of HGB, RBC, HCT, and MCHC in groups 2&3 were greater than in the control. MCV, MCH, and WBC levels were lower ($P<0.05$) in groups 2&3 compared to controls.

Serobiochemical changes

These data which presented in Table.2 After 2 weeks of treatment, the activity of serum AST, ALT, ALP and Creatinine Kinase and the concentrations of total protein, Albumin, Triglyceride, Total Bilirubin, Direct Bilirubin, Urea, and Creatinine in groups 2 and 3 were higher ($P<0.05$) than control. and that of Cholesterol and HDL were lower ($P<0.05$) in groups 2 and 3 than control.

Effect of various level of MDMP-4en-PINACA orally gavaged to Wistar rats

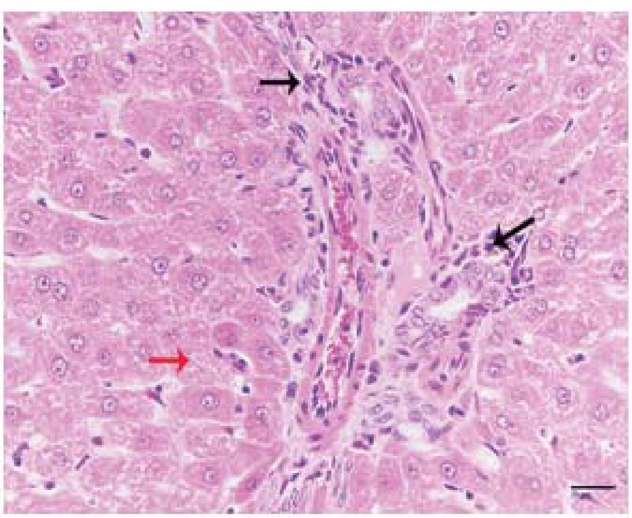

Fig.2: Photomicrograph of rat's liver treated with (50 mg/kg) of MDMP-4en-PINACA group2 showing inflammatory cells (black arrows), cytoplasmic degeneration with karyolysis (red arrow). (H&E-400X)

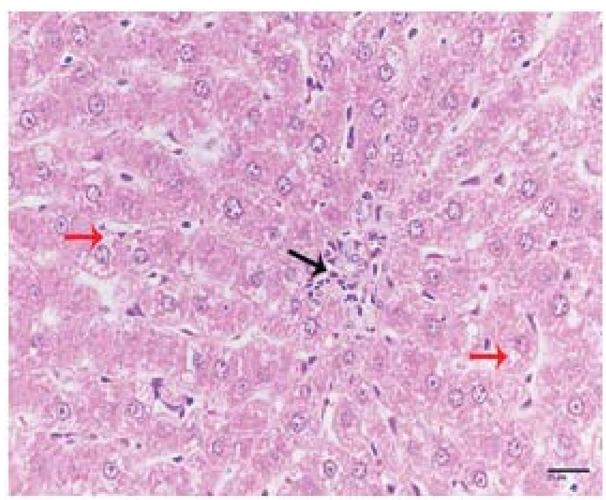

Fig.1: photomicrograph of rat's livre treated with (5 mg/kg) of MDMP-4en-PINACA group1 showing small aggregation of inflammatory cells (black arrow), cytoplasmic degeneration (red arrows). (H&E-400X)

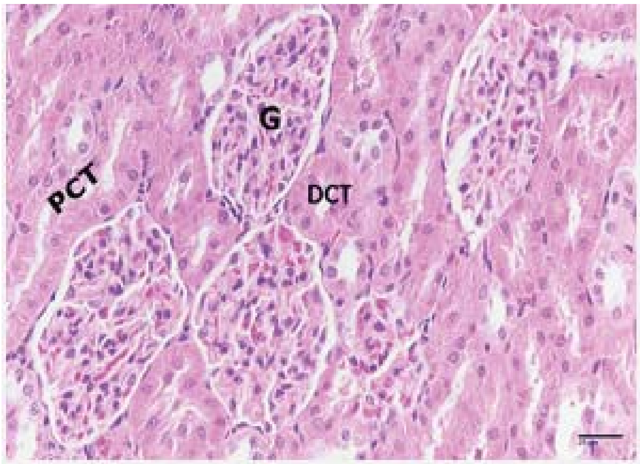

Fig.3: Photomicrograph of rat's kidney treated with (5mg/kg) of MDMP-4en-PINACA group1 showing healthy renal tissue glomerulus (G), proximal tubule (PCT), distal tubule (DCT). (H&E-400X)

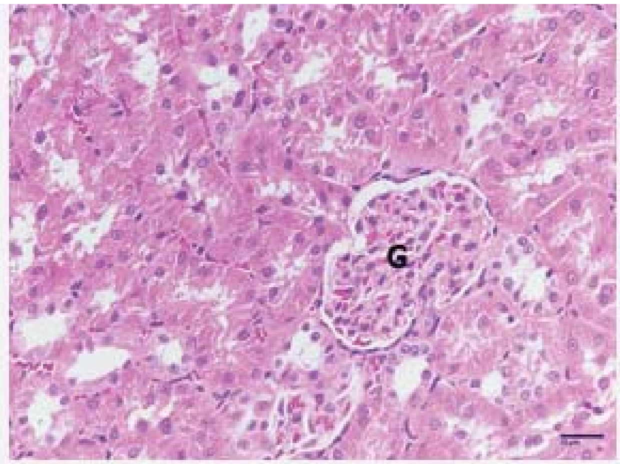

Fig.4: Photomicrograph of rat's kidney treated with (50mg/kg) of MDMP-4en-PINACA group 2 showing healthy renal tissue glomerulus (G). (H&E-400X)

Table. 1 Hematological changes in rats given various levels of (MDMB-4EN-PINACA) orally for 2 weeks

No	Parameters	Control	MDMB-4en-PINACA (5mg/kg)	MDMB-4en-PINACA (50mg/kg)
1	HGB	95.33±5.3	139.33±1.3*	97.16±2.32
2	RBC (10^6/UL)	4.51±0.31	7.9±0.13*	5.38±0.11*
3	HCT (%)	32.11±2.17	42.7±0.52*	35.68±0.67*
4	MCV (fl)	60.73±2.35	53.9±0.89*	56.66±0.33*
5	MCH (pg)	19.28±0.86	17.56±0.18*	17.71±0.24*
6	MCHC (g/l)	318.66±6.74	326.16±2.41*	319.83±2.21*
7	WBC (10^3/UL)	5.81±0.2	5.73±0.17*	4.68±0.45*

Values are expressed as mean ± S.E.; *: Significant at ($p<0.05$)

Table. 2 Serobiochemical changes in rats given various levels of (MDMB-4EN-PINACA) orally for 2 weeks

No	Parameters	Control	MDMB-4en-PINACA (5mg)	MDMB-4en-PINACA (50 mg)
1	AST (U/L)	149.16±1.24	164±1.46*	158.16±1.01
2	ALT1 (U/L)	68.33±1.83	75±1.59*	71.16±0.94*
3	ALP1(U/L)	195.16±1.57	210.3±1.6*	245.6±9.6*
4	Creatine kinase (U/L)	324.33±3.32	899.5±1.97*	355.6±1.78*
5	Total protein (g/L)	67.49±1.7	72.3±0.93*	68.5±1.29*
6	Albumin (g/dl)	5.81±0.14	6.78±0.33*	5.9±0.23*
7	Cholesterol (mmoI/l)	1.44±0.08	1.19±0.03*	1.4±0.1*
8	Triglyceride	0.27±0.01	0.4±0.002*	0.62±0.03*
9	(HDL) (mmol/l)	1.16±0.01	1.12±0.04*	0.83±0.02*
10	Total bilirubin (umol/L)	2.46±0.14	3.03±0.18*	2.68±0.13*
11	Direct bilirubin (umol/L)	0.55±0.03	0.34±0.01	0.82±0.02*
12	Urea (mmol/l)	7.7±0.26	7.11±0.13*	7.81±0.19*
13	Creatinine (umol/L)	30.51±0.67	40.16±0.43*	36.5±0.61*

Values are expressed as mean ± S.E.; *: Significant at ($p<0.05$)

Discussion

Average body weight growth was all different across the groups throughout the trial since all animals got the same meal. There has been no evidence of the effects of MDMB-4en-PINACA taken orally on the development of Wistar rats at this time in the literature available. Most of the studies reporting toxic effects of SCs are case studies of ER patients with recent consumption of SC substances. The most-reported system affections are CNS, gastrointestinal, and cardiopulmonary. Acute renal toxicity and acute hepatotoxicity were also reported at a lower rate as a complication of acute toxicity. Case studies give attention to the clinical symptoms and leading causes of death without paying attention to specific organ pathology. Organized animal studies evaluating the histopathological toxic effects on different body organs are scarce[9]. As a result, the current investigation was designed to look into the histopathological and biochemical profiles of MDMB-4en-subacute PINACA's effects in the liver, kidneys, and heart of control and treated animal groups.

The current investigation found that group 2 liver tissue underwent histological evaluation 2(5mg/kg of MDMP-4en-PINACA) showed small aggregation of inflammatory cells besides to some cytoplasmic degeneration, while liver tissue of group 3 (50mg/kg of MDMP-4en-PINACA) exhibited gathering of inflammatory cells and cytoplasmic degeneration accomplished by karyolysis which means complete digestion of nucleus. The liver's role in metabolism and excretion may provide an explanation for these outcomes of MDMB-4en-PINACA[5]. On reviewing the available literature there was no published experimental study revealing the histopathological effects of SC on body organs. However, many studies were found exploring the toxicological effects and the leading cause of death in human cases of acute intoxication. Some of them reported postmortem histological analysis of different body organs. hepatic affection is not a common presentation of SC intoxication, there are confirmed cases of fulminant hepatic failure and liver affection after smoking SC. However, there was no histopathological assessment in these cases.

[10]reported a case of acute hepatic failure after consumption of SC substance. The case developed hyperbilirubinemia, an increase in INR, shooting liver enzymes, and coma. However, the case improved with supportive treatment. Similar findings were described by[11] who reported three cases with hepatic affection from SC use and the cases had been improved with supportive treatment. Histopathological changes can be explained by oxidative stress in tissues causing cell apoptosis[12].

The increase in ALT and AST may result from liver disease, a disruption in the production of these enzymes, a shift in the likelihood of liver membrane potential, and other factors [13]. Other studies [14] revealed a correlation between liver cell damage and an elevation in transaminases and overall protein level.

The present study revealed that histopathological examination of kidney tissue after 14 days of treatment, group 2 (5mg/kg of MDMP-4en-PINACA) showed relative healthy renal tissue with abundant glomeruli and proximal and distal convoluted tubules while kidney tissue of group 3 (50mg/kg of MDMP-4en-PINACA). Aside from the appearance of tubular casts, tubular degeneration increased. Glomeruli atrophy was accompanied by an increase in Bowman's space. The current study's rise in urea concentration is a symptom of decreased renal function. Clinical assessment of renal function is based on Urea and Creatinine measurements [15]. High levels of creatinine are seen in the liver, cardiac and skeletal muscle, kidneys, where glomerular filtration accounts for most of its elimination [16]. According to these results, MDMP-4en-PINACA significantly altered the liver and kidneys' general health. These changes might have been the result of MDMP-4en poisoning. The results of the current investigation show that the liver and kidneys are more susceptible to the negative effects of the drug used, MDMP-4en-PINACA.

Hematological characteristics acted as biomarkers while detecting organ damage- cellular or tissue level, in animal reproductive, and in the identification of infections, parasitism, and other illnesses. The RBC, HCT, HGB, MCV, MCH, and MCHC counts are routinely employed in clinical practice to evaluate the erythrogram [17]. The ability to investigate the link between erythrocyte size and HGB content in its interior is provided by the RBC, MCV, MCH, and MCHC databases, which is important for determining the differing levels of anemia [18]. MCV is used to categorize anemia among normocytic, microcytic, and macrocytic erythrocytes and to determine the degree of anisocytosis [19]. The decrease in MCV and rise in MCHC in this research imply microcytic hyperchromic anemia.

The evaluation of biochemical parameters provides crucial information on the diagnostic state, dietary balance, metabolism, functioning of organs and tissues, as well as proof of concealed diseases, allowing treatment and prognosis monitoring [20].

Changes in the ALT, AST, Albumin, and Total protein levels can be symptoms of certain disorders. Rapid ALT increase implies a liver lesion [21], When combined with a rise in AST concentration, it implies severe hepatocyte injury[22].

Conclusion

The liver and kidneys are the organs most vulnerable to the negative effects of synthetic cannabinoids, therefore it is reasonable to conclude that MDMP-4en-PINACA may induce microcytic hyperchromic anemia. MDMP-4en-PINACA.

Ethics Approval: Ethical approval obtained from the Experimental Animals Ethics Committee of Naif Arab University for Security Science, following the international standards for the handling of experimental animals. (Nauss-Rec-22-03)

Conflict of Interest: Nill

Consent to Participate: Nill

Consent for Publication: Not Applicable

Funding-Nill

Acknowledgements (if any)-Nill

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18892

Analytical Instrument and its Utilization in Soil Forensic: A Review

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How to cite this article: Neha Yadav, Lav Kesharwani. Analytical Instrument and its Utilization in Soil Forensic: A Review. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

In the present paper, we give an overview on the importance of the analytical instrument used in the field of forensic science for the elemental analysis of soil evidence collected from the scene of occurrence. The forensic scientist must rely upon the elemental composition of major and trace elements for the soil sample comparison and discrimination. Variation in the composition of soil sample allows considerable discrimination through the instrumental technique even there is a little amount of sample. Through this paper, reviews on the techniques which are extensively used in forensic sciences have been reported. Report summaries based on soil analysis application and techniques employed for the elemental composition like X-ray fluorescence (XRF), SEM/EDX, inductively coupled plasma (ICP) spectrometry, and XRD. ATR-FTIR for mineral identification.

Key words: Forensic Science, ICP-, XRD, XRF, SEM/EDX, and Vibrational Spectroscopy, notably NIR and DRIFT.

Introduction

Soils matrix is composed of both organic and inorganic components and majority of examination methods of soil for its characterization and identification by a forensic soil scientist is based on the analysis of inorganic materials. [15] A soil sample is usually composed of more than just rock and minerals. Leaves, seeds, pollen, and other organic components are commonly present. Fourier transform infrared spectroscopy can be used to characterize the bulk soil organic components, such as plant fats and waxes, proteins, cellulose, and lignin.[15,20]. Soil contains variety of elements and the elemental composition of soil is basically due to the rocks composition which comprise the earth crust. Environmental condition also effects the elements present in the soil. The earth crust contains elements such as sodium (Na), Calcium (Ca), Iron (Fe), potassium(k) and magnesium (Mg). In tropical condition climate area soil are produced with high contain of alumina and ferric iron oxide, in arid climate area gypsum and calcium carbonate are produced in soil. Sandy soil contains silica in higher concentration while clay soil contains silica in less amount, but contains alumina in higher concentration. In this paper, we have tried to explain the available analytical instruments for analysis of Soil evidence analysis.

Crystallography in Geology: Non-opaque minerals can be identified by the optical, crystallography. The crystal structure and mineral identification of the soil trace evidence can be determined by using different analytical instruments. Techniques which are used for identify minerals in the soil sample are such as scanning electron

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microscope/Energy dispersive X-ray spectroscopy (SEM/EDX), X-ray Florescence spectroscopy (XRF), X-ray powder diffraction (XRD).

Scanning electron microscope/Energy dispersive X-ray spectroscopy (SEM/EDX): Through SEM/EDX we can determine the elemental composition of a substance. In this process an electron beam is targeted on the sample and is used to excite an electron within the element present in the sample. Like in XRF, the X-ray emission spectra that are produced will have the maximum that correspond to the energies of particular electron transition and these transitions are associated with particular elements. The composition that are close to the surface of minerals can also be determined through SEM/EDX, as the SEM can magnify a sample up to 300,000x. [12] In SEM/E DX the SEM is to produce an image of the sample and serves as an excitation source by generating a beam of electron in a vacuum, whereas EDX detects and measures the electron induced X-ray emission allowing for qualitative analysis of the elements present in the sample [16]. In majority of soil examination through SEM/EDX involved either visual comparison of mineral morphological or individual mineral identification, rather than a bulk elemental analysis of a soil sample [6] but, both Cengiz et al [22] and Pye and Croft [14] prefer sample preparation methods for bulk elemental analysis of soil through SEM/EDX.

X-ray Diffraction Analysis: X-ray Diffraction (XRD) is one of the most important and reliable methods of identifying the composition of geological soil and other crystalline structures [5]. The method is based on the arrangement of atoms, ions, and molecules within a crystalline structure. X-ray diffraction is capable of distinguishing between, for example, pure carbon in graphite form and pure carbon in diamond form as the crystalline structures are different. The sample is analysed by passing X-rays through the crystal and measuring the angle of diffracted X-rays. The interpretation of X-ray diffractograms relies upon Braggs law, specifically the d spacing and the intensity. Each crystalline material has its own distinctive X-ray pattern which is compared to either a reference database or a pattern produced by a known mineral for identification [5]. If a simple comparison between samples is required then the X-ray diffractograms may be easily compared without identification.

XRD analysis was employed to define the mineralogy of each soil, to identify and quantify the dominant clay minerals present as well as to determine the amorphous content in each sample. Moore & Reynolds define a 'clay mineral' as the relatively small number of minerals that occur as grains and are less than 2μm in size [11]. The selection of soils with specific characteristics for subsequent analysis will be assisted by the knowledge of their mineralogy obtained through the XRD methods. Sample preparation is an important requirement for accurate analysis of soils by XRD. This is especially important for soils that contain finely divided colloids, which are poor reflectors of x-rays, as well as other materials such as iron oxide coatings and organic materials. Appropriate sample preparation techniques for soils have been described by Moore and Reynolds and are designed to remove undesirable substances as well as to obtain desirable particle size, orientation, and thickness [11]. In this work, each of the soils, were mixed with the use of a stainless-steel spatula. Those soils with a sample mass of greater than ca. 50g were split to attain a representative sub-sample. XRD analysis requires the soils to consist of extremely fine grains to achieve good signal-to-noise ratio, avoid spottiness and minimise preferred orientation. Conversely, excessive dry grinding can result in lattice distortion and changes of phase. Formation of an amorphous layer around individual grains has been known to occur as a result of excessive grinding [18]. In extreme cases, this can lead to strains on the crystal structure that cause XRD line broadening or the production of X-ray amorphous material [11]. Thus, sample preparation aimed to improve diffraction characteristics of the sample and to promote dispersion during size fractionation.

X-ray Florescence spectroscopy (XRF):

XRF is a popular technique in forensic geochemistry and uses a beam of primary radiation produced in an x-ray tube to excite a secondary x-ray emission from the sample. The emitted x-rays have a characteristic energy for each element, allowing for quantitative and qualitative elemental abundance analysis.

In an XRF instrumentation, X-rays produced by the X-ray tubes source are used to irradiate the sample. The interaction of the x-rays with the sample causes electron to be ejected from the atoms of the elements within the sample. Due to the ejected electrons, the elements present in the sample will emit fluorescent X-ray radiation with discrete energies that are characteristics of these elements. The XRF detects and measures the intensity of the emitted fluorescence allowing for qualitative analysis of the elements present in the sample [(19)] in geological laboratory several grams of the soil sample are required for the XRF analysis and the sample preparation involves either high temperature heating or high pressure compaction of finely grounded powder to produce fussed-glass or pressed-powder respectively[(13)] **Anjos et al[(17)]** used the pressed -powder sample preparation method then elementally examined the soil sample by XRF to determine the use of organic compost from recyclable urban garbage resulted in heavy metal contamination of both the soil and radishes growing in the soil. In a study by Rawlins and Cave [(3)] elemental abundance data for 19 elements, obtained by XRF analyses, was used to investigate the extent to which samples derived from the same geological parent material could be distinguished from each other. For 13 of the 19 individual elements, they found that on average, it was possible to discriminate between more than 80% of the samples within parent material groups, but when using the elements in combination, more than 99.8% of samples could be discriminated from one another. Hiraoka[(25)] used XRF to analyse soil sample collected from 110 different sites in the Kyoto district of Japan to predict unknown soil origins. Whilst trace evidence forensic laboratories may have access to a µXRF, the current methods using an XRF system are not suitable for forensic analysis of soil due to the sample preparation issues. In forensic term, a large amount of soil is required and the sample should be milled prior to producing fused – glass or pressed-powder disc. This sample preparation methodology which is currently used to prepare soil sample prior to analysis using XRF is destructive and would restrict any possible additional analyses a forensic or geological expert could conduct on the soil sample.

Inductively coupled plasma (ICP) spectrometry: ICP analysis requires the soil to be in solution. This can be achieved by digesting the powdered soil sample using either an acid or alkaline technique. An extremely high temperature plasma (up to 10,000^{0}C) generated by radio-frequency is used to atomise and ionise the soil solution. The elemental concentration of the soil sample is determined by either measuring the light emitted by the atoms and ions (atomic emission spectrometry- ICP-AES) or the ions are sorted by mass and measured (mass spectroscopy- ICP-MS). ICP analysis is extremely sensitive and can be used to measure up to 70 elements simultaneously. Some ICP systems have a laser ablation modification (LA-ICP) which allows for the analysis of solid samples without the need for digestion [(14)]. Numerous articles have presented the benefits of ICP analysis to determine the elemental composition of soils [(8,24)], however, most trace evidence forensic laboratories do not have access to an ICP. Further, ICP analysis only requires a small amount soil sample, which is of benefit for a forensic examination, however the need for the sample to be in solution means the process is destructive and would restrict any possible additional analyses a geological experts could conduct on the soil sample. Whilst LA-ICP is less destructive than traditional ICP, for bulk characterization of soils, the soil sample should be milled then compressed into a disc, again making the technique effectively destructive for further forensic testing.

Organic Examination: That being said, infrared spectroscopy has been used by geologists as a method to predict the organic carbon content, the presence of nutrients and trace metals, the pH, the redox potential, and the conductivity of soil sample as well as to identify the presence of minerals in soil sample[(23)]. By predicting these parameters, the soil scientist may be able to recommend procedures to improve soil quality.

Fourier transform infrared spectroscopy: Fourier transform infrared spectroscopy (FTIR) can be used to determine the chemical composition of a sample. Organic materials are composed of atoms bonded together in a specific manner unique to that material. The absorption of infrared light by a sample result in frequencies generated from bending and stretching of bonds between atoms or group of atoms.

The resulting absorption or reflection of wavelengths is unique for a material. Alternatively, the IR spectra could be used to compare samples or standards to determine similarities or difference. There are two main methods geologists use to present a soil sample to the FTIR spectrometer: the manufacture of potassium bromide (KBr) discs and the use of a Diffuse Reflectance infrared Fourier transform spectroscopy (DRIFTS) holder. KBr is an IR inactive salt. The preparation of a KBr disc involves finely grinding a quantity of KBr with a sample of milled soil. The soil needs to be milled and the KBr mixture finely ground to remove the scattering effects from large crystals. The mixture is then placed in a KBr die set and pressure applied creating in a translucent, indurate disc. The KBr method requires a very small amount of soil sample, approx. 1.5mg. The KBr disc is analysed using transmission spectroscopy. The DRIFTS method of IR analysis involves placing the soil sample in a sample holder and the spectrum is collected on the bulk sample. The DRIFTS sample method utilises reflectance IR spectroscopy.

In a forensic trace evidence laboratory transmission FTIR with a microscope attachment and attenuated total reflectance (ATR) FTIR are commonly used for comparison of typical samples-including paints, fibres, rubbers, tapes, adhesives, and other miscellaneous materials. [1, 7].

Attenuated Total Reflectance (ATR) FTIR: ATR-FTIR is particularly useful to the forensic scientist as the examination requires little or no sample preparation, only a very small sample is required, and the non-destructive nature of the analysis means that the sample is still available for further testing. ATR is an FTIR sampling technique that enables samples to be examined directly without further preparation. A beam of infrared light is passed through the ATR crystal such that it reflects off the internal surface in contact with the sample. This reflection forms a wave that extends into the sample. The beam is then collected by a detector as it exits the crystal. There has been limited work using ATR-FTIR for the examination of soils, and very little ATR-FTIR soil comparisons work in a forensic context. In 2004, linker[21] proposed the use of ATR-FTIR to determine the nitrate concentration in soils. Weinger et al[4] in 2009, expanded on this work and proposed the use of ATR-FTIR for the identification of silicates, phosphates, nitrates, and carbonates, while Madejova [10] concentrated on identifying clay minerals. Schulz and Baranska[9] examined plant metabolites using ATR-FTIR to determine the quality parameters in horticulture and agriculture crops. This work could be used to form the foundation of work on the organic humic content of soil sample. Morrison et al[2] used ATR-FTIR as part of a wider soil examination process to examine the soil organic matter and the mineral composition for the discrimination of soil from urban areas around Scotland. The research to date shows that IR examination can provide information on both the organic and inorganic components of a soil sample. As both the KBr and DRIFTS FTIR examination have limitation in a forensic context and ATR-FTIR is a technique commonly available in forensic trace evidence laboratories which requires no sample preparation.

Discussion

The analytic techniques initiated by forensic experts have continued to expand in complexity and improve in reliability. Many new analytic tools have been applied to analytical problems in almost all areas of the field, and the technology continues to open new areas of research. Over the last two decades, a new analytical tool has been developed. Forensic examiners continue to be concerned about conducting unequivocal identification of toxic substances in such a manner that the results can withstand a legal challenge. The problems of substance abuse, designer drugs, increased potency of therapeutic agents, and widespread concern about pollution and the safety and health of workers present challenges to the analyst's skills. Today investigators have a wide range of analytical tests and sophisticated equipment with which to study microscopic pieces of evidence collected at such crime scenes. As disgruntled individuals and terrorists continue to use fire and explosives to disrupt society, forensic chemists will go on developing methods for identifying the persons responsible for such events.

Ethical clearance- Nil

Source of funding - Self

Conflict of Interest- Nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18893

Knowledge and Awareness of Forensic Odontology among Medical and Dental Graduates and Undergraduates in Karnataka, India

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How to cite this article: Pratima R Bhat, Namratha Patil, Prasanna S Jirli. Knowledge and Awareness of Forensic Odontology among Medical and Dental Graduates and Undergraduates in Karnataka, India. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: Forensic odontology is one of the crucial contender of forensic medicine. Medical and dental professionals with appropriate knowledge of forensic Odontology will be able to identify and produce right data at right time which will help in criminal investigation.

Knowledge and awareness of medical and dental students is significant factor that influences quality of medicolegal reports like certification of age, determination of race and sex. Hence reasonably good knowledge and skill regarding forensic odontology should be known to them.

Aim of the study is to assess knowledge and awareness of forensic odontology among medical as well as dental graduates and undergraduates.

Study design: Cross- sectional observational study conducted among 1000 medical and dental students of Jawaharlal Nehru Medical college and Vishwanath Katti Institute of Dental Sciences, Belagavi, India in month of May 2022. A predesigned pre-validated multiple choice questionnaire containing 16 questions was used in the study. Data was analysed and results were expressed in percentage.

Results: Most of the participants could correctly answer basic knowledge based questions but only few could answer in depth knowledge questions. 94 % of participants were of opinion that there is need for maintaining dental records. But only 18 % were aware of period for maintenance of dental records. 12 % of students knew that amelogenin gene can be used in determination of sex and only 13 % participants were of dimerjian's method of age estimation from teeth.

Conclusion: This study shows that participants had positive attitude and basic knowledge of forensic dentistry but lacked in depth knowledge. Structured skill modules should be included in the curriculum and implemented appropriately so that both medical and dental students gets hands on training in field of forensic dentistry.

Keywords: Forensic odontology, dental records, bitemarks, forensic dentistry

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Introduction

Forensic odontology is one of the most rapidly developing branches of forensic medicine. According to Keiser Neilsen forensic odontology is that branch of dentistry which in the interests of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings. Dr. Oscar Amoedo is father of forensic dentistry. [1]

Dental identification is one of the most sophisticated method of comparative identification if there is proper maintenance of dental records. Identification plays important role in criminal cases like rape, murder, civil cases like insurance claims, matrimonial disputes, impersonation, issuance of license and passports. Human dentition is never same in any two individuals. Teeth and jaws are usually protected from fire, mechanical trauma. Teeth are highly resistant to post mortem destruction and decomposition. [2]

The first case of identification using dentition in India was in 1191 when Raja Jaichand of Canouj who died on battlefield was identified using his false anterior teeth. There is shortage of experts who specialize in forensic odontology in India. Doctors untrained in field of forensic odontology giving expert opinions result in poor quality of work. [3]

Medical and dental professionals with appropriate knowledge of forensic Odontology will be able to identify and produce right data at right time which will help in criminal investigation. Knowledge and awareness of medical and dental students is significant factor that influences quality of medicolegal reports like certification of age, determination of race and sex. Hence reasonably good knowledge and skill regarding forensic odontology should be known to them.

This is first study in Southern India wherein we are assessing knowledge and awareness of forensic odontology among both medical as well as dental graduates and undergraduates.

Materials and Methods

Study design : Cross- sectional observational study conducted among 1000 medical and dental students of Jawaharlal Nehru Medical college and Vishwanath Katti Institute of Dental Sciences, Belagavi, India in month of May 2022.

Data collection : A predesigned pre-validated multiple choice questionnaire containing 16 questions was used in the study (table 1). Questionnaire was distributed by means of google forms to 1400 students out of which 1200 had responded. Only complete forms were considered for analysis. A total of 1000 students belonging to 3rd part I and 3rd part II MBBS batches and those belonging to third and final year of BDS and medical and dental interns were included in the study. Participation was voluntary.

Participants were informed about purpose and objective of study. Data was analysed and results were expressed in percentage.

Results and Discussion

In present study, out of 1000 respondents, 71.4% were medical students and 28.6 % were dental students, this disparity is mainly because the intake capacity of students admitted to BDS course is less than those admitted to MBBS course.

Most of the participants (93.4%) knew that forensic odontology deals with teeth. The results correspond with Mohit et al study (96.69%) but contrast results in Abdul et al study conducted in Saudi Arabia where 37.5 % participants were unaware of branch called forensic odontology. [4,5]

About 86.6 % were aware of the fact that dentition is never same in two individuals. Similar results were seen in Mohit et al study were 96.69 % were aware of use of dentition in identification. [4]

94 % of participants were of opinion that there is need for maintaining dental records. But only 18 % were aware of period for maintenance of dental records. Results are similar to Harchandani et al study where 19 % had knowledge of period of maintenance of dental records. [6]

In present study 67.7 % students were aware of use of bite marks in identification and 77.4 % participants had knowledge about uniqueness of lip print. In Preethi et al study about 82 % participants knew the significance of bitemarks. But as per Monsy et al study only 56.3 % had knowledge of bitemarks and their impressions. And as per Abdul et al study only 27.3 % of undergraduates knew significance of bitemarks. [7,8,5]

In this study when in depth questions were put forth regarding forensic dentistry participants were unable to answer them correctly. 12 % of students knew that amelogenin gene can be used in determination of sex and only 13 % participants were of dimerjian's method of age estimation from teeth. 42 % of students were aware of race determination from teeth.

Most of the participants (82.4 %) had knowledge of use of teeth as source of DNA. Results are similar to Mohit et al study (81.8 %) and Sahni et al study (95%) but contrast results were seen in Abdul et al study where only 41 % of undergraduates were aware of the fact that teeth can be used as source of DNA. [4,9,5]

In present study about 95.2 % students were of opinion that dental evidence is legally accepted in court of law, but 82 % of them were unaware of period for maintaining dental records. Similar results were seen in Mohit et al study (89.25%) and Monsy et al study (77.9%) [4,8]

When students were asked about subject of interest nearly half of them (48%) considered forensic odontology followed by Analytical toxicology (31.8%)

Conclusion

The present study both medical as well as dental graduates as well as undergraduates were aware of branch of forensic odontology and nearly half of them chose it as subject of interest too. Both medical and dental students had positive attitude towards forensic dentistry.

When students were asked basic questions on forensic dentistry they were able to answer them properly but when they were put forth in depth knowledge questions only few students managed to answer them correctly.

Medical as well as dental students had reasonably good knowledge on forensic dentistry.

But knowledge and positive attitude alone is not enough unless they acquire skills as currently they are not provided with any training during their MBBS course or BDS course.

To overcome the deficiency structured skill modules should be included in the curriculum and implemented appropriately.

Conflict of interest : The authors declare no competing interests.

Source of funding : This research received no specific grant from any funding agency.

Ethical clearance : Taken from institutional ethical committee of Jawaharlal Nehru Medical college

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18894

Assessing Time Since Death by using Changes in Electrolytes in C.S.F and Vitreous Humour in Bodies Subjected to Autopsy

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How to cite this article: Rama. V, Uthayakumar R. Assessing Time Since Death by using Changes in Electrolytes in C.S.F and Vitreous Humour in Bodies Subjected to Autopsy. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Death is an unpredictable truth in every one's life. Death can be broadly classified as natural and unnatural. Medicolegal experts are concerned only with unnatural deaths. My study was aimed to estimate time since death (TSD). TSD is done grossly using various factors, to narrow down the limit of margin of error I assessed changes in electrolytes in Cerebro spinal fluid and vitreous humour in bodies subjected to autopsy. The study was conducted on 100 cases brought for medicolegal autopsy. I concluded as there is definite relation in the values of electrolytes with relation to the post-mortem interval or time since death.

Key Words: Time since death (TSD), Electrolytes, Cerebro spinal fluid (CSF) and vitreous humour (VH).

Introduction

Death is definite in everyone's life and it is also unpredictable. It may come in the form of natural or unnatural causes. In criminal cases, the Postmortem Interval (PMI) or Time Since Death (TSD) serves as an important clue for the Investigating Officer to probe and helps them to eliminate the innocent. In civil cases, the PMI helps a vital role in deciding the legal heirship, inheritance or succession of the property.

Estimating time since death as per CAMPS[1], was by a reasonable guess, taking into account all known factors, and our aim should be to limit the margin of error inherent in assessing the effect of these factors.

To fix time since death based on postmortem finding alone has been a constant challenge for the medico-legal workers in many situations. It is evident that longer the interval of time between death and postmortem examination, the wider will be the limits of probabilities[2]. The judiciary is in need of fixing exact time since death. Singh et al[3] in 2005 studied 1026 subjects and found that mean vitreous Na+/ K+ ratio was slightly more in the left eye (13.50 ± 5.27) than in the right eye (13.48 ± 4.95), however this difference was found to be statistically insignificant ($p < 0.05$).In 44 B.C external postmortem examination was carried out in unnatural deaths, so body of Julius Caesar was carefully examined by physician ANTISTIUS to confirm cause of death,

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but the postmortem examination consisted of only external examination and no method employed to find time of death[4].

The first medico legal work was done by Giuvanni Fillippo in 1520 who suggested that rigor mortis is one of the indicators to determine the time of death[5]. Casper in 1861 explained the role of cooling of body temperature as one of the determinants of time of death[6]. Jaffe found a consistent rise in the level of potassium starting shortly after death and continuing for 125 hours[7]. Leahy and Farber (1967) worked on 52 cases and found values of vitreous potassium ranging from 4.44 to 16.6 mEq/l[8]. Henry and Smith (1982) reviewed the post mortem interval by chemical analysis on blood and Cerebrospinal Fluid. They inferred an importance in early postmortem interval[9].

Many biochemical changes begin to take place immediately or shortly after death and progresses in a fairly orderly way until the body disintegrates. These changes occur in various body fluids including the vitreous humour of the eye and CSF. Among these, the mostly widely used method is estimation of electrolytes in vitreous humour and CSF.

Materials and Methodology

The study was conducted on 100 cases brought for medico-legal autopsy at Department of Forensic Medicine, Tirunelveli Medical College during May 2016 to May 2017. The material for study were vitreous humour and CSF. The details of the cases including time since death were obtained from the hospital records. The study included cases between 15 to 70 years of age whose time since death should be known and samples were collected within 24 hours of death. The study excluded cases with injuries to eyeball and head in whom clear samples couldn't be obtained. The vitreous humour was withdrawn from the eye and the CSF was withdrawn from either cisternal or lumbar puncture. Then the values of sodium, potassium and chloride in the samples were calculated and recorded.

Results and Discussion

The present study consisted of 100 samples out of which 70 from males and 30 from females. The sample collection was divided into 4 groups as per the TSD. 3% of my cases belonged to 0-6 H of TSD, 29% of cases belonged to 6.1 to 12 H, 45 % of cases belonged to 12.1 -18 H and 23% of cases belonged to 18.1 -24 H.

Table No.1: Showing the levels of Potassium (range & mean) in VH depending upon TSD:

S.No.	TSD (hrs)	No. of Cases	Range of Potassium (mEq/L)	Mean ($\pm$) SD
1.	0 – 6.0	3	8.2 – 8.3	8.23±0.05
2.	6.1 – 12.0	29	6.3 – 13.5	8.87±1.58
3.	12.1 – 18.0	45	6.5 –12.6	9.29±1.51
4.	18.1 – 24.0	23	7.0 – 13.5	10.25±2.03
	TOTAL	100		

The table above shows the distribution of the value of potassium concentration in VH divided into 4 groups as per TSD. The four groups are: 0- 6 H, 6.1 –12 H, 12.1 –18 H and 18.1 – 24 H respectively. In 0- 6 H there were 3 cases with the potassium concentration ranging from 8.2 to 8.3 mEq/L. In 6.1 -12 H there were 29 cases with the potassium concentration ranging from 6.3 – 13.5mEq/L. Between 12.1 -18H there were 45 cases with the potassium concentration ranging from 6.5 -12.6 mEq/L. And in 18.1 – 24 H the potassium concentration is between 7 to 13.5 mEq/L

Table No.2: Showing the level of Sodium (mean & range) in VH depending upon TSD:

S.No.	TSD (hrs)	No. of Cases	Range of Sodium (mEq/L)	Mean (±) SD
1.	0 – 6.0	3	144 –171	162±15.58
2.	6.1 – 12.0	29	121 – 165	137.62±10.44
3.	12.1 – 18.0	45	120.4 – 158	136.32±5.89
4.	18.1 – 24.0	23	110 – 151	140.89±8.64
	TOTAL	100		

The table above shows the distribution of the values of Sodium concentration in VH divided into 4 groups as per TSD. The values in four groups are: In TSD of 0- 6 H the sodium concentration ranges from 144 -171 mEq/L. In TSD of 6.1 -12 H the range of sodium concentration varies from 121 -165 mEq/L. Between TSD of 12.1 -18H the sodium concentration varies from 120.4 - 158 mEq/L. And in 18.1 – 24 H TSD, the sodium concentration varies between 110 - 151 mEq/L

The distribution of the values of Chloride concentration in VH divided into 4 groups as per TSD. The value of four groups are: In TSD of 0- 6 H, there were 3 cases with Chloride concentration ranging from 106 - 121 mEq/L. In TSD of 6.1 -12 H, 29 cases with the Chloride concentration ranging from 161.8 -121 mEq/L. Between 12.1 -18H, 45 cases, with the Chloride concentration ranging from 76 -136.5 mEq/L. And in 18.1 – 24 H TSD the Chloride concentration is between 89.4 -124 mEq/L.

The distribution of the values of potassium concentration in CSF divided into 4 groups as per TSD. The four groups are: 0- 6 H, 6.1 – 12 H, 12.1 –18 H, and 18.1–24 H. In TSD of 0- 6 H there were 3 cases with the potassium concentration ranging from 22-33.5 mEq/L. In TSD of 6.1 -12 H there were 29 cases with the potassium concentration ranging from 16.9 – 30.5mEq/L. Between 12.1 -18H there were 45 cases with the potassium concentration ranging from 16.5 -35.6 mEq/L. And in 18.1 – 24 H there were 23 cases with potassium concentration ranging between 26.8 to 31.6 mEq/L.

Table No.3: Showing the level of Sodium (mean & range) in CSF depending upon TSD:

S.No.	TSD (hrs)	No. of Cases	Range of Sodium (mEq/L)	Mean (±) SD
1.	0 – 6.0	3	126 – 153	144±15.58
2.	6.1 – 12.0	29	110 – 144	117.89±7.59
3.	12.1 – 18.0	45	107 – 133.1	117.11±17.29
4.	18.1 – 24.0	23	110 – 129.6	117.27±7.27
	TOTAL	100		

The table above shows the distribution of the values of sodium concentration in CSF divided into 4 groups as per TSD. The value in four groups are: In 0-6 H there are 3 cases, with the sodium concentration ranging from 126 – 153 mEq/L. In 6.1 -12 H there are 29 cases, with the sodium concentration varying from 110 -144 mEq/L. Between 12.1 -18H there are 45 cases, with the sodium concentration ranging from 107 - 133.1 mEq/L. And in 18.1 – 24 H, there are 23 cases, the sodium concentration is between 110 – 129.6 mEq/L.

Table No. 4: Showing the level of Chloride (mean & range) in CSF depending upon TSD:

S.No.	TSD (hrs)	No. of Cases	Range of Chloride (mEq/L)	Mean (±) SD
1.	0 – 6.0	3	106 – 127	113±12.12
2.	6.1 – 12.0	29	95 – 119.2	108.74±7.68
3.	12.1 – 18.0	45	94 – 136.4	112.31±11.47
4.	18.1 – 24.0	23	95 – 138	111.84±15.47
	TOTAL	100		

The table above shows the distribution of the values of Chloride concentration in CSF divided into 4 groups as per TSD. The four groups are: 0- 6 H, 6.1 –12 H, 12.1 –18 H, and 18.1–24 H. In 0- 6 H there are 3 cases with the chloride concentration ranging from 106 -127 mEq/L. In 6.1 -12 H there are 29 cases with the chloride concentration ranging from 95 -119.2 mEq/L. Between 12.1 -18H there are 45 cases with the chloride concentration ranging from 94 -136.4 Eq/L. And in 18.1 – 24 H the chloride concentration is between 95 -138 mEq/L

The table below (Table No.5) summarizes my values of electrolytes as per TSD irrespective of the age group and cause of death.

Sl.No	TSD(Hrs)	K+(VH)	Cl-(VH)	K+(CSF)	Cl-(CSF)
1	0- 6	8.2 – 8.3	106 - 121	22 – 33.5	106 - 127
2	6.1 – 12	6.3 – 13.5	61 -123	16.9 -31.0	95 – 119.7
3	12.1 – 18	6.3 – 12.6	75 - 136	16 – 33.0	95 - 138
4	18.1 – 24	7 – 13.5	87.5 -124	28.1 – 23.6	95 - 126

The analysis does not show any significant change in the levels of vitreous and CSF electrolytes in male and female cases. The observation is also authenticated by other workers.Analysis based on age, not show appreciable role in changes in the level of concentration in vitreous humour after death. In this study of assessing time since death using electrolytes from VH and CSF, in over 100 samples, all the value of electrolytes falls in the same range with no obvious difference with change in TSD irrespective of age, gender and cause of death. Hence assessing time since death using electrolytes from VH and CSF is not of much use if accuracy is in need.

Conclusion

The conclusions from the study:

1. The changes in electrolytes (sodium, potassium and chloride) in VH and CSF do not show any significant relation with the sex (male or female) of the individual.
2. The changes in electrolytes (sodium, potassium and chloride) in VH and CSF do not show any significant relation with the age of the individual.
3. The changes in electrolytes (sodium, potassium and chloride) in VH and CSF do not show any significant change with the various cause of death of the individuals.

4. The TSD and value of electrolytes do show any particular relationship in estimating time since death.

Source Of Funding: Self.

Conflict Of Interest: Nil.

Ethical Clearance: Taken from "The Ethical Committee, Thirunelveli Medical College, Thirunelveli."

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Original Research Article

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18895

Pattern of Mortality among Adolescent Suicides in Victoria Hospital Mortuary

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How to cite this article: Ramesh. C, Karen Harshitha, Mahesh. C et. al. Pattern of Mortality among Adolescent Suicides in Victoria Hospital Mortuary. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: Each year approximately 8 lakh people die by suicides worldwide.(1) Suicideamong adolescents warrants special concern for several reasons. Early adolescence and young adulthood display increase in deaths from suicides.(2) It is the second leading cause of death in adolescents in comparison to other age groups. Adolescence and youth are predominant ages during which suicide is attempted.(3) Hence, studies on adolescent suicides potentially presents opportunities to prevent the same, thus saving many lives.

Objectives: To determine pattern of adolescent suicides in terms of socio-demographic parameters, methods, and causes.

Materials & Methods: A Cross sectional study was conducted at the Victoria Hospital Mortuary for 18 months between November 2017 to May 2019. Medicolegal autopsies were performed on the victims of suicidal deaths between the age group of 13-18 years during that period. The cases were then analysed with the information gleaned from the police, family, and the autopsy procedure.

Results: 192 cases belonged to the study age group and 48% (92 cases) of the cases were suicides. Majority of the victims were between 17-18 years of age and belonged to lower middle socio-economic status.Family history of suicide was seen in 1%. Hanging was the commonest method of suicide followed by poisoning and burns. Family conflicts,Love failure, psychiatric disorder, financial problems, exam failure werefew reasonscompelling suicide.

Conclusion: Adolescence is a vulnerable age. Adequate addressal of increasing suicide rates among teenagers is the need of the hour by increasing psycho-social awareness and implementing necessary regulations.

Key Words: Adolescent suicide, Psycho-social profile, Suicide prevention.

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Introduction or Background

Suicide is a leading cause of death across all age groups. Increased rate of suicide can be attributedto social and cultural transformations of societies throughout the world. However, suicides among adolescents warrant particular concern for several reasons. First, the sharpest increase in the number of suicide deaths occurs between early adolescence and young adulthood. [1] Second, suicide ranks higher as a cause of death during adolescence compared to other age group. It is the second leading cause of death in childhood and adolescence. Third, many people who considered or attempted suicide in their life first did so during their adolescence and youth. [2]India has one of the world's highest suicide rates for youth aged 13 to 29 years, according to a 2012 Lancet report.In 2015, the number of student suicides stood at 8,934. In the five years leading to 2015, 39,775 students killed themselves. The number of attempted suicides, many unreported, is likely to be higher. Adolescence is a transitional phase of growth and development between childhood and adulthood. Coping mechanisms are still underdeveloped in this age group when hormones rage but sensibility wanes. Multiple factors such as familial pressures and unrest, academic failure or stress, undetected mental illness, lack of an effective support group or counselling, substance abuse, etc., to name a few compel a teenager to attempt suicide.It is important to add that in 30 to 50 per cent of teen suicide cases, substance abuse is a part of the event itself.South India is considered as the world's suicide capital. Karnatakahas the dubious distinction of holding the 2nd position among states. Bangalore has thehighest rate of suicides among the cities of India.

This study attempts to delve into the intricate patterns of deaths in adolescents due to suicides by analysing the socio-demographic and psychological parameters to identify the high-risk groups and advocate preventive measures.

Material and Methods

The sample for this study was obtained from the autopsies of adolescents between 13-18 years of age at the mortuary of Victoria Hospital between 2018-20. Decomposed, unknown and fragmented bodies were excluded from the sample population. The history obtained from the families, friends and relatives, along with the medical records in some cases were considered. Also, the crime scene details from the concerned police with suicide notes if available were perused in tandem with detailed post-mortemexamination and obtained findings.

Findings

During the study period of 18 months 4724 cases were autopsied out of which 192 cases were in the study age group. Out of 192 cases in the study age group 11.45% (22 cases) were accidental burns; 17.70% (34 cases) were Road traffic accidents; 4.16% (8 cases) were homicides; 11.95% (11 cases) were accidental fall; 4.16% (8 cases) were accidental railway deaths; 2.60% (5 cases) were accidental drowning; 4.16% (8 cases) were accidental electrocution; 2.8% (4 cases) were Natural deaths and majority of the cases i.e., 48% (92 cases) were Suicides.

Table.1: Age distribution.

Age	Frequency	Percent
13-14	14	15.2
15-16	16	17.4
17-18	62	67.4
Total	92	100

67.39% (62 cases) were in the age group of 17-18 years. A study conducted by Department of Forensic Medicine, AIIMS, New Delhi,also showed that out of 222 cases studied, the commonest age group was 15-18 years in both sexes. [3]

Table 2. Age and Gender distribution

Gender	Age			Total
	13-14 years	15-16 years	17-18 years	
Male	7	7	22	36
	19.4%	19.4%	61.1%	39.1%
Female	7	9	40	56
	12.5%	16.1%	71.4%	60.9%
Total	14	16	62	92
	15.2%	17.4%	67.4%	100%

Gender presents a now well-established paradox in which adolescent girls are more likely to have experienced suicidal ideation and suicide attempt than boys, but adolescent boys are more likely to die by suicide. In the present study a greater number of females (60%) committed suicide than males (40%) It is in contrast with a study [4] in which more number of females committed suicide than females.

Table 3. Distribution of Socio-economic Status.

Socio economic status	Frequency	Percent
Upper Middle	2	2.1%
Lower Middle	61	66.3%
Upper Lower	21	22.8%
Lower	8	8.6%
Total	92	100%

In this study, majority of the cases i.e., 66.3% (61 cases) belong to Lower middle class, 22.8% (21 cases) belong to Upper lower class.

Table 4. Distribution of Family History of suicide

Family History of Suicide	Frequency	Percent
Yes	91	98.9
No	1	1.1
Total	92	100

The table represents distribution of family history of suicide in only 1.1% (1 case). Completed suicide and psychiatric illness in relatives are risk factors for suicide, and the effect of family suicide history is independent of the familial cluster of mental disorders. Family history of suicide should be established in the assessment of suicide risk.[5]

Table 5: Distribution of Suicidal methods

Suicidal method	Frequency	Percent
Hanging	57	62
Poison	23	25
Burns	9	9.8
Others*	3	3.3
Total	92	100

In the present study, Hanging is the most preferred method used to commit suicide with 57 cases (62%) out of 92 cases, followed by 23 cases (25%) of poisoning, 9 cases (9.8%) of burns. No death by firearm is reported in this study.

Table 6. Distribution of Cause of suicide in Males and Females

Cause of Suicide	Gender		Total
	Males	Females	
Family Conflicts (FC)	10	13	23
Exam Failure (EF)	6	12	18
Hopelessness/Fear (HO)	6	10	16
Unbearable pain at the time of act (UP)	2	12	14
Love Failure (LF)	1	7	8
Financial Problem (FP)	5	0	5
Bereavement /Death of a loved one (BD)	3	1	4
Mental Illness (MI)	2	0	2
Harassment (HR)	0	1	1
Substance Abuse (SA)	1	0	1
Total	36	56	92

Family conflicts (25%), exam failure (20%), chronic physical pain (15.2%), Love failure (8%), psychiatric disorder (3%), financial problems (6%), dowry harassment (1%), substance abuse (1%) formed the bulk of factors which compelled them to end their lives. Similar findings were reported in the study[6].

Discussion

Adolescence is one of the most stressful periods in development. Adolescents face a host of biological, social, and psychological stressors. Expectations of parents and teachers, peer pressure, interpersonal problems, academic stress, worries about the future, and home environment are some of the stressful issues faced by adolescents. These stressors could lead to mental health problems including adjustment disorder, anxiety, depression, and suicide.

In his article[7] on attempted suicide among students, Venkoba Rao reported that during 10-month period, 35 students had attempted suicide, of which seven proved fatal. The most common mode was insecticide ingestion. There were more male students (19) than female (16), most were aged between the ages of 16 to 30 and majority of them were students of Arts and Sciences. Eight of them had attempted suicide previously. No intellectual sub-normality was reported in the sample.

In another study on the psychosocial and clinical factors associated with adolescent suicidal attempts Kumar, Sudhir et al.[8] compared potential risk factors between adolescent and adult suicide attempters and found that the adolescents had significantly higher levels of depression, hopelessness, lethality of event, and stressful life events. Sharma, et al.[8] in their study on adolescent students found the prevalence of suicide risk behaviour quite high with almost 16% having suicide ideation and 5% having attempted suicide. Females were seen as being more vulnerable. The presence of role models who were seen drinking and smoking was seen as increasing the risk behaviour.

Another consideration is whether other suicides have occurred in the environment. There have been multiple lines of evidence demonstrating time-space clustering of suicides (i.e., point clusters). Studies show that these point clusters are more common among adolescents (e.g., 15–19 years). Some studies demonstrate mass clusters across countries following widely publicized media coverage of suicide.[9]

Relevant to media usage, the field has increasingly explored the potential influence of the Internet, a common source of suicide-related information. In a rare longitudinal study exploring various sources of suicide-related information, online discussion forum usage was shown to increase suicidal ideation over time controlling for prior history of suicidal ideation and depression, as well as exposure to peer influence. [10]

The most frequently studied cognitive process in youth suicide literature is impulsivity, which has received moderate support as a risk factor for suicidal thoughts and behaviours. Trait impulsivity, typically assessed using self-report measures, has been shown to prospectively predict suicidal ideation and suicide attempt among adolescents and young adults.[11]

Conclusion

In a predominantly youth-oriented culture, particularly among the youth of that culture, death is topic easily avoided or denied. It is in this context that the death of a young person rapes our sensibilities, especially when the death is self-imposed.Provisions by the Government under Section 115(A) of Mental Health Care Act 2017, presuming extreme stress goading a person to attempt suicide, shows an awakening and awareness among the policymakers.

Suicide prevention may focus on primary prevention, which involves developing skills or reducing risk factors to prevent people from becoming suicidal. Primary prevention strategies can either focus on an entire population or specific high-risk group such as youth and young adolescents.

Secondary prevention strategies involve interventions with people who are already suicidal or at high risk of suicide. Suicide prevention hotlines and telephone crisis intervention services are regularly available in most developed countries and many less developed parts of the world. These centres vary from “active listening” services, where people can talk about any problem, to more specifically focused suicide prevention organizations that evaluate suicidal risk and urgency in all calls and focus their efforts on helping suicidal persons, friends, and family members of suicidal persons, and sometimes persons bereaved by suicide.

Knowing the warning signs is also critical. Warning signs for those at risk of suicide include: talking about wanting to die, feeling hopeless, having no reason to live, feeling trapped or in unbearable pain, seeking revenge, and being a burden on others; looking for methods and making plans such as searching online or buying a gun; increasing use of alcohol or drugs; acting anxious or agitated; behaving recklessly; sleeping too little or too much; withdrawal or isolation; and displaying rage and extreme mood swings. The risk of suicide is greater if a behaviour is new or has increased and if it seems related to a painful event, loss, or change. Paying attention to warning signs for mental health challenges that can be associated with increased risk for suicide is also important.

Conflict of interest: The authors declare that they have no known conflicting financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Source of Funding- self or other source: The authors declare that no funding or financial aid was taken for the conducting of this study which could influence the work reported.

Ethics Committee: Institutional Ethics Committee, Bangalore Medical College,Bengaluru. Approval Status: Exemption granted for studies involving fully anonymized retrospective data. Approval / Reference Number: BMC/ PG/124/2018-19. Approval Date: 03/11/2018

Consent for Publication: The authors to this manuscript ensure that we qualify as such and warrant that nobody who qualifies for authorship has been excluded. We agree to its submission to this esteemed Journal; and, if accepted, to its publication in this journal. We warrant that this article is original, does not infringe on any copyright or other proprietary right of any third party, is not under consideration by another journal and has not been previously published. Ethical approval has been sought and obtained as necessary and any conflicts of interest or the lack of it stated.

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Case Report

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18896

Autopsy Findings of Endocardial Fibroelastosis in an Adult

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How to cite this article: Razuin R., Nur Amirah MA, Mardiana AA. Autopsy Findings of Endocardial Fibroelastosis in an Adult. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: Endocardial fibroelastosis (EFE) is commonly presented with diffuse endocardial thickening due to deposition of collagen and elastin, usually affecting the left ventricle of the heart. **Case presentation:** A 59-year-old gentleman who had no known medical illness had collapsed while performing house chores at home. Autopsy examination showed cyanosed lips and nail beds. The heart weighed 360 gm with distinct presence of whitish, firm and thickened endocardium of the left ventricle. The anterior descending coronary artery showed an almost complete occlusion by atheroma, in keeping with coronary artery disease. Mild pulmonary oedema was present. Histological examination revealed fibroelastosis forming plaque-like covering of the inner ventricle, with patchy myocardial fibrosis. Numerous 'heart failure' cells were present in the intraalveolar spaces. **Conclusions:** This case showed remarkable autopsy findings of EFE in adult with evidence of congestive heart failure episodes in his lifetime.

Keywords: Endocardial fibroelastosis; Cardiomyopathy; Sudden cardiac death; Autopsy

Background

Endocardial fibroelastosis (EFE) is a rare heart disease which usually presents with diffuse endocardial thickening due to deposition of collagen and elastin, most commonly affecting the left ventricle.[1,2] EFE can be categorized into primary and secondary. Primary EFE refers to an absence of any causative factor, therefore it is hypothesized to be caused by genetic factors, viral infections or transplacental crossing of maternal antibodies.[1,3] Secondary EFE occurs as a result of structural heart diseases, particularly related to the left ventricular outflow tract obstructions.[1] An underlying condition includes congenital cardiac malformation, aortic stenosis, coarctation of the aorta, hypoplastic left heart syndrome and ventricular septal defect.[1,4] This pathology is commonly found in infants and children and its progressive nature usually leads to heart failure and death.[5] EFE in adults is rarely diagnosed and reported. Therefore, we report a case of an adult man who had collapsed and pronounced dead at home, and EFE was diagnosed at autopsy.

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Case Presentation

A 59-year-old male subject was brought to the forensic department for a medico-legal autopsy examination. He was pronounced dead at home by a paramedic who responded to an ambulance call made by his wife, as he collapsed in the living room while performing some house chores. There was minimum history which could be obtained. He was an immigrant with no medical record and no history of illness known to his spouse.

Autopsy examination revealed a male subject, measuring 169 cm in length and 90 kg in weight. Post-mortem changes such as lividity and rigor mortis were present. Slight bluish discolouration of the lips and nail beds was present, indicating cyanosis. Internal examination of the skull and brain showed intact skull with foci of ischaemic infarction. The thoracic cavity was clear of effusion or adhesions. The lungs were relatively heavy, weighing 400 gm and 450 gm on the right and left sides respectively. On cut surfaces, the lungs were slightly firm, however, there was no apparent consolidation seen. Mild pulmonary oedema was present. The heart weighed 360 gm. On cut surfaces, the endocardium of the left ventricle was whitish, firm and distinctly thickened, with some areas appeared almost detached from the myocardium (Fig. 1a). The right ventricle was normal. The coronary arteries showed an almost complete occlusion of the left anterior descending coronary artery located at the proximal third of the vessel, 3.5 cm in length. There was no evidence of acute myocardial infarction seen. Examination of the other internal organs such as the liver, spleen, kidneys, and intestines generally showed congestion, with no gross pathology observed. Representative tissue samples from the heart, lungs and other internal organs were obtained for histology examination.

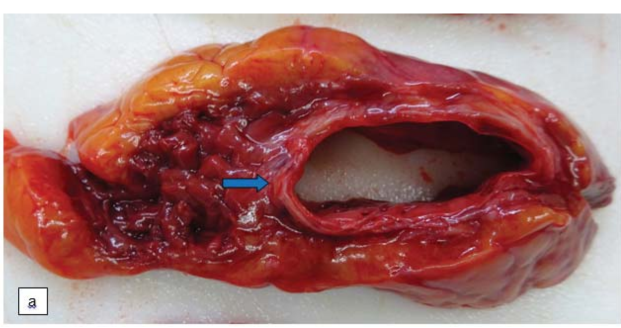
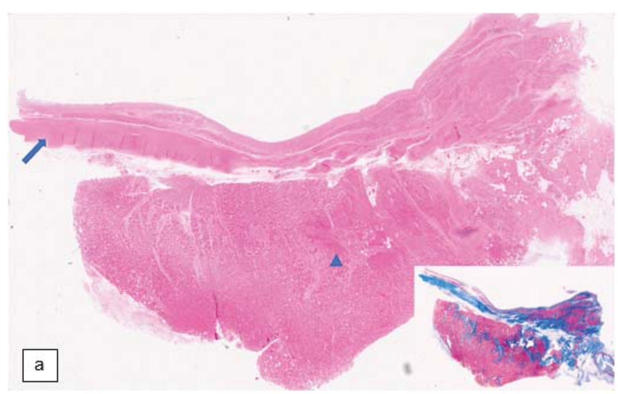


Fig. 1 (a): Cross section of the heart at the mid-ventricular level shows a diffuse thickening of the endocardium of the left ventricle. The fibrotic endocardium appears slightly detached from the myocardium (blue arrow). (b): The apex shows a firm layer of fibrous tissue lining the endocardium of the left ventricle (blue arrow).

Microscopic findings

The endocardial layer was markedly thickened by fibroelastosis, involving the entire left ventricular wall, forming a plaque-like covering of the inner ventricle (Fig. 2a). Patchy myocardial fibrosis is also seen in the subendocardial myocardium, confirmed by Masson Trichrome stain (Fig. 2a, inset). Eosinophils were inconspicuous and there were no microscopic features of an acute myocardial infarction seen. The lungs show vascular congestion with numerous intraalveolar haemosiderin-laden macrophages, consistent with heart failure (Fig. 2b). Representative sections from other organs were non-contributory. In view of the gross autopsy and microscopic findings, the cause of death was concluded as 'coronary artery disease compounded by endocardial fibroelastosis'.



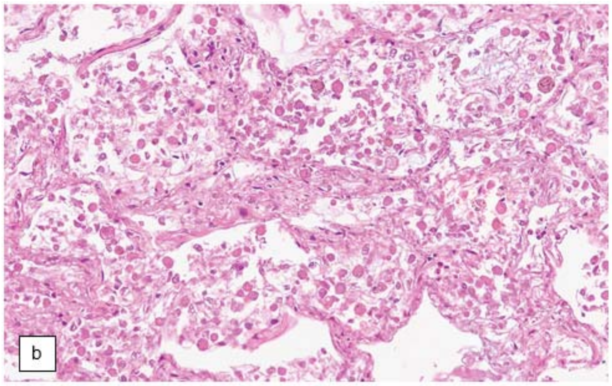


Fig. 2 (a). The endocardial fibrosis forms a plaque-like covering (arrow). The fibrosis merges with the underlying myocardium. Patchy myocardial fibrosis is also seen (arrowhead). H&E and Masson Trichrome (inset). (b) The intraalveolar spaces contain numerous haemosiderin-laden macrophages. H&E 20x.

Discussion

EFE is characterized by a thickened fibrotic or elastic layer in the endocardium, resulting in reduced ventricular distensibility and impaired diastolic filling. EFE may be primary (idiopathic) or secondary to an existing cardiac anomaly causing severe left ventricular outflow tract obstruction such as aortic stenosis or atresia, mitral incompetence, coarctation of aorta and patent ductus arteriosus.[2,6] Primary EFE is often diagnosed in infancy or childhood, with reports illustrating potential associations with foetal hydrops, inherited conditions such as X-linked recessive cardiomyopathy and mutations involving the MYBPC3 gene.[1,5,7] Only rare cases present in adulthood.[2,8,9]

Until now, the diagnosis of EFE is difficult to be established due to its non-specific presenting clinical symptoms and echocardiographic findings.[2] As this disease is more commonly seen in infants, the typical age of diagnosis is 2 to 12 months. Infants in this age group may present with unexplained acute heart failure and cardiogenic shock, which may lead to sudden infant death.[5,6] Similarly, EFE in adults may have presenting symptoms such as cyanosis and progressive dyspnea, indicating congestive heart failure of unknown cause.[6] Sudden death without any apparent clinical symptoms also occurs in adult.[8]

Our case is an example of EFE diagnosed in adulthood, discovered during an autopsy examination. While cases in infancy and childhood tend to present with rapidly progressive clinical course, cases diagnosed in adulthood may have relatively mild symptoms or progress at a slower rate in comparison.[2,10] There were no overt structural cardiac anomalies present in our case to ascribe as a potential cause for secondary EFE. The fact that the deceased was an immigrant in the country, a good medical history and clinical investigations record were impossible to be obtained. Even the actual nature of his final clinical presentations could not be established, therefore, the authors had to rely completely on the macroscopic and microscopic findings at autopsy to hypothesize the possible clinical symptoms the deceased had in his lifetime, attributed by the EFE.

It is plausible that the EFE had contributed to some degree of ventricular dysfunction, which, in concert with severe coronary artery luminal occlusion, resulted in an acute ischaemic event leading to his sudden demise. It is worth to note that patchy myocardial fibrosis which was present throughout the underlying myocardium of the left ventricular wall may be explained by reduced diffusion capacity from the ventricular lumen, as a direct result of the subendocardial thickening. The presence of numerous intraalveolar haemosiderin-laden macrophages ('heart failure' cells) is highly suggestive of past episodes of congestive heart failure, however, there was no sign of acute heart failure discovered at the time of death.

Conclusions

In conclusion, the findings of this case are consistent with EFE, with accompanying patchy myocardial fibrosis. As the heart also showed presence of coronary artery disease, in the absence of gross and microscopic findings of acute myocardial infarction, we hypothesized that a very acute ischaemic event could have been the immediate cause of death. While the EFE certainly did not cause the patient to be in failure at the time of death, the presence of numerous 'heart failure' cells in the lungs were the tell-tale sign that he probably had episodes of congestive heart failure with a fairly good recovery in his lifetime.

Conflict of interest: The authors declare that they have no competing interests.

Funding: Not applicable.

Ethics approval and consent to participate: We seek for waiver of ethical review and approval since the data were not directly indicative of the individual subject, observatory in nature and the research involved no risk to the deceased subject.

Consent for publication: The authors would like to thank the Director General, Ministry of Health Malaysia for the kind permission to publish this manuscript.

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Availability of data and material: All relevant data supporting the conclusions of this article are included within the article.

Competing interests: The authors declare that they have no competing interests.

Funding: Not applicable.

Authors' contributions: RR and NAMA performed the autopsy examination. They were involved in the conceptual design of the study and major contributor in writing the manuscript. MAA performed the histological examination and wrote the relevant part in the Microscopy findings and Discussion section. All authors read and approved the final manuscript.

Acknowledgment: The authors would like to thank the staff of the Department of Forensic Medicine, Hospital Sungai Buloh, and the staff of the Anatomical Pathology Laboratory, UiTM Sungai Buloh for their kind assistance in making this project a success.

List of abbreviations

EFE: Endocardial fibroelastosis

H&E: Hematoxylin and eosin

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18897

Profile of Poisoning in Autopsy cases in Bangalore South: A Ten-Year Retrospective Study

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How to cite this article: Aditya Kidiyoor, Jayprakash. P. Profile of Poisoning in Autopsy cases in Bangalore South: A Ten-Year Retrospective Study. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Poisoning occurs when any substance interferes with normal body functions after it is swallowed, inhaled, injected, or absorbed. In this retrospective study, all cases of fatal poisonings brought for medicolegal autopsy during the period 1st January 2011 to 31st December 2020 were analysed at the Department of Forensic Medicine & Toxicology, RRMCH, Bengaluru. The data obtained was computed and descriptive analysis of baseline characteristics were inferred. In our study, 12.18% of the total cases in the study period were deaths due to poisoning of which the males formed 512 cases (73.14%) and females formed 188 cases (26.86%), the male to female ratio being 2.7 : 1. Most of the cases belonged to the 18-30 years age group. Majority of cases were suicidal in manner. Most common poison was noted to be organophosphorous compound. The majority of hospitalised cases involved consumption of organophosphorous compound forming 23 cases. Most of the hospitalised cases had a survival period of less than 12 hours. The study concluded that males were more commonly involved, and poisoning is seen most commonly among people from the age group of 18-30 years. The most common cause of death being suicidal poisoning by use of organophosphorous compound, and if hospitalised with a survival period of less than 12 hours.

Key words: Retrospective; Poisoning; Organophosphorous; Hospitalised; Manner of Death.

Introduction

A poison is a substance which if introduced into the living body, or brought into contact with any part thereof, will produce ill-health or death, by its constitutional or local effects or both.[(1)] The branch of medicine that deals with the study, diagnosis and treatment of poisons is known as toxicology.[(2)]

Poisoning is a significant global public health problem. According to WHO data, in 2012 an estimated 193,460 people died worldwide from unintentional poisoning. Of these deaths, 84% occurred in low- and middle-income countries. Nearly a million people die each year as a result of suicide, and chemicals account for a significant number of these deaths. For example, it is estimated that deliberate ingestion of pesticides causes 370,000 deaths each year. The number of these deaths can be reduced by limiting the availability of, and access to, highly toxic pesticides.[(3)]

Acute pesticide poisoning is one of the most

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common causes of intentional deaths worldwide.[4] Self-poisoning with pesticides accounts for 14–20% of global suicides, an estimated 110,000–168,000 deaths each year.[5]

The National crime records bureau (NCRB)'s Accidental Deaths and Suicides in India shows that in 2019, there have been 4,12,959 accidental deaths of which 5.1% were due to poisoning. It also shows that 1,39,123 cases of suicide occurred out of which 11,288 case (25.8%) were due to poisoning with a male predominance between the ages of 18-30 years.[6]

As agriculture is major profession in the rural part of India farmers stock the pesticides to eradicate the weeds and pests. Due to easy availability of the pesticides, they are commonly used by the individuals to end their life in stressful situations. [7] Organophosphorous (OP) compounds cause most common suicidal poisoning deaths in southern, central India.[8]

While in northern India, aluminium phosphide causes most suicidal poisoning deaths.[9]

In general, accidental poisoning is more common in young children, whereas suicidal poisoning is more common in young adults.[10]

The exact incidence in India is difficult to estimate as there is a lack of data at the central level. While mortality data are a poor indicator of the total burden on the healthcare system due to poisonings, it is further compounded by absent or wrongful recording of data. The pattern of poisoning varies from region to region depending on the availability of compounds, culture, customs, education, socio-economic status, etc. However, it is vital to glean this information as it directly influences the health need of that regional population and the healthcare manpower and infrastructure planning for dealing with such cases. Often the lacunae in the chain of poisonings are the failure to implement preventive measures. With this in mind, the present study was conducted with the aim to investigate the poisoning trends for the last 10 years in Bangalore South.

Materials and Methods

The study is a ten-year retrospective study conducted at the Department of Forensic Medicine, Rajarajeshwari Medical College during the time period of 1st January 2011 to 31st December 2020. In the study, all cases of fatal poisoning brought for medicolegal autopsy were included. A standard proforma specially designed was used to collect information regarding the age, socio-economic status, manner of poisoning, types of poison, hospitalisation, and survival period.

Standard autopsy protocols were followed and relevant viscera/samples were subjected for chemical analysis. Bodies in advanced stages of decomposition and cases where the chemical analysis report was negative were excluded. Descriptive analysis of baseline characteristics was analysed and then summarised.

Results

In the study period between 2011 to 2020, the total number of cases subjected to autopsy were 5749. Of these, 721 cases were those of suspected poisoning. Furthermore, it was found that 700 (12.18%) cases were confirmed cases of poisonings with positive chemical analysis reports from the regional Forensic Science Laboratory, these cases formed the sample for this study. **(Table no: 1)**

Table 1: Year-wise Incidence of Poisoning Cases

Year	Total Autopsies	Total Confirmed Poisoning Cases	Percentage
2011	484	36	7.4
2012	539	52	9.6
2013	513	72	14.0
2014	573	84	14.6
2015	605	135	22.3

Year	Total Autopsies	Total Confirmed Poisoning Cases	Percentage
2016	627	66	10.5
2017	628	73	11.6
2018	607	59	9.7
2019	659	72	10.9
2020	514	51	10
Total	5749	700	12.18

Out of the 700 cases studied, the two most common age groups were found to be 18-30 years and 30-40 years forming with 371 cases and 213 cases respectively. The least common age group was found to be children forming 8 cases in total. It was also noted that men far outnumber women by a ratio of 2.7 : 1. However, it was noticed that in cases above the age of 50 years there were more female cases (n=19) than male cases(n=14). (Table no: 2)

Table 2: Age and Sex wise distribution of cases

Sl. No.	Age group	Male (n=512)	Female (n=188)	Total
1	<18	5	3	8
2	18-30	276	95	371
3	30-40	154	59	213
4	40-50	58	17	75
5	>50	14	19	33

Table 3: Alleged Manner of Death from History

	Male	Female	Total
Suicide	457	146	603 (86.14%)
Accident	46	37	83 (11.85%)
Homicide	4	1	5 (0.71%)
Unknown	5	4	9 (1.28%)

The most common manner out of the 700 cases was suicidal with 603 cases, the second being accidental poisoning with 83 cases, and homicidal with 5 cases. **(Table no: 3)**

Table 4: Type of Poison/Venom

Type of Poison	Number of Cases
Organophosphorous	359
Organochlorine	181
Aluminium Phosphide	69
Paraquat	28
Carbon Monoxide	19
Cyanide	4
Corrosive	8
Vasmol	14
Paracetamol	4
Benzodiazepine	2
Snake bite	9
Other chemicals/Undetermined	3
Total	700

The most commonly observed poison in cases at autopsy was noted to be Organophosphorous compound with 359 cases, the least common being benzodiazepines with only 2 cases. Only one case in the study had an undetermined result. **(Table no: 4)**

Table 5: Poisons in Hospitalised Cases

Poison	Cases (n=49)
Organophosphorous	23
Organochlorine	10
Snake bite	6
Vasmol	5
Corrosive	3
Paracetamol	1
Amitriptyline	1

Table 6: Survival Period in Poisoning Cases

Survival Period	Cases (n=49)
<12 hours	19
12-24 hours	14
24-48 hours	11
>48 hours	5

Among the 49 cases (0.07%) that were hospitalised before being subjected to autopsy, the most common poison encountered again was organophosphorous compounds and organochlorine compounds with 23 cases and 10 cases, respectively. **(Table no: 5)** The most frequent survival period noted was <12 hours, and 12-24 hours with 19 cases and 14 cases respectively. Survival periods tapering in a downward progression from beyond 24 hours. **(Table no: 6)**

Discussion

Poisoning is the most common among people from the age group of 21-30 years and then progressively declines as the age groups progress according to a study done by Celine et al.[11]

Gender-wise distribution had males outnumbering females, 512 cases (73.14%) to 188 cases (26.85%). In another study it was noted that there was a male to female ratio of 3:1.[12]

Similar male predominance of cases was noted in the study done by Kiran N et al where it was seen that out of 148 cases, males formed 93 cases and females formed 55 cases.[13] However, in another study it was noted that there were more females (52.3%) than males (47.7%). [14]

Most common manner of death was found to be suicidal in 86.14% of cases, accidental in 83, and unknown in 9 cases (1.28%). In all the manners, males were more predominantly involved than females. The unknown cases had no suicide notes, history of self-harm, no history of mental illness or self-harm, as per the families.

This is in agreement with the study done in North Karnataka, where it was seen that among 229 cases, suicidal was the manner in 78% cases, accidental was the manner in 21% of cases. [15]

It is also in agreement with the study done in RIMS, Ranchi wherein it was observed that 180 cases were due to suicidal self-harm, in which men showed a predominance. [16]

Further similarity was noted in the 5-year study done in Gulburga by Gunnar, Prakash, and KSN Reddy, where it was seen that out of 900 (97.5%) cases were suicidal in manner and 23 (2.5%) were accidental in manner, and the suicidal cases were more than the accidental cases in both the sexes. [17]

Among the various compounds, it was noted that organophosphorous composed more than half the cases of poisoning with 359 cases (51.28%), followed by organochlorine 181 cases (25.85%) and aluminium phosphide 69 cases (9.8%). The least common poison in use was Benzodiazepines with 2 cases.

In a study conducted at AIIMS, New Delhi, it was noted that out of a total of 726 poisoning cases insecticides formed a major component (12.80%) of the poisoning cases, further it was observed that carbamate (47) formed the maximum group followed by organophosphorous (43) and organochlorine compounds. [10] A study done in North Karnataka it was noted that out of 229 cases of fatal poisoning, The commonest poison encountered was the Organophosphorous compounds in 128 cases (73.14%) and benzodiazepine forming 16 cases (9.14%). [15]

Gupta et al observed that organophosphorous poisoning constitutes a majority of total cases in North Bangalore, accounting for about 49%.

In a study done by Kiran N et al, at St. Martha's Hospital, Bangalore it was observed that out of 148 cases, the common insecticides used for poisoning were organophosphorous compounds with 89 cases (60.14%). 17 cases were reported for corrosive substance poisoning followed by rodenticides and petroleum products. Eight cases of barbiturate poisoning were reported.[13]

Many studies have shown that deliberate self-poisoning has a far higher mortality than accidental poisoning.[18]

The use of a poisonous compound is determined by several factors including its easy availability in the market, price, and popularity among the masses and appropriate laws concerning the poisonous agent.[19]

Other compounds comprised of one case of each of beta-blocker overdose, hydrogen sulphide, and amitriptyline overdose. Vasmol (Super Vasmol-33 Keshkala hair dye) poisoning comprised 14 cases of the total number, which is an emerging poison in the tropical states. A retrospective study conducted over

3.5 years (January 2006-July 2009) of 13 consecutive patients with Super-Vasmol poisoning admitted to a tertiary care, referral hospital in South India showed that 8 cases (61.53%) were discharged with complete recovery.[20]

It appears that Organophosphorus poisoning constitutes a majority of cases because of easy availability, low cost, unregulated sale, and its presence in majority of households in this region. Pesticide poisoning being a major public health problem in the developing world.[21]

It was also observed in our study that 49 cases out of 700, were hospitalised. Poisonings that were hospitalised were noted to be organophosphorous most commonly. This could be attributed to the location of the centre being situated near agricultural lands. The least common were noted to be other chemicals like amitriptyline and paracetamol, both of which were suicidal in manner and were brought for treatment upon being found unconscious at their respective homes. The survival periods of these cases had most deaths occurring within the first 12 hours, with only 5 cases surviving beyond 48 hours. This is similar to a study done in Melmaruvathur in which it was observed that out of 106 cases, 49% (n=52) of cases, had a survival period of less than 24 hours.[22]

Conclusions

The present study was conducted in Rajarajeswari Medical college over a period of 10 years, and it was found that the male to female ratio was 2.7 : 1, with the maximum cases seen in the age group of 18-30 years. Organophosphorous compound is the most commonly used poison, along with organochlorine compounds. Suicidal manner was most common with 86.14%, followed by accidental 11.85%. Most of the hospitalised cases showed a survival period of less than 24 hours.

The need for prompt and accurate diagnosis of poisoning in patients is a growing demand. Poison detection centres, poison information centres, and poison control centres are still not a reality to most regions of India. This contributes to a lack of immediate diagnosis and relevant management, which in turn causes an inability to provide quality treatment.

To tackle this, certifications in toxicology and basic emergency skills could prove to be valuable, however, curbing the easy access to toxic substances is where prevention begins.

Ethics Committee approval: Not required

Funding: Nil

Conflict of Interest: None

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18898

A Group of Iraqi Patients with type II Diabetes Mellitus have a Correlation between HbA1c, lipids, and Thyroid Hormone

Editor's Note: This article has been retracted as of January 2026 as it is out of scope

ormone. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: The objectives of this study were to: (1) find out the levels of thyroid hormones, lipid profile, and glycosylated hemoglobin (HbA1c) in diabetic patients type II; and (2) examine the relationship between thyroid hormones and HbA1c, as well as distinctive sorts of lipids and HbA1c in the patient groups.

Materials and Methods: A retrospective chart review study for the group of patient's vs control was carried out at Al-Yarmouk Teaching Hospital in Baghdad Al-Karkh, Iraq. From December 2020 to February 2022, 100 male and female patients with type II diabetes mellitus and 100 non- diabetic males and females as controls were included, respectively, in this study. The biochemical laboratory tests were obtained from a laboratory database of the hospital. Statistical analysis was performed using SPSS version 21 to estimate the P-value from the T-test of independent groups.

Results: For the patient groups compared with the control groups, there was an increase in the mean levels of both HbA1c (7.84%) and TSH (7.65 µlU/ml), while T4 (10.31 µg/dl) and T3 (1.44 ng/ml) were normal. It also increased mean levels of triglycerides (191.46 mg/dl) and normal total cholesterol (185.94 mg/dl). The results of the patient groups showed an insignificant correlation between HbA1c and TSH ($P = 0.96844$) and a significant correlation between HbA1c with T4 and T3 ($P = 0.00323$) and ($P = 0.00001$) respectively. Significant and positive relationship between HbA1c and total cholesterol and triglycerides ($P = 0.00001$), ($P = 0.00001$) respectively.

Conclusion: Increased blood glucose did not cause the anterior pituitary gland to enhance TSH production, although there was a clear link between increased glycemic index and the rate of thyroxin secretion. Furthermore, there is a link between blood glucose and several lipid markers, according to the findings.

Key words: Correlation, HbA1c, thyroid hormones, and cholesterol and triglycerides

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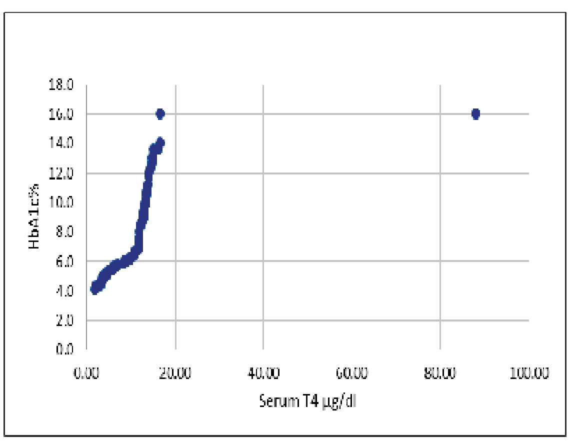
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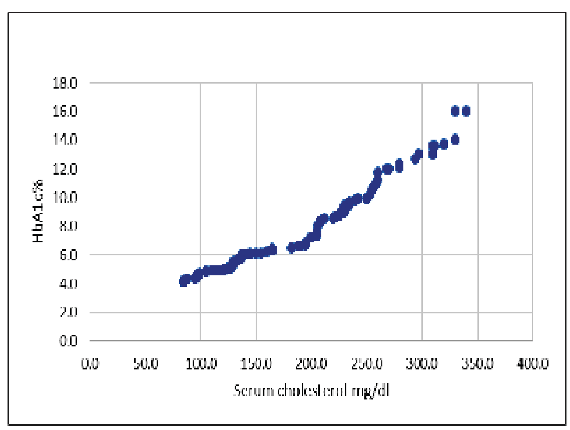
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Serum cholesterol mg/dl
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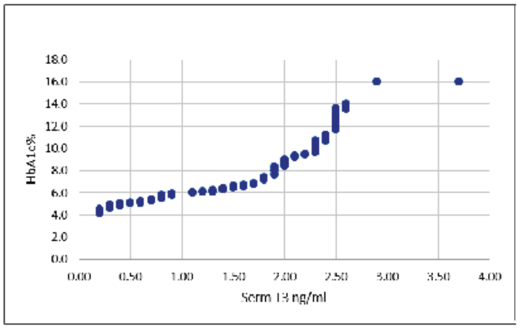
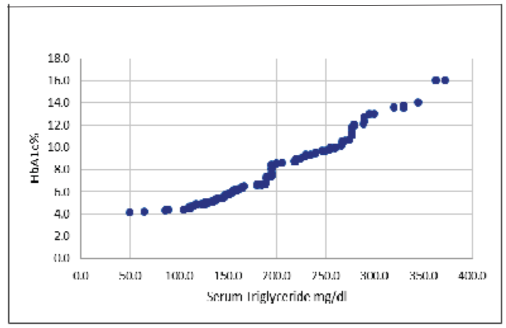

HbA1c%
Serm T3 ng/ml


HbA1c%
Serum Triglyceride mg/dl

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18899

Proteomic Approaches *vis-a-vis* Forensic Evidence Analysis: Forensic Proteomics a Valuable Tool

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How to cite this article: Ajay Kumar Gautam, Vijay Yadav, Anurag Sharma et. al. Proteomic Approaches *vis-a-vis* Forensic Evidence Analysis: Forensic Proteomics a Valuable Tool. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Proteomics is a valuable tool for identifying biological systems because it allows researchers to study all the proteins in an organism or system on a large scale. Advanced proteomic techniques can be used in the forensic field as a confirmatory and complementary approach to well-designed genomic analysis. When nucleic acids are missing or destroyed at the crime scene, it is particularly beneficial for efficient and reproducible peptide and protein analysis, identification, and characterization in a variety of biological and non-biological contexts. In forensic sciences, this could help identify new biomarkers. Unlike DNA markers, protein markers prevent sample contamination while giving quantifiable and highly reliable data that can be evaluated employing databases. They are used in forensics to identify body fluids, ethnic groups, genders, and individuals, and to estimate post-mortem intervals from decomposition fluid, bone and muscle samples. Our current review focuses on a wide spectrum of human samples used in forensic proteomics, as well as recent research achievements. This review is for forensic investigators who want to learn and explore more about proteomics and how to get more information from biological evidence.

Keywords: Proteomics, Forensic, serology, body fluid, evidence.

Introduction

Forensic proteomics is still in its early phases of development. It has been utilized in forensics for tissue and body fluid identification, protein toxin identification and quantification, human individualization, detection of protein pharmaceuticals and hormones in sports, and post-mortem interval estimate. Forensic proteomics is still in its early phases of development. It has been utilized in forensics for tissue and body fluid identification, protein toxin identification and quantification, human individualization, detection of protein pharmaceuticals and hormones in sports, and post-mortem interval estimate. A crime scene is a

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location where the crime is believed to have occurred. At the scientific level, the investigator must learn to recognize, identify, secure, and collect physical evidence.[1]

Protein can thus be used to identify the source of a sample's tissue or bodily fluid, a fundamental forensic context that is still used today. Protein molecules also have genetic information in the form of polymorphisms in amino acids. However, the protein molecules can explore vast information regarding forensic samples, even though it is extremely complex.[4] Some of this information may be important to investigators because it provides context regarding the origin of the material from the donor tissue. Proteomic advances, for the most part, mass spectrometry, have had a considerable impact on the life sciences, and they comprise the potential for forensic investigations as well. The impact of these proteomic opportunities on forensic practice is an open topic that will be explored in the future. Our current review focuses on a wide spectrum of human samples used in forensic proteomics, as well as recent research achievements[2].

Fig. 1: Various type of samples for Forensic Proteomics analysis.

Advancements in proteomics

Genes encode proteins, which are complex molecules that catalyze activities, transmit information, and build three-dimensional cellular support structures that are structured spatially and temporally. The goal of several of the early proteomic research was to link individual proteins to biological processes. Even though this effort was successful, it is essential to mention that proteins do not always have a specific task or role in physiology and one of the major challenges of proteomics is identifying the various cellular functions and roles of proteins in cells. Proteomics has advanced to the point that it can now identify post-translational changes in proteins, protein-protein interactions, and protein locations inside cells. Recent proteomic investigations aim to discover protein structures or folding on a large scale and in vivo. Advances in cryogenic electron microscopy (cryo-EM) have resulted in a massive rise in the number of challenging protein structures identified. However, because most of these studies have been conducted in vitro, it is critical to evaluate how these structures relate to those seen in cells. Mass spectrometry (MS) has been used successfully to analyze native proteins and native protein complexes, and it is currently being utilized to research whole cells in an attempt to determine the state of folding of proteins within whole proteomes.[3] New instruments and approaches are required to enhance the acquisition of proteomic information.

Proteomics of Forensic Samples

Proteomics is an effective method to know more information about biological systems. Recent advances in LC-MS /MS have made it possible to analyze peptides and proteins in samples in a time frame similar to next-generation sequencing (NGS). Proteomics can save time and money when compared to immunological procedures that need antibodies and polymerase chain reaction (PCR) with particular primers. In a single experiment, proteomics methods allow the exact identification of a particular protein.[4]

The first technique is to analyze the effectiveness of the peptide matching procedure in shotgun proteomics datasets internally and statistically. The second way of validation is to compare the reported peptide masses and mass spectra to approved standards using an assigned peptide sequence. Finally, standard peptides can be used to compare spectra of known peptides with spectra of peptides found in a sample.[5]

Proteomic genotyping

Proteomic genotyping explains the finding of genetically variant peptides (GVPs) containing Single amino acid polymorphisms (SAPs) along with corresponding single nucleotide polymorphisms (SNP) alleles in the genome of the sample donor. It has been confirmed in the literature that GVPs can accurately identify nearly 500 non-synonymous SNP alleles. Proteomic genotyping is useful for forensic investigators in contexts where obtaining DNA-based information is complicated.[6]

Instrumental analysis of proteins

Proteomics is an effective method for exploring biological systems. Recent advancements in LC-MS/MS have made it possible to analyze peptides and proteins in samples quickly, in a manner comparable to next-generation sequencing (NGS). The expansion of proteomics including liquid chromatography-tandem mass spectrometry (LC-MS/MS) to analyze peptides and proteins in samples in a time frame comparable to next-generation sequencing (NGS).[7]

Forensic serology

Forensic serology classifies biological fluids of forensic interest (such as semen, urine, breast milk, blood, saliva, vomit, and vaginal/menstrual fluid) recovered in connection with a crime scene (Table 1).

Sample types	Proteomic methods	Biomarkers	Applications	References
Blood	Liquid chromatography-tandem mass spectrometry (LC-MS/MS)	Phospholipase A2	Identified snake venom	8
Bone	Liquid chromatography-tandem mass spectrometry (LC-MS/MS)	Collagen alpha-1(III) chain, decorin, olfactomedin-like protein 3 (OLFL3)	Accurate post mortem interval (PMI) and age-at-death (AAD)	9
Skin	Liquid chromatography-tandem mass spectrometry (LC-MS/MS)	Genetically variable peptides (GVPs)	Human identification.	10
Blood	Capillary reversed-phase liquid chromatography MS/MS	Apolipoprotein A1 (ApoA1) and α-1 antitrypsin	Diagnosis of drowning	11
Hairs	Liquid Chromatography-Tandem Mass Spectrometry	Genetically variant peptides (GVPs)	Protein-based human identification	12
	High-Resolution Tandem Mass Spectrometry	Genetically variant peptides (GVPs).	Protein-based human identification	13

Sample types	Proteomic methods	Biomarkers	Applications	References
Tissue	Western Blotting	Fosl1 protein	Wound age estimation	14
Saliva	Phadebas Paper	α-amylase	Identification of saliva	15
Urine	Liquid chromatography-tandem mass spectrometry (LC-MS/MS)	Osteopontin and Tamm-Horsfall protein (THP)	Identification of body fluids	16
Sweat	Liquid chromatography-tandem mass spectrometry (LC-MS/MS)	Dermcidin	Identification of body fluids	16

Table 1. Proteomic techniques used to identify biological markers in forensic human samples.

Proteomic analysis of blood/body fluids

Blood plays an important role in the analysis of available components in the blood, it is the most important body fluid among others because it is one of the most important indicators of a violent incident and is difficult to remove from the scene of a crime. Every biological body fluid serves a unique purpose, the composition and concentration of proteins present in each fluid are also unique. Swanson et al. devised a thorough screening approach for forensic toxicological analysis utilizing mass spectrometry and enzyme-linked immunosorbent assay (ELISA) in a recent study. In this comparative investigation, a method for recognizing drugs was devised using postmortem blood samples with minimal sample preparation consisting only of protein precipitation. For forensic specimen analysis, the LC/MS-MS approach performed as well as or better than the other methods.[17]

In contrast, studies using mass spectrometry to identify proteins in menstrual blood have identified several different markers, including orexin-A (OREX) and the semaphorin receptor (PLXA1, D1), involved in cord vascular tissue formation and extracellular matrix adhesion, respectively. Kennedy et al. developed a proteomics method based on MALDI MS for reliable detection of blood, differentiation of human and animal blood, determination of animal blood species, and identification of sperm.[18] Based on the success of forensic proteomics, peptidomics can be used to identify potential. peptide biomarkers in these fluids and also has a wide range of applications in forensic science. Peptide mapping software such as SWPepNovo and Peptigram has been developed. Peptide biomarkers in seminal fluid corresponding to known seminal protein biomarkers have also been identified, including prostate-specific antigen, semenogelin I and II, and prostate acid phosphatase.[19]

Hair Proteome

Hair shafts are common at almost all crime scenes but are underutilized forensically. Keratinization of epidermal keratinocytes leads to their formation. The strong hair tissue is due to extensive isopeptide and disulfide cross-linking, which effectively transforms the hair shaft into a single protein molecule. In a recent study, it was found that keratin peptides in human hair can be used to determine the gender (using keratin peptides K81, K83, and K86 of type II peptides) and ethnicity (using type I and type II keratin K33b, K81, K83, and K86 peptides).[20]

Bone Proteome

The extracellular matrix contains bone proteins, most of which are collagen proteins (90 percent). Due to their interconnected structure and the protection provided by the bone matrix, bone collagens are extremely stable. Prieto-Bonete et al. employed proteome analysis to identify 32 proteins that might distinguish between postmortem intervals of different time intervals in 40 femur bones from 40 different cadavers.[21] Notably, the muscle protein fructose bisphosphate aldolase A (ALDOA) decreased in abundance as PMI increased, whereas the proteins peptidylprolyl cis-trans isomerase (PPIA) and coagulation factor VII (F7A) might be used as biomarkers to differentiate samples from terrestrial and aquatic environments.[22]

Muscles

The degradation of skeletal muscle proteins can be used to estimate Mid-PMI (approximately 24–120 h PMI) by using gel electrophoresis, Western blotting, and casein zymography. Choi et al. recently used proteomic profiling to examine global alterations in rat and mouse skeletal muscle proteomes at 0, 24, 48, 72, and 96 hours after PMI, and found two proteins, elongation factor 1alpha 2 (eEF1A2) and glyceraldehyde3phosphate dehydrogenase (GAPDH). These proteins were found to be viable for PMI estimation in human autopsy cases, as confirmed by traditional Western blot experiments.[23]

Fingernail

A study has reported the detection of cornulin (a protein biomarker for vaginal fluid) up to 5 h and hemoglobin (a protein biomarker for blood) up to 18 h post-deposition in fingernails.[24]

Protein markers for species identification

In forensic scenarios, identifying the originating species of biological evidence is required as part of the standard criminal investigation. Proteins contain phylogenetic information as well as information about genetic variation in human populations. Baniasad et al. recently studied how forensic evidence could be used in protein-based human genetically variable peptides (GVP) analysis in the future to help in-person identification. A reliable protein extraction (RapiGest) and digestion (trypsin enzymatic digestion) approach for skin proteins are critical for downstream GVP analysis and the advancement of this technology may improve the analysis of forensic queries.[25]

Challenges and Future of Forensic Proteomics

In the future of Forensic Science, Proteomics will play an important role. Various studies have reported potential applications of proteomics in forensic sciences. However, forensic proteomics may face several difficulties. Less amount of samples is generally encountered by forensic scientists. So less abundant proteins are difficult to analyze in these types of cases. A standard operating protocol (SOP) should be regulated by investigation agencies. So, the collection, and preservation of evidence will be performed appropriately. In the scenario of Proteomics many standard protocols, regulations, etc have already been applied. This is the need of the hour that these regulations, SOPs should also be applied in the field of Forensic Science. Proteomics attracted forensic scientists for the answers to several questions which remained unsolved. Forensic Proteomics is highly beneficial for those problems which were unsolved by the DNA profiling technique.

Conclusion

This article has discussed the role of proteomics in the context of forensic evidence analysis. Proteomics techniques have been used to discriminate between different body fluids and tissues in the context of unidentified forensic biological samples, as well as to identify unfamiliar proteins and species. The protein population in a biological sample is large and complicated, with chemical, biological, and genetic features that are relevant to the investigator. Advances in cryogenic electron microscopy (cryo-EM), LC-MS/MS, and Next-generation sequencing (NGS) play important roles in protein identification. One of the most problematic aspects of forensic proteomics is that trace evidence samples can be quite small, making sample preparation difficult. Low-abundance proteins cannot be recognized when the sample amount is very little. Bottom-up proteomics, on the other hand, has been developed to allow the analysis of modest sample amounts. The ability to analyze the protein composition of evidence more efficiently and effectively gives the potential for those looking to extract as much information as possible from a crime scene.

Ethical Clearance - No ethical clearance required.

Source of Funding - Self

Conflict of Interest - Nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18900

Retrospective Chart Analysis of Sexual Assault Victims Referred to Psychiatry OPD

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How to cite this article: Ajita Nayak, Ritika Behera, Sagar Karia et. al. Retrospective Chart Analysis of Sexual Assault Victims Referred to Psychiatry OPD. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: Sexual assault is a traumatic experience and can lead to various physical and psychiatric health issues. The victims of sexual assault have to live with the long-lasting implications of mental health problems. This study aimed to assess the prevalence of psychiatric disorders in people with a past history of sexual assault referred to outpatient department of a tertiary healthcare facility in urban India.

Methods: A retrospective chart review was carried out by analyzing clinical records of the patients with a past history of sexual assault who were referred to the Psychiatry OPD of our hospital from January 2021 to December 2021. For analysis, demographic data like age, sex, employment status, and marital status and phenomenological data like type of sexual assault, frequency of assault, frequency of assault leading to pregnancy, and psychiatric illness were collected.

Results: The study included 33 patients with a past history of sexual assault, out of which 30 were females and 3 males. It was found that 7 patients were diagnosed with Major Depressive Disorder and 2 had Intellectual Disability. Furthermore, 4 patients were diagnosed as having Attention deficit hyperactive disorder, Anxiety disorder, Post traumatic stress disorder, and adjustment disorder with depressed mood each.

Conclusion: Almost 40% of patients with history of sexual assault had some or the other psychiatric disorders. So, its important to follow up these patients to diagnose early and intervene at right time.

Key words: sexual assault, psychiatric health problems

Introduction

Sexual assault or sexual violence is defined as a physical assault of a sexual nature against another human without their consent.[1] Sexual assault is a heinous crime and can happen in many forms. For ease of understanding, we can categorize it into contact and non-contact assault. Non-contact sexual assault is unwanted sexual experiences that do not involve touch or penetration, like taking a photo or recording a video of someone naked, showing them

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pornography, or masturbating in front of them all without their consent. On the other hand, contact sexual assault is unwanted sexual experiences that do involve touch or penetration. It includes unwanted touching, peno-oral intercourse, peno-vaginal intercourse, and consensual intercourse when the consent has been obtained by threatening the victim or their loved one.[2]

The prevalence of sexual assault cases in India has been showing an increasing trend, despite the gross under-reporting of such cases. There has been an increase in rape-related crimes from 2001 to 2018, going from 11.6 in 2001 to 19.8 in 2018 per 100,000 women and girls. From 2001 to 2018, more than 1.5 million sexual assault cases were reported in India. Out of this, 28.1% were cases of rape accounting for about 0.45 million cases in total between 2001-2018. There has been a significant increase of 58.7% in the number of reported rape crimes from 2001-2018 as per the data published on the National Crime Records Bureau website.[3]

Sex-related offenses can be perpetrated by anyone against anyone irrespective of gender, employment status, marital status, race, ethnicity, etc., and are reported in every society. These kinds of assaults have a serious impact on both the mental as well as physical health of the victims. While the physical health problems range from sexually transmitted diseases to local tissue damage due to the forceful nature of the act, the mental health issues include depression, post-traumatic stress disorder, and anxiety disorder to name a few. Sexual violence can be a life-changing event for the victim potentially destroying their social well-being due to the stigmatization of such topics, especially in India.[4]

We now turn our focus entirely toward the mental health issues that victims of sexual abuse might suffer from. Many recent meta-analyses have pointed to the increased prevalence of depression, anxiety, stressor, trauma-related disorders, substance use or dependence, obsessive-compulsive disorder, and suicidality in sexual abuse victims. Post-traumatic stress disorder and suicidality were the two major psychiatric issues seen strongly associated with sexual violence. It has also been found that victims of rape have worse as well as longer duration of PTSD symptoms post-assault as compared to other PTSD sufferers with different kinds of trauma. Depression and anxiety disorders, including agoraphobia and social anxiety disorder are the comorbid psychiatric disorders frequently associated with rape.[5-8]

When it comes to sexual assault, we have to understand that both physical and mental health is at stake. We need to be able to look out for and identify the physical and psychiatric issues as early as possible in order to adequately treat them and offer support to the victims of sexual abuse. With an aim to study the prevalence of psychiatric health issues in victims of sexual assault post-trauma, we took this study.

Materials and Methods

A retrospective chart review was carried out by analyzing clinical records of the patients with a past history of sexual assault who were referred to the outpatient department of the Psychiatry department of a tertiary health care center in Mumbai from January 2021 to December 2021. The analysis was done using Microsoft Excel Sheets version 2010. The patients were evaluated thoroughly by 2 psychiatrists in order to assess their psychiatric health issues and arrive at their diagnoses. The study was approved in the departmental review meeting. For analysis, demographic data like age, sex, employment status, and marital status and phenomenological data like type of sexual assault, frequency of assault, frequency of assault leading to pregnancy, and psychiatric illness were collected.

Results

The study included 33 patients with a past history of sexual assault. Table 1 describes the demographic details of study population. Table 2 shows peno-vaginal intercourse had the maximum frequency in our study population, followed by consensual intercourse, inappropriate touching, and recording naked videos/photos in that order. Other less frequent forms of sexual assault included being shown pornography, peno-oral intercourse, undressing with genital touching, and inserting a finger in the vagina. Amongst our participants, more than half of them had been sexually assaulted more than once with 13 patients being assaulted more than thrice. There were 4 patients who became pregnant as a result of the sexual assault while the rest 29 did not. Depression was seen in 21% of patients.

Table 1: Demographic details of study population:

Parameter (N = 33)		Mean ± S.D./ Frequency (%)
Age in Years		17.15 ± 9.79 (4 -50)
Education in Years		7.09 ± 4.34 (0 - 15)
Gender	Male	3 (9.1%)
	Female	30 (90.9%)
Employment	Employed	2 (6.1%)
	Unemployed	13 (39.4%)
	Student	18 (54.5%)
Marital Status	Married	3 (9.1%)
	Unmarried	29 (87.9%)
	Divorced	1 (3.0%)

Table 2: Phenomenological details of sexual assault and psychiatric illness:

Parameter (N = 33)		Frequency (%) Overlapping Data
Type of Sexual Assault	Peno- vaginal intercourse	16 (48.48%)
	Consensual Intercourse	6 (18.18%)
	Inappropriate Touching	4 (12.12%)
	Clicked photo/Video shoot naked	4 (12.12%)
	Showed pornography	2 (6.06%)
	Peno-oral intercourse	2 (6.06%)
	Undressing with genital touching	2 (6.06%)
	Inserting finger in Vagina	1 (3.03%)
Frequency of assault	Once	15 (45.45%)
	Twice	3 (9.09%)
	Thrice	2 (6.06%)
	Multiple times	13 (39.39%)
Did patient get pregnant due to assault	Yes	4 (12.12%)
	No	29 (87.87%)
Comorbid Psychiatric Illness	Major Depressive Disorder	7 (21.21%)
	ADHD	1 (3.03%)
	Intellectual Disability	2 (6.06%)
	Anxiety Disorder	1 (3.03%)
	PTSD	1 (3.03%)
	Adjustment disorder with depressed mood	1 (3.03%)
	None	20 (60.6%)

Discussion

The present chart review examined the prevalence of psychiatric health issues in victims of sexual assault referred to the Psychiatry OPD of our hospital in the last year. Based on our analysis, less than half of the study population suffered from a psychiatric illness post-sexual assault. The rest were not diagnosed with any mental health problems. Out of the 13 patients with psychiatric health issues, most were diagnosed with major depressive disorder. Two patients were diagnosed with intellectual disability and there was one patient each with the diagnosis of attention deficit hyperactive disorder, post-traumatic stress disorder, anxiety disorder, and adjustment disorder with depressed mood.

We can infer from this retrospective chart review that amongst the patients with a past history of sexual assault diagnosed with a mental health problem, major depressive disorder is the most frequent diagnosis. The second most common diagnosis is that of intellectual disability. While PTSD, ADHD, anxiety disorder, and adjustment disorder with depressed mood is the less common diagnoses with a prevalence of about 3% each. Whereas the prevalence of no psychiatric issue was the highest at around 60%. However, the results of a similar retrospective chart review by Bijjal et al. were slightly different. According to their analysis, less than half of the sexual assault victims did not suffer from any mental health problems. Out of those who did, the highest prevalence was that of adjustment disorder, followed by dysthymia, depression, obsessive-compulsive disorder, and psychosis. [9]

The meta-analytic review done by Dworkin et al. in 2017 pointed to the increased prevalence of post-traumatic stress disorder, acute stress disorder, adjustment disorder, depression, anxiety, bipolar disorder, eating disorders, suicidality, substance abuse/ dependence, and obsessive-compulsive disorders in victims of sexual assault. This is in accordance with the results of our retrospective chart review. In our chart review, amongst the patients who suffered from a mental health condition, the prevalence of major depressive disorder was the highest. Other prevalent mental health conditions included PTSD, anxiety disorder, and adjustment disorder with depressed mood. [10]

Furthermore, according to published data, adults diagnosed with ADHD in childhood are more likely to report being victims of sexual assault as compared to adults without ADHD histories. [11] As per another meta-analysis, it was found that individuals with intellectual disabilities are more likely to experience sexual abuse and less likely to report it as compared to individuals with average or above IQ. [12]

Our study found that the prevalence of ADHD and intellectual disability in victims of sexual assault was 3% and 6% respectively. Due to limitations of the study design, it could not be sufficiently established whether the mental health conditions were a result of sexual assault or a risk factor or neither.

The problem of sexual assault is a grave one. The health implications on those exposed to this kind of trauma can be drastic and long-lasting. We need to better understand these complications and create stricter laws to prevent such crimes.

Our retrospective chart review aids in improving our understanding of the psychiatric implications of sexual violence. Sexual assault victims are at an increased risk of suffering from mental health problems, therefore, a thorough evaluation of their mental health is of paramount importance to identify illnesses early on and treat them. We understand that when patients present with trauma and stress-related disorders, mood disorders, adjustment disorders, or some other psychiatric disorder we need to ask them about any past trauma, including sexual assault.

It is our duty as doctors to provide adequate and complete therapy that addresses the range of symptoms survivors may experience. Cognitive behavioral therapy along with approved drugs can help mitigate the negative mental health outcomes and allow victims to heal over time from their trauma. For example, trauma-focused CBT has shown good outcomes in patients suffering from PTSD.

Sexual violence has lasting impacts on the lives of the people involved and their loved ones. We as a society need to deploy strategies and plans through multi-sectoral collaboration to deal with the ever-growing problem of sexual assault. We need to start by creating awareness and by dispelling common myths and misconceptions surrounding the issue. This can be done by involving community partners like leaders, healthcare providers, teachers, etc. who can influence people in the right direction with the help of campaigns and awareness programs. The introduction of sex education in schools will enlighten young adolescents and teenagers to understand consent and its significance. Thus, it is imperative that we use evidence-based data regarding risk factors of sexual assault and devise ways to safeguard the high-risk groups. Only by involving several groups of society can we begin to reduce the burden of sexual assault.

Conclusion

In the present retrospective chart analysis, it was revealed that major depressive disorder has the maximum prevalence amongst patients who suffered from a psychiatric health condition with a past history of sexual assault. After MDD, the most common diagnosis was that of intellectual disability, followed by an equal prevalence of PTSD, ADHD, adjustment disorder with depressed mood, and anxiety disorder. It was found, however, that more than half of the study participants did not suffer from any mental health condition. Our study population included all patients of sexual assault who have been referred to the psychiatry OPD in last year, so these findings cannot be extrapolated to general population.

Acknowledgements: Nil

Conflict of Interest: Nil

Funding: Nil

Ethical Clerance: Study approved by departmental review meeting.

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18901

Prevalence of Injury in Elderly Patients in Dr. Soeradji Tirtonegoro Hospital

Editor's Note: This article has been retracted as of January 2026 as it is out of scope

Beta Ahlam Gizela[1], Ahnav Bil Auvaq[2], Nurholis Majid[2]

Abstract

Background: Health and quality of life problems in elderly are one of the problems that should be addressed in order to improve overall health expectancy. Elderly injury risk factors in Dr. Soeradji Tirtonegoro Hospital need to be determined, which includes the demographic and cognitive condition of the elderly. The aim of this research is to study the injury cases data from Dr. Soeradji Tirtonegoro Hospital Emergency Department medical records and then compare the data with existing relevant studies.

Methods: The method used in this research is cross-sectional study. Data were collected from the medical records of the emergency department of Dr. Soeradji Tirtonegoro Hospital, Klaten.

Results: From the medical records of the emergency department of Dr. Soeradji Tirtonegoro Hospital, there were 1,055 reported injury cases in 2019. 127 of those were patients aged 60 and older. There were reported 37 non-traffic accidents, such as falling at home, slipping, *et cetera*. There were reported 83 traffic accidents. The other 7 accidents were accidents related to illnesses and disabilities.

Conclusion: The data reported 1,055 cases of injury, only 127 of those are elderly with the criteria of age 60 years old and older. As the data is limited and there are no risk factors reported, there is no further conclusion that can be made. Further studies can help better understand cases of injuries and even help predict reentry of patients by using a form to collect the data of risk factors of the patients admitted into the emergency department.

Keywords: Injury, Elderly, Emergency Department

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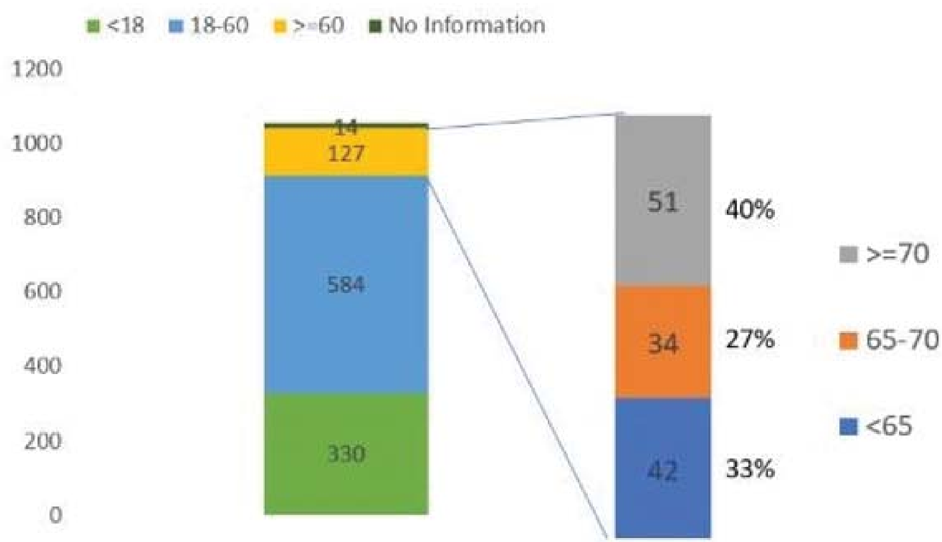
<18
18-60
>=60
No Information
1200
1000
800
600
400
200
0
14
127
584
330
51
34
42
40%
27%
33%
>=70
65-70
<65

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18902

Efficacy and Safety of Prophylactic-Dose Anticoagulation Therapy with Intermediate-Therapeutic Doses in Covid-19 Patients

Editor's Note: This article has been retracted as of January 2026 as it is out of scope

How to cite this article: Diva Rachma Kurniawati, Agus Subagjo, Lilik Djuari. Efficacy and Safety of Prophylactic-Dose Anticoagulation Therapy with Intermediate-Therapeutic Doses in Covid-19 Patients. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Introduction: Coronavirus Disease-19 (COVID-19) caused by the severe acute respiratory syndrome coronavirus-2 (SARSCoV-2) was declared a worldwide pandemic on March 11, 2020 and globally, on April 29, 2022, there were 510,270,667 confirmed COVID-19 cases, including 6,233,526 deaths, reported to WHO. As of April 2022, the Government of the Republic of Indonesia has reported 4,249,323 confirmed cases of COVID-19. There have been 143,592 COVID-19-related deaths reported and 4,096,194 patients have recovered from the disease. COVID-19 is associated with a high risk of venous thromboembolism (VTE), however, to date, optimal prophylactic anticoagulant therapy remains uncertain and may depend on the severity of COVID-19.

Objective: The aim of this study was to determine the difference in efficacy and safety in administering prophylactic doses with intermediate/therapeutic doses in confirmed COVID-19 patients.

Results: This study used 6 studies that met the inclusion of differences in efficacy and safety in administering prophylactic doses with intermediate/therapeutic doses in confirmed COVID-19 patients.

Conclusion: From 6 studies, there were 2 studies comparing anticoagulant prophylactic doses with intermediate doses and 4 studies comparing anticoagualnt prophylactic doses with therapeutic doses. In all studies, there were no significant differences in thromboembolic events or all-cause mortality in COVID-19 patients. The incidence of bleeding at the intermediate and therapeutic doses increased compared to the prophylactic dose, but the difference was not significant.

Keywords: COVID-19, thromboprophylaxis, anticoagulants, thrombosis, bleeding

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Source of funding: Self-funding

Conflict of Interest: There is no conflict of interest

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18903

Comparative Study of Different Modalities of Management of Patients with Upper Ureteric Calculus in Today's Era: Study of 50 Cases

Editor's Note: This article has been retracted as of January 2026 as it is out of scope

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Abstract

Background: The incidence of the stone disease has risen significantly over the last several decades because of modern lifestyles and dietary modifications. This puts a financial liability over the health care delivery system. The reported lifetime risk of having urinary stone is around 5-21%. Ureteric stones account for 2/3 of all urinary calculi brought to attention[1]. Moreover, the recurrence rates are even more troublesome, reaching 10% at one year, 35% at five years and 50% at ten years. Since the affliction mainly involves adults with a peak incidence in 3-5th decade, the loss of work years and deleterious effects on productivity are considerable.

Aims and Objectives:

- To compare the different modalities of treatment in managing the patients presenting with upper ureteric calculus.
- To evaluate the impact of the following in patients with upper ureteric calculus:

  a) Age distribution

  b) Sex distribution

  c) Clinical presentation

  d) Sensitivities of radiological investigations

  e) Stone size

Study Design: Prospective Study

Sample Size: 50

Duration : June 2020 to June 2022

Conclusion:

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- The most common presenting symptoms of patients are Pain in abdomen, Nausea/ Vomiting and Burning micturition.
- Amongst all investigations CT-IVP has the highest sensitivity of 100% in diagnosing upper ureteric calculi and assessment of renal function.
- Analysis shows that URS yields significantly greater stone free rates for majority of the stone stratifications. However, for the stone size <10mm and stone of HU <1000, ESWL is a better option in terms of stone free rates and complication rates.
- Pushback-PCNL is done only in few selected cases and only when ESWL fails (requiring >3 sittings),
- Complications have been reported in all procedures with Bacteriuria/UTI being the most common complication in all, but when considering URS only, the most common overall complication in the post op period was Fever.

Keywords: upper ureteric calculi, Extracorporeal Shockwave Lithotripsy (ESWL), Ureterorenoscopy (URS),Pushback Percutaneous Nephrolithotomy (pushback PCNL),Laparoscopic Ureterolithotomy

1. Age Distribution:

Table 1: Comparison of Age Distribution

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18904

A Study of Seropositivity of HIV, HBV, HCV and SYPHILIS in Blood Donors in Tertiary Care Hospital, Rajkot

This Editor's Note: This article has been retracted as of January 2026 as it is out of scope

Gauravi A. Dhruva[1], Khevana N. Karavadiya[2], Amit H. Agravat[3]

Abstract

Background: Blood is elixir of life. Although blood transfusion plays important role in the supportive care of medical and surgical patients, use of unscreened blood transfusion keep the patient at risk of acquiring many TTIs like hepatitis virus (HBV, HCV), human immunodeficiency virus (HIV), syphilis.

Aim: To study the seroprevalence of the HIV, HBsAg, HCV, VDRL and malaria in blood donors. To compare the seroprevalence of these disease in male and female donors. To compare gender and age wise seroprevalence.

Methods: The study was conducted in blood bank, Department of pathology, P.D.U medical college and hospital, Rajkot, India from 1st June 2021 to 31st May 2022. Blood samples were collected from blood donors who came to donate at blood bank or donated in voluntary blood donation camp. We collected data from total a total of 18951 donors out of which 18804 were accepted and 147 were rejected.

Results: A total of 18,951 donor samples were analyzed during the said period. Out of 18,804 accepted donors, a total of 156 (0.82%) were diagnosed positive for TTI infection.

Conclusion: Comprehensive, screening of blood donors for HIV, HBV, HCV, VDRL and malaria, strict selection of donors with emphasis on getting Young voluntary on remunerated donors rather than replacement donors, reestablishment of strict guidelines for blood transfusion and use of sensitive laboratory screening tests may be possible to reduce the incidence of transfusion transmitted diseases in India.

Keywords: Blood donation, Seropositivity, Blood donors, HIV, HBsAg, HCV, VDRL, seropositive donors.

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18905

A Study on Blunt Thoracic Trauma with Medico Legal Significance

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How to cite this article: Gunathilaka M.M.A.C, Kitulwatte I.D.G, Handun Wijewardena et. al. A Study on Blunt Thoracic Trauma with Medico Legal Significance. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Introduction: Thoracic trauma (TT) accounts for significant mortality and morbidity. Blunt thoracic trauma is reported more frequently than sharp force trauma, where motor traffic collisions account for the majority. Addressing medico-legal issues is often a challenge in TT. The purpose of this study was to evaluate blunt chest trauma from a medico-legal point of view.

Methods: A retrospective descriptive study was conducted based on case records of the victims (living and dead) of TT over three years presented to a Teaching Hospital and a District General Hospital in Western Province.

Results: There were 248 living patients and 195 deceased. Road accidents accounted for TT in 236 (53.3%), followed by 166 (37.5%) assaults. Out of the deceased, 89% had a very short survival period. "Multiple chest injuries" was the cause of death in 83 (42.5%) dead, and 91 (46.7%) died due to TT. Road accidents accounted for N=71 (78% of deaths due to TT). Out of the live patients, 87 (35.8%) had grievous or above-category injuries to the chest, and victims of assault were commonly having non-grievous injuries with a significant association ($p<0.001$). A total of 175 (39.5%) had rib fractures, and 125 were following motor traffic accidents.

Conclusions: Blunt TT accounts for significant mortality and morbidity, with the most common circumstances being road accidents. Most of them come under a severe category of hurt with a short survival period among the dead.

Keywords: Thoracic trauma, Blunt force, Medico-legal significance

Introduction

Trauma accounts for many deaths, especially among the young, and it is the third leading cause of death (COD) in all age groups after cardiovascular diseases and cancer[1]. Although trauma-related injuries can occur in many parts of the body, thoracic trauma makes a vital contribution to mortality and morbidity. One in four trauma patients reported succumbs to thoracic trauma (TT) or its

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complications[2]. It is a serious problem today due to many high-speed vehicle accidents. TT can be of two types, penetrating and blunt. Penetrating injuries such as stabs and firearm injuries destroy tissue integrity. Blunt injuries can cause damage to organs and structures without damaging the integrity of the tissue.

Blunt thoracic trauma is more common than penetrating chest injury, accounting for more than 90% of thoracic injuries. Blunt injuries to the chest are one of the leading causes of morbidity and mortality in both young and old trauma victims [3]. After the head, the chest is the next most common region of injury, and severe internal damage is often present in the absence of visible external injuries [4]. In vehicle occupant fatalities, injuries to the chest are even more common than head injuries [4].

Blunt trauma to the chest can produce a spectrum of injuries ranging from no injury and minor injury to life-threatening or fatal injury. The walls of the chest and soft tissues are most commonly affected by blunt trauma [5]. Rib fractures are the most common blunt chest injury in adults and children [6]. Blunt injury to the chest can potentially pose a threat to the airway, breathing and circulation, thus directly affecting the clinical course and outcome of the victim [6]. Road traffic trauma, assault, and falls are common causes of blunt chest injuries. Out of these, 70% -80% of blunt chest injuries are due to traffic accidents [7].

Studies have been conducted for the forensic assessment of blunt thoracic trauma in various populations [8] [9] [10]. There are limited studies in Sri Lanka regarding thoracic trauma [11]. Furthermore, there are no studies on blunt chest injuries from a medico-legal point of view in Sri Lanka.

Objectives

To study the medico-legal significance of blunt chest injuries among the victims of chest trauma presented to Colombo North Teaching Hospital and District General Hospital Gampaha for medico-legal examination and postmortem examination.

Study design

A retrospective descriptive study was conducted based on case records of the victims of chest injuries for three years who had been presented with chest injuries for medico-legal examination and postmortem examination at Colombo North Teaching Hospital and District General Hospital Gampaha.

Data Analysis:

Data were entered into Microsoft Excel worksheets and analysed using Statistical Package for Social Sciences (SPSS). Frequencies and percentages are used to present the data. A comparison of different circumstances of chest injuries was made, and the significance of associations was measured with a P value.

Results

Among study sample (N=443), a majority (n=280, 63%) of the victims were between 21 and 50 years of age (Figure 1). There were 350 (79%) males and 93 females (21%).

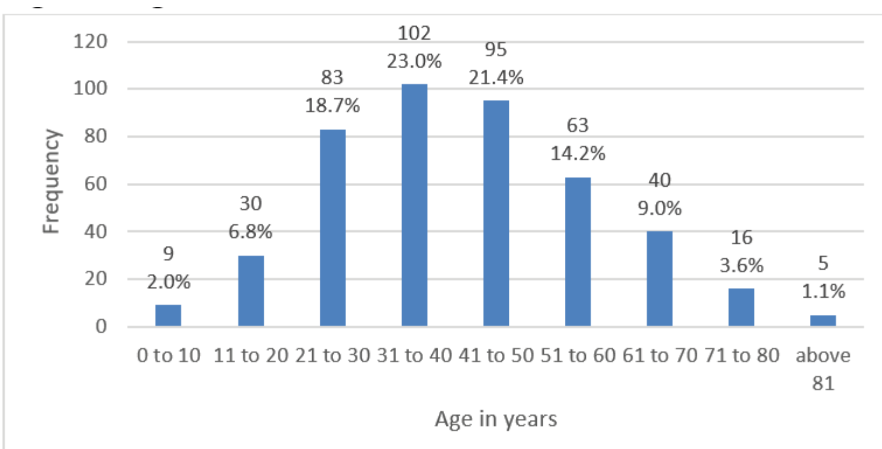

Figure 1: Age distribution of the victims

Most victims were brought following accidents. There were n=236 (53%) victims following road traffic accidents (RTA) and 166 (37.5%) victims of assault (Table 1). Among the victims of road accidents were 75 pedestrians, 16 pedal cyclists, 103 motorcyclists (rider or pillion rider), 17 three-wheeler drivers or passengers and 25 motor vehicle occupants. Among the other accidents, there were ten victims of railway track accidents and three domestic accidents.

There were 195 deaths and 248 live victims among the group. Most deceased persons were victims of road accidents, while most live patients were admitted following assaults (Table 1). The chances of death are highest, with falls from height (91%) followed by accidents other than road accidents (80%). TT was responsible for n=91 (46.6%) of the total deaths among the victims of blunt chest trauma, which included multiple chest injuries (n=83), cardiac lacerations (n=5) and late complications (n=3) (Table 1).

Table 1: Circumstances with COD and fate of victims

		Assault	RTA	Simple fall	Fall from a height	Accidental (other than RTA)	Any other	Not known	Total
COD	Multiple injuries to chest	1 3.3%	68 51.5%	0	10 47.6%	4 50%	0	0	**83 18.7%**
	Cardiac laceration	2 6.7%	3 2.3%	0	0	0	0	0	**5 1.1%**
	Late complications	0	0	3 100%	0	0	0	0	**3 0.6%**
	Other than chest injuries	27 90%	61 46.2%	0	11 52.4%	4 50%	0	1 100%	**104 23.5%**
Fate of victims	**Death**	**30 18.1%**	**132 56%**	**3 60%**	**21 91.3%**	**8 80%**	**0**	**1 100%**	**195 44%**
	Injured	**136 81.9%**	**104 44%**	**2 40%**	**2 8.7%**	**2 20%**	**2 100%**	**0**	**248 56%**
	Total	**166 37.5%**	**236 53.3%**	**5 1.1%**	**23 5.2%**	**10 2.3%**	**2 0.5%**	**1 0.2%**	**443 100%**

Out of the deceased, 52.2% of the victims of road accidents who had a shorter period of survival or no period of survival had the cause of death recorded as chest injuries. In comparison, 6.7% of the deceased victims of assault who came under the same category had the cause of death as chest injuries (Table 2).

The category of hurt (COH) concerning TT was non-grievous among 201 (45%) victims (Table 3). Out of the 166 victims of assault, 136 (82%) had non-grievous injuries to the chest. In contrast, out of the 236 road accident victims, 182 (77%) had injuries categorized as grievous or above in their chest, which included 16 victims with necessarily fatal (NF) injuries and 52 with injuries that are fatal in the ordinary course of nature (FIOCN). There was a significant association in the categories of hurt according to the circumstances (X^2 (1, N=443) = 273.72, p<0.001).

Table 2: Circumstances vs Period of survival for the victims died due to TT

	Assault	RTA	Simple fall	Fall from a height	Accidental (other than RTA)	Any other	Not known	Total
Death confirmed at scene	2 66.7%	32 45.1%	0	4 40%	4 100%	0	0	**42** **21.5%**
Dead on admission	0	16 22.5%	0	3 30%	0	0	0	**19** **9.7%**
Few hours	0	21 29.6%	0	0	0	0	0	**21** **10.8%**
1 – 2 days	1 33.3%	0	0	0	0	0	0	**1** **0.5%**
3 – 7 days	0	2 2.8%	0	0	0	0	0	**2** **1%**
>7 days	0	0	3 100%	3 30%	0	0	0	**6** **3.1%**
TT total	3 10%	71 53.8%	3 100%	10 47.6%	4 50%	0	0	**91** **46.7%**
Other than TT	27 90%	61 46.2%	0	11 52.4%	4 50%	0	1 100%	**104** **53.3%**
Total deceased	**30**	**132**	**3**	**21**	**8**	**0**	**1**	**195**

Table 3: Category of hurt of TT vs cause of death

COH	Multiple chest injuries	Cardiac laceration	Late complication	Other than chest injury	Not applicable (Live victims)	Total
Non grievous	0	0	0	40	161	201
Grievous (other)	1	0	0	36	75	112
Grievous (Endanger Life)	10	0	3	23	12	48
FIOCN	54	5	0	5	0	64
NF	18	0	0	0	0	18
Total	83	5	3	104	248	443

The most common form of bony injury was rib fractures. There were 175 (39.5%) individuals with rib fractures (Table 4). Among the victims of motor traffic accidents were 57 pedestrians and 37 motorcyclists with rib fractures. Among the road trauma victims, 76% of the pedestrians and 36% of the motorcyclists had rib fractures.

There were 63 clavicular fractures, and 52 resulted from road accidents, i.e., 22% of all road accident victims (Table 4). Fractures of the vertebrae were the next most common bony injury (n=25), which was again common among road accidents (n=16) victims, followed by falls from heights. (n=7). (Table 4). However, the percentage of the victims of falls from a height with vertebral fractures was 30.4%, while it was only 6.7% for road trauma victims.

Among the victims, there were 110 cases of hemothorax, pneumothorax or hemopneumothorax (Table 4). Commonly observed traumatic pathology of the body cavities was hemothorax alone (n=76) or together with pneumothorax (n=18). Among them, n=69 (73%) were the result of road accidents, followed by 13 (13.8%) assaults. Among the victims of road accidents, motorcyclists (n=29) and pedestrians (n=23) were the most common.

Injuries to the lungs are frequently observed as internal organ trauma. There were 47 victims with lung contusions and 24 victims with lacerations of the lungs in our sample. Lung injuries were observed among 53 (22.4%) victims of road accidents and only 7 (4.2%) victims of assault (Table 4). Victims with lung injuries included 48% of the total vehicle occupants and 37% of the injured pedestrians.

Frequently observed injuries to the heart were contusions (n=21) followed by lacerations (n=9). Most cardiac injuries were associated with road accidents (n=25), and many were on pedestrians (n=13). However, three-wheeler occupants were more susceptible than pedestrians since 29.4% of three-wheeler occupants were followed by 17.3% of pedestrians in the group.

There were 15 victims with damage to great vessels (aorta), and all of them were victims of road accidents (Table 4). Motorcyclists were high on the list, which included 11 victims with great vessel damage.

Table 4: Circumstances vs bony and internal injuries

	Assault	RTA	Simple fall	Fall from a height	Accidental (other than RTA)	Any other	Not known	Total
Rib fractures	27 16.3%	125 53%	3 60%	11 47.8%	9 90%	0	0	**175 39.5%**
Sternal fractures	0	17 7.2%	0	3 13%	1 10%	0	0	**21 4.7%**
Scapular fractures	1 0.6%	5 2.1%	0	0	0	0	0	**6 1.3%**
Clavicle fracturs	5 3%	52 22%	2 40%	0	2 20%	2 100%	0	**63 14.2%**
Vertebral fractures	0	16 6.8%	0	7 30.4%	2 20%	0	0	**25 5.6%**
Lung injury	7 4.2%	53 22.4%	3 60%	2 8.7%	6 60%	0	0	**71 16%**
Heart injury	2 1.2%	25 10.6%	0	0	3 30%	0	0	**30 6.8%**
Great vessel (aorta) damage	0	15 6.3%	0	0	0	0	0	**15 3.4%**
Hemothorax	13 7.8%	51 21.6%	3 60%	4 17.4%	5 50%	0	0	**76 17.1%**
Pneumothorax	3 1.8%	9 3.8%	0	2 8.7%	2 20%	0	0	**16 3.6%**
Haemopneuomothorax	0	18 7.6%	0	0	0	0	0	**18 4.1%**
Total	**166**	**236**	**5**	**23**	**10**	**2**	**1**	**443**

Discussion

Thoracic trauma causes approximately 25% of traumatic deaths worldwide [12]. More than 65% of thoracic trauma results from blunt impacts [13]. Forensic medical experts are expected to opine on many medico-legal issues on thoracic trauma. These include assessment of severity, period of survival and possible volitional activities, determination of the mechanism of causation and mechanism of death, identification of causative force/weapon, and determination of the circumstances.

The study revealed that a majority of TT is a result of accidental trauma, especially road accidents. Furthermore, most of them are vulnerable road users, including riders of motorcycles and pedestrians. Motor vehicle accidents cause over 70% of victims with blunt TT reported in previous studies worldwide [7] [13].

Most deceased persons were victims of road accidents, while most live patients were admitted following assaults. Chest injuries were responsible for 46.6% of deaths among the victims of blunt chest trauma, while 53.7% of the deceased victims of road trauma and only 10% of dead victims of assaults with TT succumbed to TT.

The chances of dying are highest with falls from height, followed by accidents other than road accidents, even though they are common among dead victims due to their high prevalence. Out of the total road trauma victims, 56% had died, and out of the victims of assault, only 18% had died. However, the cause of death among 90% of the victims of assault was injuries other than chest injuries, and they had a fatal injury to the head. According to a published study on blunt TT, none of the victims of assaults with TT had died [8].

Out of the deceased victims, 89% had a very short survival period. The majority among this group were road trauma victims, 94% of deceased victims due to road trauma, and 90% of dead victims of assaults were among them. Injuries other than chest injuries accounted for the on-the-spot deaths of 50% of victims of accidents other than road accidents. There was a significant association of fatalities on the spot with accidents other than road accidents.

All victims with injuries that are 'necessarily fatal' and the injuries that are 'fatal in the ordinary course of nature' involving the chest had died. Among the group who died from injuries other than chest injuries, 73% had either non-grievous or uncomplicated grievous injuries to the chest. TT is observed in approximately 60% of victims with polytrauma, with a mortality of 20-25% [14] [15]. Consistent with our finding, the literature has shown that a relatively higher number of minor injuries are reported with assaults. More serious injuries are reported in motor vehicle accidents [8].

Rib fractures are common injuries accounting for 60-80% of all victims with blunt TT [7]. The relatively low percentage of rib fractures among our sample could be due to having many victims following assaults in this group. Rib fractures included 27 victims of assaults, i.e. 16% of the total assault cases, even though rib fractures are described as non-accidental injuries in children and are not commonly identified as a complication of blunt impact assaults [8]. The study sample included only nine young children who were not victims of battered baby syndrome. There was no specific association of the location of rib fractures with the circumstances of the injury. Motor vehicle collisions cause anterolateral or postero-lateral rib fractures, while simple falls result in lateral fractures [16]. Most of these assaults and fights are associated with falls, which may be why they have no specific association.

Among the cases of clavicular fracture, a total of 43.75% of all pedal cyclists, followed by 25% of pedestrians, had clavicular fractures. Forces directly applied to the lateral shoulder are responsible for more than 80% of clavicular fractures [17], while some result from falls on the outstretched hand or direct blows to the area [18]. The direct forces applied are most commonly reported in falls on the shoulder following road accidents [19]. This was also evident in our study since falls following crashes are inevitable among pedal cyclists and pedestrians.

The percentage of victims of 'falls from a height' with vertebral fractures is almost five times greater than that for road trauma victims. The most common traumatic cause of vertebral fractures reported is high energy trauma, including falls from great heights and motor vehicular collisions [20].

Blunt chest trauma is the most common underlying reason for hemothorax and pneumothorax [21]. Such findings in the pleural space are expected with chest wall injuries, especially rib fractures [22]. Since 39.5% of individuals had rib fractures, this is expected.

Pulmonary contusions are reported most commonly among drivers of motor vehicles due to compression with the steering wheel [23]. This explains the involvement of a higher percentage of vehicle occupants compared to other victims of road accidents. High-speed motor vehicular crashes are responsible for lung lacerations [23].

Direct impact to the anterior chest, sudden high-speed deceleration, compression of the chest, or a combination of those could result in blunt cardiac trauma [24]. This is consistent with our finding as most cardiac injuries were associated with road accidents.

The most frequent location of the tear was the junction between the arch and the descending aorta (67%). In previous studies, approximately 80% of traumatic aortic ruptures have been reported at this site [25].

Conclusions

Road accidents are responsible for the most severe medicolegally significant blunt thoracic injuries and deaths due to blunt thoracic injuries, while inter personnel violence is associated with less severe injuries. Rib fractures were observed frequently and were especially common among pedestrians following road trauma. There was a significant association of some of the internal injuries with different circumstances of causation, which can be used in event reconstruction.

Ethical clearance: Taken from Ethics Review Committee, Faculty of Medicine, University of Kelaniya, Ragama, Sri Lanka

Source of funding: Self

Conflict of Interest: Nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18906

Platelet Rich Plasma in Erectile Dysfunction A Double-Blind, Randomized, Placebo-Controlled Clinical Trial

Editor's Note: This article has been retracted as of January 2026 as it is out of scope

Jihad Anad Khalef[1], Shaymaa Abed Hasan[2], Ahmed Nazar[3]

1

Abstract

Background: The studies postulate that platelet-rich plasma (PRP) injections improve key elements of neovascualrity to erectile dysfunction (ED).

Aim: Double-blind, randomized, placebo-controlled trial assessing the efficacy and safety of PRP injections in patients with mild and moderate ED. Exclusion criteria were patient undergo sever ED

Methods: Study is accomplished in Alnuman teaching hospital 2019 and 2022 over 59 patients were complaining mild to moderate ED, four sessions of P-shot 2 weeks apart each session.

Results: In period 3, 6 months' interval, a response was achieved by 35/42 (83%) patients in the PRP group compared to 5/17 (29%) in the placebo group.

Key words: Platelet rich plasma, erectile dysfunction, p-shot, intracavernosal injection

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18907

Study on Socio Demographic Profile of Natural Death in a Tertiary Care Teaching Hospital Hyderabad, Telangana

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How to cite this article: K Srinivasulu, Jupaka Om Shanti, Aditi V Sajjanar et. al. Study on Socio Demographic Profile of Natural Death in a Tertiary Care Teaching Hospital Hyderabad, Telangana. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

A cross sectional study was conducted on socio demographic profile on natural death in a tertiary care teaching Hospital Suraram, Hyderabad Telangana, it was a retrospective and record based study. 100 death case sheets were collected from Medical record department {MRD} of the hospital for a period of 1 year from 1st July 2020 to 30th June 2021. Socio demographic and clinical details were collected in the pre structured data sheet and statistically evaluated by MS Excel software.

Non communicable diseases are predominant in our study. We observed five leading causes of deaths among the most common cause of death was due to diseases of the respiratory system (36%) Pneumonia being the leading cause, Cardio vascular diseases (18%), septicemia (15%), GIT and liver diseases caused mortality (14%) and Central nervous system diseases are (7%). Highest number of deaths was observed in urban, married and above 50 years age group individuals. Diabetes and COPD was the highest co morbidity found in our study group. Heavy traffic congestion and many industries in the hospital catchment area are the probable reasons for highest respiratory diseases. Better ergonomics and industrial health management can prevent these diseases.

Keywords: Socio demographic profile, Natural death**.**

Introduction

Natural death defines as deaths that occur from natural causes, as disease or old age, rather than from violence or an accident. Natural deaths are communicable and non communicable. At a global level, 7 of the 10 leading causes of deaths in 2019 were non-communicable diseases, accounted for 74% of deaths globally in 2019. The world's biggest killer is ischemic heart disease, responsible for 16% of the world's total deaths. Since 2000, the largest increase in deaths has been for this disease rising by more than 2 million to 8.9 million deaths in 2019. Stroke and chronic obstructive pulmonary disease are the 2nd and 3rd leading causes of death responsible for approximately 11% and 6% of total deaths respectively. Lower respiratory infections remained the world's most deadly communicable disease

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ranked as the 4th leading cause of death. Neonatal conditions are ranked 5th. Cancer of lung, trachea and bronchus are in 6th level. Alzheimer's in 7th followed by diarrheal diseases, diabetes and kidney diseases.[1]

In last 50 years the death rate in India was declining at a moderating rate to shrink from 16.7 per 1,000 people in 1971 to 7.2 per 1,000 people in 2020, as death rate is declining the population is increasing enormously. India is the second most populated country in the world according to the 2019 revision of the World Population Prospects. According to the survey India is being projected to surpass China to become the world›s most populous country by 2024.[2,3]

In 1990, the top five individual causes of diseases in the country were all communicable such as Diarrheal diseases, lower respiratory infections, neonatal preterm birth, tuberculosis, and measles. In 2016, three of the top five causes were Non communicable diseases ischemic heart disease, chronic obstructive pulmonary diseases and cerebrovascular disease, while communicable diseases are diarrhea and lower respiratory infections were responsible for the remaining two.[4]

Non-communicable diseases are increasing at an alarming rate in rural India, with long-term consequences on people health and finances. The pattern of Non-communicable diseases in rural India looks largely similar to that in urban India. High blood pressure is the biggest risk factor for deaths worldwide, which now affects one in five adults in rural India, while diabetes affects about one in 20 adults.[4,5]

The aim and objective of the study is to evaluate the most common causes of natural death occurring in MRIMS Hospital Hyderabad Telangana, with following objectives.

- To know the most common causes of natural deaths occurring in this demographic area.
- To identify any co-morbid conditions associated with the disease.
- To explain socio-demographic relation with the disease.

This study will help to create awareness among the doctors in regard to natural deaths occurring in the hospital, this will helps to prepare a better treatment protocol and useful to reduce the morbidity and mortality.

Materials and Methods

A cross sectional, retrospective study on socio demographic profile of natural deaths was conducted in a tertiary care teaching hospital at Suraram, Hyderabad Telangana. Death case sheets from 1st July 2020 to 30th June 2021, duration of one year were collected from the MRD department of the hospital after obtaining permission from the Institutional ethics committee and the hospital authority. The names of the patients were kept anonymous and absolute professional secrecy was maintained. All inpatient case sheets of death due to Natural causes are considered. Brought dead, death on arrival and unnatural deaths were not included in this study.

The following socio demographic and clinical data was collected from the case sheets.

- IP Number
- Age, Sex, Marital status, Locality, Personnel habits.
- Built, Type of diet, any associated co-morbid conditions present.
- Any specific treatment protocol followed.
- Duration of stay in hospital.
- Time of death(24 hrs)
- Cause of death

All the above data was collected from the hospital records and documented in the pre-structured pro-forma taken in to MS Excel spread sheet and statistically analyzed with MS excel software.

Results

The study was a cross sectional, retrospective and record based study conducted in a tertiary care teaching hospital Hyderabad, 100 case sheets of death due to natural causes were collected from MRD of hospital and the following information was observed.

Tabl 1: Socio demographic results of study population.

Socio - demographic details	Findings
Total study population	Males-61, Females-39.
Age wise distribution	<1yrs-13, 1 to 10 – 2, 11 to 20 yrs – 5. 21 to 30 yrs – 10, 31 to 50 yrs – 21. 50 to 70 yrs -35, More than 70 yrs – 14.
Locality of study group	Urban - 86, Rural – 14.
In relation to marriage	Married - 71, Un married - 29
Dietary habits	Vegetarian- 19, Mixed diet- 81
Built of study group	Thin – 25, Moderate – 65 Obese - 10
Personnel habits	No habits – 60 Smoking & Alcohol - 40 Drugs - Nil
Time of death	12am to 6am – 17, 6am to 12 noon – 23 12noon to 6pm – 22, 6pm to 12 am – 38.

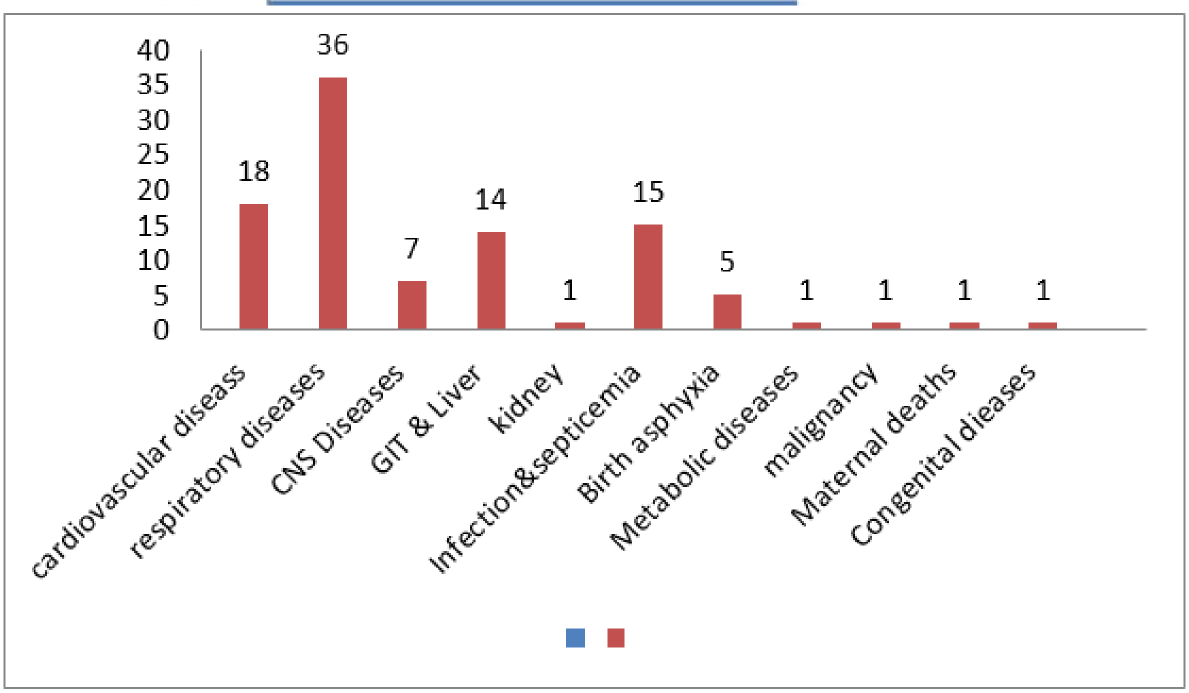

Figure 3: Causes of death in the study group.

Discussion

A retrospective record based study on socio demographic profile of natural deaths was conducted in a tertiary care teaching hospital in Hyderabad Telangana. We found the following results. Large percentage of deaths was observed in males than in females. Study revealed that 61% of males and 39% of females died due to natural causes of death in this demographic area.

The highest deaths were occurred in the urban area than in rural. 86% of deaths reported from urban locality and 14% from rural area, this is due to location of the hospital in the urban area; most of the patients were from the surrounding areas.

Age is the most common factor associated with death, as age increases the chances of survival decreases, our study results revealed that almost 50% of deaths reported in the age group of above 50 years. Highest number of deaths, 71% was observed in married group, whereas 29% observed in unmarried group. Based on the study majority are above 21 years and it is the age for marriage hence the number of deaths are more in married individuals.

Personal habits like smoking, alcohol and drug addiction contributes to the pathology to some extent, in our study 40% of death case sheets shows history of either smoking or alcohol. Smoking and alcohol are risk factors for cardiovascular and respiratory diseases.

Majority of deaths are reported in mixed dietary habit individuals, which is about 81% of the total deaths. Non vegetarian diet with sedentary life style may result to hypercholesterolemia and lead to cardio vascular diseases. We observed 65% of our study population have moderate built and 10% are obese. In relation to death rate and time of the death, we found highest number of deaths was reported in between 6pm to 12am midnight. A study conducted by Mitler et al, in 1987[6] revealed that majority of deaths occurred between 6am to 8 am; in our study second highest number of deaths was reported in the morning time.

Our study shows that most of the patients [49%] are died in first 24 to 48 hours of stay in the hospital. The highest number of deaths in the first 1 to 2 days was because of emergency admissions with critical illness. In our study 51% of study population was associated with co morbid conditions, out of which 32% of patients were suffered from diabetes and hypertension and 16% of patients with (COPD) chronic obstructive pulmonary disease. The most common causes of death reported in our study population was due to Respiratory diseases which was 36% of the total deaths, next common cause was due to cardio vascular diseases 18%. Infectious diseases and GIT Gastro intestinal including liver diseases contributes 3rd and 4th position, Infections and septicemia 15%, GIT and liver diseases are contributes to 14% whereas Central nervous system diseases are in 5th position, which contributes only 7%.

Respiratory diseases are predominant cause of death, 36% of deaths were reported in this hospital area because geographically the hospital is located in the industrial zone; among respiratory diseases Pneumonia contribute highest mortality due to predominant co morbidity of diabetes and COPD. Cardio vascular diseases are 2nd most common causes of death was reported in our study. In GIT and liver diseases, alcohol cirrhosis was the most common cause, 40% of patients in our study group are smokers and alcoholics, as alcohol consumption is usually very high in urban and industrial zone.13% of deaths were reported among the Infants less than 1year of age, the major cause of death in our study group was birth asphyxia. Congenital, metabolic and malignancy diseases contribute very less in this hospital area.

A prospective study of causes of death in rural Gadchiroli[7], conducted by Yogeshwar Kalkonde et, al and study reports of Institute for Health Metrics and Evaluation[8] done in 2019 shows that cardiovascular diseases are leading cause of death and respiratory diseases contribute 2nd most common causes of death both urban and in rural population of India, whereas in our study area respiratory diseases are leading cause of death.

Conclusion

Non communicable diseases are leading cause of death in our study. Top being Respiratory diseases, cardio vascular diseases are 2nd most common. Septicemia and Gastrointestinal diseases including liver diseases are3rd and 4th common causes of death are noticed. Central nervous system diseases are in the 5th position. Majority of the deaths are preventable, a better industrial hygienic environment and health care facilities in the hospital can reduce the mortality.

Conflict of interest: Nil

Ethical clearance: Institutional ethics committee permission was taken.

Source of funds: Self

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18908

Assessment of Serum cholinesterase and Serum Creatinine Phosphokinase Levels in Organophosphorus Poisoning Patients at a Tertiary Care Centre of Northern India

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How to cite this article: K.K. Gupta, Somesh Srivastava, Kauser Usman et. al. Assessment of Serum cholinesterase and Serum Creatinine Phosphokinase Levels in Organophosphorus Poisoning Patients at a Tertiary Care Centre of Northern India. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Introduction: Poisoning with Organophosphorus compounds is an important global health problem, possibly the most common acute poisoning in developing countries. This study was done to correlate the severity of acute organophosphorus poisoning with serum cholinesterase and serum creatine phosphokinase level.

Materials and Methods: A Prospective observational clinical study was done on 42 patients suspected of Organophosphorus poisoning of age >15 years admitted to the emergency unit at a tertiary healthcare center in northern India. Serum cholinesterase levels and serum Creatinine phosphokinase levels were estimated at the time of admission in all patients and the severity of Organophosphorus poisoning was assessed according to Peradeniya Organophosphorous Poisoning (POP) Scale.

Results: In this study, among 42 patients of acute organophosphorus poisoning 32(76.2%)were males and 10(23.8%) were females. Our study authors observed a significant correlation between the severity of poisoning categorized by the POP scale and the serum cholinesterase and Serum CPK level at the time of the patients' initial presentation. Also found that there was a significant correlation between serum cholinesterase and serum CPK with the outcome of the patients.

Conclusion: In our study severity as well as outcomes of OP poisoning was directly correlated with serum cholinesterase level and serum Creatinine phosphokinase.

Keywords: organophosphorus, poisoning, serum cholinesterase, serum Creatinine phosphokinase, severity, correlation.

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Introduction

Poisoning with organophosphorus (OP) compounds is a worldwide problem. Organophosphorus poisoning occurs due to exposure to organophosphorus which results in the accumulation of acetylcholine (ACh) in the body, as acetylcholinesterase (AChE) gets inhibited. Organophosphorus poisoning most commonly results from exposure to insecticides or nerve agents. The World Health Organization estimates that one million serious unintentional poisonings occur every year in addition to two million cases of suicide attempts, with pesticides.[1]

India is a predominantly agrarian country where pesticides are routinely used for farming. These are the third most common agents implicated in suicidal poisonings after household agents and drugs, according to the National Poison Information Centre, India[2.] Erythrocyte cholinesterase (EchE) and plasma cholinesterase (PchE) are reduced in OP poisoning, but their estimation is costly and not regularly performed. There are emerging options for new cheaper biochemical markers for OP poisoning. The serum level of creatine phosphokinase (CPK) is often found to be elevated in OP poisoning.

To present study correlate serum cholinesterase and serum creatinine phosphokinase level with the clinical criteria score described by the POP scale at initial presentation and the severity of organophosphorus poisoning. The correlation may help in predicting the clinical outcome and in making timely decisions regarding transferring the patients for intensive care management.

Materials and Methods

A Prospective observational study was done on 42 patients, in the medicine department of King George medical university Lucknow for 1 year.

A purposive sample technique was used. All cases of OP poisoning meeting the selection criteria that applied to the study center (METC) during the period August 2020 to July 2021 were included in the study. A detailed case history is taken and relevant investigation such as Serum Cholinesterase level, Serum Creatinine Phosphokinase level, complete blood count, renal function test, liver function test, Serum electrolyte sent at the time of admission and repeat after 1 week.

Clinical severity was assessed and categorized according to Peradeniya organophosphorus poisoning scale (POP scale). The score was obtained at initial presentation before any medical intervention and it represented the muscarinic, nicotinic, and central effects of the acute cholinergic manifestations of OP poisoning. A score of 0 to 3 is considered mild poisoning, 4 to 7 moderate poisoning, and 8 to 11 as severe poisoning.

Measurement of SChe and SCPK level:

Serum ChE was measured by the Butyrylthiocoline potassium hexacyanoferrate (lll) method (Kinetic test)with Biological ref. range 4850-12000IU/L.

Serum creatine phosphokinase measured by Liquid stable optimized UV method with Biological ref. range 24-195 IU/L with CK(NAC act) KIT with cat no. 110206021.

Peradeniya Organophosphorus Poisoning (POP Scale)

Parameter	Criteria	Scale
Pupil Size	≥2 mm	0
	<2 mm	1
	Pinpoint	2
Respiratory Rate	<20/min	0
	≥20/min	1
	≥20/min with central cyanosis	2
Heart Rate	>60/min	0
	41-60/min	1
	<40/min	2

Parameter	Criteria	Scale
Fasciculation	None	0
	Present, generalized / continuous	1
	Both generalized and continuous	2
Level of consciousness	Conscious and rationale	0
	Impaired response to verbal command	1
	No response to verbal command	2
Seizures	Absent	0
	Present	1
0-3: Mild Poisoning, 4-7: Moderate Poisoning, 8-11: Severe Poisoning		

Statistical Analysis: The results were analyzed using descriptive statistics and making comparisons among various groups. Categorical data were summarized as proportions and percentages (%) while discrete (quantitative) as mean (SD). All the associations were tested by using the chi-square test. An unpaired t-test was used to compare the means between two categories. One-way analysis of variance (ANOVA) was performed for comparing means of continuous variables among various outcome categories. Statistical analyses were performed using SPSS version 23.0 (SPSS Inc., Chicago, IL, USA). A value of $p<0.05$ was considered statistically significant

Observation and Results

A total 42 of patients were taken for the study. Among them maximum cases of poisoning belonged to the age group 20-30 yr (52.4%), most of them were males (76.2%) and farming was the most frequent occupation (54.8%) followed by the students (26.2%). Most of them were belonging to the lower socioeconomic status (88.1%) Table 1. A suicidal attempt was the most common reason for poison ingestion as seen in 90.5% of Table 2. The mild, moderate, and severe POP grading was found in 47.6%, 31.0%, and 21.4% cases respectively. The proportion of death was increased with severity as 0.0%, 15.4%, and 77.8% of deaths was found in mild, moderate in severe cases respectively Table 3. A significant association was found between outcome and severity according to POP grading ($p<0.001$). On comparing the mean S.CHOLINESTREASE at admission among various severity levels, the mean S.CHOLINESTREASE was maximum in mild cases and minimum in severe cases, and the difference was found to be highly significant ($p<0.001$) Table 4. On comparing the mean S.CPK level at admission among various severity levels, the mean S.CPK level was maximum in severe cases and minimum in mild cases, and the difference was found to be highly significant ($p<0.001$) Table 5.

Table 1: Distribution of Cases according to Socio-Demographic Profile

Variable		Total	
		No.	%
Age	< 20 Yr	10	23.8%
	20 - 30 Yr	22	52.4%
	> 30 Yr	10	23.8%
SEX	Male	32	76.2%
	Female	10	23.8%
Occupation	Farmer	23	54.8%
	House Wife	7	16.7%
	Labourer	1	2.4%
	Student	11	26.2%
Socioeconomic Status	Lower	37	88.1%
	Middle	5	11.9%

Table 2: Distribution of Cases according to Type of Ingestion

Variable		Total	
		No.	%
Type of Ingestion	Accidental	3	7.1%
	Homicidal	1	2.4%
	Sucidal	38	90.5%

Table 3: Distribution of Final Outcome with POP Grading

Variable		Death		Survived		chi sq	p-value
		No.	%	No.	%		
POP Grading	Mild	0	0.0%	20	100.0%	22.71	<0.001
	Moderate	2	15.4%	11	84.6%		
	Severe	7	77.8%	2	22.2%		

Table 4: Comparison of S.CHOLINESTREASE (ADMISSION) with Severity

Severity	S. Cholinestrease (Admission)		Anova	
	Mean	SD	F-value	p-value
Mild	3077.80	560.60	98.88	<0.001
Moderate	1623.15	473.18		
Severe	434.56	275.37		
Total	2061.14	1171.22		

Table 5: Comparison of S.CPK LEVEL (ADMISSION) with Severity

Severity	S.CPK LEVEL (ADMISSION)		ANOVA	
	Mean	SD	F-value	p-value
Mild	165.15	37.16	15.76	<0.001
Moderate	194.23	53.70		
Severe	498.00	326.22		
Total	245.48	200.57		

Discussion

In this study, among 42 patients of acute organophosphorus poisoning 32(76.2%)were males and 10(23.8%) were females and as in most other studies, male-dominated females(M:F ratio 3.2:1). Mutalik GS, et al;

Young age group between 20-30 yr (52.4%), most of them were males (76.2%) and >30 years consisted of 10(23.8%) were the most sufferer. This indicates that there is an increased incidence of organophosphorus compound poisoning among young people. Various studies had shown the same result[3,4]. This age group is the most active one, physically, mentally, and socially and so, it was more prone to stress during life.

Farmers (54.8%) were the most sufferers in this study, Similar observations were also made by Joshi S C et al and Shakuntala et al who showed 51.07% and 70.07% were farmers respectively.[5,6]

Acute pesticide exposure can be accident or suicide, occupational, bystander exposure, or exposure because of consumption of food items containing pesticide residues. The commonest incidence of OP poisoning was a suicidal attempt as in this study[3,7]

In this study out of 42 patients, 20 were classified as mild poisoning, 13 as moderate poisoning, and 9 as severe as per the POP scale. In mild OP poisoning mean serum ChE level was 3077.80±560.60, in moderate poisoning level was 1623.15±473.18 and in severe poisoning, it was 434.56±275.37. Our study observed a significant correlation between the degree of derangement in serum ChE level and severity of OP poisoning, p-value <0.001. The higher the score on the POP scale, the higher the degree of derangement in the serum ChE level. Similar observations were made by Rehman S et al which Showed in mild (n=35) op poisoning mean S. ChE level was 2647.7 ±391, in moderate (n=13) serum ChE level was 200.2 ±39 and in severe (n=2) op poisoning this was 124.5

±39.5, P<0.001.[8]

When we correlated Serum CPK levels in our patients, their mean value was 165 ±37 in mild cases, in moderate OP poisoning this was 194 ± 53.0 and in severe cases, it was 498 ± 326. We found that there statistically significant correlation between the serum CPK levels and the severity of acute OP poisoning, p <0.001. The mean S.CPK Level at admission among dead cases was more than the survived cases, and the difference was found to be significant (p<0.001). A similar study by D. Markandeyulu et al showed mean S. CPK level in mild op poisoning patients 291 (± 78.16), in moderate 532.82 (± 105.3), and severe 1124.78 (± 349.32). They found the presence of a high degree of correlation between initial CPK value and severity of acute OP poisoning, P-value <0.001 [9].

Nermeen A. M. Hassan et al also showed that there was a high degree of correlation between the initial serum CPK levels and the severity of acute OP poisoning; as illustrated by the positive correlation of initial serum CPK level with the POP scale. These correlations were found to be statistically highly significant (P < 0.001)[10]. These results are in agreement with Bhattacharyya et al [11] who confirmed the presence of a high degree of correlation between initial CPK value and POP scale, serum EChE levels, arterial pH values, and total dose of atropine in acute OP poisoning.

In our study, the decreased levels of SChE had a significant correlation with mortality (p <0.005), also evidenced in studies by Eddleston et al[12]. Lower ChE level was also directly correlated to death outcome (P<0.001). These findings were consistent with studies by Rehman Set al.[8]

In the present study serum, CPK level was also correlated with the outcome of the patients and it was statistically significant p <0.001. Also evidenced Sam KG et al showed CPK level for a poisoned patient as an acceptable predictor for the outcome in poisoned patients.[13] Further studies are still needed.

Conclusion

In this study, the severity of poisoning was directly correlated with serum cholinesterase and serum CPK level. There was a significant correlation between serum cholinesterase, CPK, and the outcome of the patient. However, more research is required with an increased sample size.

Ethical clearance- Taken from Institutional Ethics Committee KGMU Lucknow, Ref code-104 ECM IIB-Thesis/P15

Source of funding- Self.

Conflict of Interest - Nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18909

Pneumonitis Following Diesel Oil Siphonage: A Case Series

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How to cite this article: Komal Gharsangi, Parul, Rajesh Bhawani. Pneumonitis Following Diesel Oil Siphonage: A Case Series. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Manual siphoning of diesel with mouth from automobiles is common practice in rural communities. This practice can be hazardous leading to ingestion and aspiration of diesel leading to chemical pneumonitis. Here we present two cases of chemical pneumonitis following siphonage of diesel managed with steroids and recovered completely.

Keywords: diesel, siphonage, pneumonitis

Introduction

Diesel siphoning through rubber tubbing from the automobiles is a very common practice in rural areas which can be hazardous leading to chemical pneumonitis. Diesel is a mixture of long chain saturated hydrocarbons which disrupt surfactants and cause direct inflammatory response in lungs leading to lung injury. Diesel ingestion usually results in transient vomiting, diarrhoea, and abdominal pain. [1] In the local injury it can cause chemical burns in the oral cavity. Most patients recover without any significant pulmonary sequelae in chemical pneumonitis due to diesel siphonage.

Case 1

A 28 year old male patient presented to emergency with accidental inhalation of diesel while siphoning from his vehicle 4 hours back. His chief complaints were of fever, breathlessness, cough and chest pain. His past medical and surgical history were uneventful. On examination his temperature was 37.2˚C, heart rate was 106/min, blood pressure was 100/70 mmHg, respiratory rate was 28/min with oxygen saturation of 91% on room air with non-invasive pulse oximetry. Blood parameters showed leucocytosis of 13300/cumm while his renal and liver function tests were within normal limits. X ray showed infiltrations in bilateral lower lobes. Patient was given oxygen through face mask intermittently and started on inj. ceftriaxone and inj. dexamethasone 6 mg iv once daily which was continued for 7 days. Patient showed improvements in terms of reduced respiratory rate and oxygen saturation 95% on room air with no further oxygen requirement. Patient was discharged on 10th day and followed up in the outpatient department.

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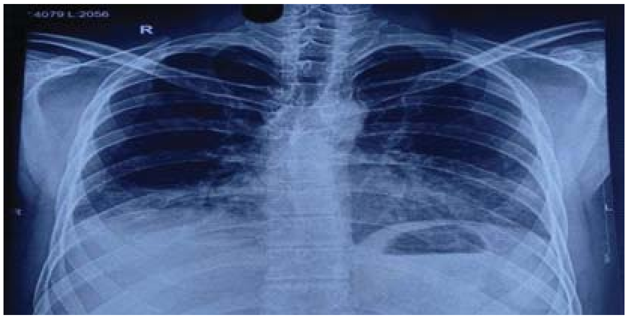

Figure 1

Patient's CXR revealing opacifications and infiltrations over the right lower, and left lower lung fields.

Case 2

A 24 year old male patient presented to emergency with complaints of chest pain, breathlessness and dry cough. Patient has history of diesel siphoning two days back. Patient has a heart rate of 120/min, blood pressure of 120/78 mmHg, respiratory rate of 40/min, oxygen saturation on room air of 88-89%. Patient has harsh breath sounds on right side of chest on auscultation. His blood reports showed leucocytosis of 11500/cumm and chest X-ray showed infiltrates in the right lower lobe only. Patient was given oxygen therapy with venturi mask and started on antibiotics and inj. dexamethasone 6 mg i.v once a day. Patient was continued with steroids for 10 days and stopped when there was improvement in symptomatology. Patients respiratory rate improved and no longer needed oxygen therapy.

Discussion

Diesel is distilled from petroleum and is commonly used as fuel for engines. Diagnosis of patients who may have undertaken diesel siphonage depends on three criteria: presence of pulmonary symptoms following an episode of siphonage, typical manifestations on radiologic investigations (CXR or chest CT) with suspected history, and lipid-laden macrophages on BAL or pathologic findings.[2] Diesel causes surfactant destruction which result from inflammatory reaction due to activation of macrophages and release of inflammatory cytokines.[3] Yi-jung Chen et al reviewed 15 articles, which included 3 original articles and 12 case reports and reported that most cases were among men and the age range of patients was 18–64 years. Most patients became symptomatic within 1 day of fuel siphonage and clinical features of fuel siphonage as cough, chest pain, dyspnoea, fever were present in more than half of all patients. Leukocytosis was a common finding in most patients. In imaging the right middle lobe was the predominantly involved lung field followed by right lower lobe.[4] In our cases also both the patients were young male with blood leucocytosis and bilateral lower lobe infiltrations. Supportive care and treatments with intravenous antibiotics, steroids are common therapies. Sen et al reported in their retrospective study that patients with hydrocarbon pneumonitis responded well to steroid therapy.[5] Use of steroids is thought to limit inflammation and fibrosis. But still the role of antibiotics and steroids is controversial in these cases.

Conclusion

Chemical pneumonitis by diesel siphonage rarely causes severe morbidity, or mortality in patients but this should be prevented by educating people and making them aware about the hazards of such practices.

Funding: None

Conflicts of interest: None

Acknowledgement: None

Ethical approval: Approved

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18910

DNA Identification in Mass Casualty – Forensic Perspective

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How to cite this article: Meenakshi Malhotra, Hemant V. Vaidya, Naresh P. Zanjad. DNA Identification in Mass Casualty – Forensic Perspective. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Fire related mass casualty incidents have always been difficult in terms of identification. Often the bodies recovered are in such bad shape making the process near impossible to get them identified through secondary methods of identification. Extremely charred bodies having remnant burnt soft tissue and bones are most difficult to get identified. It is exactly where Primary method of identification i.e. DNA Analysis comes into play.

One such incident occurred at a Sanitizer manufacturing factory where tragic massive fire broke out engulfing lives of seventeen adult humans. The victims were trapped because of ongoing fire making it inescapable. On autopsy, necessary samples were preserved and sent for DNA Analysis to Forensic Science Laboratory. Blood samples of all claiming relatives were also sent to the laboratory for cross matching of the DNA. Identity of all victims was thus ascertained, once again proving how DNA Analysis has been a scientific boon to the humans.

Key words: Body identification, DNA Fingerprinting, Mass Casualty, STR Profiling.

Introduction

Human generated disasters in form of fire related mass casualty are frequently encountered by the medical professionals. Establishment of identity of a victim is necessary on humanitarian grounds for all the grieving relatives and for legal purpose to achieve closure for that case. Human body consists of about six thousand billion cells which constitute organ systems. Every living cell has got some genetic material having chromosomes located inside the nucleus. DNA - Deoxyribonucleic acid, being only present in nucleated cells is made of chemical molecules, which codes for a particular protein called gene. Gene is further located on each segment of a chromosome. DNA resists variations in temperature and pH. It also doesn't lose its characteristics on contamination with adulterants

The primary and most reliable means of identification are visual identification, fingerprint analysis, comparative dental analysis, DNA analysis and personal belongings.[1] DNA identification is a technique which involves chemical division of DNA into small fragments forming a unique pattern and matching that 'identity profile' with the pattern

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obtained from the test's sample. Loci is a specific region within DNA which is short and repeats itself. Short tandem repeat loci are a class of highly polymorphic DNA markers which consist of simple, tandemly-repeated sequences of l-6 bp in length.[2] These loci often exhibit length variation (polymorphism) due to differences in number of repeat units present, making them ideal markers for use in human identification.[3,4]

The present autopsy study highlights the establishment of identity of seventeen charred and completely burnt bodies through DNA Identification by Polymerase Chain Reaction Technique involving Short Tandem Repeats (STR) Analysis.

Material and Methods

The present study was carried out at Byramjee Jeejeebhoy Government Medical College and Sassoon General Hospital, Pune in the year 2021. The autopsy series comprised of Seventeen extremely charred and burnt bodies which were brought at the mortuary in fibre jute sacks. All the bodies were recovered from a mass casualty site at a sanitizer manufacturing factory where a sudden tragic fire had occurred. They were in such bad shape that it had become impossible to get them identified by personal effects and other secondary methods of identification. The fire rendered all the bodies in a crumpled deformed shape. The complete autopsy was carried out on all deceased and for identification by DNA profiling.

All the bodies were assigned a serial number for labelling. Piece of sternum bone was preserved in 09 cases, part of humerus bone preserved in 02 cases, part of femur bone preserved in 04 cases, part of tibia bone preserved in 01 case, part of fibula preserved in 02 cases and teeth were preserved in 08 cases and sent to Regional Forensic Science Laboratory. The blood samples of next of kin were sent for comparative DNA analysis. The data obtained was tabulated and analysed systematically and is shown in Table 1. All the samples were typed at 15 STR Loci and gender specific amelogenin locus using PCR Amplification technique.

Observations

On autopsy during the external examination, all the bodies showed 100 percent superficial to deep burn injuries with complete blackening, charring and heat ruptures exposing internal organs to the exterior. Heat ruptures of skull exposing underlying cooked brain matter were observed in 15 cases. Sex could be only determined in 04 bodies out of 17 where two male bodies and two female bodies were identified. On internal examination, all the organs were cooked and hardened. Uterus and ovaries were observed and identifiable in 14 cases and prostate was identifiable in 02 cases. Preliminary sex allocation to all the bodies was done based on autopsy findings.

DNA from bone and tooth samples was analysed at 15 autosomal STR markers (D7S820, D19S433, CSF1PO, D13S317, D8S1179, VWA, TPOX, D3S1358, D19S43, D5S818, TH01, FGA, D16S539, D2S1338 and D18S51), to determine the owner of these samples. For sex determination of the victims we included the X/Y specific amelogenin gene marker. The DNA profiling conclusively established the identity of all sixteen victims and for the seventeenth case as no parental relatives were available, the identity was established by exclusion.

Table 1: DNA profiling of victims and cross matching through DNA (Autosomal and Y STR Typing) Methods

CASE NO.	STR LOCUS	GENOTYPE		SEX ON EXTERNAL EXAMINATION	SEX ON INTERNAL EXAMINATION
		DNA OF VICTIM	DNA OF ALLEGED FATHER/MOTHER /SON/DAUGHTER/ HUSBAND		
UNKNOWN FEMALE	D7S820	8,11	8,11	NON IDENTIFIABLE	UTERUS AND OVARIES
	D19S433	13,13	13,1		
	AMEL	X,X	X,Y SON		
2. UNKNOWN FEMALE	CSF1PO	12,12	12,12	FEMALE	UTERUS AND OVARIES
	AMEL	X,X	X,X DAUGHTER		

CASE NO.	STR LOCUS	GENOTYPE		SEX ON EXTERNAL EXAMINATION	SEX ON INTERNAL EXAMINATION
		DNA OF VICTIM	DNA OF ALLEGED FATHER/MOTHER /SON/DAUGHTER/ HUSBAND		
3. UNKNOWN FEMALE	D7S820 D13S317 AMEL	8,12 10,11 X,X	8,12 10,11 X,Y SON	NON IDENTIFIABLE	UTERUS AND OVARIES
4. UNKNOWN FEMALE	D8S1179 CSF1PO VWA TPOX AMEL	14,14 12,12 17,17 8,9 X,X	14,14 12,12 17,17 8,9 X,Y FATHER	NON IDENTIFIABLE	UTERUS AND OVARIES
5. UNKNOWN FEMALE	D3S1358 D19S433 TPOX D5S818 D18S51 AMEL	15,16 12,13 11,11 11,12 12,13 X,X	15,16 12,13 11,11 11,12 12,13 X,X MOTHER	NON IDENTIFIABLE	UTERUS AND OVARIES
6. UNKNOWN FEMALE	D19S433 AMEL	13,14.2 X,X	13,14 X,Y FATHER	NON IDENTIFIABLE	UTERUS AND OVARIES
7. UNKNOWN FEMALE	NO PARENTAL DNA SAMPLE AVAILABLE		HUSBAND	NON IDENTIFIABLE	UTERUS AND OVARIES
8. UNKNOWN FEMALE	CSF1PO D3S1358 AMEL	10,12 16,18 X,X	10,12 16,18 X,X MOTHER	NON IDENTIFIABLE	UTERUS AND OVARIES
9. UNKNOWN FEMALE	D3S1358 AMEL	15,16 X,X	15,16 X,X MOTHER	NON IDENTIFIABLE	UTERUS AND OVARIES
10. UNKNOWN FEMALE	CSF1PO AMEL	12,12 X,X	12,12 X,Y FATHER	NON IDENTIFIABLE	UTERUS AND OVARIES
11. UNKNOWN FEMALE	D7S820 TPOX TH01 D16S539 AMEL	8,10 11,11 9,9 9,12 X,X	8,10 11,11 9,9 9,12 X,Y SON	FEMALE	UTERUS AND OVARIES
12. UNKNOWN MALE	CSF1PO D3S1358 TPOX AMEL	10,11 15,16 11,11 X,Y	10,11 15,16 11,11 X,Y FATHER	MALE	PROSTATE

CASE NO.	STR LOCUS	GENOTYPE: DNA OF VICTIM	GENOTYPE: DNA OF ALLEGED FATHER/MOTHER /SON/DAUGHTER/ HUSBAND	SEX ON EXTERNAL EXAMINATION	SEX ON INTERNAL EXAMINATION
13. UNKNOWN HUMAN BODY-MALE	D8S1179	13,16	13,16	NON IDENTIFIABLE	NON IDENTIFIABLE
	D7S820	11,11	11,11		
	D3S1358	15,17	15,17		
	D13S317	12,12	12,12		
	AMEL	X,Y	X,X MOTHER		
14. UNKNOWN FEMALE	D7S820	8,8	8,8	NON IDENTIFIABLE	UTERUS AND OVARIES
	AMEL	X,X	X,Y SON		
15. UNKNOWN FEMALE	D3S1358	15,15	15,15	NON IDENTIFIABLE	UTERUS AND OVARIES
	D13S317	9,12	9,12		
	VWA	16,17	16,17		
	TPOX	11,11	11,11		
	D5S818	12,13	12,13		
	FGA	21,23	21,23		
	AMEL	X,X	X,X MOTHER		
16. UNKNOWN FEMALE	D5S818	11,11	11,11	NON IDENTIFIABLE	UTERUS AND OVARIES
	D2S1338	18,23	18,23		
	AMEL	X,X	X,Y FATHER		
17. UNKNOWN MALE	D3S1358	15,17	15,17	MALE	PROSTATE
	TH01	7,9	7,9		
	AMEL	X,Y	X,Y FATHER		

Discussion

Establishment of identity in mass casualty is an extremely challenging task which demands a careful planning and execution involving a team of life savers, police personnel and medical experts including forensic pathologists and forensic odontologists. In the present autopsy study, all the bodies were completely charred and unidentifiable by other means where DNA profiling helped to establish the identity of victims.

In charred fire victims, both autolytic changes as well as deleterious effects of heat will cause degradation of the DNA.[5] The advantage of using STR technology is that polyacrylamide gels can resolve DNA fragments differing by as little as one nucleotide in length, allowing precise allele designation and thus removing the need for continuous allele distribution models and match guidelines required for conventional DNA profiling methods.[6] Thus, the applicability of Restriction Fragment Length Polymorphism (RFLP) analysis can be limited. PCR provides greater sensitivity and specificity for genotyping/phenotyping techniques. It obviates the need for radio isotopic detection, and it also reduces the time and laboratory work required. Moreover it enables the analysis of extensively degraded samples.[7,8]

For forensic purposes, a study of at least 08 loci is recommended in STR typing. Teeth being resistive to incineration, decomposition, microbial action, temperature and weather changes is an excellent source for DNA collection.[9,10] Pulp tissue is used commonly to extract DNA because it is least likely to get contaminated and remains protected by dentin and highly mineralised enamel- hardest structure in human body.[11]

DNA can be usually extracted from canines and molars where molars being more preferred.[12,13] Raimann P.E. et al. in their study proposed that molars and premolars were good samples to obtain DNA profiles irrespective of the type of laboratory procedure used or if body was decomposed.[14] Chances of any two individuals having same 08 Loci DNA profile are one in one billion. In the present study as well, teeth were preserved for DNA identification.

On August 29, 1996, a Russian Airliner crashed while landing resulting in death of all 141 passengers and crew members on board. 257 body parts recovered from the disaster site were reconstructed into 141 individuals by STR analysis at 8 loci. Individual victim identification of 139 persons was successfully established while reference DNA samples were not available for 2 persons demonstrating a 100% success rate for DNA typing.[15]

Soares-Vieira J.A. et al. solved a police chase following a kidnapping where a car crashed and burnt completely. On autopsy, blood from the corpse's cardiac chamber was preserved which was compared to DNA obtained from corpse's alleged biological parents. Blood collected from the carbonized corpse, even with highly degraded DNA, could be analysed by the PCR technique and positively identify the victim.[5]

A raging fire broke out on 19 April,1993 near Waco, Texas, USA in a compound where a large stockpile of armaments and ammunitions were kept leading to unabated fire because of continuous explosion of these munitions. 61 extremely charred remains were recovered. Analysis of specimens from 61 bodies with parental samples predicted the genotype of 26 victims and identifications were made using the STR quadruplex.[16]

In the present autopsy study, external examination could not establish sex for all the victims except 04. Internal examination findings helped in sex allocation to 16 victims. Victim's body identifications were successfully established using the results from reference DNA samples in form of blood to predict the genotype of the deceased family member, in a paternity-style analysis. All the seventeen victims were identified using DNA analysis typing at 15 STR Loci for each victim.

Conclusions

DNA profiling serves as an irrefutable evidence of unjustified convictions and establishes a vital link to the actual executioners of crimes. It also dissuades some offenders from committing more serious offenses in future. Criminals can be convicted by the evidence provided through DNA profiling. It has become the gold standard for identification of victims in both mass casualty incidents and forensic cases where human remains are highly fragmented and / or degraded, due to a relatively low cost and high degree of discrimination.[4]

This present study has demonstrated the utility of PCR amplification of STR loci when applied to forensic investigations, especially when involved in identification of extremely charred and unidentifiable bodies in fire related mass casualty. This study also illustrates the vital role that DNA typing plays for individualization of extremely damaged human remains. PCR based techniques can provide a means for typing DNA derived from samples of fire victims. The technology is simple and provides data in an expeditious manner. When reference DNA samples are readily available, this approach may be extremely useful for rapid potential identification of human remains.

Statements and Declarations

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

Funding- The authors did not receive support from any organisation for the submitted work.

Ethics approval - All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was granted exemption from requiring institutional ethics approval, because the deceased victims were charred and burnt lacked the possibility of their identification by personal effects or facial recognition, required a quick identification by DNA profiling so as to be handed over to their respective relatives or family for cremation and closure of case.

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18911

A Study of Pattern of Envenomation in Bilaspur Region of Chhattisgarh: A Three Years Cross Section Retrospective Study

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How to cite this article: Piyush Kumar Singh, Gyanendra Kumar, Ulhas Gonnade. A Study of Pattern of Envenomation in Bilaspur Region of Chhattisgarh: A Three Years Cross Section Retrospective Study. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Myths and ancient medical literatures states, snake bites must have been the first kind of poisoning known to human being. Chhattisgarh states economy majorly depends upon agriculture, which is also relatively dependent on rainy season and this season along with good crop gives a fear of fatal snake bites and scorpion stings. The present cross section retrospective study was carried out in the Department of Forensic Medicine & Toxicology, CIMS, Bilaspur, during the period from January 2019 to December 2021 which includes 209 envenomation death cases out of 3392 cases brought to the mortuary for medico-legal postmortem examination. In Present study records of post mortem requisition form, panchanama, post mortem report and other relevant documents were compiled, tabulated and analyzed. During the study period 63.6% of total envenomation cases were male victims and 36.4% are female, maximum affected age group is of young adults ranging from 21 to 50 years (54.5%), most cases are in the month of September (15.3%), attacks at night (51.2%), and snake bite are more prevalent (75.6%) than scorpion stings (24.4%), in rural region (65.1%) of Bilaspur. The main objectives of the study were: to ascertain the various aspects of envenomation deaths, to analyze the probable reasons for the same & to find preventive measures to bring down the incidence of mortality.

Key words: - Envenomation, Snake bite, Scorpion sting.

Introduction

Snake bite or animal sting is an injury caused by the bite by venomous species. Snake bite lead to significant medico-legal issues all over the world, especially in south Asian countries, it has been estimated that 5 million snake bite cases occur every year worldwide.[1]

Chhattisgarh population mainly depends upon paddy farming for which it also known as 'DHAAN KA KATORA' or 'Bowl of paddy' which cultivates

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mainly in month June to November.[2]

Tapkara of Farsabahar block in Jashpur district is so called '**Naaglok on earth**' lies in the eastern part of Chhattisgarh state mainly famous for Cobra, Krait and viper variants species.[3]

There are more than 3500 species of snake in which about 250 are venomous. In India about 216 species are found of which 52 are venomous.[4]

In India it is believed that around 2,00,000 people are bitten by snake and about 15,000 - 30,000 cases prove to be fatal, predominantly snake bite deaths are reported from Andhra Pradesh, Uttar Pradesh, and Bihar, and rest follows.[5]

According to WHO report the global annual incidence of envenomation and death ranges minimum of 4,21,000 to a maximum of 18,41,000 and 20,000 to 94,000 respectively, and it's also mentioned the highest snake bites in south Asia and sub-Saharan Africa.[6,7]

Animal sting particularly scorpion has been estimated that the annual global incidence is about 1.5 million envenoming resulting in 2600 death mostly mortality result in children.[8] A common symptom of bite from venomous animal is the presence of two puncture wounds and India contribute to 50% of estimated deaths due to venomous snake bite globally.[9,10]

The snake bite is also a occupational hazard and accidental interaction between an animal and human being, while working in cultivation, gardening, plantation, wood collection, watching the crops, even during walking.[11,12] Rarely homicidal, in ancient times Hannibal and Antiochus defeated the romans by throwing earthen pots containing poisonous snake to their ships. Cleopatra committed suicide by making an asp bite her.[13]

Present study aims to analyze the pattern of death due to snake and animal sting & to find preventive measures to bring down the incidence in and around Bilaspur region of Chhattisgarh.

Materials and Methods

The present **cross section retrospective study** was carried out in the Department of Forensic Medicine & Toxicology, CIMS, Bilaspur, during the period from January 2019 to December 2021 which includes 209 envenomation death cases out of 3392 cases brought to the mortuary for medico-legal postmortem examination.

Details of the cases were collected from the police papers, history given by relatives, the inquest reports, hospital records and during autopsy like age, sex, residence, place and time of snake bite. Site of bite or sting were noted from postmortem report. The information was compiled, tabulated and analyzed.

Results

A total of 3392 cases are subjected to autopsy between period of January 2019 to December 2021 out of these 209 cases of snake bite and animal sting (scorpion) from different police station that comes under jurisdiction of CIMS, Bilaspur.

During the study period envenomation in male victims was more evident with accounting 133 (63.6%) cases as compared to females 76 (36.4%), and male: female ratio was 1.75:1. (Table 1).

Out of 209 cases of envenomation 75.6% were snake bite followed by 24.4% were of scorpion sting. (Table 2)

In present study 31-40 years age group in males i.e., 18 (8.6%) snake bite and 13 (6.2%) scorpion sting were most effected and minimum in the age group of >71 years i.e., 1 (0.5%) snake bite and 1 (0.5%) scorpion sting whereas in female's maximum incidence was noted in the age group of 11-30 years i.e., 26 (12.4) snake bite and 6 (2.9%) scorpion sting and minimum 1 case were reported in age group of above 71 years i.e., 1 (0.5%) snake bite and 0 (0.0%) scorpion sting. (Table 3)

In present study Maximum number of deaths occurs in Monsoon season i.e., 124 (59.3%) in the month of September i.e., 32 (15.3%) whereas minimum number of deaths occurs in summer season i.e., 28 (13.4%) in the month of March i.e., 7 (3.3%). (Table 4)

In present study maximum number of cases comes from rural area i.e., 136 (65.1%) followed by urban area i.e., 73 (34.9%). (Table 5)

In present study maximum envenoming were caused on lower limb i.e., 141 (67.5%) followed by upper limb i.e., 53 (25.3%). Minimum envenoming was caused on back of body i.e., 1 (0.5%) (Table 6)

In present study maximum envenoming were caused during night time i.e., 107 (51.2%) followed by day time i.e., 102 (48.8%). (Table 7)

Table 1: Sex Wise Distribution Of Snake And Scorpion Sting Cases (n=209)

	Snake	Scorpion
Male	92 (44%)	41 (19.6%)
Female	66 (31.6%)	10 (4.8%)
Total	158 (75.6%)	51 (24.4%)

Table 2: Age Wise Case Distribution (n=209)

Age in years	Snake		Scorpion		Total
	male	female	male	female	
0-10	7 (3.3%)	17 (8.1%)	2 (0.9%)	1 (0.5%)	27 (12.9%)
11-20	15 (7.2%)	13 (6.2%)	2 (0.9%)	3 (1.4%)	33 (15.8%)
21-30	16 (7.7%)	13 (6.2%)	8 (3.8%)	3 (1.4%)	40 (19.1%)
31-40	18 (8.6%)	4 (1.9%)	13 (6.2%)	1 (0.5%)	36 (17.2%)
41-50	15 (7.2%)	10 (4.8%)	12 (5.7%)	1 (0.5%)	38 (18.2%)
51-60	11 (5.3%)	6 (2.9%)	1 (0.5%)	0 (0.0%)	18 (8.6%)
61-70	9 (4.3%)	2 (0.9%)	2 (0.9%)	1 (0.5%)	14 (6.7%)
>71	1 (0.5%)	1 (0.5%)	1 (0.5%)	0 (0.0%)	3 (1.4%)
Total	92 (44.1%)	66 (31.6%)	41 (19.6%)	10 (4.8%)	209 (100%)

Table 3: Season Wise Distribution Of Envenomation Cases (n=209)

Season	Month	2019	2020	2021	Total
Summer	March	2 (0.9%)	2 (0.9%)	3 (1.4%)	7 (3.3%)
	April	6 (2.9%)	4 (1.9%)	1 (0.5%)	11 (5.3%)
	May	3 (1.4%)	3 (1.4%)	4 (1.9%)	10 (4.8%)
Monsoon	June	4 (1.9%)	7 (3.3%)	6 (2.9%)	17 (8.1%)
	July	12 (5.7%)	10 (4.8%)	5 (2.4%)	27 (12.9%)
	August	11 (5.3%)	6 (2.9%)	7 (3.3%)	24 (11.5%)
	September	9 (4.3%)	12 (5.7%)	11 (5.3%)	32 (15.3%)
	October	10 (4.8%)	7 (3.3%)	7 (3.3%)	24 (11.5%)
Winter	November	9 (4.3%)	4 (1.9%)	5 (2.4%)	18 (8.6%)
	December	4 (1.9%)	4 (1.9%)	5 (2.4%)	13 (6.2%)
	January	4 (1.9%)	2 (0.9%)	7 (3.3%)	13 (6.2%)
	February	1 (0.5%)	3 (1.4%)	9 (4.3%)	13 (6.2%)
	Total	75 (35.9%)	64 (30.6%)	70 (33.5%)	209 (100%)

Table 4: Area Wise Distribution Of Envenomation Cases (n=209)

Rural	Urban	Total
136 (65.1%)	73 (34.9)	209

Table 5: Distribution Sting/Bite On The Body (n=209)

Site of sting/bite	Total
Lower limb	141 (67.5%)
Upper limb	53 (25.3%)
Head and neck	11 (5.3%)
Trunk and abdomen	3 (1.4%)
Back of body	1 (0.5%)

Discussion

Mythology says that snakes are in the form of garland of Lord Shiva and to be worshiped as equal to a god. Animals whether wild or domesticated have a sizeable population in our ecosystem, their presence has great implications for the maintenance of food chain and the surrounding environment, the Bilaspur region Chhattisgarh well known for growing paddy and also surrounded by a forest region like Achanakmaar wild life sanctuary. Most of population residing in rural areas, where men to animal contact arises right from house hold to the vicinity where they go.

In present study males (63.6%) are affected more as compared to females (36.4%) by bite either snake or scorpion sting, almost similar results were found by Rituparno Ghosh et al,[14] Rajesh kumar mandal et al,[15] Bijayeeni Mohapatra et al,[16] Peranantham S, Jeyasingh T.[17]

In present study predominantly venomous bites were in the age group of 21 to 50 years (39.2%) in males whereas 0-30 years (9.5%) in females. Similar finding was noted by Rituparno Ghosh et al[14], Bijayeeni Mohapatra et al[16].

In present study majority of snake bite and scorpion sting cases were during the month of June to October (59.3%) because agriculture depends more on monsoon season. Similar results were found by Bijayeeni Mohapatra et al[16], Rahul Gajbhiye et al[19].

In present study most of the cases were brought from rural areas (65.1%) because of village area has farms, bushes, woods, rat holes where snake have their habitat. During the rainy season they come out and try to find safe place and they may enter houses and encounter humans indoor and outdoor.

In present study majority of snake and animal bites occurred on the lower limbs (67.5%) followed by upper limbs (25.3%). Similar finding was noted by Nilesh Keshav Tumram et al[18], Rahul Gajbhiye et al[19], Mahamuni N M et al[20] and differs from study of Rajesh kumar mandal et al[15]. lower limbs are more vulnerable to bite as they are most dependent part of the body and accessible while standing and there is chance of stepping over the snake while walking.

In our study venomous bites occur mostly at night (51.2%) followed by day time (48.8%). Similar finding was noted by Peranantham S, Jeyasingh T[17] and differ from study conducted by Rajesh kumar mandal et al[15].

Conclusion and Recommendation

Snake bite, scorpion sting is a medical emergency in developing country, most of times sting or bite mark are not noticed at the time of autopsy. Neurotoxic snake bite specially kobra, krait lead to fatal result. Early recognition and treatment of envenomation is lifesaving. Delayed transfer of the patient or treatment from quack can lead to increase amount of mortality.

6.1% envenomation cases out of 3392 total cases is not a small number to be left out, as envenomation is still a reducible cause of death by adopting a few preventive measures. As more cases are from villages and bites are predominantly happening on lower limbs in the rainy season, it is advisable to wear thick and high boots for farming works, not to sleep on the floor and use mosquito nets as they can physically prevent children as well as adults from snake bites and scorpion sting.

Prevention is better than cure and effective prevention requires a good understanding of major risk factors. Government, NGO'S and other organisations need to intensify their efforts in raising the awareness of public at large to reduce the preventable causes of death.

Preventing bites from happening is a great method to reduce mortality from venomous bites but even if they occur, to reducing mortality awareness should be raised about the do's and dont's mention in Ministry of Health And Family Welfare, Government of India, a quick reference guide on management of snake bite.[21]

Conflict of interest: None.

Ethical clearance: Obtained at the institute level.

Funding: None.

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18914

Supporting Factors in Continuing Life of Chronic Renal Failure Patients Undergoing Hemodialysis

Editor's Note: This article has been retracted as of January 2026 it is out of scope

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How to cite this article: Putu Agus Ariana, I Made Ady Wirawan, Dyah Pradnyaparamita Duarsa. Supporting Factors in Continuing Life of Chronic Renal Failure Patients Undergoing Hemodialysis. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Chronic Kidney Failure Patients undergoing hemodialysis therapy experience an impact. Not only the physical impact, but the patient also experiences a psychosocial impact. On the other hand, the patient must also continue his life with a good quality of life. This study aims to obtain an overview of the supporting factors of chronic kidney failure patients undergoing hemodialysis therapy to continue their lives. This research used qualitative research with a phenomenological study approach. Data was collected through semi-structured in-depth interviews with 32 participants who underwent hemodialysis therapy at a hospital in Buleleng. Data was analyzed by the steps in the Colaizzi method. Results: There were 4 themes generated: encouragement to bounce back from oneself, support from the surrounding environment, psychological burden during treatment, and the role of religion and culture. This theme is the basis for developing intervention models and service systems to reduce psychosocial distress in patients undergoing hemodialysis

Keyword: Supporting factors; Continuing life; Hemodialysis;

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		Age	**Education**	**Long Time Undergoing Dialysis**
			Primary School	
	Man		Primary School	
	Man		Senior High School	
	Woman		Primary School	
	Man		Senior High School	
	Man		Senior High School	
	Man		Junior High School	
	Woman		Senior High School	
	Man		Primary School	

Participants	Gender	Age	Education	Long Time Undergoing Dialysis

Table 2: Categories and themes of research results

Category	Theme

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18915

Determining Carboxyhaemoglobin levels in Children with Asthma and Recurrent Wheezing in Relation to Exposure to Second-hand Smoking and Solid fuel

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How to cite this article: Richa Choudhury, Priyanka Rai, Shamrendra Narayan. Determining Carboxyhaemoglobin levels in Children with Asthma and Recurrent Wheezing in Relation to Exposure to Second-hand Smoking and Solid fuel. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: This study aimed to see association of exposure to solid fuel for cooking and second-hand smoking (SHS) with asthma and recurrent wheezing in children. Carboxyhaemoglobin (COHb) levels were also estimated levels in these children and their relation to exposure to solid fuels and SHS was assessed.

Methods: The study enrolled 124 children in two groups; 72(58.1%) in Group 1 with asthma/recurrent wheezing and 52(41.9%) in Group 2 as controls. Exposure to SHS and solid fuel were assessed using a simple questionnaire in both the groups. COHb levels were estimated non-invasively and it's relation to demographic variables, occurrence of asthma, exposure to SHS and solid fuel was estimated.

Conclusion: The study reported significant association of SHS and use of solid fuel among children with asthma and recurrent wheezing seen in 26(36.2%) and 26(36.2%) respectively. The study showed that COHb levels were greatly elevated among children with asthma and wheezing conditions (5.45%) as compared to controls (2.95%). The study showed association of COHb levels with use of SHS and solid fuel exposure which were found to be (5.31%, 5.98%) respectively, thus emphasizing the need for interventions to reduce these potential sources of carbon monoxide exposure.

Key words: asthma; wheezing; children; second -hand smoking; solid fuel; carboxyhaemoglobin; carbon monoxide

Introduction

Around 93% children under 15 years of age globally breath polluted air putting them at serious health risks. About 600,000 deaths in children under 15 years of age were attributed to the joint effect of ambient and household pollution in 2016[1]. Infants and young children are more susceptible to air pollution

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as they have a higher rate of oxygen consumption per unit body weight [1]. Moreover, the lungs of a child are still growing and early exposure to environmental pollutants can easily alter lung development and function[2]. Exposure to second- hand smoking (SHS) increases the risk of acute lower respiratory tract infections, chronic respiratory symptoms, reduced pulmonary functions[3]. Children are susceptible to the effects of second-hand smoke because they breathe faster and so, take in more smoke. Some studies also provide evidence for correlation between indoor air pollution due to cooking with solid fuels with respiratory disorders[4].

Carbon monoxide (CO) is a toxic air pollutant which is produced from incomplete combustion of carbon-containing substances including coal, oil, wood, and tobacco. Children are exposed to CO from indoor pollution source as well as outside environment. About 3 billion households worldwide use solid fuels for cooking, including coal and biomass (wood, animal dung, lignite, charcoal, straw/shrubs, grass, and agricultural crop) exposing children to potential CO source[5]. The second-hand smoking exposure is another important source of CO. Blood CO is mostly determined by measuring blood carboxyhaemoglobin (COHb) levels as CO binds to haemoglobin with approximately two hundred times greater affinity than oxygen, thus forming COHb. It decreases oxygen delivery to tissue, thereby causing tissue hypoxia[6]. COHb levels of up to 1-3% were considered acceptably safe for children[7].

Exposure to potential CO source such as second-hand smoking have been shown to exhibit increased COHb levels[8]. High blood COHb concentrations have also been detected after exposure to smoke from biomass fuel[9]. Most research on the relationship between the level of COHb have been conducted in adults [10,11]. There have been very limited number of studies in children. Hence, this study was undertaken to see association of exposure to solid fuel and second-hand smoking in children with asthma and recurrent wheezing. The study also aims to determine COHb levels in relation to potential sources of CO exposure.

Methods

This prospective cross-sectional study was conducted from January 2020 to June 2021 at a tertiary care hospital in North India. Children between 1 to 12 years were enrolled in the study after obtaining consent from the parents or guardians. The study was initiated after getting approval from Institutional Ethics Committee.

Inclusion criteria-There were two study groups. Group 1 comprised of children with probable asthma/recurrent wheezing in accordance with GINA Guidelines[12]. Children who presented with one or more symptoms - wheeze, cough, shortness of breath, chest tightness with at least one episode of exacerbation in last 12 months were enrolled in Group 1. Bronchodilator reversibility was demonstrated in cases where feasible. For children less than 6 years wheezing, cough with or without heavy breathing for > 10 days with > 3 such episodes in last 12 months was taken as asthma/recurrent wheezing. Group 2 comprised of healthy children without presence of respiratory symptoms at presentation and no history of wheezing or asthma exacerbation in last 12 months. They were randomly selected from the pre anaesthetic clinic and enrolled in the study during the same period.

Exclusion criteria-Children with chronic conditions such as tuberculosis, cardiovascular illness or who had haemolytic anaemia or any other bleeding disorder were excluded from the study. Children whose parents refused to consent for the study were also excluded from the study.

Demographic and clinical details of the patients enrolled in the study were recorded. Parents/caregiver were asked to complete a simple questionnaire which evaluated the child's major sources of household air pollution:1) what type of fuel does your household mainly use for cooking? Responses were coded as clean fuel (if responses were electricity, liquid petroleum gas) and solid fuel (if responses were coal, lignite, charcoal, wood, straw/shrubs, grass, agricultural crop, and others) 2) Does child currently lives with a smoker? (parents/elder siblings and all smokers in the household were noted) Response were coded as second-hand smoking (yes or no).

COHb levels were measured noninvasively using a CO-Oximeter (Radical-7 Rainbow SET Pulse CO-Oximeter; Masimo, Irvine, CA, USA). Prior to use, COHb monitor was checked to confirm accuracy. An age-appropriate disposable finger sensor was applied to the child's hand or foot.

Statistical analysis

Data was analysed using SPSS version 20. Comparisons between Group 1 children with asthma/recurrent wheezing and Group 2 healthy children with respect to following parameters (Age; <=6 years/>6 years, gender; male/female, location of residence; urban/rural, use of cooking fuel: solid fuel/clean fuel, second-hand smoking; yes/no) were performed by contingency table analysis with the χ^2 test for categorical variables or Wilcoxon's rank-sum test for continuous variables. COHb values were presented in mean and percentages. The correlation between different sources of CO exposure (second-hand smoking, fuel used for cooking) and demographic profile (age/gender/residence location) was seen with COHb levels using Mann Whitney test. Comparison of mean levels of CoHb among children of Group 1 and 2 was also done. P value <0.05 was considered statistically significant.

Results

In this study we examined the association of second-hand smoking and exposure to biomass fuel with asthma and recurrent wheezing in children. In addition, COHb levels were estimated and their relation to second hand smoking and exposure to solid fuels was determined. A total of 124 participants were included in the study; 72(58.1%) children in Group 1 with asthma/recurrent wheezing and 52(41.9%) in Group 2 without respiratory illness. Most of the children 74(59.6%) were <6 years and most of the subjects were males 78(62.9%). Majority of the subjects 107(86.2%) had residence in urban location. Second-hand smoking was seen in 37(29.8%) participants and 35(28.2%) children were exposed to solid fuels in their household. Similar observation has been made in a study from India where 32.4% children were exposed to environmental tobacco smoke and 31.5% children's families were using biomass fuels for cooking[13].

Demographic factors, exposure to second-hand smoking and solid fuel for cooking were compared among Group 1 and Group 2 (Table 1). It was observed that there were even number of children in both age groups (<6 years and >= 6 years) in the two groups (p=0.143). There was no statistical difference in gender distribution among the two groups(p=0.164). It was seen that urban residence was more common in both the groups (77.8% in group 1 and 98.1% in group 2). It has been observed in another study that 7.9% children diagnosed as having asthma, was highest in industrial areas (11.8%), followed by residential (7.5%) and village areas (3.9%)[13]. However, in our study both groups of children were mostly from urban location so such association could not be established.

There were significantly larger number 26(36.2%) of children in Group1 exposed solid fuel as compared to group 2 subjects where only 17.3% were using solid fuels(p=0.022). In a study from Kenya, indoor air pollution was associated with asthma among 9–11year olds[14]. Most people from low-middle income countries use biomass fuel in their homes as clean fuels such as liquefied petroleum gas are often unavailable or unaffordable[15]. Biomass combustion has been identified as risk factors for asthma in children as well as adults[16]. Second-hand smoking exposure was found to be significantly more frequent in Group 1 children (36.2%) as compared to Group 2 children where 21.2% were exposed to second-hand smoke(p=0.002). It has been reported in a study that 21% of clinically diagnosed asthma cases in children have either parent as a smoker [17]. In another study parental smoking has been shown to be associated with wheezing in preschool children [14].

CoHb levels were estimated in children of both the groups and compared. Group 1 children showed significantly higher COHb levels (5.45%) as compared to their healthy counterparts (2.95%) (P=.002). The mean COHb levels among children with asthma was well above 1-2% considered background in urban non-smokers[18]. It is a matter of concern as the average COHb levels are above 5% in our study, the level at which neurobehavioral and cognitive effects may be seen[17]. In another study similar observations were made where the COHb levels in asthmatic and allergic rhinitis groups were found to be higher (4.8% and 7.3%) respectively as compared to children with controlled asthma who had lower mean COHb levels (1.5%)[19].

Table 1: Comparison of Demographic, Cooking fuel and Second -hand smoking in Group 1 vs Group 2 subjects:

	Variables		Group 1 N(%)	Group 2 N(%)	P value*
1	Age (years)	<6 years	39(54.2)	35(67.3)	0.143
		≥6 years	33(45.8)	17(32.7)	
2	Gender	Female	23(31.9)	23(44.2)	0.164
		Male	49(68.1)	29(55.8)	
3.	Residence	Rural	16(22.2)	1(1.9)	0.001
		Urban	56(77.3)	51(98.1)	
4.	Cooking fuel	Clean fuel	46(63.8)	43(82.7)	0.022
		Solid fuel	26(36.2)	9(17.3)	
5	Second-Hand Smoking	Yes	26(36.2)	11(21.2)	0.002
		No	46(63.9)	41(78.8)	

*P value was obtained by comparison in group1 and 2 using 2x2 contingency table for the parameters

Table 2: Correlation of COHb levels with Demographic profile, Asthma, Second-hand Smoking and Cooking fuel:

Parameter		50^{th} centile COHb	Mean COHb	P value
Age (years)	<6 years	2.0	3.27	0.0001
	≥6 years	4.5	6.07	
Gender	Female	2.0	3.86	0.494
	Male	3.0	4.72	
Residence	Rural	3.0	4.05	0.559
	Urban	3.0	4.46	
Asthma /wheezing	Group 1	4.0	5.45	0.002
	Group 2	2.0	2.95	
Second-hand smoking	No	2.0	3.92	0.076
	Yes	4.0	5.31	
Cooking fuel	Clean fuel	2.0	3.17	0.027
	Solid fuel	4.0	5.98	

*P value obtained by comparison of COHb values for different parameters using Mann Whitney test

COHb levels were compared in relation with demographic variables and exposure to second hand smoking and exposure to solid fuels (Table 2). Male subjects had higher mean COHb levels (4.72%) than females (3.86%) (P=0.494) but the difference was not significant. In another study in children under 5 years of age, higher mean COHb were reported among male children[20]. COHb levels were also analysed in two distinct age groups: <6 years and >=6 years, high COHb levels were seen in the group >= 6 years as compared to <6 years group (6.07%,3.27%) respectively and the difference was found to be statistically significant(p=<0.0001). The possible explanation could be increased exposure of these older children at work-places along with their parents. Moreover, their vulnerability towards imbibing the smoking habits from peers or parents could also lead to higher COHb levels in older children. Children from rural and urban residence did not show difference in COHb levels (4.05%, 4.46%) respectively (p=0.559).

Children with second-hand smoking exposure had higher mean COHb levels (5.31%) than those with no such exposure (3.92%), difference was large but not statistically significant (P=0.076). In another study around 200 children with second-hand smoke exposure demonstrated that higher COHb levels were seen in children exposed to second-hand smoke as compared to children not exposed to smoking[21]. Statistically significant difference was noted between COHb levels in children with exposure to solid fuels (5.98%) as compared to those using clean fuels (3.17%)(P= 0.027). There can be fairly high carbon-monoxide exposure when cooking using unclean fuel sources. In a study from rural Malawi where less than 1% household were using clean fuels, a mean COHb level of 5.8% was reported among children[22].

Limitations of our study

Lack of detailed information on biomass fuel such as frequency of use, ventilation, size of the home and details of second-hand smoke exposure such as number of packs used, smoking near child or outside home can be recognised as limitation of our study.

Conclusions

In our study, we observed significant association of second-hand smoking and use of biomass fuel for cooking with asthma and recurrent wheezing in children. The study also reported a very high COHb level (5.45%) among children with asthma and recurrent wheezing. The COHb levels were found to be associated with exposure to second-hand smoking and use of biomass fuel for cooking (5.31%, 5.98%) respectively. This is a matter of great concern, and appropriate measures should be taken to control such toxic exposures to our vulnerable population. Interventions such as transitions to cleaner fuels and parental counselling regarding second-hand smoke exposure would be required.

Competing interests: The authors declare that they have no competing interests.

Funding: None

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18916

Psychological Evaluation and Comparison of Alcohol and Marijuana users' w.r.t Violence (Adult)

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How to cite this article: Gurleen Kaur, Surender Sehrawat, Sreya Gosh. Psychological Evaluation and Comparison of Alcohol and Marijuana users' w.r.t Violence (Adult). Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Marijuana and Alcohol both are psychological drug. There are evidences and studies where it proves intake of these drugs can result in various criminal activities. And despite both having psychological affects one is legal (alcohol) whereas other is not (marijuana). There are many research and review article regarding alcohol and marijuana, in relation to violence but very less work done on comparing both side by side with respect to the personality traits of user. Thus review paper helps other researchers, model creator and policy makers in regard to legalization of both marijuana and alcohol and their effects.

Keywords: Marijuana, alcohol, Personality trait.

Introduction

Criminal psychology is a branch of psychology and deals with the study of thought, intention, action and reaction of criminal and other that partake in criminal behavior.[1] Through studying someone's personality traits we can predict his behavior and his criminal tendency.[1, 2] It helps in determining one's future regarding his violent behavior and how to work on them, in order to become a civilized man rather than a criminal in upcoming future.

In crime, both marijuana and alcohol are found to be the most common drug used before doing the crime either intentionally or unintentionally. [2,3,4] As both drugs psychologically effects the body thus make brain senses and motor functions numb, thereforebeing effective to suppress feeling or emotion before committing crime.[3] In case of alcohol it is found prominent that with increase in consumption violence also increases exponentially.[4]

Marijuana also known as ganja, cannabis, pot, weed and grass as its street names, and intake can be done through smoking (or mixed with tobacco), as edibles, by vaporizing or as an extract. It has psychoactive properties due to its main component tetrahydrocannabinol (THC), one of 483 known compounds in it, including at least 65 cannabinoids, mainly CBD. Due to high lipid solubility nature of its cannabinoids, it remains present on the body for

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a long period of time (can stay for months). Even after a single use of marijuana, it can be detected for weeks after its use. For this reason, some researchers and scientists clam it is the reason for marijuana ill effect (on chronic use) as it may accumulated in lipid membrane of the neuron. Marijuana has both short- and long-termeffects on body.[5] Short term effects include anxiety, panic, dry mouth, red eyes and feeling of paranoia. It also has physical short term effects, like increase in heart rate, difficulty in breathing and nausea. Long term adverse effects chronic coughing, more probability to get respiratory infection and can decrease mental ability for those who abuse it regularly before brain is fully developed (i.e before age of 23 year).[5]

Alcohol also known by its chemical name ethanol. Alcohol is a depressant i.e. after consumption the vital organs are slowed down, resulting in slurred speech, euphoria, delusion, loss of body control, etc The effects of alcohol is dependent upon the quantity you intake.[6] Their intoxication can be deadly, above 0.35% of BAC (Blood Alcohol Consumption) can put you in coma and above 0.45% result in death.[6,7] The alcohol use results in various behavioral changes including cognitive impairments, tolerant power, incoordination of motor functions and dependency. On Consumption it targets our Central nervous system (CNS), most likely the GABA (gamma amino butyric acid) receptor in brain.[8] Alcohol enhances GABA receptor function which causes effects like sedation, hypnosis, anesthesia and anxiousness. And at concentration it can change the lipid composition present in surrounding membrane.[8,12]

Alcohol also has both long and short term effects on body, these effects can be adverse in nature. Short term effects are dizziness, vomiting, hangover, visual impairments, motor function impairments, headache, nausea and neurocognitive function impairment, as alcohol is addictive and increases tolerance on use which can result in dependency and lead to ultimately long-term effect such as liver damage, brain damage and cancer (breast, pancreatic cancer etc.).[9,10]

Neo Big- V personality assessment test is a test which divides personality of people in 5 different traits. These 5 traits help in determining the person personality i.e his character and their behavior.[14] As Personality traits are directly and indirectly related to the physical aggression and violent tendency. [11,12]

The five broad traits are

1. **Extraversion:** Represent sociability of the individual.
2. **Agreeableness:** Show characteristics like friendly, trusting, affection and compassion.
3. **Openness:**Deal with person imagination and his insight
4. **Conscientiousness:** Include characteristics like organized, thorough and methodic.
5. **Neuroticism:** Define emotional stability of individual.

Material and Methodology

Sample Collection

Sample were collected through Big NEO- V questionnaire having 60 questions with average 15minute response time. Total 17 sample (2 female, 15 male) is collected for marijuana and 20 (6 female & 14 male) for Alcohol

Analysis and Comparison

The data is analyzed mainly focusing on 3traits, namely Conscientiousness, Neuroticism and Agreeableness as they are responsible for the behavior and help successfully predicting violent nature. The mean is calculated for each trait and then compared side by side to find significant difference between Alcohol and marijuana users behavior.

Discussion

To study the affects of marijuana and alcohol on the violence, we used Big NEO- 5 test questionnaire which includes 60 questions. Each question have 5 response to opt i.e. **strongly disagree**, **Disagree, Neutral, Agree** and **strongly agree.** All the individual are asked to fill the form honestly. The questionnaire is distinguished through the drug they take.

The 60 questions are related to the personality of the individual having 5 major traits, 12 question per trait. All these question arranged in such a manner so no one can repeat themselves.

For the study we concentrated on 3 traits,

Neuroticism, Agreeableness and **Conscientiousness.** As these 3 traits are directly related to anti-social behavior and aggression which lead to violence.[15]

Table 1. Time interval of drug intake

Intervals	Marijuana	Alcohol
Daily	10	8
3-7 days	5	10
2weeks	2	2

Table 2. Comparison between marijuana and alcohol user(Personality traits)

Traits	Marijuana (mean)	Alcohol (mean)
Neuroticism	0.43	0.58
Agreeableness	0.56	0.57
Conscientiousness	0.60	0.62

Conclusion and Future Prospect

In our study after analysing and comparing the data these findings are concluded

1. Both the user score similar in **Agreeableness** trait, alcohol- 0.57, marijuana- 0.56.
2. Both user score similar in **Conscientiousness** trait, Alcohol- 0.62, marijuana- 0.60.
3. However in **Neuroticism** trait alcohol user score big which is alarming at 0.58 in comparison to marijuana 0.43.

The Neuroticism in criticized as alarming in alcohol because in many finding it is directly related to violence. High score indicate these individuals get stressed easily, feel insecure and in pressure situation can do violent activities as they are emotionally unstable (can't handle emotions).

Ethical clearance: For this study, questionnaire were filled by the proper consent of individuals.

Source of funding: Self

Conflict of Interest: Nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18917

A Search for Neuropsychological Indicators: A Comparative Study with Children with Conflict in Law

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How to cite this article: Saranya Banerjee, Sanchari Roy, Atanu Kumar Dogra et. al. A Search for Neuropsychological Indicators: A Comparative Study with Children with Conflict in Law. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Law violation amongst adolescents have become a very important area of concern for the nation as a whole. In the current study, the objectives are to find whether there exist any neuropsychological markers that will help to differentiate children in conflict with law (CCL) from neurotypicals who have never engaged in law violation and also to find whether there exists any significant difference between CCL-I, CCL-E and CCL-M with respect to the neuropsychological markers. The sample included 59 adolescents out of which 10 were neurotypicals, 14 CCL with predominantly internalising manifestation (CCL-I), 17 CCL with predominantly externalising manifestation (CCL-E), 18 CCL with both internalising and externalising manifestation (CCL-M). The tools used in the study are Child Behaviour Checklist- Youth Self Report(CBCL/YSR), Bhatia Battery of Performance tests and three subtests from Delis- Kaplan Executive Functioning System. Statistical analysis was done using Kruskal Wallis test. Test results included significant differences between the groups with respect to 'Twenty Questions Test' and 'Colour-word Interference Test'.

Key words: law violation, children in conflict with law, internalising, externalising, neuropsychological marker.

Introduction

Juvenile offenses have become a matter of utmost significance, especially because of its spiralling tendency. As per a report by National crime Records Bureau in 2013, the percentage of juvenile crimes has increased by 13.6% and 2.5% in 2013 under the Indian Penal Code and Special Local Law[1].Furthermore, this has become an issue of great challenge for law makers and administrators, since the youth constitutes a major asset for any nation and it is a matter of great concern if the youth get more engrossed in negative pursuits.

These reports point out to the need to understand 'Children in conflict with law' (CCL). The Juvenile Justice Act (2015)[2] defines a CCL as a 'child who is alleged or found to have committed an offence and who has not completed eighteen years of age on the date of commission of such offence'. Research till now has focussed mostly on understanding the causal factors of law violation. However, the need of the hour requires the identification of indicators that will differentiate children in conflict with law from

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children without any history of law violation. These indicators will help in early identification as well as help in planning remediation programme.

This is somewhat in line with 'Risk-need Model' of Offender Rehabilitation approach. This model suggests that offenders who are released should be classified on the basis of the risk they pose to the society. The higher therisk, the more intensive the rehabilitation approach. This model also states that the needs of these 'at risk' people should also be identified so that the rehabilitation can be accurately planned[3].

During the course of our work, it was also realised that most CCLare either predominantly 'Internalising' type (CCL-I) or 'Externalising' type (CCL-E). Many of them also possess both Internalising and Externalising traits and constitute the third group known as 'Mixed' type (CCL-M).

Research literature has also indicated that 'Children in conflict with law' has both externalised manifestations like aggression and rule breaking, as well as internalised manifestations like withdrawn behaviour and anxiety[4]. Other studies have also indicated the children in conflict with law often have features of conduct disorder[5,6]. Similarly, features of depression or anxiety have also been found among this group[7,8]. A study has also indicated that children experiencing internalised features also develop externalised features later on[9].

It is also important to understand whether there exists any significant difference in the neuropsychological markers of CCL-I, CCL-E and CCL-M.

Thus, on the basis of the existing literature, currently two objectives were identified:

- Whether there exist any neuropsychological markers that will help to differentiate children in conflict with law from neurotypicals who have never engaged in law violation.
- Whether there exists any significant difference between CCL-I, CCL-E and CCL-M with respect to the neuropsychological markers.

METHOD

Participants

Data was initially collected from 94 adolescents, but 18 subjects had to be excluded from the Neurotypicals and CCL group because of below average intellectual functioning (3 from Neurotypicals, 3 from the CCL-I; 7 from CCL-E and 5 from CCl-M). Once data collection was started 17 subjects dropped out which included both neurotypicals and CCLs. Final data collection included10 neurotypicals, 14 CCL with predominantly internalising manifestation (CCL-I), 17 CCL with predominantly externalising manifestation (CCL-E), 18 CCL with both internalising and externalising manifestation (CCL-M).

Sampling was done using purposive method. Only males were included in the study. All the adolescents were between the age range 12-17 years. All the participants have completed at least 10 years of formal education. Participants having below average level of intellectual functioning were excluded from the study.

The neurotypicals do not have any history for violation of law. Their scores were in the 'average' range in all the domains of YSR, hence there was no history of any psychopathology. Those included in the 'Children in conflict with law' group have been in a child care intuition for law violation for at least 2 months. 'Children in conflict with law' were also administered the same checklist and on the basis of the scores, the participants were divided in three categories: CCLs with predominantly Internalising manifestation (having 'clinical' range in the domains of Depression or/and Anxiety or/and Somatic Symptoms), CCL with predominantly externalising manifestation (having 'Clinical' range scores in the domains of Aggression and Rule Breaking) and CCL having internalising and externalising manifestation (having 'clinical' range scores in both internalising and externalising categories)and participants in all the groups were matched in terms of age.

Tests Administered

- **Child Behaviour Checklist (Youth self report)**[10]: This self rating scale helps to develop a profile of the behavioural and emotional problems of adolescents. The scale has good external and internal reliability with test-retest reliability measuring upto. 95 and cronbach's alpha amounting to an average of 0.83.

- **Bhatia battery of Performance Tests of Intelligence**[11]: In this study, this test was administered on all the participants as a screening test. Test-retest reliability of the scores for the literate group is 0.851 and the same for the illiterate group is 0.841. The validity of the test for the literate group is 0.703 and for the illiterate group is 0.717[12].
- **Delis-Kaplan Executive Functioning Test**[13]: This test is a measure of executive functioning and includes 9 subtests, all of which can be administered together or independently. Three subtests were administered to this group: Design Fluency, Colour-word Interference Test and Twenty Questions test. Previous research has indicated that the reliability and validity of the total scale is 0.79 and 0.78 [14]

Procedure

The work received approval from the Institutional Ethics committee in the year 2021 (Ref No: 08/ET/21-22/1792). The Ethical committee ensured that proper consent is taken before conducting the assessment, no hazardous substances were being used for assessment and that no damage will be caused to the participants. Along with that approval was taken from requisite Government bodies to visit child care institutions related to CCLs and to conduct necessary assessments. The tests were translated to regional languages for easier comprehension. The translations were done following the guidelines stated by Gudmundsson (2009)[15].Following this, CCLs residing in institutional homes were addressed. Their consent was taken, following which detailed background information is collected from them. They were then administered the Child Behaviour Checklist (Youth Self Report). On the basis of the profile, CCLs were categorised into three groups. Bhatia Battery of Performance Test of Intelligence and Delis Kaplan executive functioning test were administered, following COVID protocol. In addition to this, data was also collected from children residing in the community following necessary ethical guidelines. Data Collection was done within August 2021 and December, 2021. Post data collection, statistical analysis was done. After conducting initial analysis of normality distribution, it was found the scores of the CCL were not normally distributed. Thus, non-parametric analysis of Kruskal- Wallis test was done. Statistical analysis was done using IBM SPSS Version 25 and the statistical significance was set at 0.05 level.

Results

As per the objectives, the graph indicates the mean and the Standard deviations of all the three groups

Insert Graph 1.1

The second table shows the presence of significant differences, if any amongst neurotypicals, CCL-I, CCL-E and CCL-M.

Insert Table 1.1

The result table indicates that there exists a significant difference between the scores of neurotypicals and CCL-E, neurotypicals and CCL-I and neurotypicals and CCL-M with respect to all the domains of the Twenty Questions Test. The three domains of this test are 'Initial Abstraction', 'Total no of questions asked' and 'Total weighed score'.

For the colour word Interference test, significant differences exist with respect to the domains of inhibition/switching versus colour naming and inhibition/ switching versus Inhibition. For the former, significant differences exist between CCL-I and CCL-E, neurotypicals and CCL-E, neurotypicals and CCL-M and CCL-I and CCL-M. For the latter domain, difference exists between the scores of neurotypical and CCL-E, neurotypicals and CCL-I and neurotypicals and CCL-M.

There exists no significant difference among the groups with respect to the 'Design fluency test'.

Table 1.1: This table is a comparative study of Neurotypicals. CCL-I, CCL-E and CCL-M.

Subtest	Groups	Test statistic	P value
Twenty Questions: Initial Abstraction	Neurotypical-CCL-I	21.743**	<.001**
	Neurotypical-CCL-E	26.159**	
	Neurotypical- CCL-M	19.350**	
	CCL-I-CCL-E	4.416	
	CCL-I-CCL-M	-2.393	
	CCL-E-CCL-M	-6.809	
Twenty Questions: Total no. of questions asked	Neurotypical-CCL-I	25.729**	<.001**
	Neurotypical-CCL-E	30.844**	
	Neurotypical- CCL-M	24.772**	
	CCL-I-CCL-E	5.116	
	CCL-I-CCL-M	-0.956	
	CCL-E-CCL-M	-6.072	
Twenty Questions: Total weighed score	Neurotypical-CCL-I	21.550**	<.001**
	Neurotypical-CCL-E	31.888**	
	Neurotypical- CCL-M	24.578**	
	CCL-I-CCL-E	10.338	
	CCL-I-CCL-M	3.028	
	CCL-E-CCL-M	-7.310	
Design fluency	Neurotypical-CCL-I		.068
	Neurotypical-CCL-E		
	Neurotypical- CCL-M		
	CCL-I-CCL-E		
	CCL-I-CCL-M		
	CCL-E-CCL-M		
Colour Word Interference Test: Inhibition Versus Colour naming	Neurotypical-CCL-I		.302
	Neurotypical-CCL-E		
	Neurotypical- CCL-M		
	CCL-I-CCL-E		
	CCL-I-CCL-M		
	CCL-E-CCL-M		
Colour Word Interference Test: Inhibition/Switching Versus Colour naming and Word Reading	Neurotypical-CCL-I	1.871	.024*
	Neurotypical-CCL-E	15.535**	
	Neurotypical- CCL-M	14.356**	
	CCL-I-CCL-E	13.664**	
	CCL-I-CCL-M	12.484**	
	CCL-E-CCL-M	-1.180	
Colour Word Interference Test: Inhibition/Switching Versus Inhibition	Neurotypical-CCL-I	14.786**	.026*
	Neurotypical-CCL-E	18.618**	
	Neurotypical- CCL-M	18.444**	
	CCL-I-CCL-E	3.832	
	CCL-I-CCL-M	3.659	
	CCL-E-CCL-M	-0.173	

Discussion

Mental health disturbances during adolescence are associated with low cognitive control and lack of control on emotional reactivity [16]. A hypothesis by Crone and Dahl (2012)[16] states that a poor cognitive control and increasingly reactive subcortical regions make it difficult for adolescents to control their emotional reactivity.

In the present study, it has been observed that there is a significant difference between the Neurotypicals and the other three groups, namely CCL-I, CCL-E and CCL-M with respect to the different domains of 'Twenty Questions test': initial Abstraction, Number of Questions and Total weighed score. The study table indicates that neurotypicals have significantly higher score than the other groups on this domain.

As it has already been mentioned, Twenty Questions test is a measure of abstract reasoning, hypothesis testing and concept formation[17]. Neurotypicals were therefore better in abstract reasoning, hypothesis testing and concept formation than the other groups. The reason for this maybe that since they were devoid of any significant externalising or internalising symptoms, they had more cognitive control and their emotional reactivity was also within limits. In other words, there was a synchronisation between the pre-frontal activity and the activity of the amygdala, leading to a more harmonious mental health[18].

There is no significant difference in the scores of Twenty Question test between the CCL-I and CCL-E, thereby suggesting that exacerbation in either emotional or behavioural problems leads to over-activation of the limbic system and reduced connections between the prefrontal cortex and limbic system, causing emotionality to take over rationality.

Considering each of the domain of twenty questions test, Initial abstraction measures the ability to engage in hypothesis testing, that is the ability to formulate a rule to categorise objects[13]. In the test, initial abstraction measures how many items the participant is able to eliminate with the very first question. This requires careful deliberation of any situation. Previous research has indicated that Children in conflict with law have reduced connections between the prefrontal cortex and the amygdala[19], which has also been proposed in other research papers on developmental immaturities in brain of adolescents[20]. Because of their inability to understand the underlying meaning of the situation, they often respond in impulsive manner. Similarly, because of their inability to inhibit responses, they continue responding in their impulsive manner.

This pattern of responding is synonymous to their functioning in daily life situations as well. In their everyday functioning as well, CCL often finds it difficult to understand the probable consequences of their behaviour in situations which they perceive to be exciting or emotionally loaded.This results in poor decision making and eventually to law violation.

Hypothesis testing is a higher-level function and it includes two stages: Hypothesis formation and Hypothesis testing[21]. Reduced functioning of the prefrontal cortex leads to reduced Hypothesis formation and thus, ability to engage in abstraction and form concepts also gets reduced. Inability to generate hypothesis often leads to cognitive inflexibility and perseveration. As a result of cognitive inflexibility, ability to think divergently gets impacted. Similarly, because of perseveration, respondents continued with same style of incorrect responding. Therefore, they often ask questions impulsively naming one object after the other, thus increasing the total number of questions asked. On the other hand, the questions asked by the neurotypicals were more strategically planned, gradually moving from more generic categories to specific categories, as designed to meet the needs of the task and hence they could complete the task using lesser number of questions. Similarly, in case of total weighed score, the scoring has been designed in a way that only participants who follow the correct strategy of asking questions would receive the highest score. As already mentioned, since the responses of CCL were given impulsively, the scores they received were comparatively lower.

It is also important to mention here that there are no significant differences among the groups with respect to the 'Design Fluency Test'. This test measures creativity of individuals and results indicate that there is no significant difference between the groups with respect to creativity. The reasons for this can be inferred only after further research in this domain.

Result Table 1.1 also indicates that there is a significant difference between the groups with respect to two domains of 'Çolour-Word Interference Test': Inhibition/Switching versus Colour Naming and Word Reading and Inhibition/Switching versus Inhibition. For the former category, neurotypicals have performed better than CCL-E and CCL-M. CCL-I have also been found to have better scores on this domain than CCL-E and CCL-M. In the latter category, neurotypicals have scored higher than CCL-I, CCL-E and CCL-M.

From the test results, it appears that the poor performance of CCLs with externalising features or mixed manifestations may be due to their language difficulties. Studies have often indicated that children with behavioural problems often have language difficulties[22]. The test results are not suggestive of similar difficulty in those with internalising manifestation. On the contrary, it may be inferred that significant differences of CCL-I with neurotypicals in the last domain may be a result of deficits in cognitive flexibility, set shifting or verbal inhibition.

Thus the results of the 'Colour Word Interference Test' helps to further explain the findings of the 'Twenty Questions Test'. For CCL-E and for CCL-M., the basic deficit is most likely at the level of verbal fluency. Inability to generate verbal concepts makes further processing of information difficult, whereas the findings are somewhat different for CCL-I. Their basic deficit is at a higher level of functioning, wherein they lack the cognitive flexibility and the ability to shift their set.

It is important to mention here that lack of Verbal fluency is not simply a result of poor academic or societal exposure. It is also a result of neuropsychological deficiency and needs further detailed investigation.

Conclusion

What emerged to be very significant from this research is that CCL-I and CCL-E have different neuropsychological indicators. These indicators will direct therapeutic intervention at community level. However, only identifying neuropsychological indicators may not be prove to be helpful. These indicators will have to be integrated withother psychological attributes.

Conflict of Interest: None

Source of funding: Directorate of Child Rights and Trafficking, Govt. of West Bengal.

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Original Research Article

Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18918

Study of Assessment of Medico-Legal Knowledge among Interns and Post Graduate Students

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How to cite this article: Shilpa Rani G.R, Sunil Kumar C. A, Nagaraj R Shetkar et. al. Study of Assessment of Medico-Legal Knowledge among Interns and Post Graduate Students. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Introduction: Forensic Medicine and Toxicology is an essential subject for medical students as it deals mainly with legal aspects

Aim and objectives: To assess medico legal knowledge and awareness in interns and post graduate students.

Materials and methods: A cross-sectional, questionnaire with 20 questions was designed and distributed to 120 interns and 80 post graduate students from January 2022 to April 2022. The data was collected and analyzed statistically for number and percentage using EPI-Info statistical software.

Results: Total 200 students were included in our study. We found that 84 (70%) interns and 32 (40%) post graduate students had no proper knowledge in handling medico legal cases independently. 55 (45.83%) interns and 63 (78.75%) post graduate students were of opinion that the present UG teaching is not sufficient for them to tackle medico legal cases. Only 36 (30%) interns and 33 (41.25%) post graduate students were aware about the best type of consent in MLC and 25 (20.83%) interns and 65 (81.25%) post graduate students were aware of Consumer Protection Act.

Conclusion: We detected that the knowledge about various medico-legal aspects needs to be freshened up time to time chiefly at internship and postgraduate levels. They need be refreshed about various medico-legal aspects which can be done by giving training to them.

Key Words: Medico Legal issues, autopsy, medico-legal certificate, Consent, poison, injury.

Introduction

Forensic Medicine and Toxicology is mostimportant subject that deals primarily with medico-legal cases, collecting evidence and giving opinion and attending court[1]. Doctors should have sufficient knowledge in this field, as general public through easily available print and electronic media have become well aware about their legal rights. Now that medical care has come under the purview of consumer protection act, the responsibilities of

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doctors has increased and it is mandatory to have thorough knowledge about Forensic Medicine and Toxicology[2]. Every day there is increase in complaints against both government and private doctors by the patients, and judicial system is also passing negative remarks about doctors. Keeping the above facts in mind The syllabus for undergraduate students of this important subject has been shifted to 3rd year from 2nd year, medical colleges all over India should increase the importance of Forensic Medicine and Toxicology subject by covering all its aspects theoretically by conducting regular medico legal workshops all through their course, as it is very common that they will forget the subject in course of time and need to be refreshenned on regular basis[3]. Doctors are called to the court to give expert witness regarding sexual assault cases, poisoning cases, burn cases etc. Due to lack of proper medico-legal knowledge, most of the doctors are very badly exposed in courts. Every doctor should realise that irrespective of the post graduate speciality they chose, throughout their career they have to deal with medico-legal cases. Hence they should have sufficient knowledge about medico-legal aspects whether they work in private hospitals or government hospitals [4,5]. Keeping the above facts in mind, we carried our study to assess interns and postgraduates about the knowledge in Forensic Medicine and Toxicology and also to make them aware of this important subject so that they can effectively handle medico-legal cases

Aim and objective

To assess awareness and knowledge about Medico-Legal Issues among Interns and Post GraduateStudents.

Material and Methods

A questionnaire based cross-sectional study was conducted in KBN Medical College, Gulbarga, Karnataka, India for a period of four months (January 2022 to April 2022) after obtaining approval from Institutional Ethics Committee. The study was carried out in 120 interns and 80 post graduate students. A good harmony was established with them. They were explained the purpose of study and prior written informed consent was taken from all of them. They were informed about the confidentiality of the information collected, so as to get more reliable answers from them. A self-administered questionnaire containing 20 questions relating to the knowledge of Forensic Medicine was designed.

Questionnaire

1. what is the Medico Legalcase(MLC)?
2. UG teaching is sufficient to know medico-legal responsibilities?
3. Which is the best type of consent in MLC?
4. What is Consumer Protection Act?
5. Do you know steps in management ofpoisoning case?
6. How do you preserve gastric lavage in poisoning cases
7. Do you have knowledge of injury certificate -Yes/No
8. What are the evidences to be collected in a rape case
9. Do you know what is Rule of Nine -Yes/No
10. Do you know about Death certificate designed by WHO -Yes/No
11. Which cases require Medico legal Autopsy?
12. Minimum age of consent for organ donation in India
13. Do you know what is HOTA(Human organtransplantation Act)?
14. Do we need to register MLC irrespective of patients or relatives request- Yes/No
15. procedure of exhumation?
16. How long do you have to keep IPD records of medico -legal case?
17. What is the minimum age to give consent for major operation?
18. Not attending a patient during emergency is a punishable act?
19. Refusing to treat a HIV positive patient is an offence?
20. For MTP whose consent is required? And recent amendment in MTP?

Results

Total 200 students were included in our study. We found that 84 (70%) interns and 32 (40%) post graduate students had no proper knowledge in handling medico legal cases independently. 55 (45.83%) interns and 63 (78.75%) post graduate students were of opinion that the present UG teaching is not sufficient for them to tackle medico legal cases. Only 36 (30%) interns and 33 (41.25%) post graduate students were aware about the best type of consent in MLCand 25 (20.83%) interns and 65 (81.25%) post graduate students were aware of Consumer Protection Act (**Table - 1**).

Table 1: Number and percentage of students having knowledge about Basics in Forensic Medicine.

Sr. No.	Variable	Interns	PGs
1	Knowledge of handling MLC cases	84 (70%)	32 (40%)
2	Opinion regarding present UG teaching sufficient to know medico-legal responsibilities	55 (45.83%)	63 (78.75%)
3	Knowledge about best type of consent in MLC?	36 (30%)	33 (41.25%)
4	Awareness about Consumer Protection Act	25 (20.83%)	65 (81.25%)

We also observed that 86 (71.66%) interns and 54 (67.5%) postgraduates were aware of various steps of management of poisoning cases. 110 (91.66%) interns and 69 (86.25%) postgraduates had knowledge regarding preservation of gastric lavage in poisoning cases. 68 (56.66%) interns and 71 (88.75%) postgraduates knew about collection of essential evidences in sexual assault cases. Of all the questions students irrespective of the category had least knowledge about how to write an injury certificate, only 5 (4.16%) interns and 12 (15%) postgraduates were able to state what and how to write it properly. Rule of Nine, that is used in burns patients was well known to the students, interns 90 (75%) and postgraduates 74 (92.5%) knew about it. Death certificate that is designed by World Health Organization was known to 32 (26.66%) interns and 36 (45%) postgraduates. Very few interns 25 (20.83%) and 29 (36.25%) postgraduates were aware that three copies of death certificate have to be prepared. Dead body is not to be sent for postmortem examination in natural cases was known to 90 (75%) interns and 69 (86.25%) postgraduates (**Table - 2**). 83 (69.16%) interns and 69 (86.25%) postgraduates were found to have awareness regarding the best type of consent being informed consent. Only 21 (17.5%) interns and 16 (20%) postgraduates knew about the minimum age, an individual can give consent for organ donation in India. We also found that 92 (76.66%) interns and 68 (85%) postgraduates were aware about the action to be taken during registering MLC, even when there is request from patients or their relatives for not to register MLC (**Table - 3**). 46 (38.33%) interns and 39 (48.75%) postgraduates knew about the complications of refusing treatment for HIV patients. 84 (70%) interns and 44 (55%) postgraduates knew about MTP and its recent amendments (**Table - 4**).

Table 2: Number and percentage of students having knowledge about Clinical Forensic Medicine.

Sr. No.	Variable	Interns	PGs
1	Important steps in management of poisoning case	86 (71.66%)	54 (67.5%)
2	Preservation of gastric lavage in poisoning cases	110(91.66%)	69 (86.25%)
3	Knowledge of injury certificate	5 (4.1%)	12 (15%)
4	Evidences to be collected in a rape case	68 (56.66%)	71 (88.75%)
5	Knowledge of Rule of Nine	90(75%)	74 (92.5%)
6	Death certificate designed by WHO	32(26.66%)	36 (45%)
7	Number of copies of death certificate	25(20.83%)	29 (36.25%)
8	Cases requiring medico-legal autopsy	90 (75%)	69 (86.25%)

Table 3: Number and percentage of students having knowledge about various aspects of Consent

Sr. No.	Variable	Interns	PGs
1	Best type of consent in MLC	83(69.16%)	69(86.25%)
2	Minimum age of consent for organ donation in India	21(17.5%)	16(20%)
3	Duty to register MLC irrespective of patients or relatives request	92(76.66%)	68(85%)

Table 4: Number and percentage of students having knowledge about other miscellaneous issues.

Sr. No.	Variable	Interns	PGs
1	Refusing to treat a HIV positive patient is an offence	46 (38.33%)	39(48.75%)
2	Whose consent is required for MTP and recent amendments	84 (70%)	44 (55%)

Discussion

A medico-legal case(MLC) is a case of injury/ illness where theattending doctor, after eliciting history andexamining the patient, thinks that some investigationby law enforcement agencies is essential to establishand fix responsibility for the case in accordance withthe law of the land[6]. Many doctors areapprehensive in handling such cases may be becauseof fear, unwarranted laws and regulations, attendingthe court, harassment by the lawyers and questionsby police personnel[7] .With the increase in use of internet and social media,there is an increase in awareness among public onsubject of ethical conduct of medical practitioners.Hence there are more cases against doctors. Thisissue is of immediate concern to medical fraternity.Hence all medical practitioners must be aware oflegal and ethical implications of clinical practice.We carried out a study to determine the knowledgeand awareness in interns and PG students in our institution. In our study of 120 interns and 80 PGstudents we noticed that PG students were moreaware about MLCs than that of interns may bebecause they are exposed to more MLCs during theirpost graduation. This is in accordance with the studyby Dash S.K. in 2010[7]. Most of the Interns and PG students were well awareabout written informed and valid consent but lesswas aware about medico legal record keeping inhospital. There is no specified time limit after whichthe Medico Legal reports can be destroyed; hence,they have to be preserved. In view of the multitudeof cases against the doctors under the ConsumerProtection Act, it is advisable to preserve all theinpatient records for a period of at least 5 years andoutpatient department records for 3 years[8]. Thiswas known to less participants. This finding issimilar to study conducted by Rai JJ, et al amonginterns and postgraduates about medical law andnegligence in Vadodara in 2016[8].PG students can manage the poisoning cases andknow how to preserve the gastric lavage , but bothinterns and PG students don't know exactly thematter and manner of injury certificate and WHOdeath certificate i. e. How to write immediate,antecedent and other cause of death in deathcertificate. Our findings are in agreement with studyto assess the need of Medico legal Education ininterns and residents by Pratibha Mardikar and ArtiKasulkar in 2015[8]. Medical council of India (MCI)has recommended that for MBBS graduates it isdesirable and compulsory to know about injuryreport, collection of biological material and allaspects of medico legal cases .Interns and PG students are aware about COPRA butvery less is known about HOTA and Hospitalindemnity insurance. As there is more awarenessabout human organ donation among people due tosocial media, doctors should make themselves awareabout laws related to it. Due to increase in medicalnegligence cases by doctors should have theirHospital indemnity insurance . Workshops related tovarious medical acts should be conducted regularlyso as to update the knowledge.

Conclusion

Our study was honest attempt to gauge the acquaintance of interns and postgraduates about different facets of medico-legal issues. We detected that the knowledge about various medico-legal aspects needs to be freshened up time to time chiefly at internship and postgraduate levels. They need be refreshed about various medico-legal aspects which can be done by giving training to them.

Source of funding: self

Conflict of interest: nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18919

Acute Yellow Oleander Poisoning-Its Cardiotoxicity and Clinical Profile: A Study on Eastern India Population

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How to cite this article: T.K. Bandyopadhyay, Amita Pathak. Acute Yellow Oleander Poisoning-Its Cardiotoxicity and Clinical Profile: A Study on Eastern India Population. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Background: Yellow oleander/Cerebra thevetia/Pila kaner a plant widely cultivated in the plains in india is highly poisonous. Kernels of the seeds contain glycosides thevetin, thevetoxin, cerberin, and peruvoside. Poisoning usually leads to gastrointestinal and cardiac toxicity.

Aims and Objectives: Our aim was to determine the clinical profile of yellow oleander poisoning with special emphasis on cardiac toxicity, neurotoxicity if any and outcome of management using currently available treatment.

Materials and Methods: We studied 60 patients with yellow oleander poisoning prospectively admitted in Hospital. A 12 lead electrocardiogram 3 min rhythm ECG strip and blood sample for measurement of electrolytes, Serum calcium, urea and creatinine and liver function tests were taken before treatment. ECG was also done in every patient on 2nd day of admission and at the time of discharge. Serum cardiac glycosides could not be done due to lack of facilities.

Results: Toxic manifestations included were Gastrointestinal, cardiac toxicity in the form of cardiac arrhythmia but Some patients developed neurological symptoms in the form of tremor (6 patients -10%), ataxia(8 patients-13.33%) at the end of first week, and focal seizure (only four patients-6.66%).

Conclusion: In our study we found gastrointestinal symptoms(vomitting, loose motion with dehydration) and cardiological symptoms (sinus tachycardia, sinus bradycardia, AV block and nodal rhythm, ventricular ectopics are more commonly present in Yellow oleander poisoning. Moreover we have found some Neurological symptoms in our study in the form of tremor,ataxia and focal seizures.

Keywords: Yellow oleander, cardiac toxicity, cerebra thevetia.

Introduction

Cerebra theveta /Pila Kaner/yellow oleander, a plant belonging to Apocyanaceae, is widely cultivated as an ornamental shrub in gardens in the plains in India. It has linear lanceolate leaves, yellow bell shaped flowers, a green globular fruit

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containing single nut, light brown in colour biconvex and triangular in shape. Grooved on the basal margin with two cells, each enclosing a pale yellow seed. The plant is highly poisonous. Kernels of the seed contain cardiac glycosides that are toxic to cardiac myocytes- the glycosides are thevetin, thevetoxin, cerberin, and peruvoside[1]. All these glycosides are highly poisonous and resembles glycosides of digitalis in pharmacological action. Poisoning usually leads gastrointestinal and cardiac toxicity. Fatal dose -Eight to ten seeds in adult. Fatal period-2-3 hrs.[(2,3)]

Aims and objectives

To determine the clinical profile of Acute yellow oleander poisoning with special emphasis on cardiac toxicity, ECG changes, neurotoxicity if any and outcome of management using currently available treatment.

Materials and Methods

We studied 60 patients with yellow oleander poisoning prospectively admitted in Deben Mahata Govt. Medical College and Hospital Purulia in West Bengal from October 2018 to April 2022. A 12 lead electrocardiogram 3 min rhythm ECG strip and blood sample for measurement of electrolytes, Serum calcium, urea and creatinine and liver function tests were taken before treatment. ECG was also done in every patient on 2nd day of admission and at the time of discharge. Serum cardiac glycosides could not be done due to lack of facilities. Permission and approval from ethical clearance committee of Deben Mahata Govt. Medical College and Hospital was taken vide letter no. 243/EAPC/DMGMCH dated 23rd September 2018.

Results

Incidence-: Male : Female = 2 :13. Forty five patients(75%) were young in age group 16-24 years whereas range was 14 to 48 years. All were from low socioeconomic background . Most of them reported for treatment 7-8 hours after ingestion of seeds .The number of seeds swallowed varied from one to five. Signs and symptoms are Vomitting: twice to several times - (100%). Tingling and numbness of mouth, tongue - 45 patients(75%), mild to moderate dehydration-24 patients (40%). Severe dehydration -36 patients (60%). Loose motions-21 patients (35%). 9 patients (15%) had peripheral circulatory failure. 18 patients (30%) had sinus tachycardia-(heart rate 110-146/minute). 39 (65%) patients had sinus bradycardia. Heart rate 44-58/minute. Three patients(5%) had AV block and nodal rhythm. All patients required treatment and 42 (70%) were treated with IV atropine. 3 patients(5%) had arrhythmia that was considered life threatening.(nodal bradycardia). 12 patients(20%) had occasional ventricular ectopics. Serum potassium was in the high normal or higher level in 15 pts. (range 5.1-6.1 meq/L. There were no deaths, During discharge 51 patients (80%) had normal ECG, 9 pts. (15%) had sinus bradycardia .Median Hospital stay was 5 days (range 2-7 days). Some patients developed neurological symptoms in the form of tremor (6 patients -10%),ataxia(8 patients-13.33%) at the end of first week, focal seizure only four patients(6.66%).

Table 1: Age and sex Distribution of Patients with Yellow oleander Poisoning

Total No. of cases	Age in years		Sex	
	Range	Average	Male	Female
60	15-48 years	22 years	8	52

Table 2: Gastrointestinal symptoms in Acute yellow oleander Poisoning:

Symptoms	Number of patients affected	Total number of cases of acute yellow oleander poisoning	Percentage of cases affected
Vomiting -two to several times	60	60	100%
Tingling and numbness of mouth,tongue	45	60	45%

Symptoms	Number of patients affected	Total number of cases of acute yellow oleander poisoning	Percentage of cases affected
Mild to moderate dehydration	24	60	40%
Severe dehydration	36	60	60%
Loose motions	21	60	35%
Features of peripheral circulatory failure	9	60	15%

Table 3: Cardiological Symptoms in acute yellow oleander poisoning:

Symptoms	Number of patients affected	Total number of cases of acute yellow oleander poisoning	Pecentages of cases affected
Sinus tachycardia	18	60	30%
Sinus bradycardia	39	60	65%
AV block and nodal rhythm	3	60	5%
Ventricular ectopics	12	60	20%

Table 4: Neurological Manifestations of acute yellow oleander poisoning:

Symptoms	Number of patients affected	Total number of cases of acute yellow oleander poisoning	Pecentages of cases affected
Tremor	6	60	10%
Ataxia	8	60	13.33%
Focal Seizure	4	60	6.66%

Discussions

Self poisoning from ingestion of yellow oleander seeds with suicidal intent is common in Eastern India states like West Bengal, Orissa etc. Most patients were female of lower socioeconomic background and of young age 16-24 years. Manifestations range from mild to potentially fatal. Patients with 4 or more seeds ingestion in crusted forms had significant cardiovascular effects with varying rhythm abnormalities and gastrointestinal side effects leading to dehydration.[4] Timely recognition of these toxicities are most important. Most of these young previously healthy patients had conduction defects affecting the sinus or AV nodes[5,6,7]. Relatively few had the atrial or ventricular tachyarrhythmias or ventricular ectopic beats that are typical of digoxin poisoning. Serious yellow oleander induced arrhythmias were associated with three or more seeds ingestion and hyperkalaemia[8,9]. Only a small proportion of patients admitted with yellow oleander poisoning developed life threatening cardiac arrhythmias. Treatment with atropine, IV fluids to correct dehydration and timely gastric lavage were safe and adequate in most cases. Ischaemic changes were not seen in these cases though it were seen in some study[10,11]. Temporary cardiac pacing was not required for any of our patients. There were no deaths. Some patients developed neurological symptoms in the form of tremor, ataxia, focal seizure. Tremor appeared at the end of first week in 6 patients (10%), ataxia in 2nd week (8 patients -13.33%,.and focal seizure(4 patients- 6.66%) between 5-7 days of hospital admission.

Conclusions

In our study we found gastrointestinal symptoms(vomitting, loose motion with dehydration) and cardiological symptoms(sinus tachycardia, sinus bradycardia, AV block and nodal rhythm, ventricular ectopics) are more commonly present in Yellow oleander poisoning. Most studies conducted on clinical profile of yellow oleander poisoning in the past and present have shown similar results.But we have found some Neurological symptoms in our study in the form of tremor, ataxia and focal seizures. Previous studies conducted on clinical profile of yellow oleander poisoning have shown similar results but significant neurological symtoms were not present.But we have found some Neurological symptoms in our study in the form of tremor, ataxia and focal seizure. Though some studies done by Barceloux et. al.[12] and Hayne et. al.[13] observed similar neurological manifestations. Probably these may be attributed to hypoxic-ischemic encephalopathy/ metabolic encephalopathy resulting from diminished cerebral perfusion from persistent cardiac arrhythmia.

Conflict of Interest: Nil

Funding: Self

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18920

Anthropometric Measurement of Face Index in Adult Malay Population

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How to cite this article: Thin Thin Aung, Husni Ahmed Abdullah Al-Goshae. Anthropometric Measurement of Face Index in Adult Malay Population. Indian Journal of Forensic Medicine and Toxicology 2023;17(1).

Abstract

Abstract and Aims: Anthropometry is notable for its suggestions in, human anatomy, forensic science, and physical human studies. The purpose is to determine the facial morphologic value differences between ethnic groups and indices among three unique races in Malaysia.

Materials and methods: The cross-sectional study was led on 420 people (80 Malay male, 80 Malay female, 60 Indian male, 70 Indian female, 60 Chinese male and 70 Chinese female) in the age range 18-45 years. In this study digital caliper was utilized to identify the nasal landmarks. This research was conducted that the mean of variables were statistically significant differences in nose measurement scores among adult Malay population. All the average independent variables were measured and compared whether differs at the same time among race.

Results: It was discovered that total face height measurements were remarkably smaller in Chinese compare to Malay and Indian. But there was no significant difference between Malay and Indian for total face height. The measurements of upper face height were smaller in Chinese compare to Indian and Malay. The measurements of upper face height were larger in Malay compare to Indian. The face width was remarkably larger in Chinese compare to Malay and Indian. But there was no major difference in Malay and Indian for face width parameters. Total face height, upper face height and face width measurement are huge larger in male than female.

The face shape of Chinese was hypereuriprosopic which was short and wide while shape of Malay and Indian were intermediate. The face shape of Malay was Euriprosopic and Mesoprosopic. The face shape of Indian was Mesoprosopic and Leptoprosopic. There was not a significant difference in face index between male and female.

Conclusion: The statistically significant difference in facial measurement and face index were found among adult Malay population.

Keywords: Anthropometry, face parameters, face index, ethnic group, Malay population

Introduction

Anthropometry is a fundamental device of organic humanities which includes a progression of normalized estimating procedures that express quantitatively the components of human body. Cephalometry is one of the controls of anthropometry which manages the estimation of the head and face

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of living people and bodies.[1] Cephalometry has been broadly utilized by numerous researchers for age, race and sex assessment. Such examinations are additionally helpful in medicolegal cases and clinical medication, maxillofacial surgery, facial restoration and reconstructive surgery.[2] The face morphology attributes have been presented as predictive value in (OSA) Obstructive Sleep Apnea.[3, 4] Also, the craniofacial attributes have been resolved in various patients like patients with thalassemia, Down syndrome, and so forth.[5, 6, 7]

Information on facial estimations can help researchers in various perspectives, including personal identification of decayed body, and working on the aftereffect of rhinoplasty.[8]

Facial indices were among the most significant cephalometric parameter valuable in between racial furthermore, intra-racial morphological order and classification. To compare and contrast the face shapes and face indices have been presented, like Total Facial Index (TFI), Upper Facial Index (UFI) were the two generally dependable records which were utilized in the facial anthropometric examines.[9]

As per the TFI, there were five types of the face index.

1. Hypereuriproscopic (very wide), facial index was in the scope of 75-79.9.
2. Euriprosopic (wide), individuals in the scope of 80-84.9
3. Mesoprosopic (round), individuals in the scope of 85-89.9
4. Leptoprosopic (long) who were in the scope of 90-94.9
5. Hyperleptoprosopic (very long) who were in the scope of ≥ 95.

An investigation led on two distinct populaces of North India recommended that cephalo-facial measurements enhanced by facial morphological highlights can be utilized in deciding age, sex, height and race in Indian populace.[10, 11]

Materials and Methods

Study design

This was a cross sectional study involving the collection and analysis. The location of the study was Management and Science University in Malaysia located in Shah Alam, Selangor since 2019 to 2021.

Sampling and sample selection

This was a cross-sectional examination with 420 subjects were participated in this research, 200 male and 220 female students: (130 Malaysian Chinese, 160 Malaysian Malay and 130 Malaysian Indian), aged 18±45 years old. Inclusion criteria were Malay, Chinese and Indian. The subjects confirmed their nationality by means of a self-managed survey. The Age was in the range of 18 and 45 years. Normal craniofacial configuration was included. Exclusion criteria were age lower than 18 years, and older than 45 years, blended or dubious unsure group of races, past history of craniofacial injury and history of facial surgical procedure, congenital malformation and craniofacial abnormalities.. The ethical approval was provided from Research Management Centre of Management and Science University. An informed consent was collected from each subject.

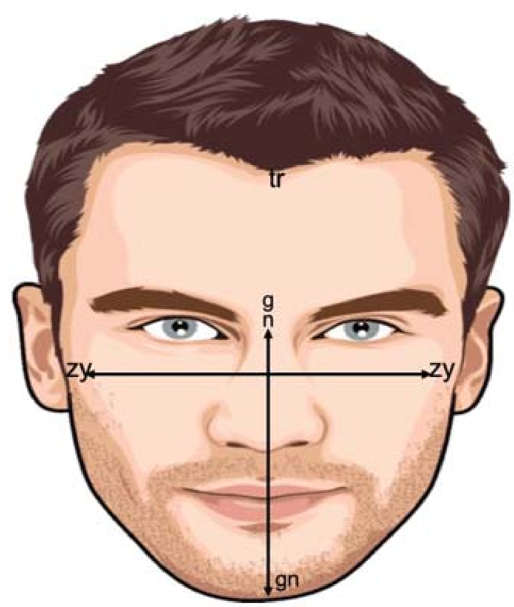

Figure 1. total face height and width of bizygomatic arch

The following landmarks were displayed in figure 1.

Trichion (tr)	junction point of the upper part of the forehead (hairline)
Glabella or nasal eminence (g)	The most prominent point on the frontal bone in the midsagittal plane between the eyebrow ridges
Nasion (n)	Deepest concavity point on the nasofrontal suture
Gnathion (gn)	Midpoint on the lower border of the mandible
Zygion (zy)	The most lateral extents of zygomatic arches
face height (n-gn)	straight distance from the nasal root (nasion) to the lowest point on the lower border of mandible
Face breadth (zy-zy)	measured as the maximum distance between the most lateral points on the zygomatic arches (distance between two Zygions).

The following linear measurement definition using landmarks were assessed.

Total face height	n-gn
Upper face height	tr -g
Face width	zy-zy

Face index was the ratio of the morphological facial height to face width and multiplied by 100.

$$Face\ index\ (FI) = \frac{total\ face\ height}{face\ width} \times 100$$

$$(FI) = \frac{n - gn}{zy - zy} \times 100$$

Statistical analysis

These data were analyzed by utilizing Statistical Package for the Social Sciences (SPSS) version 25.0. The data were investigated to be normality assumption by histograms and Q-Q plots. Independent t Test was used to determine whether there was a significant difference among races and gender. It was also to find out the correlation between dependent and each of the independent variables of ethnicity and gender. Significance was considered as p values smaller than 0.05 and the confidence interval was considered as 95%. The investigation, one way ANOVA was completed utilizing the log-changed information to explore contrasts among races and gender. The analysis demonstrated the mean, standard deviation, and mean differences, as well as the comparison of the variables among ethnics and gender. The clinically critical contrasts, a cut-off minimum value of 3mm was set.

Results

The histograms for face measurement revealed normal distribution curve for ethnics. The normality assumption of face phenotypes was conducted by Q-Q plots and box plots for race. There was statistically significant in a person correlation of concerned calculation of mean scores of face among three ethnic groups and gender.

The independent T test revealed there were statistically significant differences ($p<.001$) among races for face height and face width. Table 1 exhibited statistics for race including mean and standard deviation. Table 2, 3, and 4 exhibited the mean differences, 95% confidence interval of the differences and significant difference ($p<.001$) in concerned variables among Malay, Indian and Chinese.

Table 1: Statistics of race group

Descriptive									
						95% Confidence Interval for Mean			
		N	Mean	SD	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Total Face height	Malay	160	115.59	6.983	.552	114.50	116.68	101	126
	Indian	130	114.01	3.236	.284	113.45	114.57	110	120
	Chinese	130	106.45	3.385	.297	105.87	107.04	100	110
	Total	420	112.27	6.396	.312	111.66	112.89	100	126
Forehead height	Malay	160	77.24	6.082	.481	76.29	78.19	66	90
	Indian	130	70.54	7.480	.656	69.24	71.84	57	87
	Chinese	130	62.52	2.740	.240	62.05	63.00	58	68
	Total	420	70.61	8.407	.410	69.81	71.42	57	90
Upper face height	Malay	160	74.06	5.833	.461	73.15	74.97	63	85
	Indian	130	68.25	7.652	.671	66.93	69.58	54	85
	Chinese	130	59.50	2.706	.237	59.03	59.97	55	65
	Total	420	67.75	8.341	.407	66.95	68.55	54	85
Face width	Malay	160	134.32	7.628	.603	133.13	135.51	119	148
	Indian	130	132.89	7.635	.670	131.57	134.22	119	148
	Chinese	130	145.43	3.060	.268	144.90	145.96	140	150
	Total	420	137.32	8.535	.416	136.50	138.14	119	150

N= Number of respondents in each group, mean =Mean of group (race) of respondent,

SD=standard deviation, Std. Error=Standard error

Table 2: Independent sample T test for Indian and Chinese

							95% Confidence Interval of the Difference	
		t	df	Sig.	Mean Difference	Standard Error Difference	Lower	Upper
Total Face height	Equal variances assumed	18.391	258	.000	7.554	.411	6.745	8.363
Upper face height	Equal variances assumed	12.298	258	.000	8.754	.712	7.352	10.156
Face width	Equal variances assumed	-17.380	258	.000	-12.538	.721	-13.959	-11.118

Sig. = significance

As per table 1 and 2, for total face height, there was a significant difference in the scores for Indian (M=114.04, SD=3.236)) and Chinese (M=106.45, SD=3.385); t (258) = 18.391, p= .000 (p<0.05). The confidence interval of the difference did not include zero as lower and upper values were positive.

For upper face height, there was a significant difference in the scores for Indian (M=68.25, SD=7.652)) and Chinese (M=59.50, SD=2.706); t (258) = 12.298, p= .000 (p<0.05). The confidence interval of the difference did not include zero as lower and upper values were positive.

For face width, there was a significant difference in the scores for Indian (M=132.89, SD=7.635)) and Chinese (M=145.43, SD=3.060); t (258) = -17.380, p= .000 (p<0.05). The confidence interval of the difference did not include zero as lower and upper values were negative.

Table 3: Independent T test for Malay and Chinese

		t	df	Sig.	Mean Difference	Standard Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Total Face height	Equal variances assumed	13.673	288	.000	9.140	.668	7.824	10.456
Upper face height	Equal variances assumed	26.243	288	.000	14.556	.555	13.465	15.648
Face width	Equal variances assumed	-15.617	288	.000	-11.112	.712	-12.513	-9.712

Sig.=Significance

As per table 1 and 3, for total face height, there was a significant difference in the scores for Malay (M=115.59, SD=6.983)) and Chinese (M=106.45, SD=3.385; t (288) = 13.673, p= .000 (p<0.05). The confidence interval of the difference did not include zero as lower and upper values were positive.

For upper face height, there was a significant difference in the scores for Malay (M=74.06, SD=5.833)) and Chinese (M=59.50, SD=2.706); t (288) = 26.243, p= .000 (p<0.05). The confidence interval of the difference does not include zero as lower and upper values were positive.

For face width, there was a significant difference in the scores for Malay (M=134.32, SD=7.628)) and Chinese (M=145.43, SD=3.060); t (288) = -15.617, p= .000 (p<0.05). The confidence interval of the difference did not include zero as lower and upper values were negative.

Table 4: Independent T test for Malay and Indian

		t	df	Sig.	Mean Difference	Standard Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Total Face height	Equal variances assumed	2.389	288	.018	1.586	.664	.279	2.893
Upper face height	Equal variances assumed	7.325	288	.000	5.802	.792	4.243	7.362
Face width	Equal variances assumed	1.583	288	.115	1.426	.901	-.347	3.200

Sig.=Significance

As per 1 and 4, for upper face height, there was a significant difference in the scores for Malay (M=74.06, SD=5.833) and Indian (M=68.25, SD=7.652); t (288) = 7.325, p= .000 (p<0.05). The confidence interval of the difference was not include zero as upper and lower values were positive.

But for total face height, there was no major difference between Malay and Indian.

For face width, there was not a significant difference as at the level of p=.115 (p> 0.05) for mean values between Malay and Indian. The confidence interval of the difference included zero as upper values were positive and lower values were negative.

For total face height, there was a significant difference in the scores for male (M=114.37, SD=7.437)) and female (M=110.37, SD=4.510); t (418) = 6.735, p= .000 (p<0.05).

For upper face height, there was a significant difference in the scores for male (M=10.85, SD=1.156)) and female (M=6.66, SD=1.858); t (288) = 23.476, p= .000 ($p<0.05$).

For face width, there was a significant difference in the scores for male (M=139.88, SD=75.269)) and female (M=134.99, SD=8.941); t (418) = 6.106, p= .000 ($p<0.05$).

The confidence interval of the difference did not include zero as upper and lower values were positive.

The face shape of Chinese were short and wide (Face index <78.9) and they were hypereuriprosopic group (FI = 75-79.9) among both genders. The face shape of Malay and Indian were intermediate (Face index between 79-92.9) among both genders. The face shape of Malay was Euriprosopic (FI=80-84.9) and Mesoprosopic (85-89.9) and the face shape of Indian was Mesoprosopic (85-89.9) and Leptoprosopic (90-94.9) among genders. There was not a significant difference in face index among gender.

Discussion

The discoveries of the current investigation for face height were contrasted and the discoveries of the examinations completed by different researchers. Likeness and uniqueness have been found with the discoveries of different analysts.

Othman revealed that all facial estimations were bigger in men than female, with the exception of the facial profile angle which was bigger in ladies.[12]

Bayat discovered that the mean measurements of trichion–gnathion, were statistically greater in Iranian males than females. The comparing Iranian anthropometric norms with North American Whites, Malays, Turkish and African American women were demonstrated that there were statistically significant differences in most anthropometric measurements between Iranians and other populations.[13]

Alireza found a significant variation in face index between in genders. The facial index in men was higher than women. The investigation of face index between female and male students were Leptoprosopic and Mesoprosopic type.[14]

Williams reviewed that Philippine guys had taller facial height and longer mandible height than the women. There was likewise a huge facial tissue profile distinction between young people from Nigeria, Ghana and Senegal contrasted with Caucasian youths.[15]

Moninuola discovered that the men had dominatingly Euryproscopic faces yet the ladies had prevalently Mesoproscopic faces. The wide range of various measurements were higher in men than women.[16]

Dodangheh demonstrated that the most regular face type among the Iranian populace was connected to Hyperleptoprosopic. The most widely recognized kinds of face were Hyperleptoprosopic and Hyperleptene in total face index and upper face index, separately.[17]

Jaberi identified with the face measurement were higher in male than females. These discoveries affirmed the presence of sexual dimorphism in facial attributes of clinical students in the Iranian populace. In an investigation, the facial parameters of males and females were contrasted and that of Shiraz University of Medical Sciences students of Iranian populace. [18]

Conclusion

There was significant difference between facial measurements in which upper face height was strong correlation among Malay, Indian and Chinese.

Ethical Clearance: Taken from Research Management Centre, Management and Science University

Financial support and sponsorship: Nil

Conflicts of interest: Nil

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Indian Journal of Forensic Medicine and Toxicology
Volume 17 No. 1, January-March 2023
DOI: https://doi.org/10.37506/ijfmt.v17i1.18921

Clinico-Haematological Profile of Geriatric Anaemia (A Study of 300 Cases)

Editor's Note: This article has been retracted as of January 2026 as it is out of scope

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Abstract

Introduction: Anaemia in the elderly patients is associated with increased morbidity and poor health related quality of life. It is an emerging global health problem for 21st century which negatively impacts quality of life.

Aims and Objectives: The aim of this study is to know clinico-haematological patterns and morphological types of anaemia in elderly.

Material and Methodology: The present study is a descriptive cross-sectional study, which was conducted in Pathology Department of P.D.U. Government Medical College, Rajkot in which all the indoor patients of 60 years and above and clinically diagnosed as anaemic were included. Haematological investigations, factors like age, gender, symptoms and signs, peripheral blood smear, cause and grade of anaemia were utilized in this.

Result: Total 300 cases were studied; anaemia of chronic disease in age group 60-65 years was most common. Males were affected more than females. Smoking was the most common associated factor. Mostly respiratory system involved. Normochromic normocytic anaemia mostly seen. Grade-1 (mild) anaemia was most common.

Conclusion: Geriatric anaemia being under-reported and inadequately investigated, especially when mild, there is need of evaluation of even mild cases. Further studies with larger population and wider parameters should be encouraged.

Key Words: Anaemia, Geriatric patients, Clinico-haematological profile.

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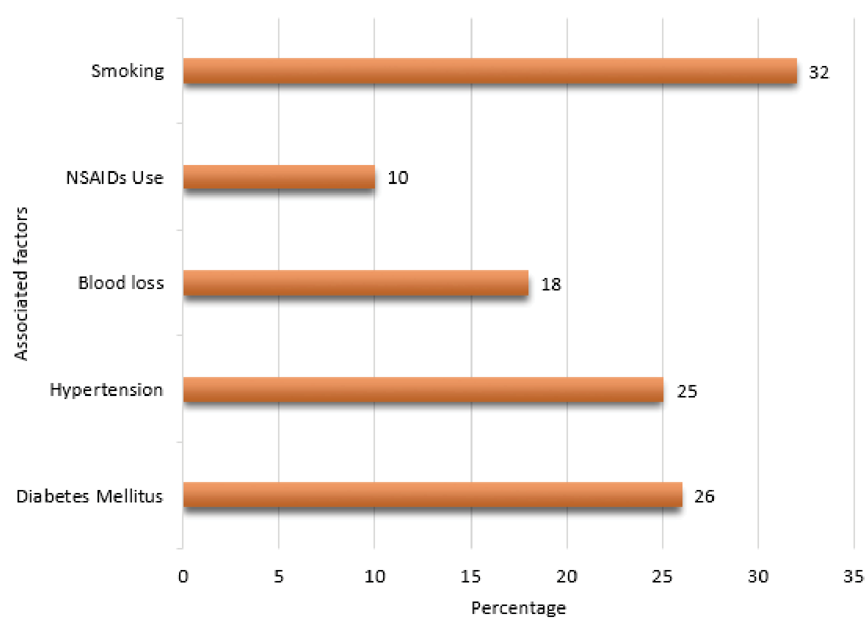
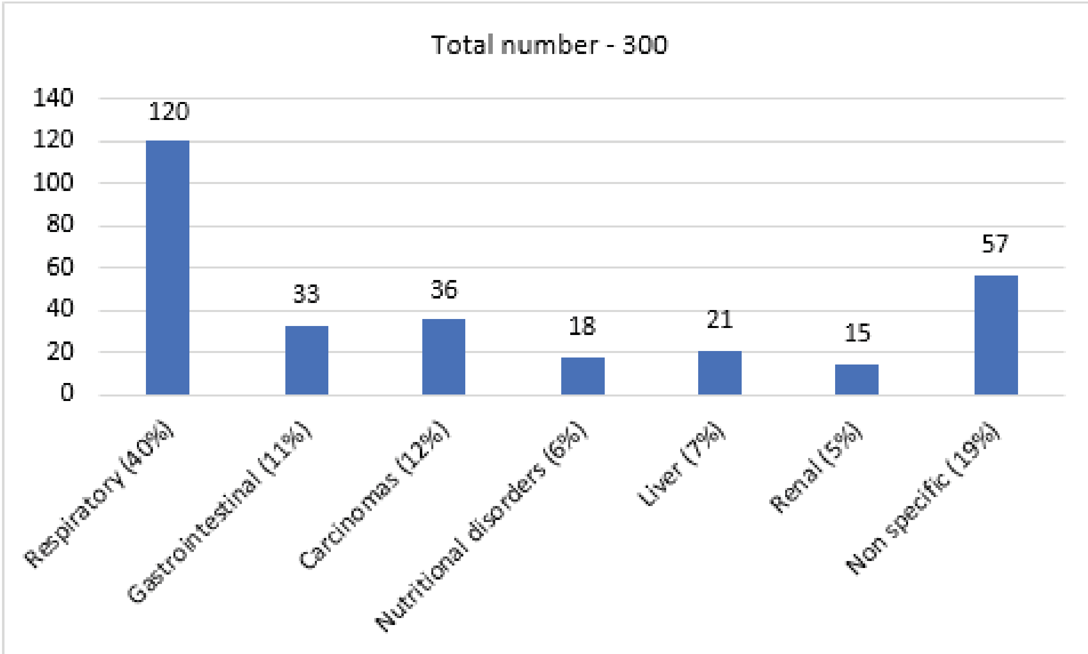
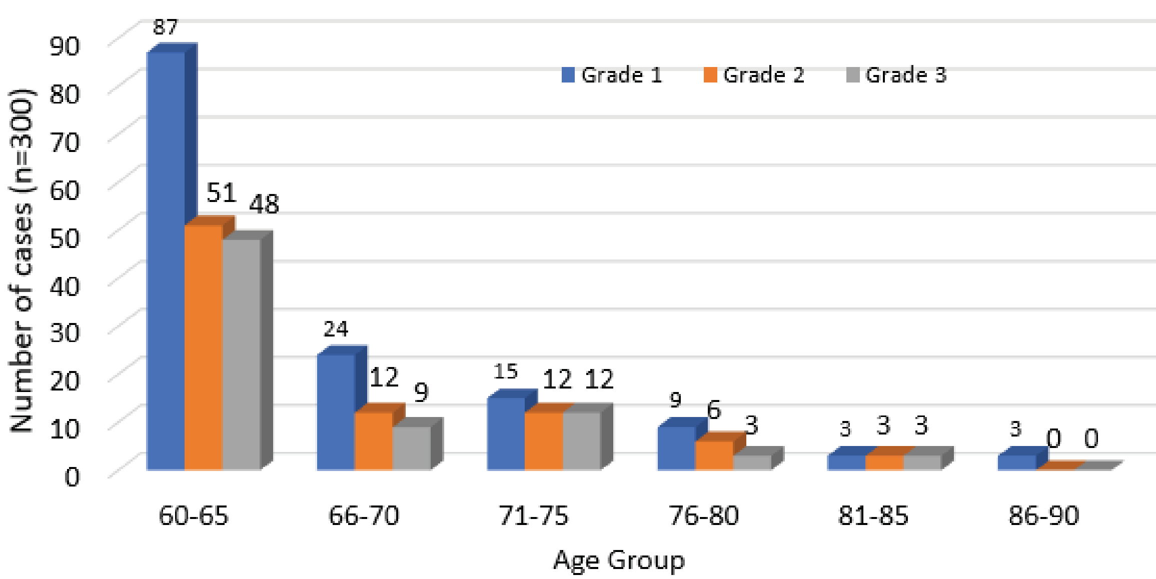

Smoking
32
NSAIDs Use
10
Blood loss
18
Hypertension
25
Diabetes Mellitus
26
Associated factors
0
5
10
15
20
25
30
35
Percentage


Total number - 300
140
120
100
80
60
40
20
0
120
33
36
18
21
15
57
Respiratory (40%)
Gastrointestinal (11%)
Carcinomas (12%)
Nutritional disorders (6%)
Liver (7%)
Renal (5%)
Non specific (19%)


Number of cases (n=300)
90
80
70
60
50
40
30
20
10
0
Grade 1
Grade 2
Grade 3
87
51
48
24
12
9
15
12
12
9
6
3
3
3
3
3
0
0
60-65
66-70
71-75
76-80
81-85
86-90
Age Group

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Registered with Registrar of Newspapers for India
(Regd. No. DELENG/2007/21789)

Printed: Printpack Electrostat G-2, Eros Apartment, 56, Nehru Place, New Delhi-110019

Published at: Institute of Medico Legal Publications Pvt. Ltd., Logix Office Tower, Unit No. 1704, Logix City Centre Mall, Sector- 32, Noida - 201 301 (Uttar Pradesh) Ph. No: +91 120- 429 4015