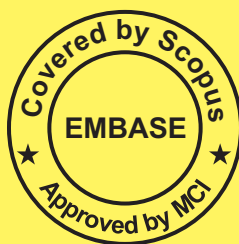




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Analytical Post Mortem Study of Head Injury in Road Traffic Accident in City Lucknow

Aditi Awasthi¹, Iram Khan², B.D. Prasad³, Anoop Verma⁴

¹JR-III, ²Associate Professor, ³Professor & Head, Department of Forensic Medicine & Toxicology, at Hind Institute of Medical Sciences, Barabanki-U.P.,

⁴Professor & Head, Department of Forensic Medicine K.G.M.U. Lucknow

ABSTRACT

This study was conducted at KGMU Morgue among 121 postmortem cases of road traffic accident (RTA) victims over a period of 1 year. The objectives of this study were to know incidence of head injury among vehicular accidents, pattern of head injury, characteristics of victims eg age, sex, involved vehicle, circumstance of accidents, helmet was used or not. In this study only those postmortem cases were observed that reached morgue after accident. The criteria for exclusion were decomposed bodies, unknown, natural diseases, admitted cases and fatality due to other body parts. Out of 121 cases 88.42% were male and 11.57% were female. The highest incidence of RTA was observed in the age group of 21-30 years. Among the two wheelers 99.22% had not used helmet. The highest number of victims were of two wheelers (46.34%). Regarding injury pattern in different parts of the body, all the victims had multiple abrasions and bruise, 83.47% had laceration, 85.12% had injury in skull bone, 100% injury to brain, 10.74% victims had injury to abdominal viscera, 16.52% had injury to rib cage bones, 14.87% to heart and lungs, 17.35% to liver and spleen and 7.43% to kidney. In the skull linear /fissure fracture was the commonest type of fracture (60.33%), followed by comminuted fracture (16.52%), depressed fracture 8.26%. Parietal bone was most prone to be fractured (32.03%) followed by temporal bone (29.12%). Most of the victims had subdural haemorrhage 85.95%.

Key words: Head Injury, Road Traffic Accident, Post Mortem, Type of Fracture, Cerebral Hemorrhage

INTRODUCTION

Most of the injuries and fatalities world wide are caused by Road traffic accidents (RTA). An estimated 1.2 million people are killed each year and around 50 million are injured due to RTA occupying 30-70% of orthopedic beds in hospital of developing countries. Developing countries bear a large share of the burden, accounting for 85 percent of annual death and 90 percent of the disability adjusted life years (DALYs) lost because of road traffic injury. RTA represents 45 - 50 % of the causes of head injury and young adults were the most common victim.

Every form of transportation has its own risks and due to the momentum caused by high speed engine used in the new motor vehicles, often the consequences of an accident are made bigger.

NEW DELHI: At least 166 people die in road accidents caused due to speeding, a trend that indicates how there is little check or driving beyond the permitted speed limit on Indian roads. The number of fatalities is higher of the crashes when speeding and drunk driving is clubbed together. According to government statistics, at least 68,000 people were killed in such crashes with only speed claiming 60,700 lives in 2012, though Delhi reported only eight such deaths.

National level data of 2012 is as such- the report prepared by the transport research wing of road transport ministry based on FIR show that states known for having better quality roads report more number of such accidents. While Maharashtra topped the list among states with at least 8,600 fatalities, Tamil Nadu reported second highest deaths due to speeding. The other states,

which registered more such fatalities, are Rajasthan, Karnataka, and Gujarat.

The NCRB data for 2013 indicates that 137423 persons including 117055 males and 20368 females, died in road accidents across the nation in 2013. The various modes of transport that was being used by the person killed in accidents include two wheelers (34187), truck/lorry (24081), four wheelers (14803) and bus (12055).

The only silver lining in the report is that the rate of deaths per thousand vehicles has gone down marginally from 1.4 in 2009 to 0.9 in 2013 as the number of vehicles have increased by 78% and the quantum of road accidents rose by 5.1% during the same period.

According to Times of India 3/9/2015, 75000 youngsters killed in road crash in 2014, aged between 15 and 34 years. Over 82% of these victims were males, according to the Road Accident Report for 2014 prepared by the road transport and highway ministry. The first helmet was used in 1885 as a view of protecting head from crashes following motorcycle accident. It did not give more protection as is given by nowadays helmet. This led to the introduction of helmet in 1931. Professor C.F. Lombard made helmet which absorbs the force of the crash. The ultimate function of a motorcycle helmet is:

1. Protect the skull from punctures
2. Provide a cushion that decelerates a rider's head during the impact.

MATERIAL AND METHOD

Study has been done in KGMU Morgue, Lucknow; as Lucknow is the referral center and many highways of all nearby districts. This study has been conducted among victims of road traffic accidents for a duration of one year (from February 2014 to 2015). In this study only those postmortems were observed which reached mortuary after death from an accident site. Various identification data of victims like age, sex, vehicle involved etc have been noted from inquest report. Points regarding injury like pathological fracture, pattern of skull fracture, intracranial haemorrhage and other major injuries were noted during postmortem examination.

PROCEDURE

A wooden block was under the shoulder so that the neck was extended and the head was fixed by hand rest. A coronal incision was made in the scalp, which started from one mastoid process to the opposite mastoid process just behind the ear and was continued over the vertex of the scalp. The scalp was reflected forward to the superciliary ridges and backward to a point just below the occipital protuberance.

AIMS AND OBJECTIVES

1. To know incidence of head injury among vehicular accidents in Lucknow metro
2. To know pattern of head injury e.g. fracture, laceration, abrasion, haemorrhage and contusion
3. To know characteristics of victims e.g. age, sex, involved vehicle etc.
4. To know circumstances of accident e.g. helmet was used or not among two wheelers.

OBSERVATIONS AND RESULT

A study was done for period of one year about the analytical postmortem study of head injury in road traffic accidents in city, Lucknow and data was collected in 121 cases about various objectives like knowing the relationship in terms of age, sex, site of skull fracture and intracranial haemorrhage associated other gross injuries and head injury year wise analysis of RTA in Lucknow District done in last five years from 2010 to 2014 (January to December) observed in the year 2010 as the number of accidents as 1281 out of which injured were 801 (62.52%). Death occurred in 497 (38.79%) total number of postmortem cases were 4180 and death due to RTA among PM were 11.88%.

In year 2011, accidents observed were 1228, out of which injured were 747 (60.83%), death occurred in 525 cases (42.75%), total number of postmortem cases were 4205 and death due to RTA among PM were 12.48%.

In the year 2012, Accidents observed were 1209 out of which injured were 811 (67.08%), death were 525 (43.42%), total number of postmortem cases were 4608 and death due to RTA among PM were 11.39%.

In the year 2013, accidents were observed in 1230, out of which injured were 794 (64.55%), death occurred in 516 (41.95) . Total number of postmortem cases were 521 and death due to RTA among PM were 9.89%.

In the year 2014, accidents observed were 1303 out of which injured were 803 (66.62) dead were 545 (48.82%) .Total number of postmortem cases were 460 and death due to RTA among PM were 11.83%.

Month wise analysis was done from February 2014 to January 2015 of total number of autopsies and total number of death due to head injury at RTA.

The minimum number of autopsies were done in the month of December 2014 of 312 cases of which 14 (4.48%) were done due to road traffic head injury.

The maximum number of autopsies were done in the month of June 2014 of 486 cases of which only 1 case (0.20%) was road traffic head injury.

Maximum number of death were observed in the month of September 2014 in which 362 autopsies were done of which 21 deaths occurred due to road traffic injury (5.80%) .

On observing age group and sex of the victims, it was noted that males 107 (88.42%) outnumbered the females 14 (11.57%) . Majority of the victims were in the age group of 21-30 years, 30.08% in males and 3.2% in females.

In road traffic accidents when data was analyzed among the type of road users, two wheeler motor vehicle occupants were maximum accounted for 57 (46.34%) cases, 26 (21.48%) were pedestrians, 29 (23.57%) were four wheelers and 04 (3.25%) were other types of road users like bicycle riders .While Bus /Truck indicate less among all victims 04 (3.25%) .

Among the motor cyclist out of 57 only 5 (8.77%) used helmet while 52 (91.22%) did not use helmet.

During autopsies of 121 case it was shown that the largest number of injuries were of abrasion and bruise (100%), lacerations were present in 101 cases (83.47%) .Fracture of skull bone was found in 103 (85.12%) of cases. Various injuries were found in every case while injury to spinal cord was found in 8 (6.61%) of cases. Other findings were fracture of rib cage bone 20 (16.52%), injury to heart and lungs 18 (14.87%), fracture

of radius and ulna (16 (13.22%), fracture of pelvic bone 18 (14.87%), fracture of femur 16 (13.22%), tibia and fibula 11 (9.09%), injury to liver and spleen 21 (17.35%), injury to kidney 9 (7.43%), abdominal viscera 13 (10.74%), while facial injuries in 16 (13.22%) of cases.

On observing the individual skull vault, out of 121 cases fractures were observed in 103 cases. Maximum number of fractures were found in parietal bone accounting for 33 (32.03%) cases, in temporal bone 30 (29.12%), in occipital 21 (20.38%), in frontal 9 (8.73%), in facial bone 3 (2.91%), where as crushed skull were found in 7 (96.79%) of cases. Skull base fracture was found in 20 cases. Fracture of middle cranial fossa was found in 11 (55%) of cases and a combination of posterior cranial fossa and middle cranial fossa was found in 2 (10%) of cases .Fracture of anterior cranial fossa was found in 3 (15%) of cases and combination of anterior cranial fossa and posterior cranial fossae was found in 3 (15%) of cases. Fracture of posterior cranial fossa was found in 5% of cases.

On observing type of fractures in vault, out of 121 cases linear/ fissure were maximum 73 (60.33%), while comminuted fracture were in 20 (16.52%) cases, depressed fracture in 10 (8.26%) cases . No fracture was found in 18 (14.87%) cases.

All cases showed meningeal haemorrhages, out of these subdural haemorrhages were seen in 104 (85.95%) cases, and a combination of epidural haemorrhage and subdural haemorrhage was found in 6 (4.95%) of cases. A combination of subdural haemorrhage, intracerebral haemorrhage and subarachnoid haemorrhage was seen in 8 (6.61%) of cases while a combination of epidural, subdural and subarachnoid haemorrhage was found in 2 (1.65%) of cases.

Brain was injured in all cases, which included area of frontal 11 (9.09%), parietal 34 (28.09%), temporal 30 (24.79%), occipital 19 (50.70%), base of brain 20 (16.52%) and whole brain 7 (5.78%) .

Out of total 121 cases, it was observed that shock and haemorrhage accounted for the cause of death due to head injury in 31 (25.61%) cases, while coma was observed as a cause of death due to head injury in 90 (81.81%) cases.

Types of Meningeal Hemorrhage

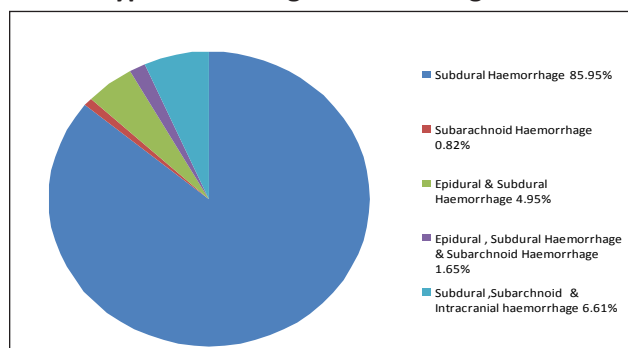


Figure No. 1

Total Age Group & Sex Victim of Male and Female

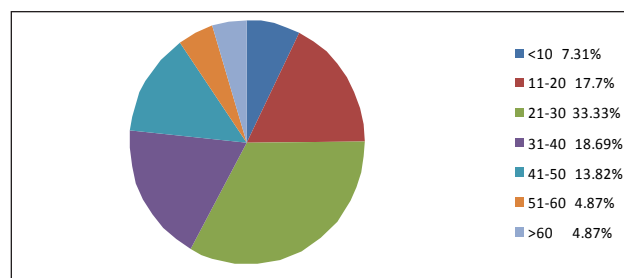


Figure No. 2

TYPE OF INCIDENCE (VICTIM)

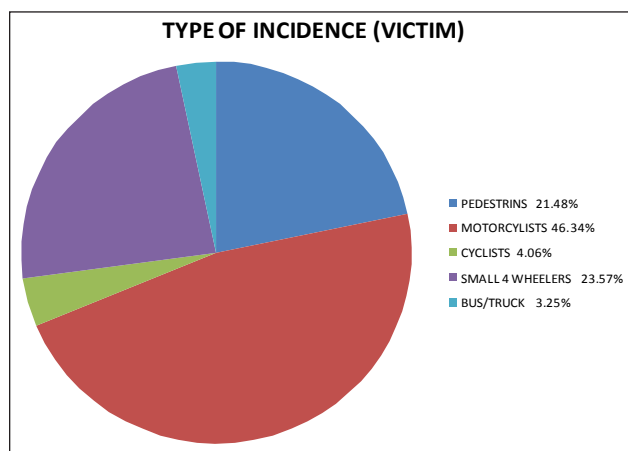


Figure No. 3

TYPES OF INJURY

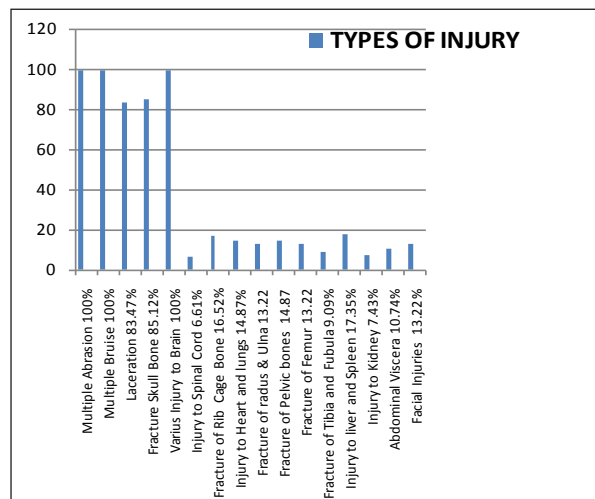


Figure No. 4

SITE OF FRACTURE IN VAULT

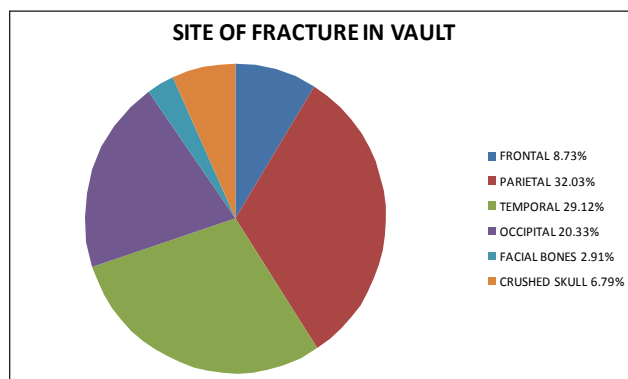


Figure No. 5

TYPES OF FRACTURE IN VAULT

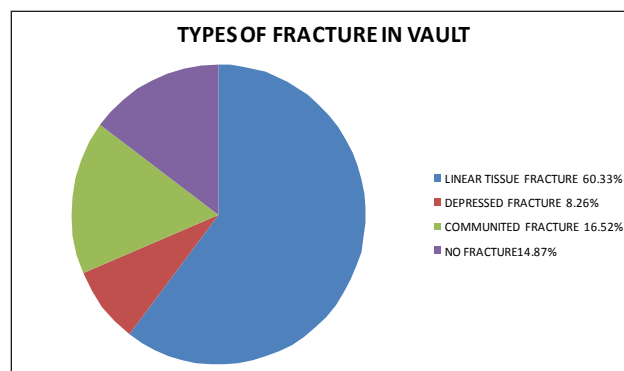


Figure No. 6



Figure No. 7: Linear & Comminuted Fracture



Figure No. 8: Comminuted & Depressed Fracture

CONCLUSION

In the present study of “Analytical post mortem study of Head injury in Road Traffic accidents in city Lucknow” had helped in drawing following conclusions:

1. Year wise analysis of RTA in the Lucknow district observed in the last five years from 2010 to 2014 (January to December) observed accidents range from a maximum of 1303 in the year the year 2014 to a minimum of 1209 in the year 2012. Among accidents maximum number of injuries (i.e. 67.08%) occurred in the year 2012, which also accounted for the maximum number of deaths of 525 (i.e. 43.42%). Year wise analysis of total number of postmortems was done with maximum number in the year of 2013 as 5216 cases. Percentage of death due to RTA among postmortem done was maximum i.e. 12.48% in the year 2011.
2. Month wise analysis of total number of deaths i.e. 21 (5.80%) due to head injury at accidental site was observed against total number of postmortems. It reveals maximum number of deaths in the month of September 2014 against 362 postmortems done. Minimum deaths was observed in the month of June i.e. 1 case against 486 postmortems done.
3. The incidence was common among the age group 21 to 30 years with 37 cases (30.08%). In this the youngest age of occurrence was 1 year old, and the oldest was 76 years.
4. Male predominance was seen in 107 cases (88.42%) and in female incidence was observed in the remaining 14 cases (ie in 11.57%).
5. Among RTA 57 (46.34%), cases were those of two wheeler motor vehicle occupants and 26 (21.48%) cases were those of pedestrians, and 29 (23.57%) were those of four wheeler occupants
6. Most common type of injury noticed was abrasions, contusions and injuries to brain in 100% cases, this was followed by laceration in 101 (83.47%) of cases. Crush injuries were seen in 7 (6.79%) cases.
7. On considering the injury of other parts of the body, rib fracture were found in 20 (16.52%) of cases, injuries in heart and lungs were seen in 18 (14.87%) of cases, fractures of long bone were seen in 16 (13.22%) of cases, abdominal injuries were seen in 13 (10.74%) of cases, pelvic bone fracture and pelvic organs injury were seen in 18 (14.87%) of cases, radius and ulna injury cases were 16 (13.22%), injury to tibia and fibula were 11 (9.09%) in number, injury to liver and spleen were observed in 21 (17.35%) cases, injury to kidney were 9 (7.34%) cases, abdominal viscera accounted for 13 (10.74%) of cases, while facial injuries were 16 (13.22%) of cases.
8. Linear and fissure fractures were the most common type of fracture of skull vault observed in 73 (60.33%) of cases, while 20 (16.52%) showed comminuted fracture, 10 (8.26%) showed depressed fractures.
9. On considering the sites of skull vault fracture, all bone fractures were seen In 7 (5.78%) of cases, parietal bone fractures were seen in 34 (28.09%) cases, 30 cases (i.e. 24.79%) showed temporal bones fracture, 19 cases (i.e. 15.7%) showed occipital bone fracture, fracture of base of bone were seen in 20 (16.52%) of cases.
10. Out of 121 cases skull base fracture was seen In 20 cases which included middle cranial fossa fracture in 11 cases (55%), anterior cranial fossa in 3 cases (15%) and posterior cranial fossa fracture in 1 case (5%). Combination of anterior cranial fossa fracture and posterior cranial fossa fracture was seen in 3 cases (15%), while middle cranial fossa fracture and posterior cranial fossa fracture was seen in 2 (10%)
11. On observing types of meningeal haemorrhage maximum number of haemorrhage observed were subdural haemorrhage In 104 cases (85.95%), followed by a combination of subdural, subarachnoid and intracerebral haemorrhage in 8 (67%) cases.

12. Sites of brain injured were observed in all cases, the maximum number of cases were found in parietal bone of 34 cases (28.09%), followed by temporal 30 cases (24.79%), in base of brain there were 20 cases (16.52%), occipital found in 19 cases (15.70%), in frontal were 11 cases (9.09%) and whole brain in 7 cases (5.78%).
13. Cause of death that was observed in 121 cases due to head injury were shock and haemorrhage in 31 (25.61%) cases while coma in 90 (i.e. 81.81%) cases.

Ethical clearance: Taken from Ethical committee Hind Institute of Medical Sciences, Safedabad, Barabanki- U.P.

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Cross Sectional Study of Medical Negligence Cases in Delhi State

Aggarwal Gaurav¹, Nangia Anita²

¹Medicolegal Consultant, Forensic Medicine, Delhi, ²Professor, Deptt. of Pathology,
Lady Hardinge Medical College, New Delhi.

ABSTRACT

Medical negligence is fairly common and cases of negligence are on the rise in USA, UK, Canada, Australia and India. To make complaints of medical negligence against Doctors and hospitals, aggrieved patients approach a host of authorities like the IMA, DMA, DHS, MOH&FW, Delhi Police, Consumer Courts, MCI, DMC and other State Medical Councils. Most authorities are required to send the cases to the Delhi Medical Council (DMC) to decide whether there is an element of medical negligence or not. Accordingly, the DMC can punish a Doctor by issuing a warning, censure, stricture or removal of name from medical register (for a variable period) if medical negligence is found. This paper's objective was to study the trend of medical negligence cases, the medical specialities involved and the punishments handed out to erring Doctors in such cases in the National Capital Territory of Delhi.

Key words: Medical negligence, Complaint, DMC, Speciality, Punishment

INTRODUCTION

The earliest historical description of medical malpractice is found in the Babylonian Code of Hammurabi 2250 BC¹- "If the surgeon has made a deep incision in the body of a free man and has caused the man's death, or has opened the caruncle in the eye and so destroys the man's eye they shall cut-off his free hand...". The first reported case of medical malpractice in the United States occurred in 1794². In the United Kingdom the reported cases of medical malpractice were rare in the nineteenth century but saw an increase in the decades preceding the Bolam's case³ of 1957. The Bolam's case however, changed the way Doctors were judged for medical malpractice cases⁴. The Bolam test has had the effect of transferring the power of evaluation

of medical malpractice from the judges to Doctors and has diminished the influence of non-medical expertise⁵. It is a common view point that a vast majority of medical errors, dissatisfactions and grievances pass without any mention⁶. In recent times, the cases of medical malpractice are on the rise in USA⁷, UK, Canada⁸, Australia⁹, India¹⁰. Medical malpractice is a prevalent phenomenon and Doctors will encounter it at some time in their career.

MATERIAL AND METHOD

Complaints by patients against Doctors range from excess billing, problems in communication, lack of time given to patient, unaffectionate behaviour, administrative issues to complaints of medical negligence. For making complaints, the patients routinely approach to various regulatory and judicial bodies like the Indian Medical Association(IMA), Delhi Medical Association(DMA), Directorate of Health Services(DHS), Ministry of Health & Family Welfare(MOH&FW), Delhi Police, Consumer Courts, Medical Council of India(MCI), Delhi Medical Council(DMC) and other State Medical Councils. For

Corresponding author:

Dr. Gaurav Aggarwal

Medicolegal Consultant, Forensic Medicine
50/G1, Block-B, Dilshad Garden, Delhi-110095
Email: drgauravagg@gmail.com

the cross-sectional study of medical negligence cases in the state of Delhi, the inclusion criteria were:

1. Only complaints of medical negligence against Doctors and/or Hospitals were studied
2. Complaints made only to the Delhi Medical Council were studied
3. Complaints decided by DMC in the first three years (since inception) only were studied
4. Complaints against allopathic Doctors registered with DMC and practising in Delhi only were studied

Delhi Medical Council (DMC) is a quasi-judicial body, formed under the DMC Act of 1997 (along with gazette notified DMC Rules 2003), responsible for regulating conduct, ethics and registration for allopathic Doctors practising within the national capital territory of Delhi¹¹.

Exclusion criteria were-

1. Complaints against Doctors registered with non-Delhi state medical councils were excluded
2. Complaints against Doctors practising outside Delhi (at the time of incident) were excluded
3. Complaints relating to excess billing, return of fees, demanding fine or penalty (not related to medical negligence) from Doctors were excluded
4. Complaints of administrative nature or behavioural issues with Doctors were excluded
5. Complaints against quacks and anonymous complaints were excluded
6. Complaints against non-allopathic Doctors were also excluded

One hundred consecutive complaints made since the inception of Delhi Medical Council were line-listed and studied.

FINDINGS

Table No. 1: Cases of medical negligence

S. No.		Number of cases (n = 100)
1	Medical Negligence	7
2	No medical negligence	93
	Total	100

Table No. 2: Medical Vs Surgical specialities in medical negligence

1	Medical specialities	37
2	Surgical specialities	29
3	Several	14
4	Not known	20
	Total	100

Table No. 3: Speciality of medicine involved in medical negligence

S. No.	Medical speciality involved in the complaint of medical negligence	Number of cases (n = 100)
1	Physician	16
2	Surgeon	8
3	Gynaecology	8
4	Orthopaedics	6
5	Radiology	4
6	Eye	3
7	Anaesthesia	3
8	ENT	3
9	Cardiology	3
10	Pediatrics	2
11	Urology	2
12	Psychiatry	2
13	Neurology	2
14	Oncology	2
15	Urosurgery	1
16	Gastroenterology	1
17	Several Doctors (more than one speciality involved)	14
18	Not known (not specified, as per DMC orders)	20
	Total	100

Table No. 4: Decision / Action taken by DMC

S. No.	Decision / Action taken by DMC	Number of cases (n = 100)
1	Medical negligence	7
2	No medical negligence	93
3	Name removed from medical register	7
4	Professional misconduct	2
5	Warning issued to Doctors	12
6	Stricture recorded in state medical register	0

Medical negligence was decided in 7 out of 100 complaints by patients to the DMC. Name of Doctor was removed from Delhi state medical register in all 7 cases of medical negligence for a variable period ranging from 2 weeks to upto 3 months. No medical negligence was found in 93 out of 100 cases of complaints. Out of the 93 cases where medical negligence was not found, professional misconduct was decided in 2 cases and a warning was issued to the concerned Doctor/hospital in 12 cases. In none of the cases, a stricture as punishment was passed against any Doctor.

CONCLUSION

Of the sample size of one hundred cases (n=100) of complaints of medical negligence against Doctors and / or hospitals, 7% were found to be negligent while 93% were not (Table 1). Medical specialities were found to be involved in 37% instances as against the 29% involvement of surgical specialities (Table 2). It is pertinent to note that in 14% cases, the charge of medical negligence was against more than one speciality (several specialities), the exact nature of the speciality involved not being mentioned in the DMC orders. There were also 20% cases in which the speciality was not mentioned at all. In effect, the total number of instances where the speciality involved was not mentioned in the records was as much as 34% or one-third of the total sample sizes. This figure of one-third of unknown speciality cases is important because if the actual speciality were known, then the figure of 37% medical and 29% surgical speciality could have swayed towards either side. This leads us to conclude that to have a good idea of the specialities involved (medical or surgical) in medical negligence cases, we need to study a sample size larger than one hundred.

Further, physicians (General Medicine) were most likely to be complained against in a case of medical negligence (16%) by a patient (Table 3). The second most common speciality involved in negligence was Surgery and Gynaecology (8% each). These were followed by Orthopaedics (6%) and Radiology (4%) respectively. Other specialities, although complained against, were fairly less likely to be involved in cases

of medical negligence. If we compare the 'bigger' specialities (General Medicine, Surgery, Gynaecology, Orthopaedics and Radiology) involved in negligence cases with the 'smaller' ones (Eye, ENT, Anaesthesia, Cardiology, etc.) that are less likely to be involved, we can conclude that in 42% of cases the bigger specialities are likely to be involved while in 24% of cases the smaller specialities are involved. This is despite the fact that in 34% cases of this study, the exact speciality was not known. This leads us to believe that the latter specialities of Eye, ENT, Anaesthesia, Cardiology, Paediatrics, Neurology, Psychiatry, etc are safer to practice than the specialities of General Medicine, Surgery, Gynaecology, Orthopaedics and Radiology. As far as the various punishments awarded to Doctors by the DMC are concerned (Table 4), the DMC found that even if a Doctor was not guilty of medical negligence s/he was found to be guilty of professional misconduct (2%) by way of advertising or fee-splitting (1 case each). It is important to note that in as much as 12% instances of complaints, Doctors' conduct and/or medical practice was found short of (if not overtly negligent enough) reasonable ethical and/or medical standards of patient care and hence a warning was issued to them so as to be careful in future. Such a warning is also recorded in the concerned Doctor's records in the DMC.

While it might give a solace to practising clinicians that 93% of Doctors in Delhi were not found to be negligent in complaints and were imparting reasonable care and skill to their patients and society at large (Table 1), it needs to be pondered over that the 7% who were not should empower themselves enough by continued medical education so as to cover their shortcomings and improve patient-care with the aim of winning patients' trust and confidence. A complaint by a patient against a Doctor, even if not found negligent, in itself means that the patient is not satisfied and rather aggrieved for some or the other reason. Doctors and hospitals administrators need to introspect and involve in some soul-searching to find out the causes of patient complaints, endeavour to eradicate them completely with the aim of compassionate and updated knowledge well-equipped for patient care.

Conflict of interest: There is no financial, academic or other conflict of interest by employment, consultancy, ownership, honoraria, or paid expert testimony in conducting the research study.

Source of Funding: Self-funded.

Ethical clearance: There was no experimentation with human beings, animals or machines while undertaking the study. Ethical clearance was not required.

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Pattern of Ligature Mark and Type of Ligature Material used in Cases of Hanging in Rural Region of Central India—An Autopsy Based Study

¹Ambedkar Ranjan, ²P. N. Murkey, ²B. H Tirpude, ³Sharjeel Khan, ²I L Khandekar, ³Pravin Zopate,

¹Post Graduate student, ²Professor, ³Assistant Professor, Mahatma Gandhi
Institute of Medical Sciences, Sevagram, Wardha

ABSTRACT

An asphyxial death is a common phenomenon. The stressful life with financial burden, poor socio-economic status, suicidal tendency, industrialisation, psychiatric disorders, human errors, estranged relationships, accidents etc had contributed to a tremendous increase in asphyxial deaths. Hanging is second or third most popular method of suicide. Hanging has been employed as the method of suicide since time immemorial. Usually all hanging cases are suicidal. Accidental hanging is un-common and homicidal cases are rare. Moreover there is great diversity related to marital status of victim and place of hanging which provides a rough clue for investigating authorities. The present study is based on the autopsies conducted in the mortuary of Forensic Medicine Department, situated in central India. A total number of 1833 postmortem examination were conducted during 1st August 2011 to 31st July 2016 and amongst these 121 cases were due to asphyxial deaths.

Key Words: *asphyxia, ligature mark, hanging.*

INTRODUCTION

The term asphyxia means absence of pulsation or pulselessness. Asphyxia is best described as a condition caused by interference with respiration or lack of oxygen in respired air or failure to eliminate carbon dioxide during breathing, due to which the organs and tissues are deprived of oxygen, causing unconsciousness or death. Among fatalities that are subjected to medico-legal autopsies, asphyxial deaths account for a significant number of cases. Asphyxial death is a common incidence in forensic practice, and determination of the manner of death is very much important. The manner of death can be suicidal, accidental or homicidal due to asphyxia. Asphyxia may be due to mechanical, environmental, industrial or pathological causes. Asphyxial deaths are divided into different types, like Hanging (Partial, Typical and atypical), strangulation (Manual, Ligature), suffocation (Environmental, Smothering, Choking, Mechanical, Suffocating gases), Chemical asphyxia

(Carbon monoxide, Hydrogen cyanide, Hydrogen sulphide), and drowning (Dry and Wet drowning).

Though hanging, is common in both sex, it will be a great challenge for the medical officer as hanging by a female is viewed very suspiciously, more so when it is atypical or the body has been let down.

In most of the cases the females use the materials which they wear. It is noticed that a female who decides to hang herself uses a cloth as a ligature material especially a saree, which elongates and stretches when pulled by her body weight which does not result in clear cut ligature mark on the neck.

Occasionally, death in a vehicular accident is due to hanging when the victim is suspended by the steering wheel of a car. Similarly a cyclist who collides with the rear of a lorry or car may suspend on the edge of its board. A person while descending a ladder may be suspended by one of its rungs. Death of an adult woman

who when drunk fell across the sharp edge of a sofa in such a manner that the weight of her body was exerted on her neck, as she lay incompletely suspended.

The “**mark of hanging**” on the victim depends upon the height of suspension point, nature and composition of the ligature material used, weight of the body, duration of suspension, things which intervene between the ligature material and skin of the neck and requires experts skill and care for the determination of cause and manner of death. Multiple rounds of ligature around the neck with two or more fixed knots calls a special care in interpretation to decide the cause and manner of death other injuries over the neck and bodily injuries could complicate the matter.

The level at which the loop lies is also of importance in making the distinction between hanging and strangulation by a ligature. When hanging is affected from a low point of suspension, the mark on the neck closely resembles that of strangulation, it may take a horizontal course round the neck at the level of the upper border of the larynx, in this case expert’s skill will be required to denote the cause and manner of death.

A running noose can tighten at the time of suspension and then produce a mark which takes a horizontal course resembling that of a ligature used in strangulation. Failure to find a **platform** at a scene of hanging by complete suspension of person’s body must arouse suspicion but attention to detailed search may lead its recognition. In cases of inaccessible point of suspension, a medico legal expert should take into consideration, the positive findings, and the circumstances surrounding death, the accessibility of point of suspension, presence of ligature material, presence or absence of intoxication or any drug in the body, should be taken into consideration while deciding whether the death is suicidal or homicidal.

A mark may be present on the neck of obese person, particularly of a fatty baby as a result of hypostasis. The skin in the natural fold of the neck remains pale. When neck is extended, it resembles to be produced by a ligature. Tight neck collar may also yield a “mark”, which superficially resembles to be of a ligature mark.

The helmet or hat with strap can also produce a mark which superficially resembles that of a ligature and may mislead the diagnosis. The use of soft ligatures (e.g. saree, scarf etc.) especially broad one and applied only for a short period of time may lead to difficulty in the Homicidal hangings are possible only when the physical disproportion is too more between the assailant and victim or the victim is comatose or intoxicated. Postmortem hanging immediately after death also looks like ante-mortem hanging which requires special skill and knowledge and thorough investigation to come on at correct diagnosis.

After strangulation or throttling a person may be hanged as complete suspension in absence of a platform, which raises a suspicion of murder and gross injuries may be seen over the neck following strangulation by a ligature or manual (throttling). Any cases of asphyxial death must be examined with meticulous attention especially the ligature mark, the hyoid bone, thyroid gland, thyroid cartilage, cricoid cartilage, upper part of air passage and upper part of the vertebral column with spinal cord beneath the ligature mark for deciding the ante-mortem or postmortem injuries and lungs in case of drowning. Lot of care is required to differentiate strangulation from other mechanical asphyxial deaths.

Absence of ligature mark or double ligature mark or partial hanging with feet touching the ground may mislead the investigating officer regarding the cause and manner of death.

A number of lock-up deaths have been reported in the state of Maharashtra due to hanging or partial hanging which makes it difficult to convince the common people and relatives of the deceased or media and human rights as to the manner of death.

AIMS AND OBJECTIVES

1. To study the profile of cases of hanging with respect to the type of ligature material used.
2. To study the position of ligature mark with respect to thyroid cartilage.

MATERIALS AND METHOD

This study is conducted in the Department of Forensic Medicine of the Medical College situated in central India. The postmortem examination was conducted in the mortuary and nearby areas as spot post-mortem examination from 1st August 2011 to 31st July 2016.

Total number of asphyxial deaths and all the hanging and drowning cases which were recorded in this department of Forensic Medicine and which had occurred in and around the nearby district and brought dead cases to the attached Hospital of this medical college were studied.

All information gathered from the deceased relatives and from the police panchanamas, crime scene reports and photographs taken and received from the police and postmortem reports of this department and histopathological reports of ligature mark from the Department of Pathology and other contributory factors was studied.

Detailed postmortem examinations conducted in all the cases of asphyxia and also all external and internal findings were noted and studied. And all other associated injuries and factors like poisoning, sedation, and history of attempted suicides and evidence of signs of struggle (defence injuries), for presence of any sedatives, intoxicants and for the presence of any suicidal notes were studied.

The present study is based on the autopsies conducted in the mortuary of Forensic Medicine Department, situated in central India. A total number of 1833 postmortem examination were conducted during 1st August 2011 to 31st July 2016 and amongst these 121 cases were due to violent asphyxial deaths. Among the asphyxial deaths 46.28% (56 cases) were due to drowning and 42.14% (51 cases) were due to hanging, the statistical analysis of these cases of hangings with regard to general incidence of age, sex, marital status, and materials used for hanging, socioeconomic factors etc., were worked out, statistical analysis of drowning cases was also done with consideration of age, sex, marital status, suicide and accidental point of view etc.

Inclusion Criteria: All the victims of hanging who died on the spot or brought dead to hospital or died after admission in hospital.

Exclusion Criteria: All the victims who died of violent asphyxial deaths other than hanging.

Statistical Analysis: 1. The software for graphs and calculation of statistical values is – SPSS.

2. The software used during creation or modification of some of the diagrams.

(a) ADOBE PHOTOSHOP(R) 7.0

(b) COREL DRAW X3

(c) WINDOWS -10

OBSERVATION AND RESULTS

Table No. 1: Type of Ligature material used

S. No.	Ligature material	Male	Female	Total
1	Nylon rope	06 (18.75%)	05 (26.32%)	11 (21.57%)
2	Dupatta	01 (3.13%)	05 (26.32%)	06 (11.76%)
3	Jute rope	04 (12.50%)	01 (05.26%)	05 (09.82%)
4	Saree	03 (09.36%)	00	03 (05.88%)
5	Cloth	01 (3.13%)	01 (05.26%)	02 (03.92%)
6	Gamaccha	00	01 (05.26%)	01 (01.96%)
7	Metallic wire	01 (3.13%)	00	01 (01.96%)
8	Ligature not accompany with deceased	16 (50%)	06 (31.58%)	22 (43.13%)
	Total	32 (100%)	19 (100%)	51 (100%)

Nylon rope was most common ligature material used for hanging (11 cases) followed by Dupatta (6 cases). Jute rope used by 5 cases of hanging and 3 cases used Saree as ligature material. 2 cases used cloth for hanging. Gamachha used for hanging in one case and metallic wire used by another one case. In 22 cases of hanging information about used of ligature material was not available and also not accompanied with the body.

Table No. 2: Relation of ligature mark with the thyroid cartilage

S. No.	Relation to thyroid cartilage	Male	Female	Total
1.	Above the thyroid cartilage	31 (60.78%)	11 (21.58%)	42 (82.36%)
2.	Over the thyroid cartilage	3 (5.88%)	3 (5.88%)	6 (11.76%)
3.	Below the level of thyroid cartilage	1 (1.96%)	2 (3.92%)	3 (5.88%)
	Total	35 (68.62%)	16 (31.38%)	51 (100%)

In maximum cases of hanging ligature mark was situated above the thyroid cartilage (42 cases) and 3 cases shows ligature mark below the level of thyroid cartilage. In 6 cases of hanging position of ligature mark was over the thyroid cartilage.

DISCUSSION

Table No. 1: Type of ligature material used—Nylon rope was the commonest ligature material used for hanging in our study 21.57% (11 cases) probably because most of the victims of hanging were farmers, farm workers or most of them belong to agricultural family background. Nylon rope is easily available due to common use for various purposes by farmers and for domestic uses and also, as it is cheap, the incidence of its use in suicidal hanging was more. The study by Sharma BR et al ⁵18.18% and Momin S et al ²28.1% have similar finding with slight variation, whereas our finding with other author does not match e.g. **Bhosle SH et al** ¹ 53%.

Table No. 2: Relation of ligature mark with the thyroid cartilage—In our study ligature mark situated above the level of thyroid cartilage in 82.36% (42) cases of hanging, which is similar with the observation of Momin S et al ²(80%), Bhosle SH et al ¹(83.33%) and Sharma BR et al ⁴(84.02%), Also Reddy KSN ³ has mentioned that mark of hanging is situated above the level of thyroid cartilage between larynx and chin in 80% cases. It may be situated at the level of thyroid cartilage in about 15% cases and

below thyroid cartilage in about 5% cases, especially in partial suspension.

CONCLUSION

- Nylon rope was the commonest ligature material used for hanging in our study 21.57% (11 cases) probably because most of the victims of hanging were farmers, farm workers or most of them belong to agricultural family background.
- In our study ligature mark was situated above the level of thyroid cartilage in 82.36% (42) cases of hanging which itself establish the universal fact.
- Hanging is the commonest method of suicide. If the trend of suicide is left unchecked the loss will be invariably insurmountable both economically and socially. Suicide is a major health problem and the medical profession has to take a role in the management of this health problem.
- Males and females both are exposed to such stresses, but in this study it seem that being a male dominated society and more exposure to external environment, such cases are commonly seen in males.
- Poverty, lack of employment, family problems, defamation and alcoholism are the main reason of suicidal cases in this particular generation of people.
- Due to repeated physical and mental torture, they go beyond threshold level of self-constrain and commit suicide by easily available ligature material. This tendency was found more in young generation of people.
- A well designed and comprehensive programme is needed to identify the causative factors and preventive of suicidal behaviours.
- The probable preventive measures to tackle suicide would be adopting de-stressing programmes for the stress prone people, providing better education and increasing the economic status by creating job opportunities for the underprivileged

and upholding the family bondage in the nuclear families.

- Various socio-economic factors responsible for the high incidence of suicide need a practical and early redressal on the Govt.-front, by properly and honestly framing the policies and implementing the same in such a manner that their benefits reach the needy.
- The NGOs and Social Organizations can contribute their bit by building a satisfactory interpersonal relationship between the young and the elders in the society.
- Popularizing vocational courses as per the caliber of the individuals will go a long way in decreasing the insecurity of the unemployed, thereby boosting their self-confidence and will power.

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Conflict of Interest: NIL.

Ethical clearance: Taken from: - Ethics committee, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha, Maharashtra, India.

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Managing Transparency and Disclosure to Prevent Medical Error in Indian Hospitals

Amit Kumar Pandey¹, Anu Prashant², Rahul Gupta³, Hargovind Kakkar⁴,
Jaya Yadav², Sanjeev Bansal³

¹Assistant Professor, ²Associate Professor, ³Dean (FMS), Director, Amity Business School,
Amity University, Sector-125, Noida (UP), 201303

ABSTRACT

This study is all about transparency and disclosure of medical services in Indian Hospitals, where researchers communicated with the hospital authority, patients and their attendants and collected primary data for further analysis. Resultants are surprised to see that in health care, services quality is not as good as patients are paying. Medical services can vary greatly - even for the same procedure, in the same area, within the same network. Quality and outcomes can vary just as greatly, with no relationship to price.

Health care transparency can help patient and their attendants to improve the throughout communication between the Hospital authority and patients. It also leads to more engaged, activated employees. Greater transparency means disclosure of all medical procedure before the attendant of patient that high-quality health care providers will receive the recognition they deserve for the excellent care they deliver.

Key Words: Hospitals, caregivers, services providers, disclosure and transparency

INTRODUCTION

Now a day there are plenty of cases of medical error at the hospitals but unfortunately intentionally or unintentionally error reporting is negligible. Not even in India, outside the country especially countries of western part of the world are also not very serious for such issues. An effective reporting system could support to the patients and medical care givers to prevent such accidents at the hospitals. Most of the time incidents took place and service provider do not understand the severity of the error which is dangerous for the patients as well caregivers. The Institute of Medicine (IOM) ignited a

fire storm of controversy in 1999 when it published a report that shocked the medical community. The IOM reported that medical errors are the eighth leading cause of mortality in the country, responsible for as many as 98,000 deaths per year¹. Some of the challenges in using error-reporting mechanisms are associated with the lack of standard definitions, gaining easy access to databases, and the associated cost of electronic applications. Prevention is always better than cure. An attentive services provider always being focused for the safety issues. Since disclosure requirements never explain the level of the disclosure but it suggested that it must be informed to the patients when any kind of mistake occurs otherwise error begun to shift from upward to downward and situation may be more fatal and it will lose the creditability¹¹. Moreover unintentionally some cases might be possible which must be reported. A reporting system is the back bone of the safety related

Corresponding Author:

Dr. Amit Kumar Pandey

Assistant Professor, Amity Business School
Amity University, Sector-125,
Noida (UP) 201303

issues and health care system should have a standard protocol so far. Patient and family should be the part of the error reporting. Sixty-nine percent of health care institutions had error disclosure policies². A sufferer should not be silent because it may harm to the society, they must raise the issue before the competent authority. It could be an initiative to save the life of others in error.

Disclosure of the error in medical profession should be a practice which required careful planning, preparation and coordination by providers and hospital administrators. Less preparation while any medical procedure raise complexity, and badly executed disclosure only frustrates practitioners, ruins the reputation of the hospitals and this fraternity. Moreover to permitting patient safety procedures to be executed in response to medical errors, disclosure has other tangible benefits to the injured patient. The information allows a patient “to obtain timely and appropriate treatment to correct problems” and to gather the “necessary information to make informed decisions³.”

REPORTING SYSTEM IN HOSPITALS

Reporting system should be a culture in any medical system. Error reporting should be mandatory at any medical system which enhanced the quality of the services. Litigation in the health care arena is an inefficient and time-consuming process that leaves most patients who have experienced a poor outcome uncompensated⁴. There are several mode of communication available for the reporting where patients as well doctors can inform to the competent authority for the error. Research suggests that a provider’s lack of transparency may actually increase the likelihood that patients will seek legal retribution, especially when they have not received adequate answers to questions, they sense an absence of accountability, or they worry that the same mistake will recur in the future⁵. Hospitals are having a risk manager at the hospital to understand the severity of the error. These services must be available round the clock where report can be lodged. It should work like as a monitoring committee not as the investigating

committee. Another study found that 24% of patients filed suit only after discovering that the physician was not honest about what had happened or that the patient had been intentionally misled⁶. Hospital employee who promptly report patient safety incidents are highly praised and appreciated. It’s important to let the reporting department should be aware about the activity.

How should overcome by such challenges like medical error. Include type of patient safety incident, examination reports, financial, legal and public relations implications of the event for system improvements, and number and quality come across. These data are used for intra quality management, research, public outreach giving out. The safety and risk management department maintains the patient safety incident management records.

TRAINING AND COUNSELING OF THE PATIENT

To improve transparency, now a day hospital administration has started continue medical education (CME) and continuing training requirements for professional, administrative and support staff. Educational requirements are met through annual competency assessments, monthly organization-wide patient safety and educational programmes, grand rounds, unit-specific patient safety and disclosure training, and train-the-trainer programmes. The level of training ranges from didactic to experiential using standardized patients and role plays. All care providers involved in an event encouraged to actively participate in the communication process and disclosure as part of their healing and learning processes.

Disclosure and transparency in this term may be second line problem which initiated by first line. In context to that hospital administration is equally responsible for the incidents, so precautionary measure is necessary for the prevention of such problems. The risk manager on call conducts a preliminary review of the patient safety.

FRAMEWORK OF THE COMMUNICATION WITH PATIENT SAFETY

Communication channel for the reporting at the hospital should be transparent. Because if a single incidents taken place over there, then a sharp reporting system stop the repetition of the same incidents again. This framework indicate the communication channel where patients, caregivers and doctors may report the iatrogenic or human at the (24X7) help desk which is for the counselor. There are three major issues which is responsible for the prompt response at the time of any medical error reporting.

- Waiting time
- Reaction Time
- Response time

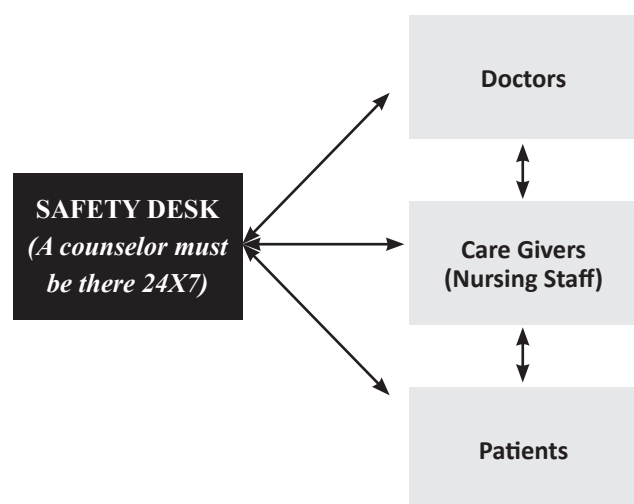


Figure No. 1: Theoretical Framework
Proposed by (IPSO)

EFFECTIVE COMMUNICATION AND PATIENT SAFETY

Communicating the details of a patient safety incident involves a series of meetings. In most cases, the responsible care provider is part of and often leads the disclosure and delivers the apology. This approach guides the timing and maintains balance of the disclosure discussions. Yet even where these reporting mandates are in place, there is generally no guidance for when and how the disclosure is to be achieved or what information is to be disclosed¹². To facilitate conversations between the

patient and provider, there should be a separate department of the reporting which people get training for the complex situations. Members ensure that the disclosure includes “an apology for any unreasonable care”⁸.

RESEARCH METHODOLOGY

Research methodology is an essential part of any research which deals with the methodological part. Methodology for different rack of the data may be different but ultimately major goal is to extract the resultants. Moreover it helps researchers to understand the need of the resources for the further analysis of collected raw data. The major concern about the hypothesis is that researchers must predict the outcomes of the research. It provides a direction and on the basis of first one researcher predicts the second hypothesis and so on. Data collection tool is structured questionnaire and total number of samples taken for the further study was 200. Data has been collected from the major government and corporate hospitals of Delhi NCR.

OBJECTIVE OF THE STUDY

- To study the effect of conversation between patients and medical services provider.
- To analyze the impact of the transparency and disclosure in medical services.

HYPOTHESIS FOR THE STUDY

Transparency and disclosure has become now a burning issue because of the awareness of the customers. In hospital industry situation is different as the parameter of the services is wide and expectation of the patients is too much. It was the matter of long back when patients never are being interested to know that what is happening and happened. But in current scenario situation is different and everyone is interested to know about the treatment and other things.

There is some hypothesis which framed for the study.

H1: Sharing of the information with the patients and their attendants regarding the medical services build better environment of transparency in any hospital .

H2: There is significance impact of disclosure of the incidents took place while medical procedure on the services of the hospitals.

H3: Reporting of the incidents and across communication among the various departments are the pillars of the services in Indian hospitals.

HYPOTHESIS TESTING FOR THE STUDY

Hypothesis 1: Sharing of the information with the patients and their attendants regarding the medical

services build better environment of transparency in any hospital organization.

H0: There is no significant impact of sharing of the information and transparency in the medical services in Indian Hospitals.

H1: There is significant impact of sharing of the information and transparency in the medical services in Indian Hospitals.

Table No. 1.1: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Information-Transparency	3.4219	200	.49213	.031254
		2.0159	200	.17234	.092412

Table No. 1.2: Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Information-Transparency	200	0.621	.721

Table No. 1.3: Paired Differences

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Information-Transparency	1.4132	.33528	.78691	1.06543	2.65230	-15.637	199	.000

The critical t value ($p = 0.05$) for 199 degrees of freedom ($n_1 + n_2 - 2$) is 0.000. The calculated value is less than the standard values. Therefore, Researcher is failing to accept the Null Hypothesis.

H2: There is significance impact of disclosure of the incidents took place while medical procedure on the services of the hospitals.

H0: There is no significant relationship between the disclosure medical procedure and services at the hospitals.

H1: There is significant relationship between the disclosure medical procedure and services at the hospitals.

Table No. 2.1: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 2	Disclosure -Services	1.7813	200	.49213	.031254
		1.7114	200	.17234	.092412

Table 2.2 Paired Samples Correlations

		N	Correlation	Sig.
Pair 2	Disclosure -Services	200	0.721	0.056

Table 2.3: Paired Differences

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Inter- val of the Difference				
					Lower	Upper			
Pair 2	Disclosure - Services	0.0699	.27123	.17234	1.0412	0.03241	09.314	199	.045

In second hypothesis of this study, where two variables disclosure and services have been taken for the analysis. Data has been collected and analyzed with the help of the t-test, where value of p is .045. Here calculated value is less than the calculated value.

Here once again researcher failing to accept the null hypothesis.

Hypothesis 3: Reporting of the incidents and across

communication among the various departments is the pillars of the services in Indian hospitals.

H0: There is no significant relationship between the internal communication and quality of medical services in Indian Hospitals.

H1: There is significant relationship between the internal communication and quality of medical services in Indian Hospitals.

Table No. 3.1: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 3	Communication-Services	2.1821	200	.012832	.078231
		1.6139	200	.021832	.009281

Table No. 3.2 Paired Samples Correlations

		N	Correlation	Sig.
Pair 3	Communication-Services	200	0.900	.832

Table No. 3.3: Paired Differences

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Inter- val of the Difference				
					Lower	Upper			
Pair 3	Communica- tion-Services	0.5682	.22412	.65732	1.00234	2.02341	14.23	199	0.004

The calculated value of p is less than the standard value. So once again researcher is fail to accept the null hypothesis.

FINDINGS

The basic problem behind the medical error is lack of the reporting. Now a day epidemic of the hospital harms is not known and reported by the

concern medical services providers. Reporting of the medical error and harmful incidents or even death as a result of the breakdown of the services chain⁹. In most of the cases of medical error patients and families who are the sufferer of the medical harm report the experience of the dishonesty and obstructing by the health care providers. However, many of the hospitals hide some vital information of the patients from their

family members. Even though family member are always more attentive to know the condition of their wards (Require Full Transparency and Disclosure of Hospital Harm and Medical Errors, 2016).

In very first hypothesis, the critical t value ($p = 0.05$) for 199 degrees of freedom ($n_1 + n_2 - 2$) is 0.000. The calculated value is less than the standard values. Therefore, Researcher is failing to accept the Null Hypothesis.

Thus, this is the case of the acceptance of the alternate hypothesis. So There is significant impact of sharing of the information and transparency in the medical services in Indian Hospitals.

In second hypothesis of this study, where two variables disclosure and services have been taken for the analysis. Data has been collected and analyzed with the help of the t-test, where value of p is .045. Here calculated value is less than the calculated value.

Here once again researcher failing to accept the null hypothesis. It means alternate hypothesis would be accepted. Thus it has been concluded that there is significant relationship between the disclosure medical procedure and services at the hospitals.

The calculated value of p is less than the standard value. So once again researcher is fail to accept the null hypothesis. Against the proposed hypothesis, Reporting of the incidents and across communication among the various departments is the pillars of the services in Indian hospitals, alternate hypothesis would be accepted. So researcher concluded with the statement that there is significant relationship between the internal communication and quality of medical services in Indian Hospitals.

CONCLUSION

In developing countries, reporting system is very sharp in hospitals. Error reporting is under the protocol of the hospitals. Especially in country like Canada, there is specific regulation for the error reporting which governed by the patchwork and regulation practices¹⁰. Patient safety and transparency go hand

in hand. A hospital that will not acknowledge medical error, or worse, tries to cover it up, is one that will not learn from its mistakes¹³. And that is a very dangerous hospital. The public has a right to such information in order to make an informed decision about what may be life and death matters — and to determine which hospitals might be contributing more to their life, or death.

SCOPE OF THE STUDY

Transparency and disclosure of the information is the uttermost need of the Indian hospitals. Hospitals of south East Asia are not so prompt in error reporting. This study will help to understand the urgency of the error reporting and realize care givers that patient safety and transparency go hand in hand.

- *There is no conflict of interest is associated with this research.*
- *There are no resources of fund behind the study.*
- *All rights are reserve with the corresponding author.*

Ethical Clearance - Not required.

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Prevalence Study of Silent Liver Pathology in Autopsy Specimens at Pathology Department, NHLMMC VSGH, Ahmedabad

Anjali Goyal¹, Hitesha Radadia², Nailesh Shah³

¹Associate Professor, ²2nd year Resident Doctor, ³Professor and Head of the Department of Pathology, Smt. N.H.L. Municipal Medical College, V.S. General Hospital, Ahmedabad

ABSTRACT

Introduction: Liver diseases are frequently underdiagnosed pathology in many cases. A wide spectrum of primary as well as secondary diseases can affect liver. The study aims to determine the prevalence of silent liver diseases in autopsy specimens and to correlate it with age, sex, known and unknown risk factors. Histopathology is an important and most useful way to find out the conditions of internal visceral organs and the unique method for diagnosis of liver diseases. Histopathology study is conducted in 212 cases in the department of Pathology and the department of forensic medicine, in NHL Municipal Medical College, at V.S. General Hospital, Ahmedabad, Gujarat, India.

Objective: To study the prevalence of silent liver pathology in autopsy specimens in the department of pathology and forensic medicine at NHL Municipal Medical College, VS General Hospital, Ahmedabad, Gujarat.

Methods: The study was conducted over a period of 11months (Jan 2016 to Nov 2016) as an observational study. We collected samples of liver tissue from 212 cases for histopathology study. Gross and microscopic examination of all the specimens was done. Tissue sections were made and stained with Haematoxylin and Eosin and then evaluated.

Results: Of the 212 cases were studied, 23 cases were excluded due to autolysis. 189 cases have analyzed for study. Among 189 cases, Males were 141(74.6%) & females were 48(25.4%). Congestion was the most common finding, found in 65(34.39%) cases followed by fatty changes in 48(25.39%) cases, normal histology in 35 (18.52%) cases, hepatic necrosis in 19 (10%) cases, periportal lymphocytic infiltration in 12 (6.34%) cases, portal fibrosis in 4 (2.11%) cases, cirrhosis in 3 (1.58%) cases, granulomatous lesions in 2 (1.05%) cases and bile stasis in 1 (0.52) case.

Conclusion: This study reflects high prevalence rate of asymptomatic liver diseases as seen in autopsy specimens. Different liver pathologies like congestion, fatty changes, hepatic necrosis, portal fibrosis, cirrhosis and granulomatous lesions are found during postmortem histopathological examination.

Keywords: Autopsy, Histopathology, Silent liver diseases.

INTRODUCTION

Liver being the principle site of many metabolic activities, it is the most vulnerable and major organ in our body facing wide variety of problems like metabolic, toxic, microbial and circulatory disturbances. In some instances the disease is primary while in others the hepatic involvement is secondary to cardiac de-compensation, alcoholism or extra hepatic

infections.^[1] Most of the chronic liver diseases even in advanced stages may cause no prominent clinical signs and symptoms.^[1] They either go undiagnosed or are found incidentally during general checkups, investigation for other diseases or surgery or remain silent throughout life and can be diagnosed in autopsy specimen. Thus, autopsystudy provides valuable information for about the disease.

The major primary diseases of the liver are hepatitis, alcoholic liver disease, circulatory disturbances and neoplasm.^[1] Alcohol abuse generally leads to the pathologically distinct liver diseases; in which the most frequent hepatic lesions are fatty change, hepatitis and alcoholic cirrhosis.^[2] Person may have any one or all three lesions at the same time ^[3]. These diseases are presently the most common chronic liver disease problem in western and developing countries like India ^[4]. Fatty change (steatosis) is a very common finding both in biopsies and at post mortem examination. Liver cell involvement may be focal, diffuse, or zonal.^[5] Nonalcoholic fatty liver disease (NAFLD) includes a spectrum of liver diseases, ranging from simple steatosis to steatohepatitis, advanced fibrosis and cirrhosis. ^[5]

Chronic hepatitis is usually due to hepatotropic viruses, or conditions like auto immune chronic hepatitis or chronic idiosyncratic drug-induced hepatitis. Similar features (like presence of piecemeal necrosis) are also found in Wilson's disease, primary biliary cirrhosis and primary sclerosing cholangitis.

These findings may vary in different geographic areas and are based on various factors such as socio-economic status, life style, diet, local or regional infections, and other endemic disease. Most of the chronic liver diseases even in advance stages may cause no prominent clinical signs or symptoms and are undiagnosed or found incidentally during general checkups, investigations for other diseases or during autopsy.^[5] Hepatocellular carcinoma and tumors arising from the bile duct epithelium are common tumors of the liver.^[6]

Many chemicals including drugs and toxins can produce liver damage. Acute injury may produce parenchymal damage, arrested blood flow and jaundice. Drugs can also produce chronic active hepatitis, fatty liver, cirrhosis, several vascular lesions and rarely neoplasm lesions of the liver. Metabolic disorders like Galactosaemia, hereditary fructose intolerance, tyrosinaemia, Zellweger's syndrome, glycogen storage diseases, lipid storage diseases (Gaucher disease, Niemann Pick disease, Fabry's disease) and disorders

of copper metabolism such as Wilson's disease and Indian childhood cirrhosis also affect the liver.^[6] Hence, determination of the prevalence of silent liver diseases and its correlation with age, sex and various risk factors have become an important ongoing study.

The main purpose of this study was to analyze different patterns of liver diseases apart from alcohol abuse that are reflected in the morphology of the liver at autopsy.

MATERIALS AND METHOD

Liver specimens were collected from 212 cases over a period of eleven months from Jan'2016 to Nov'2016 as an observational study in the department of pathology and the department of forensic medicine. The histopathological examination was conducted in the department of Pathology, NHL Municipal Medical College, V.S. General Hospital, Ahmedabad, Gujarat. 23 out of 212 cases were excluded due to autolysis & 189 cases were taken for further study. In this autopsystudy, all received liver specimens were examined grossly. All the specimens were fixed in 10% formalin & processed, sectioned and stained with Haematoxylin and Eosin after standard procedures. In each case, the important information regarding age, sex, clinical findings, suspected cause of death and post mortem findings were obtained from postmortem papers provided by the forensic medicine department.

RESULTS

The study was conducted in the department of pathology and the department of forensic medicine in which 212 cases were taken first. Out of which 23 cases were excluded due to autolysis of the specimens and 189 liver autopsies were studied finally. Out of 189 cases studied, 141 (74.6%) were males and 48 (25.4%) were females. Male population was more affected than female in the present study.

The circulatory changes in the form of congestion was the most common lesion seen in 65 (34.39%) cases followed by fatty changes [Fig-3] in 48 (25.39%) cases, normal histology in 35 (18.52%) cases, hepatic necrosis

in 19 (10%) cases, periportal lymphocytic infiltration in 12 (6.34%) cases, portal fibrosis in 4 (2.11%) cases, cirrhosis[Fig-4] in 3 (1.58%) cases, granulomatous lesions[Fig-5] in 2 (1.05%) cases and bile stasis in 1 (0.52) case. Thus, out of 189 cases, 154 cases showed pathological changes and 35 cases show normal histology.

The age wise distribution of the cases in present study was wide ranging from 5 months to 90 years. Most common age group for male was 4th (32 cases) and 5th (31 cases) decade and for female, it was 4th (14 cases) and 6th (9 cases) decade. Congestion was the most common finding followed by fatty changes. The fatty changes were seen more characteristically at the age of 40 years and above and more common in male than female. Male: Female ratio for fatty changes is 5:1 in the present study. The diagnosis of cirrhosis was made on gross examination and was confirmed microscopically. Cirrhosis of liver was seen only in 3 cases and there was one case each in the age group of 31-40 years, 41-50 years and 51-60 years. All 3 cases of cirrhosis are seen in male patients. Granulomatous lesions were found only in two cases and both patients were male and in the age group of 41-50 years.

DISCUSSION

Histopathology is the most important and useful way of diagnosing liver diseases as some may remain silent and diagnosed only at autopsy. Abnormal findings in liver autopsy can be fatty change, hepatic lobulation, glycogen storage disease, acute phosphorus poisoning, hemosiderosis, syphilis, actinomycosis, infarcts, congestion, granulomatous diseases, acute passive hyperemia, chronic passive hyperemia, amyloidosis, abscess, hydatid cyst, malignancy, cirrhosis and acute yellow atrophy^[7]. Histopathological study is a great value in improving the vision and diagnostic setup for clinical assessment. Thus we have conducted this study to obtain the prevalence of liver diseases in autopsy specimens received in the department of the forensic medicine and the histopathological examination was done in the department of pathology as a routine procedure. Causes of death in patients in the present study were road traffic

accidents, myocardial infarctions, viral meningitis, stroke, seizures, accidental fall from height, altered sensorium etc.

Here, we have compared our results with two similar and valuable studies- Study done by Dr.S.S.Pudale et al (2014)^[8] and Study done by Dr.R.ThamilSelvi et al (2012)^[9][Table-1]. Looking into the data provided by these studies, maximum liver autopsies were from pediatric age group (up to 10 years) in the study done by Dr.S.S.Pudale et al. while in the present study, incidences were higher in age groups of 4th and 5th decades in male patients and 4th and 6th decades in female patients nearly similar to study done by Dr.R.ThamilSelvi et al. Two other studies Bal MS et al.^[10] and Fubara s et al.^[11] also showed that most common age group affected was 41-50 years (53.85%) and 41-49 years (28%) respectively.

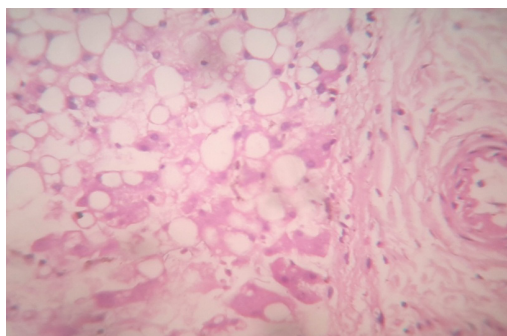
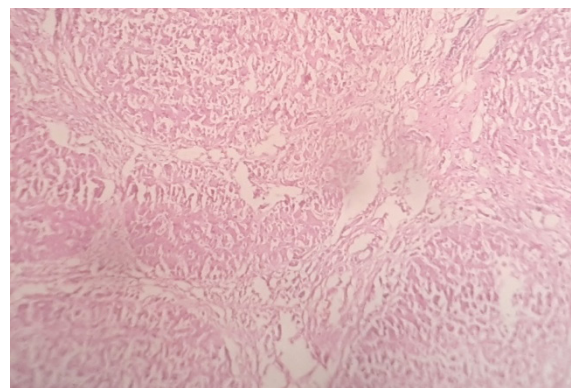
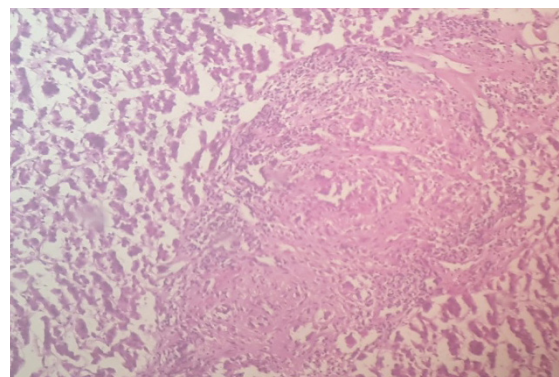
In the present study, most common finding is congestion as comparable to the study done by Dr.S.S. Pudale et al. From the above results; the study by Dr.R.ThamilSelvi et al. shows different results like most common cases of fatty livers because it was done in chronic alcohol consumption prone area. Cases of cirrhosis (1.58%) are slightly lower in our study as compared to the study by S.S.Pudale et al. (4.43%) and study by R.Thamilselvi et al. (7.4%). Morphologic changes in the liver do not occur suddenly in a short span of time and that the morphogenesis goes on insidiously. VoinovaLV^[12] observed that steatosis was the most common alcohol related damage in the liver which is contrary to our study and cirrhosis in case of viral diseases. Hence detailed examination and periodic follow-ups are necessary for early diagnosis of cirrhosis. 2 cases of granulomatous lesions were seen in the present study as compared to no cases are seen in the study done by Dr.R.Thamil.Selvi et al. and 14 cases are found in the study done by Dr. S.S.Pudale et al. whereas much higher incidence of granulomatous lesions was observed in the study done by Amarapurkar A and AgrawalV (42%).^[12] In all three studies, number of cases having normal histology is nearly comparable.

Table No. 1: showing comparision with other studies

Type of hepatic Lesions	Tamil Selvi (2012)	S.S. Pudaleet al (2014)	Present study
Congestion	16.7%	29.75% *	34.39%
Fatty liver	26.9%	15.52%	25.39%
Cirrhosis	7.4%	4.43%	1.58%
Granulomatous lesions	-	3.10%	1.05%
Normal Histo	25.9%	21.51%	18.52%
Other Findings	23.1%	25.69%	19.07%

CONCLUSION

This study shows that these 189 cases had no symptomatic liver pathology during life but in all these patients, in liver autopsy specimens, different liver pathologies like congestion (34.39%), fatty changes (25.39%), hepatic necrosis (10%), portal fibrosis (2.11%), cirrhosis (1.58%) and granulomatous lesions (1.05%) were found during postmortem histopathological examination. In this way, this study provides valuable information about prevalence of silent liver diseases in our community. This study reflects high prevalence rate of asymptomatic liver diseases. The incidences of liver diseases are common in male as compared to female. Silent liver diseases are very common amongst the apparently healthy individuals and if not detected early some of these conditions may lead to serious outcomes. The study was conducted only on specimens collected from the mortuary and may not reflect the actual pattern of liver diseases in the vulnerable group of people in the local populace.

Fig. No. 1: Frequency of liver diseases in current study**Fig. No. 2: Showing Fatty Changes in liver****Fig. No. 3: Showing Cirrhosis of liver****Fig. No. 4: Showing Granulomatous lesion in liver (H&E stain, 4x)**

Conflict of Interest: None

Source of Support: None

Funding Source: Self

Ethical Clearance: Not applicable

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Survival after Constriction of Neck: Accidental Ligature Strangulation

Shailendra Goyal¹, Anuj kumar², Vishal Survade³

¹Assoc. Proff, MCH-Neurosurgery Department of Neurosurgery, ²Post-graduate Student, Department of Surgery, ³Asst. Proff., Department of Forensic Medicine & Toxicology, R.D. Gardi Medical College, Ujjain

ABSTRACT

Accidental ligature strangulation though rare, is occasionally reported and circumstantial evidence alone can sufficiently indicate the accidental nature of the occurrence^[1]. Survival following accidental ligature by strangulation is still rare. In the present case, a 15 year-old female was accidentally strangled when her “chunni” was caught in a motor belt of thresher machine while feeding the farm produce to separate grains. This case highlights the fact that these kinds of machines can be hazardous to work around and that increased safety measures should be taken to insure people safety^[3], additionally, the people who use these machines should be educated on the potential hazards in particular about clothing.

Keywords: Accidental strangulation, chunni, motorbelt, ligature, survived.

INTRODUCTION

A living being is dependent on oxygen for continuous metabolism for survival. Plant kingdom & aquatic life may be exception. In human beings the oxygenation depends on passage of air from nostrils or mouth to lungs. It is established fact that skin breathe, however the fact is of little importance here.

Any obstruction in the passage of respiration will endanger oxygenation of circulating blood. In turn will cause hypoxia of the body tissue this if continues will lead to anoxia different part of body tolerate hypoxia differently. Brain is most susceptible.

There are various mechanism of obstruction of air passage. These may be accidental or deliberate. In the later category may self induced or forced.

Strangulation is a type of mechanical asphyxia that causes a constriction of the neck either by a ligature or hands, in which a constricting force other than the weight of the body is directly applied to the ligature^[2]. Strangulation deaths are typically homicidal and accidental cases are unusual. Generally, accidental strangulations can be separated into two groups. The first group includes

deaths without a suicidal intent that result from work- or play related strangulation. The second group includes autoerotic asphyxias^[3]. In adults, accidental ligature strangulation typically involves an article of clothing becoming tangled in some type of mechanical device, in which the clothing becomes increasingly constricted due to the continued motion of the machine^[3, 4].

A rare case of survival of accidental ligature strangulation where a 15 year-old female was accidentally strangled when her “chunni” was caught in a motorbelt of thresher machine while feeding the farm produce to separate grains & patient survived after strangulation.

CASE REPORT

A 15 years old female admitted with the alleged history accidental strangulation of neck by the “chunni” getting entangled in motorbelt of thresher machine while feeding the farm produce to separate grain. Patient complained of loss of consciousness for few minutes. No history of ear, nose or mouth bleed, No history of vomiting. Came with the complaints of inability to move neck with ligature mark over the neck.

On examination, Patient is conscious, drowsy & obeys command. No neck movements possible even on efforts. No proptosis & Extra-ocular movements normal bilateral. Pupils 4mm, central, circular & equally reacting to light & accommodation. Plantars-Right extensor & Left flexor. Spoke normally with edematous tongue associated with tremulousness [figure1] Moved all 4 limbs purposefully in bed. Pain & touch sensation normal in all 4 limbs & All vitals within the normal limit.

On external examination, the head and face appeared to be normal and the neck veins were mildly distended. A 2.5 cm wide and 0.3 cm depth ligature mark on the neck starting at the level of the thyroid[figure2] and cricoid cartilage and continuing through both sides of the neck was noted[figure3]. There was no ligature mark at the back of the neck.

Followed by radiological investigation done MRI cervical spine not show any abnormality[figure 4] & CT scan head show Normal study[figure5].

The patient managed conservatively with corticosteroids, analgesics & anti-inflammatory drugs. discharged on stable condition after 4 days.

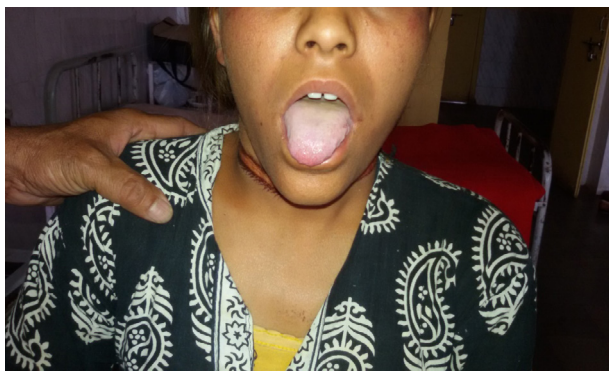


Figure No. 1: Swelling Over Tongue



Figure No. 2: Ligature Mark Over Neck



Figure No. 3: Extension of Ligature Mark Over Both Sides

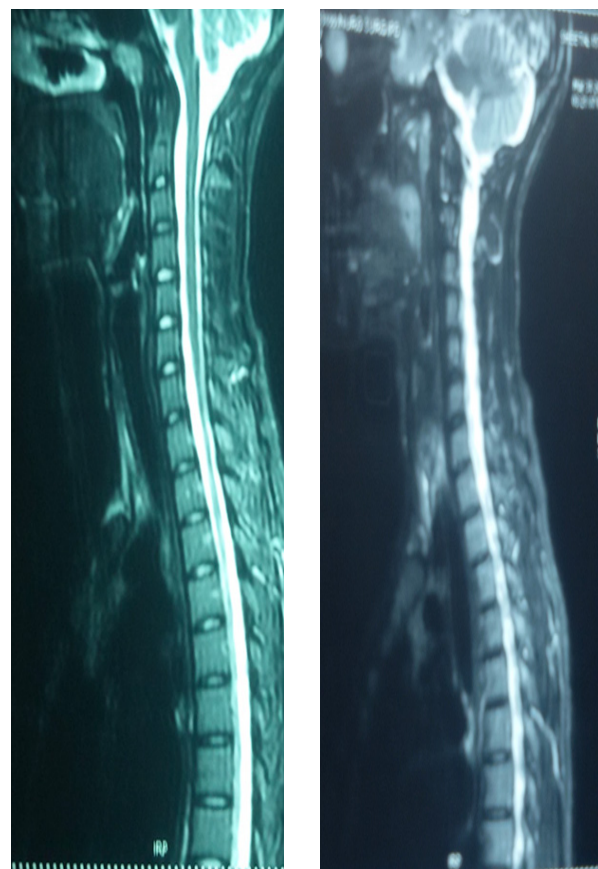


Figure No. 4: MRI Spine

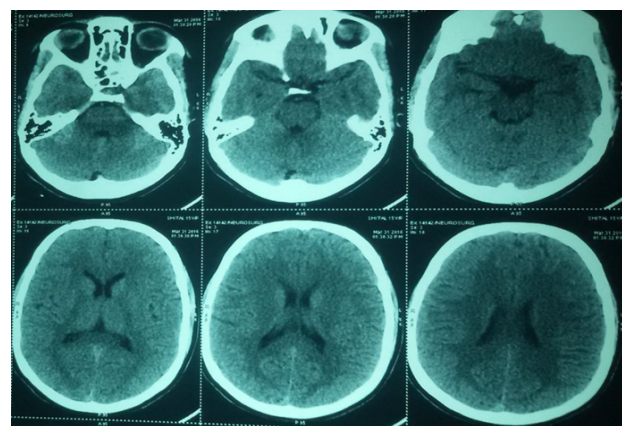


Figure No. 5: CT SCAN Brain

DISCUSSION

Accidental strangulation though rare, is occasionally reported and the circumstantial evidence alone can sufficiently indicate the accidental nature of the occurrence^[1]. The first written case report of accidental strangulation in an adult was the world-famous dancer Isadora Duncan who died on 14 September 1929. The long scarf, which she was wearing, became caught in the wire wheels of her Bugatti car, stopping the vehicle. Isadora died at the spot and was later found to have sustained a fractured vertebra^[3] larynx and carotid artery injury. Bhullar and Aggarwal and Aggarwal and Agarwal also reported a few cases of accidental ligature strangulation due to entanglement of the chunni^[5] (long scarf worn around neck by Indian women) while moving in a vehicle like a rickshaw and motorcycle. Shetty and Shetty reported a case of a young girl who was accidentally strangled when her chunni was caught in a moving electrical grinder at home^[7].

The common mechanism by which accidental ligature strangulation occurs is the progressive constriction of the neck by an article of the patient's clothing^[6]. In this case, because of the increasing constriction of the neck with the "chunni" of the patient, she injured with loss of consciousness for few minutes.

To the best of our knowledge, this is the first reported case of a ligature strangulation in which Even after such strong force of constriction of neck, Patient managed to survive which very rarely happen in case of accidental strangulation.

This unusual case also highlights the importance

of proper handling, including the use of all safety precautions, for any form of a mechanical device, even when using seemingly innocuous equipments^[2].

Conflict of Interest: None of the authors have any conflicts of interests

Ethical Clearance: Scientific & literary committee, R.D. Gardi Medical College, Ujjain.

Source of funding : Self

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A Cross Sectional Study of Female Married Victims of Domestic Violence in a Tertiary Care Hospital

Sudeepa Das¹, Ashim Mishra², K. K. Patnaik¹, S. N. Mohanty³

¹Associate Professor, Post graduate Department of Forensic Medicine, MKCG Medical college and Hospital, Berhampur, Ganjam, Odisha, ²Assistant Professor, Department of Forensic medicine, Sikkim Manipal of Medical Sciences, Gangtok, Sikkim, ³Professor & HOD, Post graduate Department of Forensic Medicine, MKCG Medical college and Hospital, Berhampur, Ganjam, Odisha

ABSTRACT

Back ground: Odisha being an economically underdeveloped state, domestic violence seldom gets reported due to ignorance, non-acceptance in society, financial dependency and illiteracy. The study was undertaken by the authors as an attempt to study the profile of the victims and other socio-demographical factors involved

Material methods: The study was carried out in the Department of FMT of M.K.C.G. Medical College. Data included victim age, education, employment status, age at marriage and other variables.

Results: The study pointed out 64.5% of the victims belonged to 26-30 years. The age of the marriage was 54.8% in 21-25 years age group. 93.5% of the victims belonged to medium socio-economic class. Dowry was leading cause of domestic violence. 100 % of the victims reported that use of abuse language. While 83.8% victims reported with simple injuries, suicidal attempt was undertaken in 16.13% cases. In 90.3% cases the first disclosure was made to the victim's mother /relative while in only 3.2% cases it was made to a friend, self-help groups and police respectively. There was delay in reporting of case of 6 months to 1 year in 58.1 cases.

Key words: domestic violence; Odisha; suicidal attempt; first disclosure

INTRODUCTION

Violence against has now gained international recognition, not only as serious violation of human rights, but as a significant public health concern, as well as a barrier to social and economic development.¹ In India the crime rate under crimes against women was reported as 56.3 in 2014 which has increased by 9.2% over the year 2013 and by 58.2% over the year 2010.²

Gender-based violence undermines the health, dignity, security and autonomy of its victims, yet it remains shrouded in a culture of silence.³

Odisha being an economically underdeveloped state, due to prevalence of the patriarchal and conservative society, domestic violence is accepted as a norm and seldom gets reported. A time lag is due to non-acceptance in society, financial dependency, insecure future and illiteracy.

The study was undertaken by the authors as an attempt to study the epidemiological profile of the victims keeping in view, the psychological framework and fragility of the individuals and taking utmost care to preserve the autonomy and confidentiality of the individuals.

Corresponding Author:

Dr. Ashim Mishra

Assistant Professor, Sikkim Manipal University,
Department of Forensic medicine, Sikkim Manipal
Institute of Medical Sciences, Gangtok, Sikkim-737102
mishra.ashim@rediffmail.com

LITERATURE REVIEW

The most common desegregation of intimate partner violence is into physical, psychological and sexual violence.⁴ Domestic violence is traditionally associated with cases of physical violence occurring within intimate relationships and in a domestic setting.⁵

Domestic violence is any act of physical, sexual, or psychological abuse, or the threat of such abuse, inflicted against a woman by a person intimately connected to her through marriage, family relation, or acquaintanceship is universal and has its root in the socio-cultural set up of the society.⁶ The educational level of women is one of the main determinants of justifying at least one reason for husband beating his wife. Women engaged in agricultural activities are more likely for justifying one or more reason of wife beating. Lower the age at first marriage, higher does the probability of justifying at least one reason.⁷ It is imperative to understand the complex interaction of attitudes, motives and situational factors underlying offender behavior is helpful in developing effective prevention strategies.⁵

A history of abuse puts women at increased risk of long-term negative health consequences including depression, suicide, chronic pain syndromes, psychosomatic disorders, and sexually transmitted diseases.⁸ It is rightly pointed in a study that economic violence results in deepening poverty and compromises educational attainment and developmental opportunities for women. It leads to physical violence, promotes sexual exploitation and the risk of contracting HIV infection, maternal morbidity and mortality, and trafficking of women and girls.⁹

METHODOLOGY

The aim of this study was to examine the characteristics of abused women who visited department of Forensic medicine, MKCG Medical College and hospital. The study was carried out in the Department of FMT of M.K.C.G. Medical College, Berhampur for a period of 2 years from 1st Oct 2011 to 30th Oct 2013. In the ongoing study a total of 31 cases of victims of domestic violence were reviewed. The female married

victims of domestic violence who reported to the department of forensic medicine of MKCG Medical College for medico-legal examination with alleged history of dowry torture, psychological, physical torture were included in the study. Data included the following variables: victim age, education, employment status, type of family, number of children, injury pattern, and history of suicidal attempt, first disclosure, reason for domestic violence and time lag of reporting late was noted. A structured questionnaire was used to collect data from abused women who gave consent after full disclosure that the study was meant for study purposes only and their identity was not to be disclosed.

RESULTS

The study pointed out 64.5% of the victims belonged to 26-30 years, followed by 16.2% victims in 21-25 years and 12.9% victims were below 20 year during reporting.

The age of the marriage was 54.8% in 21-25 years age group followed by 25.8% in 26-30 years age group. Our study revealed a peculiar trend of more cases of domestic violence seen in victims having higher education, who had gone to college (67.7%), followed by 16.2% in victims who had studied till higher secondary level and only 3.2% seen in illiterate women victims. 93.5% of the victims belonged to medium socio-economic class while 3.2% belonged to upper class and lower socio-economic class respectively. In our study 54.8% of victims were housewives, and 38.7% engaged in low paying occupation while remaining belonged to farmer and daily laborer. While 74.2% of the victims had an arranged marriage, the remaining 25.8% had marriage alliance due to love without approval of family. While 41.9% victims had a nuclear family the remaining 58.1% stayed in joint family. With respect to number of children, 7 victims had no child while 2 females have more than two children. There were four victims whose first born was a female child. Whopping 67.7% victims gave a history of induced abortion against their wishes. In our study we found out that dowry was leading cause of domestic violence, seen in 48.4% of victims followed by marital disharmony in 16.1%. About 12.9% victims

were subjected to violence due to fact that the first child born was female. 100 % of the victims reported that abuse language was always used. While 83.8% victims reported with simple injuries comprising of abrasions and contusions, 5 victims were hospitalized and reported with injuries that were grievous in nature. Suicidal attempt was undertaken by 5 of the victims out of 31 reported. The methods adopted were attempt to hanging in 4 of the victims followed by attempted poisoning in 1 case. In 90.3% cases the first disclosure was invariably made to the victim's mother /relative while in only 3.2% cases it was made to a friend, self-help groups and police respectively. There was delay in reporting of case of 6 months to 1 year in 58.1 cases followed by 25.8% cases who reported after 1 year gap. Our study reveals 51.6% feared social stigma and hence the delay in reporting of cases to police. 29% of the victims feared legal hassles that stopped from early reporting.

DISCUSSION

The study points out 64.5% of the victims belonged to 26-30 years and 12.9% victims were below 20 year. The age of the marriage was 54.8% in 21-25 years age group followed by 25.8% in 26-30 years age group. The findings were slightly different from a study where younger women and those married before 18 years of age were more prone due to inter spousal age differences and lower age confounded with lack of awareness of the marital life were the contributing factors as stated by the authors.⁷

Educational level of women makes substantial difference of being beaten or physically mistreated. Our study point out peculiar trend of more cases of domestic violence seen in victims who had gone to college (67.7%), followed by 16.2% in victims who had studied till higher secondary level and only 3.2% seen in illiterate women victims. Our findings totally differed from the study where illiterate women have found to experience violence more than three times compared to women who are educated higher secondary or above. It may be due to the fact that this study is based on profile of reported cases which is better in educated women.⁷ Our study points out that 93.5% of the victims belonged

to medium socio-economic class while 3.2% belonged to upper class and lower socio-economic class respectively slightly differs to the study where 29 percent of women with low standard of living have experienced violence compared with 20 percent of women with medium and 10 percent of women with high standard of living.⁷ In our study 54.8% of victims were housewives, and 38.7% engaged in low paying occupation while remaining belonged to farmer and daily laborer. While 74.2% of the victims had an arranged marriage, the remaining 25.8% had marriage alliance due to love without approval of family. The authors agree to the point as a stated in a study that numbers of family members, type of marriage and husband's education have significant influence on domestic violence.¹⁰

It has also been shown in earlier studies that workingwomen have a greater likelihood of being mistreated than the non-working women.⁷ It is similar to a study where the risk to pregnant women has found to be greatest among those women with lower levels of education, from disadvantaged communities and with unintended or unwanted pregnancies.¹¹

While 41.9% victims had a nuclear family the remaining 58.1% stayed in joint family.

Our study showed that 7 victims had no child while 4 victims had two children and 2 females have more than two. There were four victims whose first born was a female child. The trend reflects poor awareness in this part of economically backward state. The authors are similar in view to a study that women who have been married for less than five years are less likely to have been beaten than women who have longer marital duration. It is generally believed that not bearing children and not bearing a son are important reason for wife beating. However, the findings show that women with no living child are somewhat less experienced violence than women with living children.⁷

In our study we found out that dowry was leading cause of domestic violence, seen in 48.4% of victims followed by marital disharmony in 16.1%. About 12.9% victims were subjected to violence due to fact that the first child born was female. It differs from the

study done in Peru where the prevalence is more than three times higher (76.8%) when the intimate partner is drunk.⁴ A whopping 67.7% victims gave a history of induced abortion against their wishes. Women who are abused run twice the risk of miscarriage and four times the risk of having a baby that is below average weight.¹² In our study we found out that dowry was leading cause of domestic violence, seen in 48.4% of victims followed by marital disharmony in 16.1%. About 12.9% victims were subjected to violence due to fact that the first child born was female. This is to the fact that Odisha being a socially backward state where high prevalence of dowry is not an understatement and ignorance of the people about legal awareness.

Our study points that 100 % of the victims reported use of abusive language. While 83.8% of the victims reported with injuries that were simple in nature, 5 victims were hospitalized and reported with injuries that were grievous in nature. Intimate partner violence against women is a major cause of injuries to women. Physical violence in intimate relationships is often accompanied by psychological abuse, and it is accompanied by sexual abuse in one-third to one-half of cases.¹³ Verbal abuse is quite common in a rural setting, used to degrade the mental fabric of a female who is already in distress.

Suicidal attempt was undertaken by 16.13% of the victims. The methods adopted were attempted poisoning in 1 case followed by attempt to hanging in 4 of the victims.

An earlier study in this department showed 73.37% of women of all suicide cases were married and 66.83% were housewives. 40.23% of women committed suicides were in the age group of 21-30 years.¹⁴ The findings point towards a dangerous dent in our society. In 90.3% cases the first disclosure was invariably made to the victim's mother /relative while in only 3.2% cases it was made to a friend, self-help groups and police respectively. Research suggests that more than four in five women who experience domestic violence do not contact a specialized support agency, but are more likely to contact family and friends.¹⁵ In our study the delay in reporting of case up to 6months to 1 year was seen in

58.1 cases followed by 25.8% cases who reported after 1 year gap. It was quite high compared to a study done in Sydney where 14 to 36 percent of victims reported the most recent incident of domestic violence to police.¹⁵ Our study reveals 51.6% feared social stigma and hence the delay in reporting of cases to police. 29% of the victims feared legal hassles that stopped from early reporting.

Table No. 1: Age

Age (years)	No. of victims	%
< 20	4	12.9
21-25	5	16.2
26-30	20	64.5
>31	2	6.4
total	31	100

Table No. 2: Age at Marriage

Age at marriage	No. of victims	%
<20	4	12.9
21-25	17	54.8
26-30	8	25.8
>31	2	6.4
Total	31	100

Table No. 3: Literacy

Literacy	No.	%
Illiterate	1	3.2
Middle school	4	12.9
Higher secondary	5	16.2
College	21	67.7
Total	31	100

CONCLUSION

It is rightly pointed out that the experience of violence undermines the empowerment women and certainly is a barrier to the socio-economic and demographic development of the country.⁶ Educational and policy related interventions to change social norms, early identification of abuse by health professionals, programs and strategies to empower women, safety and supportive resources for victims of abuse and improved legal access to criminal justice system are very promising

primary interventions to stop domestic violence.¹⁶ The social stigma should be towards the abusers not the victims. Moreover the children also suffer a range of behavioral and emotional disturbances in a family.

It all depends on changing our mindsets, supportive attitude, meticulous examination and early reporting.

LIMITATIONS AND SUGGESTION

The study was a novice attempt on the part of authors to study the epidemiological profile of the victims and assessment of the injury pattern but the sample size was small. The cross sectional design of the study was a limitation to the study. Further studies from researchers like use of Domestic Violence Inventory can further substantiate the study and provide a scientific insight to the study.¹⁷

Ethical clearance: obtained prior to the study.

Conflicts of interest: None

Funding: none

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Prediction of Stature on Facial Anthropometry among Students of Nursing and Physiotherapy in Chennai

Balaji Singh M¹, Kalai Selvi LT², Mythili GY³, Thamizharasan S⁴

¹Assoc. Professor, Dept. of Forensic Medicine, ²Asst. Professor, Dept. of Forensic Medicine,

³Asst. Professor (statistician), Dept. of Community Medicine, ⁴Asst. Professor, Dept. of Pharmacology, ACS Medical college and Hospital, Velappanchavadi, Chennai

ABSTRACT

In this study we carried out estimation of stature on specific facial measurements among the students born and brought in the state of Tamilnadu, further we attempted to determine the degree of correlation between the facial measurements and stature. The standing height, morphological facial length, vertical length of nose, external biocular breadth, bizygomatic breadth, and bigonial breadth of the students comprising 100 males and 100 females aged 18 to 25 were measured and analysed. Mean stature of male was 170.63 cm and female was 155.48 cm. A fair sexual dimorphism was found among stature, and all facial measurements except vertical length of nose. Highest correlation was found between stature and morphological facial length, the values were among female 38.8 %, (at P value 0.0001), and male 31.9% (at P value 0.0012). The predicting power of multiple facial measurements was 22.38% and 14.83% among female and male population respectively. The study demonstrated that the use of facial measurements for the estimation of stature is valid and worth pursuing.

Key Words: facial measurements, Stature estimation, Regression, Tamilians

INTRODUCTION

Human face is the most beautiful, expressive, complex and unique structure of all kinds of living beings in the world. Cranio-facial anthropometry is a branch of physical anthropometry that deals with precise and systematic measuring techniques that reveals quantitatively the physical dimensions of human skull and face in cadaveric, living or radiological specimens¹. It is useful in various fields of sciences like forensic medicine, crime scene investigation, plastic surgery, post traumatic aesthetic facial reconstruction, orthodontics,

archaeology and ethno-anthropological researches and also in visual arts (animation and computer graphics designing), and sculpture².

Present research work is useful in 'forensic anthropometry' which is a scientific specialty of anthropology which deals with identification of human remains with the help of metric techniques which aids in crime scene investigations and ultimately aids in administration of justice³. Stature assessment, age estimation, sex determination and population affiliation these four parameters are called as 'big four of forensic anthropology'⁴.

Long bones and facial bones develop by endochondrial ossification, where as cranium develop from intramembranous ossification⁵. Development in long bones influences the stature, where as development in facial bones and cranium contributes to cephalo-facial anthropometry.

Corresponding Author:

Dr. Balaji Singh M

Assoc. Professor, Dept. of Forensic Medicine, ACS Medical college and Hospital, Velappanchavadi, Chennai-600077

Mobile: +91 7358849809

Email: marutlaatr@gmail.com

Except under some pathological conditions or under some ecological influences when the different elements of the skeleton system grow at different rates, almost always the stature has proportional biological relationship with other parts of the body⁶.

Stature is a vertical height of an individual in standing posture. Measurement or estimation of stature is important in medico-legal practices in the department of forensic medicine especially in cases with unknown identity. Kosa, F (2000) defined Forensic medicine as a “interdisciplinary science which in day to day practice applies all the knowledge that-medical sciences, have accepted as reliable and scientifically solid facts or processes, and qualitative and quantitative definitions with the help of which accurate and reliable statements can be made”³.

A number of studies were carried out to access the relationship between the facial measurements and stature through various methods. The present study was conducted to determine whether it is possible to estimate stature using facial measurements in Tamil Nadu population with a low enough standard error and to derive regression equations accurately to estimate the stature.

Previous studies were concern to overall India or south India, but studies among Tamil people were limited. There is a need for systematic study of stature estimation, related to population of Tamil Nadu. Considering this fact, the present study was carried out to estimate stature from facial anthropometry in this region.

OBJECTIVES

1. Descriptive analysis and their sexual diversity of stature and facial anthropometric parameters.
2. To find out the strength of correlation between stature and facial measurements.
3. To derive regression formulae to predict stature on multiple facial measurements and to detect the predicting power of independent variables in estimating stature.

Study design: present study is cross sectional and descriptive study with some analytical elements.

MATERIALS & METHOD

A total number of 200 students (100 male and 100 female) aged 18-25, who born and brought up in Tamil Nadu were randomly selected from the Faculty of Nursing and Faculty of Physiotherapy, Dr MGR Educational and Research Institute University, Chennai. The students not showing any deformity of head and face were included in the study. The measurements of all the study subjects were taken between 10 am to 12 noon, to avoid diurnal variation in stature. This study was conducted from April 2016 to December 2016. Stature was measured as a straight distance from floor to vertex using height measuring scale while the student was in standing position with buttocks and back of shoulders touching the wall, with feet well approximated and head in Frankfurt plane⁷. Morphological Facial Length (**MFL**) was measured as the straight distance from the nasion (nasal root) to the gnathion (lowest point on the lower border of the mandible in the mid sagittal plane). Vertical Length of Nose (**VLN**) measured as the straight distance between nasion and subnasale. External Biocular Breadth (**EBB**) was measured as the straight distance between outer corners of the both eyes. Bizygomatic Breadth (**BZB**) was measured as direct distance between the two most lateral points on the zygomatic arches. Bigonial breadth (**BGB**) was measured as the maximum breadth of the lower jaw between two gonion points (most posterior, inferior and laterally situated point on the external angles of the mandible). MFL and VLN measured by using vernier callipers; EBB, BZB and BGB measured by using spreading callipers. All the facial measurements were taken while the subjects were in sitting position and all the parameters were measured to the nearest-millimetre. The data which was collected in this study was analysed by using statistical package for social sciences (SPSS 17.0 software). The Mean, Minimum, Maximum and Standard deviations of the variables were presented.

RESULTS

Table No. 1: Descriptive Statistics of the Study Subjects

	EBB		VLN		MFL		BZB		BGB		Stature	
	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>
Mean	9.40	10.17	4.54	4.57	10.19	11.07	11.75	12.97	10.96	11.64	155.48	170.63
Standard Error	0.04	0.05	0.06	0.03	0.06	0.06	0.06	0.08	0.08	0.07	0.56	0.52
Median	9.40	10.20	4.49	4.50	10.17	11.05	11.80	12.91	11.00	11.60	155.20	170.65
Mode	9.70	10.30	4.30	4.50	9.90	11.10	11.80	13.50	11.20	11.40	153.00	171.50
Standard Deviation	0.40	0.54	0.63	0.34	0.63	0.57	0.61	0.83	0.78	0.71	5.59	5.21
Range	1.87	2.93	6.74	1.68	4.25	3.00	3.50	3.70	3.64	3.80	36.80	24.90
Minimum	8.54	8.82	3.16	3.95	8.67	9.85	10.20	11.30	9.16	9.90	143.50	156.90
Maximum	10.41	11.75	9.90	5.63	12.92	12.85	13.70	15.00	12.80	13.70	180.30	181.80
Count	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

MFL-Morphological facial length; **VLN**-Vartical length of nose; **EBB**-External biocular breadth;

BZB-Bizygomatic breadth; **BGB**-Bigonial breadth; **F**-femae; **M**-male.

Five facial measurements and stature were taken from all the subjects, the descriptive statistics were shown in table no.1. All the facial measurements and stature showing various degrees of sexual diversity, among all the measurements BZB showing highest index of sexual dimorphism and VLN with the least value. Their indices of sexual dimorphism are as follows MFL-7.95; VLN-0.66; EBB-7.57; BZB-9.41; BGB-5.84; and Stature- 8.88.

Formula used for index = $\frac{\text{mean of male} - \text{mean of female}}{\text{mean of male}}$ of Sexual dimorphism

Table No. 2

<i>test variable</i>	<i>sex</i>	<i>t test</i>	<i>sig(2tailed)</i>
EBB	male	1.9731	0.0000
	female		
VLN	male	1.9757	0.6288
	female		
MFL	male	1.9721	0.0000
	female		
BZB	male	1.9731	0.0000
	female		
BGB	male	1.9721	0.0000
	female		
Stature	male	1.9721	0.0000
	female		

Table No. 2 shows that 't' test values for all the measurements were significant except for VLN.

Table No. 3: Linear Regression Equations

Female population	SEE
Stature = 120.90 + 3.68*EBB	5.40
Stature = 153.82 + 0.37*VLN	5.61
Stature = 120.20 + 3.46*MFL	5.18
Stature = 127.43 + 2.39*BZB	5.43
Stature = 143.93 + 1.05*BGB	5.56
Male population	SEE
Stature = 149.91 + 2.04*EBB	5.12
Stature = 157.40 + 2.90*VLN	5.15
Stature = 138.27 + 2.92*MFL	4.97
Stature = 158.56 + 0.93*BZB	5.18
Stature = 164.44 + 0.53*BGB	5.23

SEE-standard error of estimate

Table no.3 showing the prediction function was derived through linear regression for each of the facial measurement with stature, for the female and male separately. The standard error of estimates were ranging from 4.97 to 5.61.

Table No. 4: Correlation coefficients (r) of female and male

<i>Measurements</i>	<i>FEMALE</i>		<i>MALE</i>	
	<i>Correlation coefficient (r)</i>	<i>P value</i>	<i>Correlation coefficient (r)</i>	<i>P value</i>
Stature vs EBB	0.2632*	0.0081*	0.2126*	0.0337*
Stature vs VLN	0.0411	0.6845	0.1881	0.0609
Stature vs MFL	0.3880*	0.0001*	0.3191*	0.0012*
Stature vs BZB	0.2604*	0.0088*	0.1480	0.1417
Stature vs BGB	0.1464	0.1461	0.0722	0.4751

* Statistically significant

The table no 4 shows, MFL and EBB showing significant correlation with stature among male and female populations, BZB significantly correlated with stature among female population only.

Table No. 5: Multiple regression Formula for Female

<i>Model</i>					<i>95% Confidence Interval</i>	
	<i>Coefficients of regression</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	96.4920*	13.7189	7.0335	0.0000*	69.2528	123.7312
EBB	1.5212	1.4527	1.0471	0.2977	-1.3633	4.4056
VLN	-1.0136	0.8562	-1.1838	0.2395	-2.7135	0.6864
MFL	3.7830*	0.9681	3.9076	0.0002*	1.8608	5.7052
BZB	2.3238	1.0597	2.1928	0.0308	0.2196	4.4279
BGB	-1.5107	0.8661	-1.7442	0.0844	-3.2304	0.2090

Predicted stature (female) = 96.49 + (1.52 × EBB) + (-1.01 × VLN) + (3.78 × MFL) + (2.32 × BZB) + (-1.51 × BGB)

The overall goodness-of-fit measures (female): 'R' value =0.4730; **R² = 0.2238**

Table No. 6: Multiple Regression Formula for Male

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	116.6328	14.7872	7.8874	0.0000	87.2725	145.9931
EBB	2.2924	1.4228	1.6112	0.1105	-0.5326	5.1175
VLN	2.9835	2.0377	1.4641	0.1465	-1.0624	7.0294
MFL	1.7096	1.1155	1.5326	0.1287	-0.5052	3.9244
BZB	0.2419	0.9244	0.2616	0.7942	-1.5936	2.0773
BGB	-0.4311	0.7804	-0.5523	0.5820	-1.9806	1.1185

Stature (male) = 116.63 + (2.29x EBB) + (2.98 x VLN) + (1.71 x MFL) + (0.24 x BZB) + (-0.43xBGB).

The overall goodness-of-fit measures (male): 'R' value = 0.3851; **R² = 0.1483**

The “R” values (0.4730 for female and 0.3851 for male) represents the multiple correlation coefficients, this can be considered to be one measure of the quality of the prediction of the dependent variable (stature); these values indicate a moderate level of correlation between stature and facial measurements among female and male populations. The “R Square” represents (R^2 value also called the coefficient of determination), the proportion of variance in the dependent variable that can be explained by the independent variables (technically, it is the proportion of variation accounted for by the regression model above and beyond the mean model). This values ($R^2=0.2238$ for female and 0.1483 for male) indicates that independent variables explain 22.38% and 14.83% of the variability of the dependent variable (stature) among female and male populations respectively.

DISCUSSION

Table No. 7: Comparison of Results of Previous and Present Studies

S. No	Author, year	Linear regression	Multiple regression	SEE
		Strength of correlation ($r \times 100$)	Power of prediction ($R^2 \times 100$)	
1	Kewel ⁸ krishan (2008)	MFL M - 45.5% F - - C - - BGB M - 46.2% F - - C - -	-	MFL M - 5.820 F - - BGB M - 5.131 F - -
2	Mahesh kumar ⁹ (2013)	MFL M - 17.7% F - 15.0% C - - BGB M - 16.4% F - 11.9% C - -	-	MFL 4.33 BGB 4.6
3	Sheetal Sagar ¹⁰ (2014)	Multiplication method applied to predict stature on vertical length of nose; multiplication factor for male was 34.14 and for female was 23.17		
4	Twisha shah ¹¹ (2015)	MFL - M - 4.4% F - 6.1% C - 22.3% EBB M - 2.1% F - 3.4% C - 19.0% BZB - M - 3.2% F - 4.8% C - 26.0%(s) BGB -M - 9.6%(s) F - 19.3%(s) C - 17.7%(s)	MFL + EBB + BZB + BGB M- 16.7%* F - 3%* C -34.2%*	SEE M- 8.751 F - 7.481 C - 5.870

5	Jervas ⁴ (2015)	<u>MFL</u> - M - - F - - C - 23% <u>EBB</u> - M - - F - - C - 15%	<u>MFL+IOB</u> M - - F - - C - 53% <u>MHB+MFL</u> M - - F - - C - 12.8%	
6	Rexhepi ⁶ (2015)	-	MFL + Head height + HC M - - F - - C - 26.2%*	
7	Mounika S ¹² (2015)	Estimated stature on BZB by simple linear regression method but not mentioned strength of correlation and power of prediction between them.		
8	Wankhede K P ¹³ (2015)	<u>MFL</u> - M -19.7% F - 14.4% C - - <u>VLN</u> - M -18.6% F -19.6% C - -	- - -	
9	Present study	<u>MFL</u> - M -31.91%* F - 38.80%* C- - <u>VLN</u> - M-18.81% F - 4.11% C- - <u>EBB</u> - M- 21.26%* F - 26.32%* C - - <u>BZB</u> - M - 14.80% F - 26.04%* C - - <u>BGB</u> - M - 7.22% F - 14.64% C - -	<u>MFL, VLN</u> <u>EBB, BZB and BGB</u> M- 14.83% F - 22.38% C- -	<u>SEE</u> M - 4.94 F - 5.06 C - -

MFL-Morphological facial length ;**VLN**- Vartical length of nose; **EBB**- External biocular breadth; **BZB**- Bizygomatic breadth; **BGB**- Bigonial breadth; **IOB**- Inter orbital breadth; **MHB**- Maximum head breadth; **SEE**- standard error of estimates; **HC** –Head circumference; **M**- male; **F**-female; **C**- combined population(male and female).

* Statistically significant.

Table no.7 shows that, the results (r values / R squared / SEE values) got in this study is in line with the values obtained in the other studies. Krishan K obtained highest correlation between stature and bigonial breadth (r=0.462) among male population in his study⁸. Jervas got highest values of R squared (0.53; stature on MFL

and inter orbital breadth) among combined population⁴. Agnihothri AK derived r value for stature and MFL (0.328) and R squared value (0.389) for male population in his study¹⁴. The slight low values of r and R squared value (0.1483) among male in present study may be due to genetic and nutritional factors.

CONCLUSION

This study has proved that stature of Tamilians could be estimated by using some cephalofacial measurements (MFL, EBB, and BZB) and these facial measurements can also be used when head and facial remains are brought for medico legal autopsy. The most reliable cephalofacial measurements to estimate stature using regression analysis among males and female is morphological facial length. Since regression formulae are known to be population and sex specific, there is a need for similar equations to be derived for other endogamous groups. Estimation of stature from facial measurements is a supplementary approach when limbs or other parts of the body are not available for examination. We can say that, the multiple regression equations generated performed better than the simple regressions because of the value of R squared and SEE obtained. However, there is a need for these equations to be tested on a larger sample in order to verify their accuracy. This study has demonstrated that the use of facial measurements for the estimation of stature is valid and worth pursuing.

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Ethical clearance – Institutional Ethical Committee, ACS Medical college and Hospital

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Pattern of Cardiac Injury following Blunt Trauma: An Autopsy based Study

Bedanta Sarma¹, Pankaj Suresh Ghormade², Krishnadutt Chavali³,
Sreemanta Kumar Dass⁴, Jai Prakash Soni¹

¹Senior Resident, ²Assistant Professor, ³Professor, ⁴Associate Professor, Department of Forensic Medicine,
All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

ABSTRACT

Traumatic injury is a leading cause of death and disability in our society, most of which are accidental in nature and traffic accident is the commonest cause. During 2014, 53.4% victims died following traffic accident out of which 83.7% in road traffic accident and rest in railway accident. An autopsy based descriptive study was conducted in the department of Forensic Medicine, AMCH, Assam to find out the proportion and pattern of cardiac injury following blunt trauma (direct and indirect) irrespective of cause of death. Out of 542 deaths following blunt trauma, 74 were having cardiac injury (16.37%). Victims were mostly male (85.14%) within 21-30 years age group. 74.32% incidents were following road traffic accident and pedestrian was the commonest type of victim. Cardiac injuries were mostly confined to right ventricle and contusion (71.27%) being the commonest type. They were associated with injury to chest wall (97.8%), lungs (94.59%) and pericardium (95.95%).

Key words: trauma, road traffic accidents, autopsy, contusion.

INTRODUCTION

Traumatic injury is a major cause of death and disability in our society. Tedeschi defined trauma as an injury (for instance, a wound) inflicted by a force upon a living tissue.¹ Most of the traumatic deaths are accidental, following traffic accident. During 2014, 53.4% victims died from traffic accident, out of which 83.7% in road traffic accident and rest in railway accident. 16 lives were lost every hour following such accidents.²

Physical and mechanical trauma affects any part of human body un-uniformly. Heart, although protected by the bony thoracic cage, is vulnerable to such injuries.

Rate of cardiac injury following blunt trauma varies widely and is estimated to be around 15%,³ seen mostly in civilian practices like traffic accidents, and to a smaller extent; fall from height, animal or household kicks, fists, stamping assault, railway accidents, sports related injuries etc.^{4,5} The effect of force on the heart depends on its magnitude, area of impact, compliance of chest wall and phase of cardiac cycle the heart was in, at the time of impact.⁶

Evaluation of cardiac injury in traumatic cases is very important. Very few of them reach hospital alive. Clinically silent cases are not diagnosed during examination. During autopsy, most of the cardiac injuries are missed, due to some obvious fatal injury in other parts of the body. This study has been conducted to find out the incidence and pattern of cardiac injury due to blunt trauma, with associated other fatal or non-fatal injuries involving different organs.

Corresponding Author:

Dr. Bedanta Sarma

Senior Resident, Department of Forensic Medicine,
All India Institute of Medical Sciences, Raipur,
Chhattisgarh, India.

MATERIALS AND METHOD

The present study has been carried out in the Department of Forensic Medicine AMCH for a period of one year from 1st June 2013 to 31st May 2014 to find out the pattern of cardiac injury following blunt trauma along with socio-demographic profile of victims. During this period, 1225 medico-legal autopsies were conducted; out of which 452 cases of traumatic death were examined and cardiac injuries were detected in 74 cases. These cases were then selected for this study.

Amongst all traumatic death cases, those having blunt cardiac injury with or without any other fatal or non-fatal bodily injury irrespective of cause of death were included in this study. Traumatic cases in which there was no cardiac involvement and cases in advanced stage of decomposition were excluded.

History was taken from the police and accompanying relatives, available clinical record sheets were studied. During autopsy, heart was examined in situ followed by removable from thoracic cavity. It was examined externally to see any contusion, laceration or rupture. Contusion was diagnosed only by naked eye examination (dark red, haemorrhagic areas which are usually sub epicardial).⁷ The heart was then dissected by following inflow-outflow technique and the chambers were examined thoroughly to find out any injury.

All the data were recorded in a specially designed proforma (interview schedule) then carefully compiled, tabulated and analyzed. This study was approved by Institutional Ethics Committee of this institute.

RESULTS AND OBSERVATIONS

A total of 1225 medico-legal autopsies were conducted during the period of one year. Total number of cases with blunt trauma to different parts of body were 452 (36.90%) amongst which 74 (16.37%) were having cardiac injury.

Most of the victims were male (85.14%), with a male female ratio of 5.73:1. Maximum belonging to the age group 21-30 years (32.43%), followed by 31-40 years (24.32%), 41-50 years (18.92%). They were

mostly unmarried (58.11%), illiterate (52.70%) and daily wage earner (37.84%) by occupation. In 3 (4.05%) cases socio-demographic profile was unknown.

Amongst the 74 cases, majority i.e. 66 cases were the result of blunt impact over chest (direct) and rest 6 cases fall from height (indirect). Majority (74.32%) of direct injury comprises road traffic accidents (RTA) followed by railway accident (10.81%), fall of heavy object over chest, physical assault (2.7% each) and trampled by elephant (single case). Amongst the RTA cases, pedestrian was the commonest type of victim (table 1). 45.95% of 74 incidents took place in highways between 6 pm-12 am (31.08%). Majority of victims died instantaneously on the spot (62.16%) and rest either on the way to hospital or during treatment in hospital.

Most common type of cardiac injury was contusion (70.27), followed by laceration (20.27%) and combined contusion and laceration (9.46). They were associated with chest wall injury in 97.8% cases out of which 86.49% were having rib fracture; either isolated or associated with fracture of sternum, clavicle or thoracic vertebra. Cardiac contusion and laceration were most commonly associated with fracture of isolated rib (25 cases) and combined rib-sternal (5 cases) (table 2). Association of cardiac injury with lungs and pericardium is shown in table 3. Cardiac injuries were distributed over its chambers in different manner. Most common site of injury was right ventricle (RV), followed by left ventricle (LV), right atrium (RA) and left atrium (LA). In 10 cases RV and LV were injured, all chambers were injured in 9 cases. Contusion was equally distributed in RV and LV (13 cases each). Laceration also shows equal distribution in RA and RV (6 and 5 cases respectively) (table 4). Injury to vessels, valves, septum are shown in table 5. All injuries were associated with some fatal or non-fatal injury to different parts of the body. Brain and meninges were the commonest site of such fatal injury (54.05%). 46 victims died instantaneously following crush injury to some part of the body and among the rest 28, cardiac tamponade took lives of 3 victims.

Table No. 1: Victim wise Distribution of Cases

Type of victim	Type of cardiac injury			No of cases (%)
	Contusion	Laceration/rupture	combination	
Pedestrians	26	3	4	33 (44.59)
2-wheeler rider (2w)	10	0	0	10 (13.51)
Railway tract users	3	3	2	8 (10.81)
Bicycle rider	6	1	0	7 (9.46)
Fall from height	2	4	0	6 (8.11)
Pillion rider in 2 wheelers	1	0	1	2 (2.70)
Driver of vehicle	1	1	0	2 (2.70)
Fall of heavy object	0	2	0	2 (2.70)
Homicide victims	2	0	0	2 (2.70)
Motor vehicle occupants	1	0	0	1 (1.35)
Trampled by elephant	0	1	0	1 (1.35)
Total	52	15	7	74

Table No. 2: Distribution of Cases according to Injury to Chest Wall

Injury to chest wall	Type of cardiac injury			Total number of cases (%)
	contusion	Laceration/rupture	combination	
No obvious chest wall injury	0	2	0	2 (2.70)
External injury only (Abr./ cont./ lac.)	5	0	0	5 (6.76)
Fracture of ribs	25	2	2	29 (39.19)
Fracture of ribs and sternum.	9	5	1	15 (20.27)
Fracture of ribs and clavicle	4	1	0	5 (6.76)
Fracture of ribs and thoracic vertebra	1	0	1	2 (2.70)
Fracture of sternum	1	1	0	2 (2.70)
Fracture of clavicle	1	0	0	1 (1.35)
Crush injury	6	4	3	13 (17.57)
Total	52	15	7	74 (100)

(Abr.- Abrasion, Cont.- Contusion, Lac.- Laceration)

Table No. 3: Distribution of Injury Pattern in Lungs, Pericardium and Heart

Injury Pattern		Lungs n (%)	Pericardium n (%)	Heart n (%)
Present	Contusion	34 (45.95)	24 (32.43)	52 (70.27)
	Laceration	15 (20.27)	35 (47.3)	15 (20.27)
	Contusion and laceration	21 (28.38)	12 (16.22)	7 (9.46)
Absent		4 (5.41)	3 (4.05)	-
Total		74 (100)	74 (100)	74 (100)

Table No. 4: Chamber-wise Distribution of Injury

Site of injury	Contusion	Laceration/ Rupture	Contusion and laceration	Total number of cases, n (%)
Right Atrium (RA)	06	6	0	12 (16.22)
Right Ventricle (RV)	13	5	2	20 (27.03)
Left Atrium (LA)	04	0	0	04 (5.41)
Left Ventricle (LV)	13	0	0	13 (17.57)
RA+RV	03	1	0	04 (5.41)
RV+LV	09	1	0	10 (13.51)
RV+LA	02	0	0	02 (2.70)
LA+LV	01	0	0	01 (1.35)
RA+LA	01	0	0	01 (1.35)
RA+RV+LV	00	1	1	02 (2.70)
All	00	1	4	05 (6.76)
Total	52	15	7	74 (100.00)

Table No. 5: Distribution of Injury to Coronary Artery, Septum, Papillary Muscles, Great Vessels and Valves

Injury	Coronary artery		Septum		Papillary muscle		Great vessels			Valves		
	RCA	LCA	IAS	IVS	RV	LV	aorta	IVC	All	AV	TV	All
Present	0	2	1	13	7	5	16	2	1	3	1	2
Absent	72		60		62		55			68		
Total	74		74		74		74			74		

(RCA: right coronary artery, LCA: left coronary artery, IAS: inter atrial septum, IVS: inter ventricular septum, RV: right ventricle, LV: left ventricle, IVC: inferior vena cava, AV: aortic valve, TV: tricuspid valve)

DISCUSSION

In our study, the proportion of blunt cardiac injury was found to be 16.37% amongst all blunt traumatic deaths. Most of the victims were illiterate, unmarried male of age group 21-30 years; similar to some other studies.^{8, 9, 10} Reason behind male dominance is their engagement in different types of social, industrial and agricultural fields. The commonest age group i.e. 21-30 years is the most active in different fields and is often the victim of various traumatic events.

In the study, although all blunt traumatic causes were taken into consideration, 74.32% were the victims of road traffic accident (74.32%). In our district, some part of the national highway is very narrow and the railway track runs parallel adjacent to it for about 20 km. Road traffic accidents are very common within this region. Majority of incidents took place in highways (45.95%) between 6pm-12 am by heavy vehicles. Hence, fatal injuries to various parts were common but rescue service was late at night. Hence, most of the victims died on the spot (62.16%), and 16.22% on the way to hospital (within 4 hours). Only 4.05% survived more than 48 hours. These findings are similar to other studies.^{9, 11, 12}

Commonest type of cardiac injury was contusion (70.27%). Since most of the cardiac injuries were following direct impact over chest, injury to chest wall was seen in almost all cases (98%) and rib fracture contributed most of the cardiac contusion. In some cases steering wheel impact causes extensive damage to chest wall. Internally, lungs and pericardium were injured in 94.59% and 95.95% case respectively. Similar findings are also narrated by other authors.^{9, 11, 12, 13, 14, 15, 16, 17, 18}

Due to direct impact, cardiac injuries were mostly distributed over anterior aspect and right ventricle was the commonest site due to its anatomical proximity to chest wall. In 5 cases all the chambers were lacerated and contused. Contusion was equally distributed in both RV and LV. Laceration/ rupture was most common in RA followed by RV. Atrial ruptures were located predominately in the areas where the great veins lead into. All these findings are consistent with other similar studies.^{14, 16}

Injury to coronary artery in blunt impact is unusual, found only in 2% cases.^{9, 19} In our study 2 cases were having left anterior descending coronary artery laceration, caused by fractured rib. Interventricular septum (IVS) was either contused or ruptured in 18.92% cases following volume defect or crush injury. valves (mostly aortic) were either contused or ruptured in very few cases, similar to other studies.^{9, 16, 18} Of the 19 cases of great vessel injury, majority involved proximal aorta with a single case of all vessels injury. Injury to aorta was seen on its origin to ventricles due to traction. This is similar to the findings of Kumar A et al and Onan B et al.^{13, 20} Papillary muscles were either contused or lacerated in few cases, but they could not be compared with relevant literature.

Although heart was injured in all, the victims died because of fatal injury to different parts of the body; head being the commonest. 18 victims died purely from cardiac cause, among which 3 were following cardiac tamponade. These are consistent with other similar studies.^{9, 21, 22}

CONCLUSION

We conclude with the following comments:

- Proportion of cardiac injury following blunt trauma in this region is 16.37%.
- Direct injury commoner than indirect one, mostly following RTA and pedestrian is the commonest victim.
- Cardiac injuries are associated with injury to chest wall, lungs and pericardium.
- Most common site of cardiac injury is right ventricle and contusion is the commonest type.
- Amongst all causes, only RTA can be prevented by strict traffic rules, safety measures in cars (seat belt, air bags, foldable steering wheel etc). Victims of such occurrences should be shifted immediately to casualty and no trauma victims discharged without excluding any silent cardiac injury.
- During autopsy, meticulous examination is to be done so that no cardiac injury is missed.

Conflict of interest: Declared none.

Ethical clearance: Taken from institutional ethics committee before commencement of the study.

Source of funding: Self.

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Pathogen Bacteria Identification at Mortuary of Dr. M. Djamil Hospital Padang Indonesia

Citra Manela¹, Linosefa²

¹Forensic Medical Science Department, ²Microbiology Department, Medical Faculty of Andalas University

ABSTRACT

Forensic medical practice is associated with higher risk of infection because the increasing of infectious disease-related death particularly in developing countries. It also become the source of nosocomial infection sources. This study aim to identify the type of pathogen bacteria that could be found at mortuary of Dr. M Djamil Hospital Padang. This was a descriptive study, conducted by detecting the bacteria in the air and swapping some part of the mortuary, including door handle, cupboard handle, and autopsy table. This study found that *Acinetobacter baumannii* presence at one of the autopsy table. Therefore, we also found pathogen opportunistic bacteria at hospital mortuary which can be the source of infection in immunocompromised patient. Hence, a better preventive and infection control action is required to reduce the risk of infection.

Keywords : *Infection, mortuary, autopsy, Acinetobacter baumannii*

INTRODUCTION

The risk of infection for forensic medical practitioner at mortuary was reportedly increased.¹ This was due to increasing of infectious disease-related death particularly in developing countries.² Some studies showed higher prevalence of HIV, Hepatitis B, C, D, G, Tuberculosis, Prion Disease, Hantavirus, measles, bacterial infection or HTCV on workers at mortuary.¹ Indonesia is one of developing country which is still had infectious disease problem. In 2011, some of infectious disease epidemic including Hepatitis, avian influenza, and SARS was reported in Indonesia.²

Autopsy safety was not considered as an important thing until 1980's, when the first HIV case appeared. At first, it was emphasized on Infection preventive action by conducting universal vigilance and developing Occupational Safety and Health Adminsitration(OSHA) regulation. In line with that, some regulations and procedures to minimize the probability of wound and needlestick injury were also enacted. Other hazards and their appropriate management was been identifying overtime.^{3, 4}

Most of the work accidents are due to human negligence factor and low awareness of self protection. In autopsy safety regulation, everything has been arranged very well to prevent infection, starting from requirements of autopsy room, personal protective equipment, and procedure of autopsy room disinfection.^{3, 4}

A study conducted by Sorin Hostiuc et al, using air sample in autopsy room, found some types of bacteria, including *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus faecium*, *Yersinia enterocolitica*, *Enterobacter aerogenes*, *S. choleraesuis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Nisseria sp*, dan *Streptococcus Pneumonie*. While using cotton swab taken from main door of autopsy room, three autopsy tables, and two windows, they found gram-positive cocci bacteria, sometime in the form of dyplo or small chain. Hepatitis B virus and HIV were found almost 24 hours after autopsy on immunologic test.¹ This study has never been conducted in Indonesia, particularly at M Djamil Hospital Padang.

METHODS

In descriptive study, we swabbed the door handle of mortuary, door handle of cupboard in mortuary, and autopsy table, by using cotton swab. While to identify air-transmitted bacteria, we put blood agar and MacConkey agar per 2 meters square of mortuary floor and then left open for 15 minutes. Subsequently, they were sent to microbiologic laboratory to be incubated at 37°C for 18-24 hours. Bacterial identification was done by using Vitek® 2 system.

RESULT

The result of bacterial identification at M Djamil hospital mortuary was presented in Table 1.

Table No. 1: Bacterial Identification Result

S. No.	Sample source	Name of Bacteria
1	Door handle	<i>Sphingomonas paucimobilis</i> <i>Micrococcus luteus</i> <i>Acinetobacter iwoffii</i> <i>Staphylococcus capitis</i>
2	Autopsy table	<i>Aeromonas salmonicida</i> <i>Acinetobacter baumannii</i> <i>Sphingomonas paucimobilis</i> <i>Acinetobacter iwoffii</i> <i>Kocuria kristinae</i>
3	Air	<i>Kocuria kristinae</i> <i>Pasteurella canis</i> <i>Bordetella bronchiseptica</i> <i>Acinetobacter iwoffii</i> <i>Dermacoccus nishinomiyaensis</i> <i>Staphylococcus saprophyticus</i> <i>Staphylococcus hominis</i>
4	Cupboard handle	Bacteria was not found

DISCUSSION

The result of this study showed that *Acinetobacter baumannii* was found in one of the autopsy table which certainly has direct contact with corpse. *Acinetobacter baumannii* is a gram-negative basil bacteria whose characteristics are aerobic, pleomorphic, and non-motile. This bacteria often becomes the cause of nosocomial infection in human. The colony of this bacteria can be found at infected human skin, respiratory tract, and oropharynx secretion. The incidence of *A.baumannii*-caused hospital-associated infection (HAI) is increased, therefore automatically increasing the risk of patient morbidity and mortality. This bacteria was known to be able to colonizes in operating room, ward, delivery room, and burns management room in hospital. It also contribute in acute diseases, including meningitis, pneumonia, and bacteremia. Incidence of *A. baumannii* infection on immunocompromised patient is also high, particularly who undergo long time hospitalization. Multi drug resistant could worsen patient outcome because of appropriate treatment delay, limitation of treatment choices, and higher toxicity of the available treatment.⁵

Most of other bacteria identified in this study are categorized as environmental bacteria. Those bacteria can still infect person with lowering immunity. *Sphingomonas paucimobilis* is distributed widely in natural environment. It can also contaminate water supply, hospital equipments and devices such as mechanical ventilator or catheter that will lead to nosocomial infection. *Sphingomonas paucimobilis* can cause many kinds of infection, including bacteremia, skeptical arthritis, osteomyelitis, meningitis, wound infection, urinary tract infection, intra-abdominal infection, ventilator-associated pneumonia, peritoneal dialysis-related peritonitis, and post-operation endophthalmitis.⁶

Micrococcus, as a common gram-positive cocci bacteria, is considered as a dangerous saprophyte which is resident at human skin, mucosa, and oropharynx. However, it could be opportunistic pathogen in immunocompromised patient.⁷

Acinetobacter iwoffi is a commensal organism at human skin, oropharynx, and perineum. There are some reports about *A. iwoffi* bacteremia. It is reported that there were 10 patients infected with *A. iwoffi* bacteremia in four years (2002-2005) who were hospitalized at a teaching hospital in Italy. All of them were immunocompromised patient, 8 of them used intravascular catheter and 2 of them used urinary catheter.⁸

Staphylococcus capitis, *Staphylococcus saprophyticus* and *Staphylococcus hominis* are belong to *Coagulase negative staphylococcus* (CoNS) group, which is normal flora of human skin, anterior nares, and ear canal. However, despite its position as normal flora, utilization of intravascular device is more often over time and the number of immunocompromised patient hospitalization is increasing, CoNS has become the main cause of nosocomial blood infection.⁷

Aeromonas salmonicida is the main pathogen in fish pathology and these bacteria doesn't grow in human body because it cannot grow on 37°C temperature. However, nowadays this bacteria has been identified as primary pathogen on health person as well as immunocompromised person, particularly on gastrointestinal infection and septicemia.⁹

Kocuria kristinae is not considered as primary pathogen, but for the last few years, there were some cases in patient's catheter caused by this species lead to peritoneal dialysis-related peritonitis and acute cholecystitis in chronic-ill patient and pregnant women (without other diseases history).¹⁰

Bordetella bronchiseptica is respiratory pathogen which has a strong relation with whooping cough caused by *Bordetella pertusis*. *Bordetella pertusis* can only infect human, while *B. bronchiseptica* can also infect many kinds of mammal, cause tracheobronchitis in dogs and cats, and atrophy rhinitis in pork. Human infection occurs mainly if immunocompromised person exposed by livestock infection.^{11, 12}

CONCLUSION

Acinetobacter baumannii, as opportunistic pathogen bacteria which often become the cause of

Hospital associated Infection, was found in mortuary environment. Air environment in mortuary contains environmental bacteria which can be the cause of infection, particularly in immunocompromised patient.

Ethical clearance: This study does not involve humans and animals. This study only took a swab on the surface of the autopsy room.

Source of funding: Research funding come from the medical faculties andalas university

Conflict of Interest: This research had permitted from M Djamil hospital Padang, Indonesia.

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Establishment of Relation between Supine Length and Femoral Length among Cadavers

Deepak Chaturvedi¹, N.K. Aggarwal², A.K. Tyagi³

¹Department of Forensic Medicine & Toxicology, ²Professor and Head Department of Forensic Medicine & Toxicology, University College of Medical Sciences and Guru Teg Bahadur Hospital, New Delhi India 100095

³Professor, Department of Forensic Medicine & Toxicology, Hindu Rao Hospital, Delhi India 110007

ABSTRACT

After the development of forensic anthropology at the end of the nineteenth century system of identification was started. Though estimation of stature from measurements of upper limb and lower limb bones has been done it is the lower limb bone that gives better approximation. Therefore this study was done in an apex institution of Delhi involving 200 cadavers (100 males & females) to predict relation between spine length and femoral length, along with derivation of multiplication factors, regression equations as well as to find out bilateral & bisexual variations. It was found that femoral length significantly correlated with supine length with significant bisexual variation ($p < 0.001$), but no bilateral variation in either gender. The best prediction of supine length in both the sexes and for combined cases can be done by right femoral length. Multiplication factors derived were less accurate than regression equations hence for more accurate estimation individual regression equation derived from that particular part and sex should be used.

Keywords: Anthropometry Femoral length, Identification and Supine length.

INTRODUCTION

According to an age old truth which tells a forensic expert that although there is only one way in which to be born, there are many ways in which to die. The type of death which taxes the resources of most experienced forensic expert is when the body is recovered in mutilated state and problem of identification of person is involved.¹ Alphonse Bertillon is the pioneer of forensic anthropology at the end of the nineteenth century in 1882 devised the first classification and identification system to identify criminals based on anthropometry.² Identification of a living as well as dead is must in criminal, civil cases and in mass disasters. The identity of a corpse is of supreme importance in the investigation of any death and forms the first part of an inquisition, where the body is decomposed or skeletalized.³

Stature can be estimated through the anatomical or Fully method" (George Fully 1956), and the mathematical method (for fragments of body or body

parts), FORDISC 3 and revised Fully method.⁴The contribution to stature made by long bones is limited to those the femur and tibia, which provide the most accurate stature estimates among dry bones. So the best bones to reconstruct living stature are the long bones of the lower limb the femur, tibia and fibula. Estimation of stature in mutilated bodies especially from their bones is a tedious and time consuming process and gives erroneous results due to considerable statistical differences between the lengths of fresh and dry bones.⁵ Another problem is that the whole process of collection of bones from cadaver, cleaning by treating these bones with chemicals and drying may lead to considerable difference in actual bone length meanwhile fragment of bone may be detached from the bone which make measurement difficult from intact dry bones.

As India is a country of diversity in many aspects and presently available formulae derived are from western population that cannot be used in our vast homeland.⁶

Due to lack of anthropometric data from cadavers this research work was done aiming at the anthropometric measurement of bilateral femoral length in cadavers and their correlation with supine length and to develop multiplication factors along with regression equations for the population of Delhi- NCR.

AIM AND OBJECTIVES

AIM: Determination of correlation between supine length and percutaneous measurements of femoral length in cadavers.

OBJECTIVES

Correlation between supine length and percutaneous measurements of Femoral Length.

2. Derivation of multiplication factor and regression equation.
3. To find out bilateral variation.
4. To find bisexual variation.

MATERIAL AND METHODS

Measurements of 100 males & 100 females were done after taking consent from relatives.

INCLUSION CRITERIA

- Adult cases brought to mortuary for medico legal autopsy.
- Only those individuals in whom there was no anatomical distortion of the portion of body in relation to stature were included in the study.

EXCLUSION CRITERIA

- Cases with disease or defect affecting the growth in general or of bones.
- Cases with deformity and disease affecting the bones of lower extremity.

STUDY DESIGN

Analytical cross sectional study from UCMS & GTB Hospital New Delhi. For statistical computation and understanding and also for uniform and fair comparisons total number of cases, both males and

females were divided in to four age groups of 10 year intervals with 25 individuals in each age group. Linear regression equations were formulated independently for male and female and separately for each age group in relation with the parameters included in the present study.

MATERIALS USED

- Standard Autopsy equipments.
- Scientifically standardized graduated Anthropometer.

METHODS OF COLLECTING THE DATA

- Rigor mortis was broken by standard technique of treating the dead body thoroughly with warm water and then breaking it manually if required.
- All the measurements were taken three times in centimeters, and mean value was used for computation.

1-SUPINE LENGTH: On the flat hard surfaced autopsy table dead body kept supine, with the extension at knee and hip joints. The head, neck, back and feet made in a same plane. The supine length was measured by using graduations on side of autopsy table from vertex of head to heel of foot.

2-FEMORAL LENGTH: Femoral length was taken as the distance from upper most point on greater trochanter to lower most point palpable on lateral femoral condyle.⁷



Figure 1: Showing Femoral Length Measurement

OBSERVATION AND RESULTS

This study exclusively oriented for derivation of the linear regression equations to determine the correlation between supine length and percutaneous measurements of femoral length to expedite measurements and so identification, for administration of law and justice.

1-SUPINE LENGTH: Average supine length was more in males (165.90cm) as compared to females (153.68cm). Among age groups mean supine length in males and females were minimum in >48 years age groups, while it was maximum in 18-28 years age groups in both the sexes.

2-FEMORAL LENGTH: No bilateral variation observed in either gender. However significant bisexual differences were seen in femoral lengths. Length is observed to be less in females as compared to males (Table-1). On comparing age group wise mean right femoral length in males was maximum in 39-48 years age group while in females in 18-28 years age group and minimum were observed in >48 years among both sexes.

Table No. 1: Comparison of Femoral Length

Sex	Side	Min	Max	Mean	SD
Male (n = 100)	R	33.3	44.3	38.301	2.4425
	L	33.4	44.3	38.314	2.4257
Female (n = 100)	R	30.6	40.0	35.427	2.6390
	L	30.7	39.9	35.466	2.6574

2.1 Right Femoral Length: Linear regression equation derived best prediction can be made for 29-38 year age groups, but equally good prediction can be made using regression equation derived for combined age group.

2.2 Left Femoral Length: The maximum and minimum values of left femoral length follows as were for the right femoral length, with least mean left femoral length (37.368cm). Among females least mean value observed in 18-28 years age group.

Table-2 depicts regression equation derived, on comparing age group wise right and left femoral length for prediction of supine length, best result obtained for

29- 38 year age group in both the genders, and among sexes males give better estimate than females.

Table No. 2: Regression Equations Derived

Sex	Side	Regression equation	SEE (+/-) cms	r value
Male	R	$75.524 + 2.630 \times \text{RFmL}$	3.9032	0.829
	L	$74.881 + 2.376 \times \text{LFmL}$	3.9045	0.829
Female	R	$90.860 + 1.773 \times \text{RFmL}$	4.9687	0.687
	L	$90.588 + 1.779 \times \text{LFmL}$	4.9226	0.694
Combined	R	$64.592 + 2.582 \times \text{RFmL}$	5.2916	0.819
	L	$64.292 + 2.589 \times \text{LFmL}$	5.2841	0.820

The correlation of right and left femoral length with supine length for total number of cases also give significant correlation ($p=0.001$). Hence good estimate of supine length can be made with all the cases too irrespective of the side. The standard error of estimate of total cases when combined varied from ± 5.28 to ± 5.29 .

Multiplication factors derived from this study for right femoral length among males and females was 4.332 and 4.337 respectively while for left femoral length among males and females was 4.330 and 4.333 respectively. According to Pan (1924) among East Indians (Hindus) were as follows: Femur (3.70) and Tibia and Fibula (4.48) by measuring 142 males and females cadavera.

DISCUSSION

Usually by the age of 18-20 years fusion of the epiphysis and the diaphysis takes place and so growth in terms of height stops. Friedlaender et al,(1977) suggested that a decline in stature does not commence until the fifth decade of life.⁸

1-Stature: In the present study mean stature was less in females than males, which is consistent on comparing with other studies. This was seen even true when in this study age group wise comparisons made among females and males. However the average height in both males and females among European populations was more.

2-Femoral Length: The present study is in accordance with other studies showing no bilateral variation but significant bisexual differences with greater femoral length in males. Study conducted by Ozaslan et al, Hauser et al, Mahakkanukrauh P et al and Choi et al shows significant variations in right, left and

mean femoral length in both genders with the present study. This might be attributed to different point of measurements which lead to variations with in studies. Like Ozaslan A et al measured thigh length as distance between the trochanteric height and lower leg length as shown in Table-3.

Table No. 3: Femoral Length Comparison

Authors	Population studied	Condition in which bone studied	Sex	side	Min	Max	Mean
Ozaslan et al ⁹	Turkey (203M, 108F)	Percutaneous	M	L	33.2	51.8	43.85
			F	L	32	48.9	42.29
Hauser et al ¹⁰	Poland (71M, 20F)	Isolated Fresh Bone	M	R			47.236
				L			47.290
			F	R			42.992
				L			43.168
Mahakkanukrauh et al ¹¹	Thailand (132M, 68F)	Dry Bones	M	R	38.1	49.7	43.28
				L	38.3	50	43.55
			F	R	35	45	40.28
				L	35.4	45.2	40.27
Choi et al ¹²	Korea (57 M)	Dry Bones	M	R	39.6	48.3	43.2
				L	39.5	48.2	43.1
Bhavna, Nath S ¹³	Delhi (503M)	Percutaneous	M	L			41.71
Present Study	Delhi (100M, 100F)	Percutaneous	M	R	33.3	44.3	38.301
				L	33.4	44.3	38.314
			F	R	30.6	40.0	35.427
				L	30.7	39.9	35.466

In the present study males and females shows significantly positive correlation coefficient for right and left femoral length in all age groups being highest for right femoral length($r=0.902$) in 29-38 yr age group followed by correlation coefficient of left femoral length($r=0.901$) in same age group for males. So, if the age of a person is known, then better results can be obtained by using independent linear regression equations. Supine length thus stature can be predicted with standard error of +/-

3.9 cm in males, +/-4.9cm in females and +/- 5.2cm irrespective of sexes using regression equations derived from present study. The prediction with least standard error is found in regression equations derived by Hauser et al in polish population, and the equations can be used for that population only. Although the standard error is marginally more in the present study, but as it is conducted on cosmopolitan population regression equations can effectively used for all over the country (Table-4).

Table No. 4: Comparison of Regression Equations

Authors	Gender	Regression equation	SEE(+/-) cms	r value
Ozaslan et al (Turkey) ⁹	M		5.941	0.50
	F		6.305	0.23
Hauser et al (Poland) ¹⁰	Both			0.925
	M	38.316+2.89×RFmL	3.046	0.923
		38.537+2.88×LFmL	3.049	0.923
	F	47.125+2.68×RFmL	1.770	0.892
		57.693+2.42×LFmL	2.173	0.833
Mahakkanukrauh et al ¹¹ (Thailand)	Both	32.824+2.986×FmL	5.38	0.824
	M	45.534+2.722×FmL	5.06	0.769
	F	40.602+2.778×FmL	5.21	0.762
Choi et al (Korea) ¹²	M	36.88+2.93×FmL	3.96	0.670
Bhavna, Nath S (Delhi) ¹³	M	77.99+2.15×LFmL	3.80	0.743
Present study (Delhi)	Both	64.592+2.582×RFmL	5.2916	0.819
		64.292+2.589×LFmL	5.2841	0.820
	M	75.524+2.630×RFmL	3.9032	0.829
		74.881+2.376×LFmL	3.9045	0.829
	F	90.860+1.773×RFmL	4.9687	0.687
		90.588+1.779×LFmL	4.9226	0.694

There were no any statistically significant bilateral differences in both males ($p = 0.193$) and females ($p = 0.332$).

Table 5 depicts the bisexual variations, using unpaired t-test the mean differences, t- value and p- value in both males and females were derived. Sex differences were statistically significant ($p < 0.01$).

Table No. 5: Bisexual Variations in Measurements

Variable	Mean difference	t – value	p - value	Inference
Supine length	12.220	12.562	< 0.001	Highly significant
Right femoral length	2.8740	7.993	< 0.001	Highly significant
Left femoral length	2.8480	7.915	< 0.001	Highly significant

CONCLUSIONS AND SUMMARY

The mean value of supine length in male was about 12 cm more as compared to female. Femoral length showed positive correlation with supine length. There

was a significant bisexual difference but no bilateral variation. Right and left femoral length was more in males as compared to females. The correlation of right and left femoral length with supine length observed best in 29-38 yr age group in both the sexes therefore if the age of a person is known, better results can be obtained by using independent linear regression equations. For combined cases too femoral length shows significantly positive correlation, so regression equation derived can be used for stature estimation if sex and age is unknown. Multiplication factors derived in both genders were less accurate than regression equations. Regression equations derived in this study can be used for the population all over the country as present study done in cosmopolitan population.

Conflict of Interest - There is no any conflict in any sense with respect to this research work.

Source of Funding - Self

Ethical Clearance - This research work was done with the approval of ethical committee.

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A Prospective Study of Flame Burn Victims brought for Autopsy in a Tertiary Care Medical Institute

Dhritiman Nath¹, Kanak Chandra Das², Pramod Kumar GN³, S. Kumar⁴

¹Associate Professor, Dept of Forensic Medicine and Toxicology, Mahatma Gandhi Medical College & Research Institute, Pondicherry, ²Professor and Head, Dept. of Forensic Medicine and Toxicology, Jorhat Medical College & Hospital, Assam, ³Professor, Dept. of Forensic Medicine & Toxicology, Mahatma Gandhi Medical College & Research Institute Pondicherry, ⁴Professor and Head, Dept. of Forensic Medicine and Toxicology, Mahatma Gandhi Medical College & Research Institute, Pondicherry

ABSTRACT

Introduction: Burn injuries are a major public health concern with more than 3,00,000 deaths occurring every year globally. In India, 1,63,000 to 2,00,000 burn deaths are reported every year. Considering the enormity of the problem, we undertook this study so that the risk factors and population at risk could be identified in and around the city of Guwahati, Assam.

Methods: The prospective study was done in the Mortuary of Guwahati Medical College and Hospital, Assam. A total of 91 cases of flame burns were collected for the period from 1st June 2006 to 31st May 2007. The victims were studied for age, sex, nature of incidence, educational background, occupational status, marital status, socio economic status, location of incidence, etiology, time of incidence, day and month wise distribution of incidence, seasonal variations and pregnancy history. Burns due to other causes (chemical, electricity, lightning etc) were excluded.

Results: Majority of the victims were females (78.91%). Incidence of accidental burns was more common (70.34%). Most of the victims were educated upto high school (46.16%) and actively involved in household chores (58.24%). Married people were more commonly affected (64.84%). Most of the victims were from the low income group (52.74%) and belonged to urban areas (48.87%). Widespread use of kerosene appliances resulted in most deaths (37.36%). Most common time of incidence was from 6PM to 12 midnight (54.89%). A majority of the cases were reported on Sundays (18.05%). Most of the cases occurred in winter (33.08%). A majority of the victims were not pregnant at the time of incidence (90.65%).

Conclusions: Hindu married, non – pregnant women of low income group living in urban areas, having low formal education and actively involved in domestic chores, are most susceptible to burns. Preventive strategies include minimizing the risk factors by proper interventions and raising awareness among the public by conducting educational programmes.

Keywords : Flame, burns, autopsy.

Corresponding Author:

Dr. Dhritiman Nath

Associate Professor,
Dept of Forensic Medicine and Toxicology
Mahatma Gandhi Medical College & Research
Institute, Pondicherry
Email: dhritimannath06@gmail.com
Mobile: 8903733042 / 9047333041

INTRODUCTION

WHO's International Classification of Diseases version 10 (ICD - 10) classifies burn injuries by site of injury as "burns and corrosions" (T20 - T32) and by aetiology, as that caused by exposure to smoke, fire and flames (X00 – X09), contact with heat and hot substances (X10 – X19), exposure to electric current (W85 - 87), lightning (X33) and exposure to corrosive substances

(X46, X49). In the light of this definition, injuries caused by heat, electricity, flame, friction, hot air and hot gases, hot objects, lightning and chemical substances can only be interpreted as burns. Burns caused by radiation and sunburn are not included in this classification.¹

Globally, burn injuries are recognised as a major public health problem. Every year, more than 3,00,000 burn deaths are reported with about 95% of these deaths being reported from the low and middle – income countries. Highest mortality rates are reported in South – East Asia (11.6 deaths per 1,00,000 population per year) with females constituting a major proportion of such deaths.²

India contributes a significant number of burn deaths to the global count annually. Every year 1,63,000 to 2, 00,000 burn deaths are reported with female to male ratio varying from 1.1 to 1.6 annually.³ Sensing the need for an epidemiological study of such cases in this region, we proposed to do this study. The data obtained shall be helpful to identify the risk factors and risk groups so that a preventive plan for the occurrence of such cases may be formulated in the time to come.

MATERIALS AND METHOD

The prospective study was conducted on approval of the Institutional Ethics Committee of Guwahati Medical College & Hospital, India. Fatal flame burn victims brought to the mortuary in between 1st June 2006 to 31st May 2007 were studied for age, sex, nature of incidence, educational background, occupational status, marital status, socio economic status, location of incidence, etiology, time of incidence, day and month wise distribution of incidence, seasonal variations and pregnancy history. A total of 91 cases were enrolled. A pre designated proforma was used for the purpose.

Only fatal flame burn victims were included in the study; burns due to other causes (chemical, electricity, lightning etc) were not included. The injuries were determined and recorded using International Classification of Diseases (ICD) diagnostic codes T30, T31, and T32. Analyses were done with “SPSS 17.0 for Windows” software package.

FINDINGS

Out of 1992 cases brought for autopsy during the study period, 91 cases had flame burns and constituted 4.57% of the total cases. There was a clear preponderance of female victims with 71 cases (78.9%) and males constituting 21.09% of cases.

Most of the cases were accidental (70.34%) followed by suicidal (26.37%). Homicidal cases constituted 3.29% of all cases.

Most of the burn victims had formal education upto high school (46.16%). Those educated upto primary school were the least affected (9.89%) (*Table 1*).

Table No. 1: Educational background of burn victims

Educational background	Number of cases	% of cases
Illiterate	26	28.57
Primary	09	9.89
High School	42	46.16
College	14	15.38

A majority of the victims were homemakers actively involved in day to day household chores (58.24%). People occupied in the fields and farmlands were the least affected (1.09%) (*Table 2*).

Table No. 2: Occupational Status

Occupation	Number of cases	% of cases
Homemakers	53	58.24
Student	15	16.48
Business	04	4.40
Service	09	9.89
Labour	09	9.89
Cultivation	01	1.09

Most of the victims were already married by the time of the incident (64.84%). Children (7.69%) constituted the least number of cases.

A greater section of the victims belonged to the low income group (52.74%) while people from the high income group were the least affected (7.68%).

A majority of the victims belonged to urban localities (48.87 %) while people from semi-rural areas (small towns or talukas) constituted the least number of victims (18.80%).

Predominant causative factors were the widespread use of kerosene appliances (Table 3).

Table No. 3: Causative source (etiology) of burn incident

Etiology	Number of cases	% of cases
Kerosene stove	34	37.36
Kerosene oil and match	26	28.56
Chulha	10	10.99
Kerosene lamp	08	8.79
Vehicular accidents	0	0
Gas stove	04	4.40
Open flame	02	2.20
Candle flame	0	0
Earthen lamp	02	2.20
Cracker	02	2.20
Undetermined	03	3.30

A majority of incidents occurred between 6 PM to 12 midnight (54.89%) followed by morning hours from 6 AM to 12 noon (21.05%). Incidences were almost evenly distributed throughout the week with a slight preponderance on Sundays (18.05%).

Most cases (33.08%) were reported in winter (November to February) and spring (30.82%) (March to May).

90.65% of the female victims were not pregnant at the time of the incident.

DISCUSSION

Burns are a major cause of morbidity and mortality in India.³ Our study aimed to analyze the epidemiology of burn victims brought to Guwahati Medical College and Hospital, India so that the results could be used to identify the risk factors and groups at risk.

In this study, females were more commonly affected which is consistent with other Indian studies on the same topic.^{4,5,6} However, Karimi H et al, in their study done in Iran, found that males are more commonly affected.⁷ We justify it by the fact that in Indian households, women are generally more involved in cooking. Rampant use of fire as chulha or gas stoves, often substandard in quality,

makes women easy prey to such incidents. This situation is further worsened by the widespread use of flammable substances like kerosene in Indian kitchens.

Most of the burn victims belonged to the lower economic status (52.74%) and were either illiterate (28.57%) or formally educated upto high school (46.16%). These findings are consistent with that of other studies which reported that burns are most prevalent in poor population with low levels of education.^{8,9} Our explanation would be that families of lower economic class tend to use kerosene in the form of kerosene stoves or lamps and consequently are more susceptible to burns. Kerosene was also found to be the major cause of burns in another study.⁸ Most of our cases presented with history of fallen kerosene lamp or kerosene stove explosions. With low levels of education, people might not be aware of the need to use standard and recommended kitchen appliances or the steps to be taken to prevent burns, thus making them more susceptible.

Our study, like other similar studies have surmised that homemakers are most susceptible to burn injuries.¹⁰ One possible explanation would be their active involvement in household activities like cooking, often using traditional and not necessarily safe and recommended methods.

Most of the burn victims belonged to urban localities (48.87%). This is in sharp contrast to the study by Ashkan G et al that showed rural preponderance.⁸ One logical explanation would be that our hospital is located right in the heart of the city and most of the admitted cases are from the city and not from the rural areas.

The most frequent time of incidence was between 6 PM to 12 midnight. This is consistent with another study by Eser T.¹¹ Our explanation would be that this is the time for active cooking in kitchens. Hence the possibility of sustaining burns increases manifold.

Incidences of burns were evenly distributed throughout the week with a slight preponderance on Sundays. Sundays are a day of elaborate cooking in Indian households and hence, more incidents were reported on this day.

A majority of burns occurred in the winter (33.08%). This corresponds to other studies done elsewhere.^{12,13,14,15} It can be explained by the elaborate and frequent cooking in Indian kitchens during winters and widespread use of electric heaters or open fires for warming up along with the use of woolen clothes and shawls that are easily flammable.

Due to the prevalent social rituals and associated physical changes, pregnant women tend to stay away from household chores. This explains the less number of pregnant burn victims in our study. Our finding corresponds to most of the studies done on the same topic.^{16, 17, 18}

CONCLUSION

Through our study, we sought to identify the risk factors for burns and the risk groups involved. We determined that Hindu married, non – pregnant women of low income group living in urban areas, having low formal education and actively involved in domestic chores, are most susceptible to burns. Use of kerosene and its related appliances accentuates the risk. Burns occur mostly in between 6PM to 12 midnight and are more common in Sundays and during winter.

Our findings emphasize the need for raising awareness among the population at risk by establishing educational programmes in schools, colleges, community centres, markets, hospitals and clinics. A burn registry program developed on the lines of that in Iran may be a useful step in the right direction.⁷

Conflict of Interests: Nil

Source of Funding: Self

Ethical Clearance: Study was conducted after approval of Institutional Ethics Committee, Guwahati Medical College & Hospital, Assam, India.

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Demographic Profile of Sudden Natural Deaths from among Medicolegal Postmortem Examinations in Vizag

M. Malleswari,¹ G. Jhansi Lakshmi²

¹Associate Professor, NRI Medical College, Chinakakani, Guntur District, ²Assistant Professor, Gandhi Medical College, Secunderabad, Telangana state

ABSTRACT

A sudden death is not necessarily unexpected and unexpected death is not necessarily sudden, but very often the two are in combination¹, these sudden deaths are most probably due to transformation of man to more sedentary stressful life due to advancement in lifestyle and modern technology leading to increase in risk factors for sudden death. Unfortunately, forensic autopsy is too often thought of only in reference to violent or unnatural deaths. The present prospective study was aimed to know the effectiveness of post-mortem examination to find out the cause of death. Most of the natural deaths are due to cardiovascular diseases which are sudden, unexpected and not diagnosed or witnessed. But legally certification of death is mandatory in our country, hence cause of death can be arrived by doing medico legal autopsy in such circumstances. Studies conducted at one place can't be considered as standard to other with respect to etiology because the environment and the circumstances are not identical.

Key words: Sudden death, unexpected death, lifestyle, cardiovascular disease.

INTRODUCTION

The official WHO definition of sudden death is someone who dies within 24 hours from the onset of terminal symptoms but in forensic sense, most of such people die within minutes or even in seconds of the onset of symptoms. A sudden death is not necessarily unexpected and an unexpected death is not necessarily sudden, but very often the two are in combination.¹

A person may be leading an apparently normal healthy life, although he had been suffering from a

disease, the existence of which is unknown to him. The preexisting disease or condition could not have been diagnosed earlier or the person may be on his way to hospital or dies in the hospital even before the attending physician could arrive at a diagnosis or unable to say with certainty that death is due to natural or unnatural cause or if a person dies suddenly without any pre indication, suspicion or foul play, may arise.²

The medico legal autopsy is conducted in cases of sudden and unexpected deaths, including apparently accidental deaths, primarily to establish the cause of death. This examination very frequently demonstrate natural diseases, the presence of which will raise a number of questions like

1. If death is associated with an accident
2. If death is not associated with an accident
3. If the disease is connected with trauma, homicide or crime implicated in the cause of death³

Corresponding Author:

Dr. G. Jhansi Lakshmi

Assistant Professor,
Department of Forensic Medicine,
Gandhi Medical College, Secunderabad,
Telangana state.

Email: Jhansi1962@gmail.com

Mobile: 9440496509

It is evident that if these questions are answered accurately much more may be achieved than the establishment of cause of death. Medico legal autopsy will assist legal authorities and satisfy the bereaved relatives perhaps by helping them to obtain insurance, compensation benefits and to eliminate suspicion or foul play as well as to exclude death from violence or poisoning etc. The end of justice can be properly served.⁴

A most important medico legal problem has been possible association of effort (Physical / emotional or both) with sudden death. This is especially significant with cardiovascular origin, where the influence of emotion or excitement in precipitating sudden death in the presence of a criminal offence may vary much and affect the nature of a prosecution.¹³

After thorough autopsy keenly, available photographs, naked-eye observations along with information from inquest may thus be confirmed or refuted, evidence of unsuspected disease or poisoning may be obtained, and the danger of the acceptance of the obvious may be there by avoided with the salutary demonstration of the fact that a double pathology is into a rarity.⁵

Studies conducted at one place can't be considered as standard to other with respect to etiology because the environment and the circumstances are not identical.

MATERIALS AND METHODS

This study has been carried out from October 2004 to September 2005, after taking permission from the Ethical Committee of Andhra Medical College/King George Hospital, Visakhapatnam.

The present study was conducted in the Department of Forensic Medicine, Andhra Medical College, Visakhapatnam from October 2004 to September 2005 i.e., 12 months, during which the total postmortem cases were 1215.

The records maintained for each case in this department are 1.Post mortem requisition given by Investigating Officer along with the inquests 2.Treatment records from hospital if treated 3.History from blood relatives and friends 4.observation of the circumstances at the scene by visiting the scene of offence 5.Photographs taken from the scene of offence.6.Findings in the Post

mortem examination certificates. In cases of deaths due to poisoning, chemical analysis reports from the Forensic Science Laboratory were taken into consideration.⁶

The materials used are inquest reports, inpatient case sheets, perusal of police papers, data from District Crime Records Bureau (DCRB), Visakhapatnam, records from Medical Records Section of Andhra medical college, Visakhapatnam, Post mortem Reports of all cases, information collected from the Investigating Officer, Relatives and friends of the deceased accompanied.

The factors taken to enumerate the study are the incidence of sudden natural deaths, age incidence of sudden natural deaths, sex incidence, showing religion distribution and incidence of activities during sudden natural deaths

OBSERVATIONS AND RESULTS

The term sudden death refers to the sudden and unexpected death. The external examination elicits the cause of death. The majority of these are natural deaths. But very often natural deaths form the basis of medico legal investigation, if they have occurred suddenly and unexpectedly in apparently healthy persons and under the suspicious conditions. The situation may become very knotty where the trauma per se is not fatal and pathological lesion found at autopsy may have been compatible with continued life like chronic heart disease and these can create difficulties in determining the cause of death. In such cases it is not usually possible to certify the cause of death only on external examination of the body. In all such cases an autopsy is imperative to obviate the possibility of cause of death.

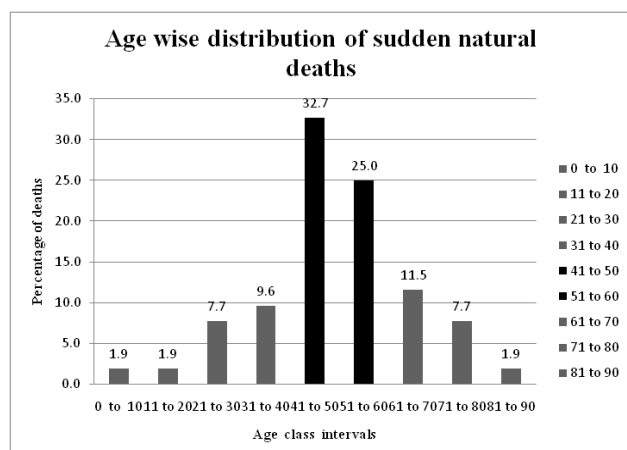
Table No. 1: Showing Incidence of Sudden Natural Deaths, the Postmortems Conducted

S. No	From October 2004 to September 2005
1. Postmortems conducted	1215 cases
2. Sudden natural deaths	52 cases
Percentage	4.2%

In this study from **Table No. 1** showing incidence of sudden natural deaths, the postmortems conducted were 1215 and out of these sudden natural deaths were 52 cases (4.2%).

The incidence is compared with sudden natural deaths due to cardiovascular disease, by this study with studies of Aligbe et al 31%, Amakin et al 23%, S.Harish 57.3%, Kagne et al 23.17%, R.K Sharma 60%, Palson and Gee 61%, Taylor 57% and Granmaison 72.7%⁷. The incidence of sudden natural deaths due to cardiovascular disease in the present study agrees with R.K.Sharma, Taylor and S.Harish studies.

Graph No. 1

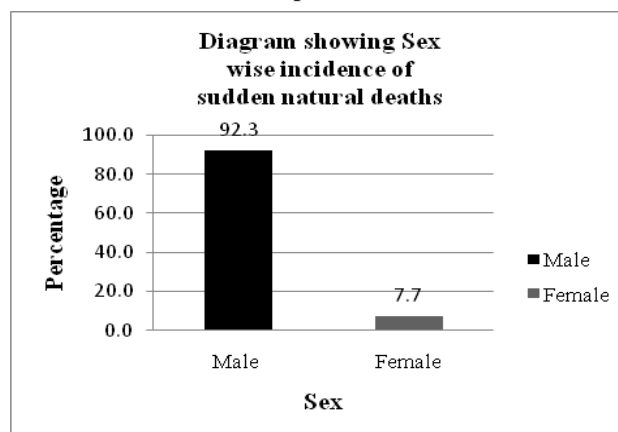


Graph No—1 shows age incidence of sudden natural deaths. The maximum number of cases i.e. 17 cases(32.69%) were seen in the age group 41-50 years⁵, the next frequency is 13(25%) in the age group 51-60 years. The least number of cases was 1(1.92%) was seen in age group of 0-10, 11-20 and 81-90 years.

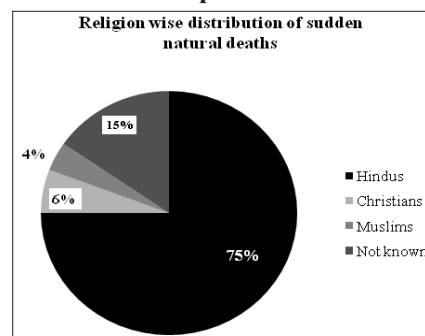
In this study individuals age ranging from 7 years and above were taken, 1.9% deaths occurred in the first decade and in the second decade 1.9%, in 3rd decade 7.69%, in 4th decade maximum i.e. 32.69%, in 5th decade 25%, in 6th decade 11.5%, in 7th decade 7.6% and in 8th decade 1.9%. In Kagne et al and R.K.Sharma studies highest number of cases were noted in the age in 4th decade i.e. 41-50 years, so this study coincides with R.K.Sharma.⁵

Graph No—2 shows sex incidence of sudden natural deaths. In this study out of 1215 cases, number of males were 48(7.69%) and 4 cases were female. 52 cases (92.3%) were involved in sudden natural deaths. Male to female ratio is approximately 12:1 is similar to reports by other studies¹¹. This may be due to paternalistic nature of our environment with more men being involved in outdoor activities.

Graph No. 2

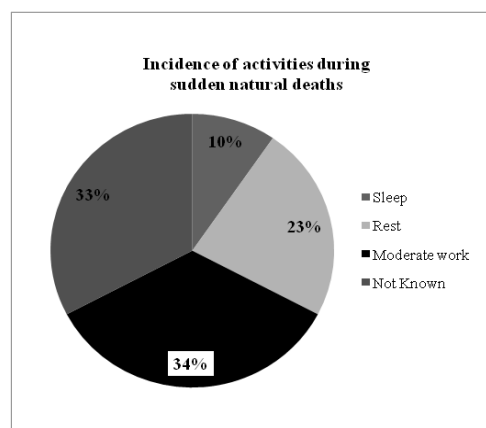


Graph No. 3



Graph No—3 shows religion distribution in sudden natural deaths. Out of 52 sudden unnatural death cases Hindus were 39 (75%), Christians were 3 (5.76%), Muslims were 2 (3.84%) and not known cases were 8 (15.38%).

Graph No. 4



Graph No—4 shows incidence of activities during which sudden natural deaths occurred. Majority of sudden natural deaths occurred while engaged in moderate work amounting to 18 cases (34.61%) followed by not known which were 17 cases (32.69%), 12 cases during rest and 5 cases during sleep.

DISCUSSION AND SUGGESTIONS

The present study indicated that a considerable number of cases from among total medico legal postmortems diagnosed to be due to natural cause of death. The importance lies in the fact that while doing medico legal postmortem examination who have to bear in mind that certain percentage cases of death could be due to natural causes, the mere presence of injuries will not always indicate death due to trauma, as sudden cardiac death is also a definite possibility as seen in four cases associated with injuries during present study. We have to obtain all available information i.e. information revealed on police investigation, inquest report, hospital case sheets, records etc. and then we have to conduct a thorough postmortem examination before coming to a conclusion regarding the cause of death of the deceased. In this way we can rule out the role of any foul play or death occurring due to accident, poisoning, assault or any other means and help in justice.

Sudden natural deaths are unexpected and can occur to any person. The present study is showing 4.2% i.e. 52 cases among 1215 cases. This can be preventable by taking basic care of life like regular exercise, proper diet and stress management. We should not over responsive or over reactive. We should maintain the homeostasis of the life.

The age incidence of sudden natural deaths prevails at the age of 41-60 years that too peak age is 41-50 years. At this stage the person will be with family and children and job related, social related, economic related problems. One should manage according to their situation and sources of the nature. One should understand that we could not do beyond our limits unless we improve ourselves and our resources.

Male gender is more prevalent in the incidence of sudden natural deaths as males need to face more pressure and stressful situations to combat with the family and their work related problems. There is much chance of catecholamine actions in the body. Relaxation techniques, yoga may help the male to overcome these problems.

It is seen that Hindu religion is more prevalent in the incidence of sudden natural deaths in this study related

area. The one culture reveals one method and one process may decrease the prevalence of sudden natural deaths.

More cases were seen at people who were doing moderate work and rest. So while doing work they might have thinking some stress related issues disturbing them for which they are more reactive which may lead to vagal imbalance. More sensitiveness of the person was the reason for this instance of sudden natural death.

CONCLUSION

The age distribution points out the fact that middle age incidence are maximum. This could be explained in ways of living, early indulgence in smoking, alcoholism, stress and strain of modern competitive world, depression, loneliness etc.

Men are at greater risk as studied in this study who indulges in smoking, alcoholism at early age and women are protected from these vices by social, cultural, ethnic culture of our traditional Indian families. In an effort to study the relationship between physical constitution, occupation, physical activity and sudden natural deaths, it was observed that moderately built individuals and those engaged in moderate activities also had considerable risk of sudden natural deaths especially cardiac death.

In this study, most of the cases 16 (31.37%) were found dead which were not witnessed indicating sudden and unexpectedness of sudden deaths. In some cases symptoms were neither severe nor typical of any disease; therefore patient may not visit the doctor.

Prevention of sudden natural deaths requires the prevention of initial and recurrent ischemic heart disease. This is best accomplished by a comprehensive multifactorial risk factor intervention by periodic checkups, lifestyle and stress management skills through yoga, counseling, proper diet and exercise.

In some cases stress functions as a catalyst, which in fact, leads to death by directly compounding existing health complications, such as heart disease. Whether it is work-related or a death in the family, stress can be the result of a variety of events in one's life. For some cases it is extremely difficult to determine if the contributing

cause of death is stress related. That being said, it is imperative that a forensic expert possess the ability and knowledge to determine if stress is a contributing cause to death and to rule-out other possibilities.

By this study it is clear that diagnosis of sudden natural death at autopsy, which are sudden and unexpected are a challenge to the profession, were defined by indicating the importance and implications in this study which evolve from time to time.

Ethical Clearance: This study has been carried out in the year 2005, after taking permission from the ethical committee of Andhra Medical College/ King George Hospital, Visakhapatnam, Andhra Pradesh.

Source of funding: Self

Conflict of Interest: Nil

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A Longitudinal Descriptive Study of Burns Cases brought to Mc Gann Hospital, Shimoga

Gunnaiah G¹, Santhosh Kumar S², Raju K³

¹Asst. Professor, Dept of Forensic Medicine, SIMS & RH, Tumkur; ²Forensic Expert, Dist. Chamarajendra Hospital, Hassan, ³Dept of Forensic Medicine, AIMS, Bengaluru.

ABSTRACT

Burn is an injury caused by application of heat or chemical substances to surface of body which causes destruction of tissues. Every day we suffer, see victims and read about burn incidents. In this one year study an attempt has been made to know the profile, manner of infliction and cause of death and complications of burn victims. The results showed maximum incidence in males, married group, and yielded other significant findings.

Keywords: burn injuries, suicide, clinical findings, domestic violence

INTRODUCTION

A burn is an injury which is caused by application of heat or chemical substances to the external or internal surfaces of the body which causes destruction of the tissue.¹

Globally burn injuries are serious public health problem. An estimated 2,65,000 death occur each year from fire alone, with more death from scalds, electric burns and other form of burns for which data is not available. Over 96% of the fatal fire related burns occur in the low and middle income countries. In addition to those who die, millions are left with disability and disfigurement following burn injury.²

In India the estimated incidence of annual burn injuries is around 6-7 million, being the second largest injuries after road traffic accidents. Nearly 10% of all the burn injuries are life threatening and require hospitalization. Approximately 50% of those

hospitalized for burn injuries succumb due to various reasons. Annually nearly 1 -1.5 lack people get crippled and require lifelong hospitalization due to burn injuries.³

Burns can be of different types like; flame burns due to super-heated oxidized air (fire); scald burns due to contact with hot liquids; contact burns due to contact with hot solid material; chemical burns due to contact with the noxious chemicals, electric burns due to conduction of electrical current through tissues.⁴

Infliction of burns may be accidental, suicidal and least homicidal. Suicidal burning is more common in females because of easy availability of inflammable substance like kerosene, liquid petroleum gas (LPG) etc. as a source of cooking in the kitchen. Suicidal burning may also be seen in both the sexes as protest against social injustice.⁵

MATERIALS AND METHOD

The present study was conducted in a tertiary care Mc Gann district teaching hospital, SIMS, Shivamogga. Approval from the institutional ethical committee was obtained before the study. The study was conducted for the duration of 12 months from January-December 2014. Data was collected using standard formats and were analyzed using suitable statistical methods.

Corresponding Author:

Dr. Gunnaiah G

Dept of Forensic Medicine
Shridevi Institute Of Medical Sciences
Sira Road, Tumkur-572106
E mail: gunnaiah.gani@gmail.com

OBSERVATION**Table No. 1: Age and sex of burn victims**

Age (years)	Male	Female	Total
<10	03(1.06%)	04(1.41%)	7(2.48%)
11-20	06(2.12%)	18(6.38%)	24(8.51%)
21-30	37(13.12%)	95(33.33%)	132(46.80%)
31-40	25(8.86%)	51(18.08%)	76(26.95%)
41-50	11(3.90%)	14(4.96%)	25(8.86%)
51-60	04(1.41%)	06(2.12%)	10(3.54%)
>60	03(1.06%)	05(1.77%)	8(2.83%)
Total	89(31.56%)	193(68.43%)	282(100%)

The incidence of burns was seen more in the age group of 21 to 30 years with 132(46.80%) cases and least was found among the age group of < 10 years with 7 (2.48%) cases. Among the sex group, females had higher incidence of 193(68.43%) cases when compared to male of 89(31.56%) cases.

Table No. 2: Marital status of burn victims

Marital status	Number	Percentage
Married	182	64.53%
Unmarried	74	26.24%
Divorce	26	9.21%

The incidence of burn injuries were high among married individuals, that is 182(64.53%) cases followed by 74 (26.24%) unmarried and 26(9.21%) divorced cases.

Table No. 3: Occupation of burn victims

Occupation	Number	Percentage
Student	30	10.64%
House wife	110	39%
Skilled	41	14.53%
Unskilled	63	22.34%
Farmer	38	13.47%

Among occupational groups house wives 110(39%) had higher incidence of injuries and student had least incidence 30 (10.64%) of burn injuries.

Table No. 4: Source for infliction of burns

Source	Number	Percentage
Kerosene	181	64.18%
Wood	41	14.53%
LPG	39	13.82%
Others	21	7.44%

Kerosene was found to be highest source of infliction to burns with 181(64.18%) cases which was followed by sources like wood 41(14.53%), LPG 39(13.82%) and others 21(7.44%) cases.

Table No. 5: Place of incident

Place of incidence	Number	Percentage
Home	228	80.85%
Work	32	11.34%
Others	22	7.80%

The incidence of burns was seen more in the house 228(80.85%) cases when compared to workplace 32(11.34%) cases.

Table No. 6: Manner of infliction of burns

Manner	Number	Percentage
Accidental	229	81.20%
Suicidal	46	16.31%
Homicidal	7	2.48%

Accidental burns 229(81.20%) were more when compared to suicidal and homicidal that is 46(16.31%) and 7 (2.48%) cases respectively.

Table No. 7: TBSA of victims

TBSA	Number	Percentage
<20%	67	23.75%
21-40%	83	29.43%
41-60%	68	24.11%
61-80%	36	12.76%
>81	28	9.92%

83 (29.43%) cases had 21-40 % total body surface area involved whereas only 28 (9.92%) cases had total body surface area involved more than 81%.

Table No. 8: Deaths and complications of burn victims

Complications	Number	Percentage
ARDS	53	24.31%
Septicemia	41	18.80%
Wound infection	102	46.78%
Acute Renal Failure	22	10.09%

In the study population 88(31.20%) cases died during the hospital stay where as 42(49.89%) cases got discharged against the medical advice. Wound infections was the highest complication seen in 102(46.78%) burns patients followed by ARDS 53(24.31%), septicemia 41(18.80%) and ARF 22(10.09%) respectively.

DISCUSSION

The present study was conducted in a tertiary care Mc Gann district teaching hospital, Shivamogga Institute of Medical science, Shivamogga. The study was conducted for duration of one year and involved total number of 282 burn patients brought to the hospital during study period. The study was a longitudinal descriptive study undertaken to evaluate socio demographic profile of burn victims, manner of infliction, source of infliction, place of infliction and percentage of burns. The study also involved morbidity pattern of burn victims where duration of hospital stay, complications, and cause of death were evaluated.

Incidence of burn injury was highest among age group of 21-30yrs(46.80%) and least among age group <10yrs (2.48%) and >60yrs (2.83%). The results of our study was similar to study conducted by Chawla et al.⁶

Sex is one of the risk factor which plays a vital role in both occurrence and prognosis of the burn injury. In the present study the incidence of burn injury were more in the female (64.83%) when compared to males (31.56%). In a similar study conducted by Khan et al.,⁷ the incidence of burn was more common in males.

In the present study the incidence of burns injuries were more common among married individuals (64.55%) when compared to unmarried to and divorced individuals. In a similar study conducted by Lal S et al.⁸ the burn injuries were more common in the married

individuals (76.28%).The increase incidence of burn injuries in the married individuals may be due to conflicts in the relationship.

Occupation is also one of the main risk factor for the incidence of burn injuries. In the present study the incidence of burns injuries were common among the housewives when compared to other professions. The same result was also obtained in the study conducted by Chakraborty et al.,⁹

Fire is the most common mode of cooking in the Indian subcontinent, where the sources are kerosene, LPG and wood etc. These sources may have a potential role in the incidence of burn injuries. In the present study the incidence of burn injuries were more common among the individuals who use kerosene as a source (64.15%). In a similar study conducted by Gowri et al.,¹⁰

In the present study among 81.20% burns victims manner of infliction of burn injury was accidental in nature (As per the information provided by police inquest paper, patient himself and his relatives). Which was similar to other studies conducted by Gupta A K et al.,¹¹ Shinde A B et al.,¹² and Gowri S et al.,¹⁰

Involvement of TBSA in burn injury has an important role in the management and prognosis of burn injuries. It is usually calculated by rule of 9. It is generally said that TBSA of more than 30% is dangerous, whereas involvement of more than 50% is 61 definitely fatal. In the present study 29.43% of individuals had total body surface area of 21 to 40%. When compared to the study conducted by LAL S et al. where 51.8% of individuals had TBSA greater than 80%. And had more than 80% mortality.⁸ This signifies that increase in TBSA leads to higher mortality.

In the present study 31.27% of patients died and 53.9% of individuals were discharged on the advice of the doctor after stabilization during the hospital stay. 14.89% of individuals got discharged against medical advice due to various factors and hence prognosis and morbidity of these patients could not be assessed. Wound infection was the most common complication

46.78% seen among the burn injury patients during the hospital stay in our study which was diagnosed by surface swab stain and culture. It was followed by other complications like ARDS (24.31%), septicemia (18.8%) which were diagnosed by clinical features and suitable investigations. In the similar study conducted by Gupta A K et al. also had wound infection has major complication among 75.2% of burn injury patients, followed by ARDS and septicemia.¹¹ The complication of wound infection among the burn injury patient may be due to involvement of more TBSA or depth of involvement, improper wound care may also lead to wound infection.

CONCLUSION

From the present study we can come to conclusion that the burn injuries were more common in the age group of 21-30 years (46.80%) and female sex (68.43%). Higher incidence of burn injuries were also seen in the individuals of the secondary educational status (36.17%), house wives (39.01%), socio economic status of class I (32.97%) and kerosene (64.18%) being used as source. Synthetic cloth (42.9%) was the most common vehicle for burn infliction; individuals in rural population (67.2%) were more prone for burn injuries. Among the site of incidence house (80.83%) was most common with manner of infliction being highest accidental in nature (81.20 %). 21-40% TBSA involvement was seen more commonly (29.43%) with mixed group of depth in (56.02%) individuals. Wound infection as the major complication (46.75%), 31.20 % of burn injury victims died of which neurogenic shock (43.18%) was the most common cause.

Conflict of interest: NIL

Funding: NIL

Ethical Clearance: TAKEN

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Study of Hanging Deaths in Tumakuru

Gunnaiah G¹, Raju K², Santhosh Kumar S³

¹Assistant Professor, SIMS & RH, TUMAKURU, ²Professor, AIMS & RC, Bengaluru,

³Medico legal consultant, Sri Chamarajendra Govt. Hospital, Hassan

ABSTRACT

Hanging is the most common method used by people to commit suicide. The rate of suicide is increasing at an alarming rate. This study is intended to know the magnitude of problems leading to suicide by hanging, socio-demographic profile of hanging death victims and detailed study of postmortem findings. This study involved the hanging deaths brought to SIMS RH and District Hospital, Tumakuru for a period of one year. In this study, males outnumbered females, 21-30 year age group was most vulnerable group, cloth material was the most commonly used ligature. A sincere attempt has been made in this study to achieve above mentioned objectives.

Key Words: Hanging, asphyxia, autopsy, suicide

INTRODUCTION

Hanging is a form of asphyxia caused by suspension of body by ligature around the neck, the constricting force being the weight of the body.¹ When body is completely suspended it is called as complete hanging, if part of body is touching ground it is called as incomplete hanging. If ligature mark is symmetrical on both sides and point of suspension is on occipital protuberance it is called as typical hanging. If ligature mark is asymmetrical and point of suspension is other than occipital protuberance it is called as atypical hanging.² Based on manner of death hanging can be suicidal, accidental and homicide. Though hanging is a form of violent asphyxia death, it produces painless death. It is the most common method of suicide as it produces painless death and easy availability of ligature materials.³ Hanging is one among the top ten causes for suicidal deaths.⁴ All cases of hanging are considered to be suicidal until the contrary is proved.⁵

Corresponding Author:

Dr. Gunnaiah G

Dept of Forensic Medicine
Shridevi Institute Of Medical Sciences
Sira Road, Tumkur-572106
E mail: gunnaiah.gani@gmail.com

MATERIALS AND METHODS

A concurrent and prospective study was carried from January 2016 to December 2016. All hanging deaths brought to District Hospital and SIMS & RH Tumakuru, were examined during the study period. The data was collected by information available from relatives, inquest papers and post mortem reports. The data was analyzed by using suitable statistical methods.

OBSERVATION/RESULTS

Out of total 1496 medico legal autopsies conducted during the study period, 106 (7.08%) were hanging deaths.

Table No. 1: Sex Wise Distribution

SEX	No of cases	percentage
MALE	68	64.15
FEMALE	38	35.85
TOTAL	106	100%

In the present study, majority of victims are males 68 (64.15%), while females are 38(35.85%). Male to female ratio is 1.78:1.

Table No. 2: Age Wise Distribution

Age Group	No of cases	Percentage
<10	1	0.94
10-20	21	19.81
21-30	35	33.01
31-40	22	20.75
41-50	11	10.37
51-60	15	14.15
>60	1	0.94
TOTAL	106	100%

Above table shows least vulnerable group was extreme age group i.e., <10yrs and >60 yrs which constituted only two (1.88%) cases. Most vulnerable group is 21-30 yrs age group which involved 35 (33.01%)

Table No. 3: Manner of Death as per Inquest Papers

Manner of Death	No. of Cases	Percentage
SUSPICIOUS U/S 174 (C) CrPC.	07	6.60
SUICIDAL	97	91.52
HOMICIDAL	01	0.94
ACCIDENTAL	01	0.94
TOTAL	106	100%

97 (91.52%) deaths out of study of population were suicidal. 7(6.60%) cases were reported suspicious, but the postmortem findings were suicidal. One each was homicidal and accidental hanging deaths as per the inquest papers.

Table No. 4: Ligature Material Used

Material used	No. of Cases	Percentage
Belt	01	0.94
Bed sheet	06	5.66
Cloth material	11	10.38
Curtain	12	11.32
Dupatta/ Veil	50	47.16
Electric wire	03	2.84
Muffler	01	0.94
Nylon rope	04	3.77
Sari	18	16.99
TOTAL	106	100%

In the present study of 106cases, most common ligature material used was dupatta/viel in 50 (47.16%)

cases followed by sari in 18(16.99%) cases. Nylon rope in 4 (3.77%) cases. Electric wire was used in 3 (2.84%) cases; unclassified cloth material was used in 11 (10.38%) cases. Bed sheet in 6 (5.66%) cases. Muffler and Belt each was used in 1 (0.94%) case.

Table No. 5: Type of Knot

Type of knot	No. of Cases	Percentage
Not known	86	81.13
Simple knot	18	16.99
Complex knot	02	1.88
TOTAL	106	100

As per the information provided by relatives and inquest papers 18(16.99%) had simple knot, 2(1.88%) had complex knot. 86(81.13%) went unspecified.

Table No. 6: Type of Hanging based on Position of Knot

Position of knot	No. of Cases	percentage
Atypical	84	79.25
Typical	22	20.75
TOTAL	106	100

22 (20.75%) cases out of 106 were observed to be of typical hanging, while 84 (79.25%) cases were of Atypical hanging.

Table No. 7: Post-Mortem Findings

Pm Findings	No. of Cases	Percentage
Cyanosis	55	51.89
Face congestion	12	11.32
Ligature mark	104	98.11
Saliva dribbling	17	16.03
Semen emission	5	4.71
Subconjunctival hemorrhage	29	27.35
Petechiae	22	20.75
Hyoid bone fracture	02	1.88

Cyanosis of limb and nail beds was seen in 55 (51.89%) of cases. Congestion of face was seen in 12(11.32%) of cases. Ligature mark was present in

104(98.11%) cases. Sub conjunctival hemorrhage was present in 29(27.35%), saliva drooling was seen in 17 (16.03%) cases. Fracture of greater cornua of hyoid bone was seen in two deaths in age group 31-40 and 51-60.

DISCUSSION

1. Male female distribution: Males 68 (64.15%) outnumbered the females 38 (35.85%). This may be because of increased exposure of males to socio-economic problems in society. Suicidal hanging were more common among males, reason due to increasing depression among young people, leading to suicidal attempts.^{6,7} Similar increased male preponderance was also reported in a study by Chaurasia N et.al.⁸
2. Relation of Age factor: Maximum percentage of violent asphyxia deaths was in age group 21-30 yrs i.e., 35 cases (33.01%). As it is the most active period in one's life and there are great fluctuations of emotions, young people get frustration due to various reasons such as unemployment, family acceptance, poverty and love failure etc so most of the cases were below 40 years of age. This was quite similar to the study done by Sharma et al.⁹
3. Manner of death: 97 (91.52%) deaths out of study of population were suicidal. 7(6.60%) cases were reported suspicious, but the postmortem findings were suicidal. One each homicidal and accidental hanging deaths as per the inquest papers.
4. Ligature material used: In the present study of 106cases, most common ligature material used was dupatta/viel in 50 (47.16%) cases followed by sari in 18(16.99%) cases. Nylon rope in 4 (3.77%) cases. Electric wire was used in 3 (2.84%) cases; unclassified cloth material was used in 11 (10.38%) cases. Bed sheet in 6(5.66%) cases. Muffler and Belt each was used in 1 (0.94%) case. In India clothed materials are preferred, while in western countries rope is the most used ligature.
5. The position of knot and postmortem findings showed high degree of variance, as autopsy was conducted in mortuary and there would be

changes in the position of knot and few position dependent post mortem changes.

Hanging is most common method of suicide used by youth belonging to all socio-economic class. It is usually committed in familiar surroundings using easily available ligature nearby.

CONCLUSION

From the above study following inferences are drawn

1. The maximum cases of death due to hanging occurred in age group between 21-30 yrs, and higher incidence was in males.
2. Most of the hanging deaths are suicidal, except two cases of homicide and one accidental hanging.
3. Accidental hanging is seen one child who is aged less than 10 years.
4. Majority of the victims used cloths or cloth like material like sari, dupatta, lungi, muffler and others.
5. Cyanosis, ligature mark, petechiae being signs of asphyxia is markedly seen in all cases. Hyoid bone fracture, contusion of neck strap muscles is rarely present in hanging deaths.

Conflict of Interest – Nil

Source of Funding – Nil

Ethical Clearance – Obtained From Institutional Ethical Committee.

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Sex Determination from Adult Hyoid Bone: A Study in Bhopal Region of Central India

Kumar Gyanendra¹, Satapathy Satyaram², Yadav Jayanthi³, Dubey B.P.⁴

¹Assistant Professor, Department of Forensic Medicine, ²Demonstrator, Department of Microbiology, Late. B.R. K. M. Government Medical College, Jagdalpur CG, ³Professor & Head, ⁴Dean, L. N. Medical College, Bhopal. Ex Dean and Ex Professor & Head, Department of Forensic Medicine, Gandhi Medical College, Bhopal

ABSTRACT

Sexual dimorphism can provide information on behavioral and ecological characteristics of extinct species. Sexual dimorphism is predominantly done by long bone, pelvis and skull, but hyoid bone least notable bone for sex determination. In present study 100 adult hyoid bone, out of 72 male and 28 female hyoid bone, remove from corpse and buried in soil, examined using discriminant function analysis (IBM SPSS20). Age of deceased ranged from 18 years to 90 years, four discriminant function were tested and was obtained, Discriminant Function = $2.563 \text{ mlgrelt} + (-0.265) \text{ mlgrect} + 1.761 \text{ dislessc} - 11.398$, Cut off score was (-0.296) , 76% accurately classified in to their groups. Cross-validated results showed correct classification in 74% of the cases were correctly classified.

Keyword: Adult, Discriminant function, Hyoid bone, Sex determination, sexual dimorphism.

INTRODUCTION

A truthful determination of sex is essential in the identification of human remains. To discuss sexual dimorphism, one must first define the term. Wikipedia, the free encyclopedia defines sexual dimorphism as “the condition in which differences in structure exist between males and females of the same species”. This should be easy enough to study, given that these differences should be readily apparent for the most part, if they exist at all.¹ In humans, it has long been noted that there are certain physical differences between males and females.

During the process of developing a biological profile for unidentified skeletal material, possibly the least

likely bone to be used is the hyoid, a small horseshoe-shaped bone positioned in the anterior, upper neck.²

³ The name is derived from the greek word ‘hyoides’ meaning shaped like the letter ‘upsilon’ or letter ‘U’.²

Hyoid bone is a part of viscerocranium placed between tongue root and thyroid cartilage to which it is connected by a thyroid membrane. It is a part of both digestive and respiratory tracts. It is placed at the level of fourth cervical vertebra and articulate with surrounding structures via muscles (suprahyoid and infrahyoid muscle groups) and ligaments (stylohyoid ligaments).⁴ The hyoid-larynx complex has anatomic interest in the differential diagnosis of traumatic lesions and anatomic anomalies.⁵ The hyoid plays an important role in mastication, in swallowing and in voice production.⁶ Study focused on sex based morphometry of the hyoid bone in Korean using digital photographs. The accuracy of discriminant function was 88.2% in both groups, proving that those could be used to distinguish men from women in statistically significant manner.⁷ In present study sex determination from hyoid bone is achieved by discriminant function analysis

Corresponding Author:

Dr. Kumar Gyanendra

Assistant Professor,
Department of Forensic Medicine,
Late. B.R.K.M. Government Medical
College, Jagdalpur CG
Email: gyan.aug30@gmail.com

and results suggest the possibility of hyoid bone in determination of sex of the corpse.

MATERIAL AND METHOD

The study was conducted in the Department of Forensic Medicine and Toxicology, Gandhi Medical College, Bhopal in the year 2012-13. The study protocol was approved by the Institutional Ethical Committee. The present study is carried out on 100 adult hyoid bone removed from the corpse during the autopsy. The material comprised of processed and cleaned 100 adult hyoid bone of known sex. Measurement taken by Sliding scientific Vernier Caliper and using four parameter were used, these are:

S. No.	Measurements	Definition
1.	Width of greater cornua at articulate point with body right (wgrcrt) and left (wgrclt)	Length of the distance from the widest portion at the articulate point to central axis of the greater cornua.
2.	Height of greater cornua at articulate point with body right (hgrcrt) and left (hgrclt)	Maximum width of the greater cornua, at articulate point measured perpendicular to the surface of the bone.
3.	Maximum length of greater cornua right (mlgrcrt) and left (mlgrclt)	Distance from the midpoint of the distal end of the greater cornua to the middle of the joint between greater cornua and the body of the hyoid.
4.	The distance between the distal ends of the two lesser cornua (dislesse)	Maximum distance between the widest points of the lesser cornua.

Result: In the present study the mean width of Greater Cornua at articulate points with body obtained for male is 0.3444 cm on (left) & 0.35 cm on (right) with standard deviations 0.10331 cm (left), 0.10209 cm

(right) and in females mean value is 0.3536 cm (left), 0.3500 cm (right) with standard deviation is 0.08381 cm (left), 0.08819 cm (right) respectively. The probability value for left & right is $p > 0.05$ that suggest there is no significant difference for males & females in Width of Greater Cornua at articulate points with body Right & Left.(Table 01)

The mean value for the parameter height of Greater Cornua at articulate points with body in males is 0.6472 cm for left side, and 0.6556 cm for right side with a standard deviation of 0.15652 cm on left and 0.15095 cm on right and in females mean value is 0.5929 cm on the left and 0.5786 cm on the right with a standard deviation 0.10516 cm on left and, 0.11339 cm on right respectively. The probability value for this parameter on Left side is $p > 0.05$, suggesting this parameter is insignificant statistically, but on right side the p value is < 0.05 , showing statistically significant in both variables groups. (Table 02)

In the present study mean and standard deviation for male on left side is 3.1194 cm, 0.28662 cm and on right side 3.1444 cm, 0.31349 cm respectively. For female Mean value are 2.7607 cm on the left, and 2.8071 cm on the right with a standard deviation of 0.3326 cm on left and 0.33657 cm on right side. The probability value for the parameter maximum length of Greater Cornua right (mlgrcrt) and left (mlgrclt) is $p < 0.001$; suggesting that there is extremely significant difference for this parameter in both variables. (Table 03)

In the present study on 72 male and 28 female hyoid bones, the mean for parameter the distance between the distal ends of the two Lesser Cornua (dislesse) male is 2.6194 cm with standard deviation is 0.29676 cm and female Mean value is 2.3250 cm with standard deviation is 0.25331 cm. The probability value for this parameter is $p < 0.001$; that shows the relationships of two variables for this parameter is extremely significant. (Table 04).

Table No. 1: Sex wise analysis of width of greater cornua at articulate point with body right and left

Group Statistics					
	Group	N	Mean (cm)	Std. Deviation (cm)	Std. Error Mean
Wgrclt	Male	72	.3444	.10331	.01218
	Female	28	.3536	.08381	.01584
Wgrcrt	Male	72	.3500	.10209	.01203
	Female	28	.3500	.08819	.01667

p-value for Left > 0.05

p-value for Right > 0.05

Table No. 2: Sex wise analysis of height of greater counua at articulate point with body right and left

Group Statistics					
	Group	N	Mean (cm)	Std. Deviation (cm)	Std. Error Mean
Hgrclt	Male	72	.6472	.15652	.01845
	Female	28	.5929	.10516	.01987
Hgrcrt	Male	72	.6556	.15095	.01779
	Female	28	.5786	.11339	.02143

p-value for left side > 0.05

p-value for right side < 0.05

Table No. 3: Sex wise analysis of maximum length of greater cornua right and left

Group Statistics					
	Group	N	Mean (cm)	Std. Deviation (cm)	Std. Error Mean
mlgrclt	Male	72	3.1194	.28662	.03378
	Female	28	2.7607	.33260	.06286
Mlgrcrt	Male	72	3.1444	.31349	.03695
	Female	28	2.8071	.33657	.06361

p-value for left side < 0.001

p-value for right side < 0.001

Table No. 4: Sex wise analysis of the distance between the distal ends of the two lesser cornua

Group Statistics					
	Group	N	Mean (cm)	Std. Deviation (cm)	Std. Error Mean
Dislessc	Male	72	2.6194	.29676	.03497
	Female	28	2.3250	.25331	.04787

P value <0.001

Table No. 5: Classification Result^{a, c}

		Group	Predicted Group Membership		Total
			Female		
Original	Count	Male	55	17	72
		Female	7	21	28
	%	Male	76.4	23.6	100.0
		Female	25.0	75.0	100.0
Cross-validated ^b	Count	Male	54	18	72
		Female	8	20	28
	%	Male	75.0	25.0	100.0
		Female	28.6	71.4	100.0

- (a) 76.0% of original grouped cases correctly classified.
- (b) Cross validation is done only for these cases in the analysis. In cross validation each case is classified by the function derived from all cases other than that case.
- (c) 74.0% cross validated grouped cases correctly classified.

Table No. 6: Wilk's Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	Df	Sig.
1	.728	30.673	3	.000

Canonical Discriminant Function Coefficients

	MLgrclt	mlgrclt	dislessc	Constant
Function 1	2.563	-0.265	1.761	-11.398

Unstandardized coefficients**Table No. 7: Functions at Group Centroids**

Functions at Group Centroids	
Group	Function
	1
Male	.378
Female	-.971

Unstandardized canonical discriminant functions evaluated group means

DISCUSSION

The majority of hyoid studies using metric methods take their measurements from digital imagery, namely radiographs^{8, 9} or digital photographs.⁷ This study differs significantly from others using similar analytical methods in that the measurements were performed on the actual bone using standard osteometric calipers.

In the present study the consisting with study of Seham A. Gad EL. Hak et al¹⁰ they also found the parameter of width of Greater Cornua at articulate points with body suggest there is no significant difference for males & females in Width of Greater Cornua at articulate points with body Right & Left.

In contrast to the finding of Sarah C. Kindschuh¹¹ & Miller et al⁹ found that Width of Greater Cornua at articulate points with body Right & Left parameter is significant to study the sexual dimorphism. This disparity may be recognized due to diverse demographic profile of these studies.

The probability value for parameter of Height of Greater Cornua at articulate points with body on Left side is insignificant statistically, but on right side statistically significant in both variables groups.

In the studies conducted by Sarah C. Kindschuh¹¹ & Miller et al⁹ found that Height of Greater Cornua at articulate points with body Right & Left parameter is significant to study sexual dimorphism. This inconsistency may be attributed to diverse demographic profile of these studies.

The probability value for Maximum Length of Greater Cornua right and left parameter is extremely significant difference between two variables.^{4, 9, 11}

But, study conducted by Seham A. Gad EL. Hak et al¹⁰ on 33 hyoid bones for this parameter showed sexual difference on left side, but on right side, this parameter was statistically insignificant. Reason for this probably was due to less quantity of sample size.

Partha Pratim Mukhopadhyay¹² studied 50 adults' hyoid bones found this parameter to be statistically significant, but they had taken this parameter on the left side only.

The parameter Distance between the distal ends of the two Lesser Cornua is consistent with the study conducted by many researchers, even from different geographical regions.^{4, 12}

This study corroborates with other studies in the most of parameters, differing only in height of greater cornua at articulate point with body on left side of hyoid bone where the discrepancy is found.

It can be said that considering all these parameter, definitely a reliable opinion regarding sex identification from hyoid bone can be achieved.

CONCLUSION

Maximum length of greater cornua right (mlgrcrt) and left (mlgrclt) and the distance between the distal ends of the two lesser cornua (dislessc) is statistically significant parameter for sex differentiation. The accuracy rate for this parameter is 76% and it represents the most significant parameter for sexual dimorphism irrespective of race or demographic variation. (Table 05)

The current study, using four variables as a three predictors of sex. The following discriminant function was obtained (Table 06).

Discriminant Function = (2.563) mlgrclt + (-0.265) mlgrcrt + (1.761) dislessc - 11.398

In our study the cut-off score was (-0.296), (calculated from the group centroid), suggesting that those cases where the discriminate function score was less than (-0.296), were female and those cases above this value were male. (Table 07)

Anthropometric analysis showed that female hyoid bones are on an average, smaller in all dimensional proportions, which is confirmed by t- test that revealed significant statistical difference between sexes.

Conflict of interest: The study was carried out during my postgraduate degree course under the guidance of senior teachers.

Source of funding: This study has not been funded by any organization or institution.

Ethical clearance: Ethical clearance has been obtained from ethical committee of the college.

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Estimation of Stature from Foot Length in Age Group between 20 to 23 Years at Tumkur, Karnataka

H C Govindaraju¹, Hemanth Raj M N², Madhu Sudhan S³

¹Professor, ²Associate Professor, ³Assistant Professor, Department of Forensic Medicine & Toxicology, Shridevi Institute of Medical sciences & Research Hospital NH-4, Sira Road, Tumkur District, Karnataka state, India

ABSTRACT

Introduction: To measure the height of an individual from different parts of the body, has always been of enormous interest to anatomists, anthropologists and forensic experts. The foot has been extensively studied to provide valuable information about an individual when an individual foot is recovered and brought for forensic examination.

Materials and methods: The present study is carried out in Shridevi Institute of Medical Sciences & Research Hospital, Tumkur, Karnataka. A total of 120 students, 60 males and 60 females are randomly selected. Age group of the students is between 20 to 23 years. Measurements of right and left foot length and the height is recorded.

Results: The correlation coefficient of height with right and left foot length for males is($r=0.679$) and ($r=0.671$). For females it is($r=0.63$) and ($r=0.61$) for right and left foot length. The P value is less than 0.05. There is a significant correlation coefficient between height and the right and left foot length.

Conclusion: Present study is carried out on the students of age group between 20 to 23 years representing the south Indian population and the results can be used by the forensic experts to estimate the stature by foot length for this area population. There is a definite correlation between the height and the foot length.

Key words: foot length, height, regression equation, identification.

INTRODUCTION

Stature is one of the primary character for the identification of a person.¹ It is well known that there is a definite relationship between the height of the person and various parts of the body like head, trunk

and length of upper and lower limbs. To measure the height of an individual from different parts of the body, has always been of enormous interest to anatomists, anthropologists and forensic experts. The foot has been extensively studied to provide valuable information about an individual when an individual foot is recovered and brought for forensic examination. The problem is encountered in cases of mass disasters, explosions and assault cases where the body is dismembered to conceal the identity of the victim. Stature has been estimated from foot prints and various measurements of the foot such as foot length and foot breadth.

Corresponding Author:

Dr. Hemanth Raj M N

Associate Professor, Department of Forensic Medicine & Toxicology, Shridevi Institute of Medical sciences & Research Hospital, NH-4, Sira Road, Tumkur District, Karnataka state, India

Email: hrbs2006@yahoo.co.in

In this study an attempt has been made to estimate the stature from foot length and derive a regression equation which would apply to the age group of between 20-23 years.

MATERIALS AND METHODS

The present study is carried out in Shridevi Institute of Medical Sciences & Research Hospital, Tumkur, Karnataka. A total of 120 students, 60 males and 60 females are randomly selected. Age group of the students is between 20 to 23 years. Measurements of right and left foot length and the height is recorded. Foot length was measured as a direct distance from the most prominent point of the back of the heel to the tip of the great toe or to the tip of second toe, when the second toe was larger than great toe by spreading caliper. Height was recorded by using standard anthropometer.

Measurements were recorded by the same observer, same instrument and between 2 pm to 4pm to avoid errors and diurnal variation.

The data is subjected to statistical analysis. Mean, Standard Deviation, Standard error of estimate and range for height, right foot length and left foot length is calculated separately for males and females. Independent linear regression equations to calculate the height is obtained for both right and left foot separately for males and females.

RESULTS

The data is collected, analysed using statistics to know the correlation of stature with the foot length and linear regression equations were derived for estimation of stature from right and left foot length for males and females separately.

Table No. 1: Shows Range, Mean and Standard deviation for right foot length, left foot length and height for males and females

Parameter	Males			Females		
	Range	Mean	SD	Range	Mean	SD
Right foot length	24.0- 28.5	26.158	1.1878	20.5- 27.0	23.637	1.2186
Left foot length	24.0-28.5	26.090	1.1923	20.5-26.5	23.592	1.1914
Height	159.0-185.0	171.945	5.3505	145.7-176.0	158.532	5.4883

Table No. 2: Shows Correlation coefficient of height with right foot length and left foot length and P values for males and females

	Males		Females	
	Coefficient	P value	Coefficient	P value
Correlation with height				
Right foot length	0.679	< 0.05	0.63	< 0.05
Left foot length	0.671	< 0.05	0.61	< 0.05

Table No. 3: Linear Regression equation and standard error of estimate for right foot length and left foot length in males and females

	Regression equation	R square	SE of estimate
Males	Height= 91.9+3.05 (right foot length)	0.461	3.96
	Height= 93.3+3.01 (left foot length)	0.451	4.00
Females	Height= 90.6+2.8 (right foot length)	0.407	4.26
	Height= 91.4+2.8 (left foot length)	0.381	4.35

DISCUSSION

In this study the height ranges from 159.0 cms to 185.0 cms in males and from 145.7 cms to 176.0 in females. The mean value is 171.9 for males and 158.3 for females. The standard deviation is 5.3 for males and 5.4 for females.(table 1)

In a study conducted by Rameswarapu suman babu and Deepika in Secunderabad the height range was from 154 cms to 182 cms in males and from 140.0 cms to 174.5 in females. The mean value was 170.98 for males and 157.65 for females. The standard deviation was 6.65 for males and 6.6 for females.²

In a study conducted by Mansur D and Haque M K in Nepal for the age group of 17 years to 25 years the height range was from 134 cms to 183 cms in males and from 140.0 cms to 185 in females. The mean value was 165.66 for males and 156.70 for females. The standard deviation was 8.34 for males and 6.16 for females.³

In this study the right foot length ranges from 24.0 to 28.5 for males and 20.5 to 27.0 for females and the left foot length ranges from 24.0 to 28.5 for males and 20.5 to 26.5 for females. The mean value for right foot length is 26.15 for males and 23.63 for females. The mean value for left foot length is 26.09 for males and 23.59 for females. The standard deviation for right foot length for males is 1.18 and females 1.21. The standard deviation for left foot length for males is 1.19 and 1.19 for females.(table 1)

In a study conducted by Utsav parek and Reeke patel at Gujarat the foot length for males ranges from 22.1 to 28.7 with mean value 25.42 cm and standard deviation of 2.02. In females the foot length ranges from 20.7 to 27.1 cms with mean value 23.91 cm and standard deviation of 1.80. ⁴

In a study conducted by Mansur D and Haque M K in Nepal for the age group of 17 years to 25 years the foot length for males ranges from 18.0 to 28.5 with mean value 23.89 cm and standard deviation of 2.09. In females the foot length ranges from 19.0 to 27.0 cms with mean value 22.64 cm and standard deviation of 1.36. ³

In this study the correlation coefficient of height with right and left foot length for males is ($r = 0.679$) and ($r = 0.671$). For females it is ($r = 0.63$) and ($r = 0.61$) for right and left foot length. The P value is less than 0.05. There is a significant correlation coefficient between height and the right and left foot length.(table 2)

In a study conducted by Mansur D and Haque M K in Nepal for the age group of 17 years to 25 there was significant correlation coefficient between height and right foot and left foot length ($r = 0.688$) and ($r = 0.689$) for male. For females ($r = 0.587$) and ($r = 0.589$). The P value was less than 0.01.³

In a study conducted by Sonali khanapurkar and Ashish radke at Maharashtra there was significant correlation coefficient between height and foot length ($r = 0.645$) for males and females ($r = 0.702$). The P value was less than 0.001.⁵

In this study separate linear regression equations were derived for males and females and for right and left foot length separately.(table 3)

For males

$$\text{Height} = 91.9 + 3.05 (\text{right foot length})$$

$$\text{Height} = 93.3 + 3.01 (\text{left foot length})$$

For females

$$\text{Height} = 90.6 + 2.8 (\text{right foot length})$$

$$\text{Height} = 91.4 + 2.8 (\text{left foot length}).$$

In a study conducted by Sonali khanapurkar and Ashish radke at Maharashtra regression equation for estimation of height by foot length was

$$\text{For males, Height} = 90.0 + 3.2 (\text{foot length})$$

$$\text{For females, Height} = 72.8 + 3.7 (\text{foot length}).^5$$

In a study conducted by Rameswarapu suman babu and Deepika in Secunderabad the regression equation was

For males

$$\text{Height} = 82.83 + 3.46 (\text{right foot length})$$

$$\text{Height} = 80.95 + 3.54 (\text{left foot length})$$

For females

$$\text{Height} = 73.52 + 3.61 (\text{right foot length})$$

$$\text{Height} = 79.83 + 3.34 (\text{left foot length}).^2$$

In a study by Jaydip and Shila Ghosh it was observed that there was significant differences ($p < 0.05$) in stature, foot length and foot breadth between sexes. It was further observed that bilateral variation was significant ($p < 0.05$) within sexes with respect to foot length, but not with foot breadth ($p > 0.05$). The higher correlation coefficient between stature and foot length over that of stature and foot breadth points to the fact that foot length, rather than foot breadth, is more accurate in estimating stature.⁶

In this study the Standard error of estimate was 3.96 for right foot length and 4.00 for left foot length for males. For females it was 4.26 and 4.35 for right and left foot length respectively.

In a study conducted by M. Khairulmazidah, A. B. Nurul Nadiah, and A. R. Rumiza at Malaysia it was found that the Standard error of estimate was 4.93 for right foot length and 5.12 for left foot length for males. For females it was 4.48 and 4.39 for right and left foot length respectively.⁷

CONCLUSION

The stature increases progressively and becomes maximum at the age between 21 to 25 years. Present study is carried out on the students of age group between 20 to 23 years representing the south Indian population and the results can be used by the forensic experts to estimate the stature by foot length for this area population. There is a definite correlation between the height and the foot length.

Conflict of Interest: Nil.

Source of funding: Self.

Ethical Clearance: Obtained from the Institutional Ethical Committee.

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An Analytical Study of Suicidal Deaths

Konduru. Laxman¹, Vamshi Madhav. B², Jakkam Surendar³

¹Associate Professor, Department of Forensic Medicine, Maheshwara Medical College, Patanchervu, Hyderabad, Telangana, ²Assistant Professor, Department of Forensic Medicine, Mallareddy Medical College for Women's, Suraram Hyderabad, Telangana, ³Assistant Professor, Department of Forensic Medicine, ESIC Medical college, Santhnagar, Hyderabad

ABSTRACT

Suicide means self murder i.e., "Homicide Against Himself" (Omicida Dise Medesimo). In present days the mortality rate shows uptrend in all over the world. To understand the suicidal nature in Hyderabad, the present study conducted in osmania medical college, Hyderabad in the department of forensic medicine in the period of July 2007 to June 2009. Total of 1820 cases observed. in this males 55.5% and females 44.5%. the most vulnerable age group being between 21-30 years next followed by 31-40 years. In them 1514 were married and most of the persons committed suicide in the home due to their family problems.

Keywords: *suicide, male, female.*

Suicide means self-murder. Attempted suicide is an unlawful act and the person is held responsible for the immediate consequence of the act in India⁽¹⁻⁴⁾.

Death by suicide is a temporary solution to a permanent problem. Most of the suicidal attempts, deaths go unreported. This multi factorial complex problem attracted serious attention of "World Health Organization" which declared every 10th September of the year to celebrate as "Suicide Prevention Day" to create awareness among people. According to it more than one million suicidal deaths were occurring every year across the world. And it is the 10th leading cause of all deaths. Among there '3' Asian countries (China, India, Japan) 40% suicidal deaths are taking place in India more than one lakh people perish due to suicides in every year. Studies show that consumption of pesticides, such as the readily available agricultural pesticides in

rural areas, is the commonest means of suicide and attempted suicide in India^{5, 6, 7} and in rural areas of low income countries.⁸ Agricultural chemical poisoning has also been reported in Japan,⁹ Thailand,¹⁰ Sri Lanka,¹¹ Bangladesh,¹² and the USA.¹³ Men are more likely to use organophosphate poisons and women are more likely to use plant poisons.¹⁴ The use of plant poisons as a means of suicide/attempted suicide is more common in India and south-east Asia¹⁵. To combat this complex problem deep comprehensive and analytical study is much needed. So far not much serious work done in this field. Evolution of ecological factors and the incidence at particular region requires to understand the cross section of that society with particular reference to its socio economic status and psychiatric problems and civilization.

AIMS AND OBJECTIVES

In order to ascertain the number means and pattern of suicidal deaths in Hyderabad city and its suburbs.

MATERIAL AND METHODS

The present study has been carried out in the Department of Forensic Medicine, Osmania Medical

Corresponding Author:

Dr. Jakkam Surendar

Assistant Professor,
Department of Forensic Medicine,
ESIC Medical college, Santhnagar, Hyderabad

College and hospital Hyderabad, during the period July 2007 to June 2009. All the cases brought to the department for medico legal autopsy with history of unnatural deaths post mortem examination were selected. A sum total of **1820** cases were selected for this prospective study. Permission of the ethical committee on the use of human material for research purpose was obtained.

Detailed information of the deceased pertaining to the cases were collected from the concerned police and relatives of the deceased by a questionnaire. In case of allegations, information was supplemented by either visit to the scene of crime or from the photographs of the scene of crime. Where ever needed samples test samples and objects other trace evidences collected and sent for the opinion of the experts of the various departments.

Suicidal notes like letters and dying declarations, statements made to the attending doctors at the time of treatment. Allegations made from relatives were taken into consideration as per inquest reports.

Chemical analysis reports with inquest and Post Mortem Findings.

OBSERVATION AND DISCUSSION

DISTRIBUTION OF STUDY OF POPULATION ACCORDING TO GENDER

In this study male were 1010 (55.5%) and females 810 (44.5%) observed. Males outnumbered the females in the study population.

DISTRIBUTION OF STUDY OF POPULATION ACCORDING TO AGE GROUP

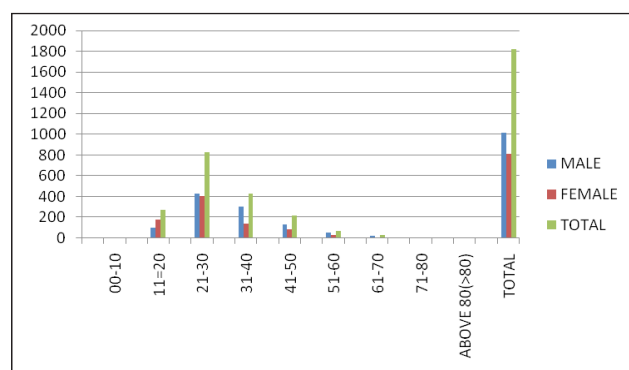


Figure No. 1

As regards age group wise incidence the most vulnerable age group being between 21-30 years next followed by 31-40 years. The youngest person to commit suicide is a 14 years old male and oldest person was a 81 years old female. There was no case recorded at the department below the age of 10 years and very few cases were recorded above the age of 81 years.

DISTRIBUTION OF STUDY OF POPULATION ACCORDING TO RELIGION

With regards to religion wise distribution 1486 (81.65%) Hindus show more predominance than Muslims 313(12.20%), very few cases, 21 (1.15%) where recorded for Christians.

DISTRIBUTION OF STUDY OF POPULATION ACCORDING TO MARITAL STATUS

In the present study population is seen more among married people 1514 (83.18%) compared to unmarried 306 (16.82%) (males 155(8.53%) females 151 (8.30%)) with predominance in male married sex (855), 46.97% than married females 659 (36.20%).

DISTRIBUTION OF POPULATION ACCORDING TO FAMILY PATTERN

According to the above table, the Nuclear family (81.48%), (males 873(47.97%), females 610(33.51%)) as compared to the Non-Nuclear families (18.52%) (males 137(7.53%), females 209(11.69%)) in the present study population.

DISTRIBUTION OF STUDY POPULATION ACCORDING TO LOCALITY

In the study population, it is observed that cases were predominant in urban areas accounting for 995 (54.67%) (males 557 (30.60%), female 438 (24.06%)) whereas rural areas accounted for 825 (45.33%) (males 453 (24.9%), females 372 (20.44%).

DISTRIBUTION OF STUDY OF POPULATION ACCORDING TO SOCIO ECONOMIC STATUS

Maximum number of cases were noticed among Upper middle class 941(51.7%) followed by lower middle class 879(48.30%), Least is seen among the upper class group.

Table No. 1: Educational Status of Suicide Victims in Respect of Hyderabad City – 2008

S. No	EDUCATIONAL LEVEL	MALE	%	FEMALE	%	TOTAL	%
1.	NO EDUCATION	359	19.73%	367	20.16%	726	39.89%
2.	PRIMARY	133	7.31%	111	6.10%	244	13.41%
3.	MIDDLE	153	8.41%	114	6.26%	267	14.675
4.	MARTICULAR SECONDARY	122	6.71%	92	5.06%	214	11.77%
5.	HIGHER SECONDARY PRE UNIVERSITY	114	6.26%	51	2.80%	165	9.06%
6.	DIPLOMA	15	0.82%	6	0.33%	21	1.15%
7.	GRADUATE	99	5.44%	54	2.97%	153	8.41%
8.	POST GRADUATE	15	0.82%	15	0.82%	30	1.64%
	TOTAL	1010	55.5%	810	44.5%	1820	100%

According to this study non education male and female accounted for 726 (39.89%). Followed by Middle educated group of male and female for 267(14.67%). Thirdly Primary education group with 244 (13.41%).

Table No. 2: Distribution of Study Population According to Manner of Death

S. NO.	TYPE OF DEATH	MALE	%	FEMALE	%	TOTAL	%
1.	POISON	400	22%	292	16%	692	38%
2.	BURNS	298	16.4%	382	21%	680	37.4%
3.	HANGING	210	11.50%	112	6.2%	322	17.7%
5.	DROWNING	80	4.4%	15	0.8%	95	5.2%
6.	OTHER MEANS	22	1.2%	9	0.5%	31	1.7%
	TOTAL	1010	55.5%	810	44.5%	1820	100%

With regards to means and methods adopted for committing suicide the following were the common means adopted in order of higher incidence.

POISONING: It is first means of committing suicide out of 692 males account for 400 (22.1%) and females account for 292 (11.4%) of total suicidal deaths (1820).

BY FLAMES: Secondly, by this out of 680 cases of suicidal burns 298(16.41%) were males and 382

(21%) were females. Female preferred burns more than males.

HANGING: It is the third and next largest means out of 322 cases. 210 males accounting to 11.5% and 112 females accounting to 6.2%. It is the male choice of suicidal method more than females.

DROWNING: It is the fourth largest group out of 95 cases 80(44.1%) males and 15(0.8%) females committed suicide by Drowning.

The miscellaneous means adopted were by Firearms and by self inflicted wounds and coming under running trains.

Among the poisoning cases recorded most of the cases ingested organo phosphate compounds.

Table No. 3: Distribution of Study of Population according to the Day of Incidents Occurred

S. No.	Day of Incident	Number	Percent
1.	MONDAY	218	11.98%
2.	TUESDAY	194	10.66%
3.	WEDNESDAY	348	19.12%
4.	THURSDAY	346	19.01%
5.	FRIDAY	214	11.76%
6.	SATURDAY	248	13.62%
7.	SUNDAY	252	13.85%

More deaths were noted on Wednesday 348 (19.12%) followed by Sunday 252(13.87%). Majority were deaths noted during the nights 482(26.48%) followed by afternoon 431(23.68%).

Table No. 4: Distribution of Study of Population According to the Time of the Incidents Occurred

S. No.	Time of Incident	Number	Percentage
1.	Morning (6.00 a.m To Noon)	427	23.45%
2.	Afternoon (Noon – 4.00 p.m.)	431	23.68%
3.	Evening (4.00 p.m. – 8.00 p.m.)	381	20.94%
4.	Night (8.00 p.m. – 6.00 a.m)	482	26.48%
5.	Un Ascertained	99	05.445

Most of the deaths were noted during the night hours 482 (26.48%) followed by afternoon 431(23.68%)

Table No. 5: Distribution of Suicide Victims by Profession

S. No.	Occupation	Number	Percentage
1.	House Wife	358	19.67%
2.	Self Employment	763	41.92%
3.	Others	247	13.57%
4.	Service	217	11.92%
5.	Unemployment	126	6.92%
6.	Students	93	5.11%
7.	Retired Person	16	0.89%
	Total	1820	100%

Most of the deaths noted in self employment group 763(41.92%) followed by the house wife 358 (19.67%).

Table No. 6: Distribution of Study of Population According to Motive

S. No.	Motive	Number	Percentage
1.	Illness	406	22.31%
2.	Family Problems	433	23.79%
3.	Alcohol	35	1.93%
4.	Dowry Dispute	47	2.58%
5.	Poverty	42	2.31%
6.	Bankruptcy/ Sudden Change in Economic Status	49	2.69%
7.	Love Affairs	51	2.80%
8.	Causes Not Known	302	16.59%
9.	Other Causes	455	25%
	Total	1820	100%

Most of the deaths were noted due to the family problem 433(23.79%) followed by the physical illness as major motives for suicidal deaths.

Table No. 7: Distribution of Study of Population According to Survival Period

S. No.	Survival Period	Number	Percentage
1.	SPOT DEATH	694	38.13%
2.	0-6 HOURS	106	5.82%
3.	6-12 HOURS	57	3.13%
4.	12-24 HOURS	21	1.15%
5.	1-3 DAYS	680	37.36%
6.	4-7 DAYS	234	12.85%
7.	>7DAYS	28	1.53%

Most of the people died at the spot itself 694(38.13%). Followed by the 680(37.36%) died after 3 days of hospitalization.

DISTRIBUTION OF STUDY ACORDING TO PLACE OF INCIDENCE

Most of the people committed suicide at the residence itself 1498(82.30%), followed by work place 191(10.50%), remote areas 74(4.07%) and other places 57(3.13%).

DISCUSSION

In this study males 1010 (55.5%) and females 810 (44.5%) observed. Males outnumbered the females in the study population. Similar opinion has been stated by Dalbir Singh, Muraru Atul, S.K.Dhattarwal and Sinha U.S.

Being male dominated society, male sex is considered as a provider of the family and any failure either in profession or person is considered as defeat and drives them to the edge of suicide. In contrast females have a subdued and submissive life and the male sex may be responsible for any failure either theirs or themselves. More over the female sex is mentally more strong and stable in dealing with situations compared to their counter parts. Hence, there is nothing to surprise to see the incidence of suicide is more in stronger sex compared to weaker sex.

In the present study population is seen more among married people 1514 (83.18%) compared to unmarried 306 (16.82%) with predominance in male married sex 855, (46.97%) than married females 659 (36.20%). These findings tallied with the studies conducted by Dalbir Singh and S.K.Dhattarwal.

In case of married males, marital disharmony, family problems, unemployment and financial constraints were the main cause whereas in case of female dowry harassment, dependency on husband, cruelty of in-laws, change of social environment after marriage and family conflicts were the main causes noticed.

The more percentage of unmarried males (8.53%) than single females (8.30%) due to unemployment, frustration in life, educational problems.

The Nuclear family (81.48%) as compared to the Non-Nuclear families (18.52%) in the present study population. It is similar to the study conducted by B.R.Sharma. The reason is due to the fact that living in Nuclear family, has to face the problems of day-to-day life, both at home and outside on their own without much needed advice and support from the elders. When problems and tension becomes unbearable, ending one's own life seems to be the only solution left to them.

In the study population, it is observed that cases were predominant in urban areas accounting for 995 (54.67%) whereas rural areas accounted for 825 (45.33%) cases. Due to rapid urbanization and agrarian crisis migration of people towards urban areas for better livelihood. Cases were reported more due to study population located in Hyderabad city and its suburbs.

The maximum number of cases were noticed among Upper lower class (48.30%), followed by middle class (51.7%). Least is seen among the upper class group. Similar findings were observed in the study conducted by Rahul Jain and Praveen Agrawal. Since this study involved the subjects residing more in Urban setup, the annual income of the upper lower class could not suffice to meet the basic amenities resulting in disillusionment in life amongst them. The incidence of poisoning is very less at the extremes of rags and riches, with maximum

incidence of 95% in the middle class. This clearly shows that money matters in poisoning with high vulnerability of the middle class due to the non compromising attitude with regards to values and responsibilities. Financial crisis and family disputes are the main drivers of poisoning tendencies in upper income groups and low income groups with varied etiology in middle income group rising from wine, women to wealth.

According to this study non education male and female accounted for 726 (39.89%). Followed by Middle educated group of male and female for 267(14.67%). Thirdly Primary education group with 244 (13.41%). India having the large share of world illiteracy population that also reflected in suicidal deaths.

In manner of death most of the people committed suicide by consuming organo phosphate compounds because these compounds used in the agriculture fields so there was easy availability of these compounds.

CONCLUSIONS

- Analytical study of data during the period July 2008 – June 2009 revealed that out of 9625 autopsies conducted at Osmania General Hospital, 1820 were suicidal deaths (18.90%).
- Out of 1820 Suicidal deaths it is observed that more number of males perish of suicides than females. Males accounting to 1010 (55.5%) and females accounting for 810 (44.5%).
- The age group most vulnerable being youth between 21-30 years accounting for 824 (45.27%). Next followed by 31-40 years accounting for 427(23.46%). Incidence of suicide is less common at both extremes of ages.
- Most commonly explored method for committing suicide is poisoning, secondly followed by burns and followed by hanging and lastly by drowning.
- The female preponderance is observed in respect of burns.
- More Hindus committed suicide when compared to Muslims, Christians are last in number.
- Further it is observed that more males adopt to commit suicide by poisoning than females.

- Out of 692 cases 400 males and 292 females commit suicide by poisoning.
- It is observed out of 322 hangings 210(65.21%) males perish and 112 (34.79%) females perished.
- More number of suicides occurred in urban (995 with 67%) areas followed by rural areas (825 with 45.33%).

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Study of Epidemiological Features in Relation to Poisoning with Special Reference to Corrosive Poisoning

K. Parvathi¹, Mohammed Abdul Mujeeb Siddiqui²

¹Associate Professor, ²Senior Resident, Department of Forensic Medicine and Toxicology,
Osmania Medical College, Hyderabad, Telangana

ABSTRACT

Introduction: Poison is any substance able to produce damage or alter the functions in the body by its chemical activity. It can enter the body in various ways to produce general or local effects (limited to the eyes, skin, lungs, etc.). Poisoning is a term used to define the ability of a chemical substance in acting adversely or deleteriously on the body. Changing trends in poisoning and its rise is a world-wide phenomenon occurring in all age groups and all sections of societies. It has mammoth medico-legal and social significance. This surge in the incidence of poisoning in current times is due to stress and anxiety related to academics in youngsters, professional and money related issues in adults and loss of social security in old individuals.

Materials and methods: The present study was carried on at Osmania General Hospital and mortuary during the period of 36 months from January 2013 to December 2015. During this period a total number of 15,589 autopsies were conducted and 2908 cases of different poisoning deaths were recorded. Among all the poisoning cases 406 deaths were reported due to corrosive poisoning. All the reported cases in the study period were investigated.

Results: A study of 15,589 autopsies and of which 2908 cases of various poisoning during 2013-2015 constituting 18.65% of all cases, among the poisoning cases 406 cases of corrosive poisoning fatalities were noted.

Conclusion: Poisoning is a common choice for suicide, organophosphates being the poison of choice due to its easy availability.

Keywords: poisoning corrosive, organophosphorus, epidemiology.

INTRODUCTION

Poisoning can be defined as taking, or being otherwise exposed to, a substance or substances which are injurious to a person's health¹. A corrosive

is a substance which has surface-destructive effect on contact. In most developed nations, increased education and product regulation (especially of acids) have decreased morbidity and mortality from caustic exposures in both adults and children. However, in underdeveloped parts of the world, exposure to caustics remains a significant problem^{2,3,4,5}. Self-harm has often been thought as a problem of the industrialized nations however the Global burden of disease, it is reported that 593000 people killed themselves in the developing world⁶.

Corresponding Author:

Dr. K Parvathi

Associate Professor, Department of Forensic
Medicine and Toxicology, Osmania Medical College,
Hyderabad-500095

Email: katkuriparvathi4444@gmail.com

A study from Bangladesh showed that 14% of all deaths amongst 10 -50 year old women were due to poisoning following suicidal ingestion⁷. Even though corrosive injuries are routinely encountered in medical facilities all over the world, there is not much published data on the epidemiological factors in relation to deaths due to corrosive poisoning. In the current study we attempt to identify some of these epidemiological features. The data was collected from all cases of poisoning which were subjected to post mortem at Osmania General Hospital/Osmania Medical College during the study period and all available medical records. Data on Epidemiology of poisoning are meagre and hardly available. Programmes on Awareness of the epidemiological features may encourage active demonstration for passing of legislation to prevent or decrease accidental poisoning as has been achieved in many countries. Poisoning is generally unintentional by children but their parents play a critical role in their intoxication especially in infants under one year of age⁸.

Aim: Aims and objectives of the study were to find the pattern of poisoning cases among all the autopsies conducted during the study period with reference to the type of poisoning distribution with reference to age and sex of victim and area of residence.

Materials and methods: In present study a total number of 2908 cases of various poisoning were studied during the study period of which 406 were corrosive poisoning fatalities autopsied at the Department of Forensic Medicine, Osmania General Hospital, Hyderabad has been made. All poisoning cases subjected to autopsy were considered for the study after obtaining clearance from the institutional ethical committee.

All the records maintained at the Department of Forensic Medicine and the Department of Medicine, Osmania General Hospital, which includes copies of the following:

1. Case sheets.
2. Inquest reports.
3. Clarification reports of the circumstances surrounding the death if any.

4. The report of post mortem examination.
5. Report of the chemical analysis of viscera of the deceased from the Forensic Science laboratory.

Information was also extracted from the relatives, attending persons and eye witnesses (in some cases), regarding the mode of poisoning and the type of poison used.

The presence or absence of a poison in the viscera sent for analysis, to the Forensic Science Laboratory was taken as the criteria to consider a case as a "Poison Fatality". In some cases, if the chemical analysis report was received as negative, it was not considered for the study as the precise cause of death was not recognized and at best a calculated guess would have been made.

All the records of the poisoning deaths were studied in detail to show the distribution of cases as per the epidemiological variations. The history given by the police was only taken as a hint. The autopsy findings must always be superior to the history furnished in case of any discrepancies between the two.

Statistical Analysis: SPSS version 21 was used for data analysis. Chi square test was used for comparison. Descriptive statistics like mean and percentage were also used.

Results and Observation: It is observed that Out of 15,589 cases subjected to Post mortem during the study period 2908 cases were of poisoning. It constitutes a total number of 18.65 % of poisoning cases among all cases.

Table 1: Distribution of Type of poisoning

Type of poison	Male	Female	Total	Percentage
OP Compounds	954	744	1698	58.39%
Alcohol	425	64	489	16.48%
Corrosives	202	204	406	13.96%
Snake bites	59	31	90	3.09%
Rodenticides	65	33	98	3.37%
Cyanide	28	4	32	1.10%
Others	63	42	105	3.61%

Table no. 1 shows the distribution of all types of poisoning and their distribution. OP compounds were the most commonly used poison with 58.39% of total cases. A total of 406 cases of Corrosive poisoning were reported which constituted 13.96% of all the poisoning cases reported during the study period.

Table No. 2: Age and sex wise distribution among deaths due to Corrosive poisoning

Age	Male	Female	Total	Percentage
0 to 10 Years	00	0	0	0%
11 to 20	14	18	32	7.88%
21 to 30	69	98	167	41.13 %
31 to 40	61	83	144	35.46%
41 to 50	12	16	28	6.89%
51 to 60	06	12	18	4.43%
61 and above	06	11	17	4.18%
Total	168	238	406	13.96%

Table 2 shows similar pattern of distribution among deaths due to corrosive poisoning with most common age group being 21-30 years with 41.13% of cases followed by 31-40 years with 35.46% of cases of corrosive poisoning.

Nil number of cases was observed in the age group of 0 to 10 years constituting 0% of all cases.

Table 3: Area wise distribution among male and female deaths due to corrosive poisoning

Area	Sex		Total	Percentage
	Male	Female		
Urban	65	96	161	39.66 %
Rural	103	142	245	60.34 %
Total	168	238	406	100 %

Table 3 shows the incidence of corrosive poisoning and a similar pattern of higher number of cases being from rural areas constituting 60.34% of corrosive poisoning cases and males being outnumbered by females.

DISCUSSIONS

Area-Wise Incidence: The incidence of deaths due to corrosive poisoning is comparatively more in rural areas than in urban community. The mortality in rural area is 60.34% and that of urban is 39.66%. The discrepancies in the various socioeconomic factors among the rural and urban population and the availability of adequate medical aid are responsible for this variation. Lack of education, poverty and inadequate transportation facilities in the rural areas claims the major brunt, while maladjustment to the various demands of urban social life has been the most important reason among the urban communities.

Age: Analyzing the age group of 2908 poisoning fatalities and 406 cases of corrosive poison fatalities, it was noted that most of deaths were between the ages of 21 to 30 years followed by ages of 31 to 40 years. (Table 2)

The predominance of this age group is due to the fact that the age group 21 to 40 years is the most active period of life. The maximum incidence of poisoning in the age group of 21 to 40 years is attributed to the factors like failures in facing the difficulties of academics, unemployment, romantic failures, family conflicts, marital disharmony, improper judgment of the problem, dowry harassment in case of females and ill health. As this age group are at the threshold of building their career and have the utmost zeal and urge to go ahead of others and these ever-increasing demands and stress of the modern mechanical lifestyle, contribute to such an act. In case of children, scolding by parents for very trivial issue and failure or less percentage in exams were the reasons being noticed.

Type of poison: Among all the cases of poisoning the most commonly used poisons were OP Compounds constituting 58.39% of all poisoning cases and least common being Cyanide which accounted to 1.10% of all cases corrosive poisoning cases were 13.96% of total poisoning cases. Use of OP compounds was most commonly used poison because of easy availability and low cost. Corrosive poisons are easily available and used for cleaning purposes hence they are easily accessible and used as a mode of poisoning.

Sex: In the present study there is female preponderance. Out of 406 cases there were 204 female and 202 males' cases of Corrosive poisoning. (Table 2)

The female dominance can be attributed to the fact that when they are unsuccessful in doing something, either professionally or personally, the sense of shame prevails, which pushes individuals to commit suicide.

Manner of poisoning: In this study the manner of death was found to be suicidal in a large number of cases. The large number of cases of suicide by corrosive poisoning is due to known toxicity of these agents and also their easy availability and relative cheapness. They are usually found in most Indian homes for floor and toilet cleaning. Suicide is a subject of great sociological and psychiatric importance with many unexamined and unresolved problems. In our country the study of this particular subject is rendered difficult by the lack of statistics about the number of attempts and successful suicides. It is always interesting to consider the reasons. The police inquest usually mention chronic ailments, unbearable pain abdomen etc., which is not always the whole truth and should always be taken with a pinch of salt.

The real cause may be domestic, unemployment, financial worries, failures in love, insecurities and psychological problems, which are prone for suicide like manic depressive psychosis etc.



Figure No. 1: Excoriation of face and mouth due to corrosive poison ingestion

On external examination there is excoriation of mouth and face due to ingestion of corrosive poison Figure1.



Figure No. 2: Charring of Oesophagus due to corrosive poison ingestion

When the neck structures are examined on dissection, the oesophagus appears to be charred due to passing of the corrosive poison Figure 2.



Figure No. 3: Charring of stomach due to corrosive poison ingestion

On opening the abdominal cavity, the stomach appears to be perforated and charred due to corrosive action Figure 3.

CONCLUSIONS

The study highlights the fatal cases of poisoning autopsied at Osmania Medical College/Osmania General Hospital between January 2013 to December 2015. The incidence of corrosive poisoning is found to be higher among females. Among females, corrosives are more often the choice of poison due to its ease of access. The study emphasises on stricter laws to control the sale and possession of these items and to spread awareness among people about the hazards of corrosive poisoning.

Conflict of Interest: Nil

Source of Funding: Self

Ethical clearance: Necessary clearance taken from Ethical Committee.

RECOMMENDATIONS

1. As organophosphorus insecticide is the most common poison causing mortality. Special laws and regulations governing the handling, storage, dealing, dispensing and disposal of insecticides should be amended. Extensive awareness campaign through mass media should be initiated with regards to proper storage, use of pesticide and the basic treatment to be instituted in cases of poisoning, to make the general public aware, which in turn can help in reduction of mortality from insecticide poisoning.
2. Poisoning among young adults can be checked by psychological counseling and tackling their problems sympathetically.
3. Among married couples, poisoning can be checked by developing satisfactory interpersonal relationships, and tackling effectively their social and psychological problems.
4. In case of children it can be largely preventable by parent education, stacking away chemicals in closets under lock and key, chemicals should not to be stored in transparent bottles and the use of child resistant containers should be encouraged.
5. It is necessary to identify these changing trends and awareness of poisoning as it can immensely help the health policy makers to equip health care institutions accordingly for the better management, thereby reducing the mortality from poisoning
6. More Poison information centers to be set up at national, state and district level which can provide information on all poisons, methods of diagnosis and treatment there by reducing mortality from poisoning and a separate wing to be set up at Medical College Hospital which can assist in treating poisoning cases and the research work can also be carried out.

7. Precautions should be taken by Forensic experts in proper collection and handling of samples with timely dispatch for chemical analysis without any untoward delay.

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Demographic Study of Fatal Snake Bite Deaths among Medicolegal Postmortem Examinations in Warangal

G. Jhansi Lakshmi¹, M. Malleswari², K. Ravimuni³, K. Naga Saritha⁴

¹Assistant Professor, Gandhi Medical College, Secunderabad, Telangana state, ²Associate Professor, ³Assistant Professor, ⁴Statistics lecturer, NRI Medical College, Chinakakani, Guntur District

ABSTRACT

Most of the snake bite deaths reported were due to delay in giving antivenom and the relatives of deceased allege against doctors that proper care is not given. Snake bite remains a public health problem in many developing countries. In India 216 species of snakes are found, of which 52 are poisonous, but only five species of them are Venomous^{4, 15} (King cobra, Common cobra, Krait, Russell's viper, and saw scaled viper).

Key words: Snake bite, Autopsy, Habitat of the victim, Socio economic Status

INTRODUCTION

The bites are always accidental^{1, 2}. Homicidal bites are recorded, but it is difficult to prove without circumstantial evidence. Suicidal bite was described in history in case of Queen Cleopatra. Snake bites are a common problem among people living in rural and agricultural areas, occupational hazard mainly in farmers, plantation workers, herders and laborers leading to significant morbidity and mortality with the most common site of such bites are on the lower limbs. The bites inflicted are frequently accidental as when snakes are trodden upon or could result due to sleeping on floor and open style habitation. Further, in rural and suburban areas the peripheral health care facilities are not well equipped and there is shortage of ASV, emergency drugs, ventilators etc thus necessitating

a trip to well equipped tertiary care hospitals, where treatment may be unaffordable due to limited purchasing power of the rural victims¹. High mortality can be attributed to loss of crucial golden hour and lack of treatment¹⁵.

Materials and Methods: The present study is made on the dead bodies that are subjected to Post-mortem examinations death due to snake bite in the mortuary of Department of Forensic Medicine, Kakatiya Medical College/MGM Hospital, Warangal, from September 2008 to June 2010, a total period of 22 months.

Inquest report, First information report, history given by the relatives and from the neighbors, who attended the Mortuary at the time of Post-mortem examination, Hospital records etc. were collected from the Police, apart from the Post-mortem examination report from the Department of Forensic Medicine Kakatiya Medical College, Warangal, to get the data for analysis purpose and basing on the inquest, post mortem examination findings and Reports of Forensic Science Laboratory. The Bitten Snake was also found in some cases from the relatives who brought dead snake along

Corresponding Author:

Dr. M. Malleswari,

Associate Professor, Department of Forensic Medicine,
NRI Medical College, Chinakakani,
Guntur District 522503
Email: malleswarimotakatla@gmail.com
Mobile: 9848198704

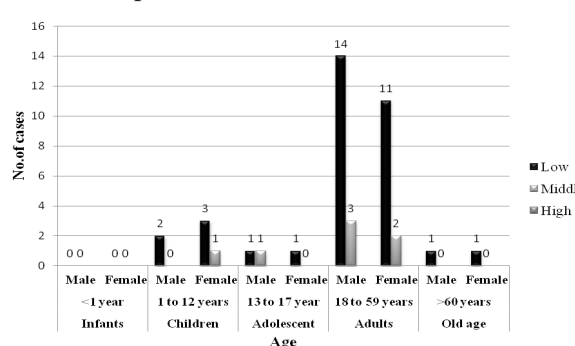
The materials used are inquest reports, inpatient case sheets, perusal of police papers, records from Medical Records Section of Kakatiya Medical College/MGM Hospital, Warangal, Post mortem Reports of all cases, information collected from the Investigating Officer.

The factors taken to enumerate the fatal snake bite study are Age & sex, Socio economic status, Educational status, Habitat of the victim and Area of bite on the body.

In all persons the viscera was congested and there were visceral hemorrhages in 27 cases spread on the parietal and the visceral surface of the organs and in only one case epicardial hemorrhages seen during post mortem examination. The number of deaths occurring due to snake bites reflects only the tip of iceberg. Many people who received the snake bite envenomation might be treated and went home, the records of which are not available. Some of them though received bites may not had the envenomation at all. Hence the percentages mentioned here reflect only of the fatal cases.

Age Group	Males	Females
<1 yr Infants	0	0
1 to 12 yrs Children	2	4
13 to 17 yrs Adolescent	2	1
18 to 59 yrs Adults	17	13
>60 yrs Old age	1	1

Graph No. 2: Socioeconomic status

**Table No. 1: Educational status**[illegible]

Table—1 showing most of the people were illiterates, which scored 32 deaths due to snake bite, it amounted to 78% of total deaths. People having primary education are next to them, in

which snakes tolled 6 lives 15%, 3 of the snake bite victims had secondary education i.e. 7%. No person who had higher education died in the present study.

Table No. 2: Habitat of the victim

Habitat	Infants		Children		Adolescent		Adults		Old age		Total	
	<1 year		1 to 12 years		13 to 17 year		18 to 59 years		>60 years			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Rural	0	0	0	2	1	1	4	2	1	1	6	6
Sub-urban	0	0	2	2	1	0	11	11	0	0	14	13
Urban	0	0	0	0	0	0	2	0	0	0	2	0

Table—2 regarding Habitat of the victim most of the victims were from sub-urban areas 27 (66%) cases. Next to them are from rural areas wherein 12 (29%) deaths;

only two male persons died of snake bites from urban population i.e 5%.

Table No. 3: Area of biting on the body

Site of bite	Infants		Children		Adolescent		Adults		Old age		Total	
	<1 year		1 to 12 years		13 to 17 years		18 to 59 years		>60 years			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Head and Neck	0	0	0	1	1	1	1	1	0	0	2	3
Trunk	0	0	0	0	0	0	1	2	0	0	1	2
Upper Limbs	0	0	1	1	0	0	6	4	0	0	7	5
Lower Limbs	0	0	1	2	1	0	9	6	1	1	12	9

Table—3 showing area of bite on the body mostly on lower limbs had bites in 21 people (51%); upper limbs had bites in 12 people (29%); Head and neck region in 5 persons (12%); and over the trunk region in 3 persons (7%).

DISCUSSION AND SUGGESTIONS

The present study is conducted on the dead bodies of death due to snake bite subjected to post mortem examination in Department of Forensic Medicine in Kakatiya Medical College/MGM Hospital, Warangal.

Graph—1 the external examination elicits the cause of death easily as snake bite especially in viperine type snakes. Slight male preponderance is seen over the female with a ratio of 1.16: 1. This says that the

movement of the population is common and equal among both sexes, at least in the rural areas around Warangal.

There are increased deaths among the age group of adults i.e. from 18 to 59 years, as it included a large number of years as well; the movement of this age group is prone to get bites. People from old age are also not spared. The victimisation may be explained as they have reduced sensation of hearing and vision. Infants are not seen in the present study as they are cared more than any other age group. Whereas toddlers have a problem of moving and they try to explore the surroundings which may result in the bites.

Graph—2 Many are seen from the low socio economic status. This reflects their inability and

ignorance to go for treatment. This statement can be justified by observing that there are no deaths seen from high socio economic group.

Table—1 Illiteracy is also another culprit which increases the ignorance of a man. This is once again reflected by the increased number of deaths in this group of people than the educated community.

Table—2 It is observed that people from sub-urban areas are more victimised¹. This can be attributed to the habitat of the snakes which are disturbed by the urbanisation. Naturally the movement of snakes among the man kind is more common in sub-urban areas than urban or rural arrears.

Table—3 Lower limb is the more vulnerable area for receiving the bites^{4, 12}, as people do not take proper precautions to protect themselves from such bites. Even upper limb is also exposed for such bites. It does not mean that trunk cannot receive the bites. But the areas on the trunk are bitten during the sleeping posture.

During the post mortem examination it is observed that there is generalised congestion of the viscera. In some cases the congestion is so marked that it resulted in haemorrhages and epicardial haemorrhages^{3, 12}.

The detection of snake venom in the tissue or blood is difficult¹⁵. It can be ascertained to many factors as, bio-degradability of the venom in the tissue, improper preservation of the tissue, improper transportation of the specimen, prolonged period between preservation and testing or non-availability of the reagents (kit) to detect the venom in the tissues. In no case of snake bite the venom was not detected from the chemical examination of the viscera. Hence the opinion about the cause of death by snake bite envenomation is empirical, based on the post mortem examination findings, history and Inquest, by ruling out of the other possibilities of death.

However all animal bites are taken as accidental⁴, they cannot be considered to. Suicidal and Homicidal bites however cannot be thought off in these days.

CONCLUSION

1. Low socio economic group not having toilets and proper living facilities are the most vulnerable

group for snake bite particularly in nights. Hence they should be educated /informed about the hazards of sleeping on the floor especially during nights.

2. Non Governmental Organizations also should involve themselves to educate and explain about the precautions to prevent the snake bite deaths. The present facility of 108 Ambulance Service with trained personnel at every place should be involved and educated for administration of Ante Snake Venom while transporting to hospital. With the facility of Apadbandhu Scheme by the Government certain cases with wrong history are noticed. It should be avoided by clearly analyzing the circumstances of the incident, when the bite took place and what are the symptoms the person developed while undergoing treatment. The Government officials are advised to make a thorough scrutiny of the cases before the settlement of the financial benefit.
3. Common and standard treatment protocol should be planned and the doctors working in the Primary Health Centres should be made aware of the latest treatment protocol by training them for saving the lives of victims.
4. Due to lack of proper education regarding the envenomous effects of the snake bite the people are consulting the snake chanters. Hence proper education must be given to the people of High Risk areas of Snake Bite.
5. Evidence of venom at the site of bite was not detected in any case.
6. There was no mention made in any case about the suicidal or homicidal attacks by these venomous animals.

Ethical Clearance : This study has been carried out in the year 2010, after permission from the ethical committee of Kakatiya Medical College/MGM Hospital, Warangal, Andhra Pradesh

Source of funding : Self

Conflict of Interest : Nil

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Unusual Method of Suicide by Plastic Bag Suffocation

Madanraj M¹, Mahabalesh Shetty², Sheryl Soares³, Suraj Shetty⁴

¹Post Graduate Resident, ²Professor and Head, Department of Forensic Medicine and Toxicology, K.S Hegde Medical Academy (KSHEMA), NITTE University, Nithyananda Nagar, Deralakatte, Mangalore, Karnataka, ³Assistant Professor, Department of Forensic Medicine, Pondicherry Institute of Medical Sciences, Ganapathichettikulam, Kalapet, Pondicherry, ⁴Assistant Professor, Department of Forensic Medicine and Toxicology, K.S Hegde Medical Academy (KSHEMA), NITTE University, Nithyananda Nagar, Deralakatte, Mangalore, Karnataka

ABSTRACT

The recent emergence of suicide by plastic bag suffocation can be attributed to the Right to Die Societies who advocate the use of this method in terminally ill patients. These cases pose a challenge to the Forensic Pathologist owing to minimal and inconclusive findings at autopsy. Toxicological analysis, visit to the scene of occurrence and psychological autopsy play a vital role in solving these cases. Hereby presenting a case where a body of a young male was found in seemingly unclear and suspicious circumstances with a plastic bag wrapped around his head. A visit to the scene of occurrence provided clinching evidence and helped us reach a conclusion of suicide by plastic bag suffocation.

Keywords: *Asphyxia, Plastic bag suffocation, Suicide*

INTRODUCTION

Asphyxia is defined as lack of oxygen in the blood or failure of cells to utilise oxygen¹. “Mechanical asphyxia” is commonly encountered in the medicolegal practice. It encompasses suffocation, smothering, gagging, choking, throttling, strangulation and mugging². Suffocation refers to death which is caused by reduction of oxygen concentration in the respired atmosphere.

Plastic bag suffocation entails the creation of a local hypoxic environment by securing the open end of the bag around the neck¹. The Hemlock Society of Oregon, USA published the book ‘Final Exit: The Practicalities

of Self- Deliverance and Assisted Suicide for the Dying’ in 1991. The author, Derek Humphrey recommended the use of plastic bag in combination with drugs as a method of ‘self – deliverance’ for terminally ill patients³. The essential mechanism of plastic bag suffocation is that a hood of impervious substance is placed over the head upto neck level². Knight states that death due to plastic bag facial occlusion is rapid cardio inhibitory rather than a purely hypoxic process². These cases present to the Forensic Pathologist, a certain level of difficulty as it involves ambiguity owing to minimal or nil asphyxial signs at autopsy^{1, 2}. It is often difficult to opine if it is an accidental, suicidal or homicidal event. One has to be even mindful of autoerotic practices which usually employs the use of plastic bags. These factors mandate a visit to the scene, the findings of which often prove indispensable in arriving to such conclusions^{2, 4}. Suicide by plastic bag suffocation is not an uncommon entity. Few studies have been conducted to observe the pattern of suicides using plastic bags^{5, 6}. Few case reports mention the use of inhalants like chloroform and helium in association with plastic bags for the purpose of suicide^{7, 8}. Hereby presenting a case of suicide by plastic

Corresponding Author:

Dr. Mahabalesh Shetty

Professor and Head

Department of Forensic Medicine and Toxicology
K.S Hegde Medical Academy (KSHEMA), NITTE
University, Nithyananda Nagar, Deralakatte, Mangalore
575018, Karnataka, India

Mobile: +91 9448130574

E-mail: drmabs@yahoo.co.in

bag suffocation by a young male where a visit to the scene played a vital role in concluding regarding manner of death.

CASE REPORT

At the scene: A young male was found dead in his apartment by the Police after the neighbours reported foul smell from the house. The house was a single bedroom flat. The deceased was a 30 year old male and an electrician by occupation who was staying alone. The team of Forensic Experts who visited the scene saw that the deceased was lying on the cot with his right leg flexed at the knee and toes touching the floor (figure 1). The head was covered in a plastic bag and the open end was fastened around the neck with a belt. (Figure 2) Both hands of the individual were fastened behind the back with a lock tie (Figure 3). Similar pack of lock ties were found on top of the cupboard beside the cot. There was some disturbance at the scene with broken porcelain mugs, plastic bottles and wooden mop lying on the floor in a disorderly fashion (Arrows pointed in Figure 1). The rest of the room was relatively neat.

At autopsy: The body showed signs of advanced stage of putrefaction. No ante mortem injuries were found on the body. Bloodless layered dissection of the neck was unremarkable. The internal organs were sent for toxicological analysis. It tested negative for sedatives or volatile substances.

A detailed interview with the colleagues and friends of the deceased revealed that the individual would often take leave of absence citing health issues. He had also resorted to excessive alcohol intake in the past few months. This helped us conclude that the deceased was suffering from some mental anguish. The owner of the flat revealed that the house did not have a working latch and the individual had devised an ingenious method to close the door from inside by using the handle of the mop. The Police, in their frenzy of opening the door had displaced the handle which in turn resulted in artifactual disturbance of the scene.

This case was being investigated along the lines of homicide due to its unusual presentation. However,

careful compilation and intelligent interpretation of the scene findings, autopsy findings and interview with friends and colleagues helped us conclude that it was a self-inflicted act of suffocation using plastic bag.

DISCUSSION

In the Forensic field, death by plastic bag suffocation has been found in several situations. Accidental deaths are seen in children, individuals engaged in autoerotic activities and solvent abusers⁸. Suicide by plastic bag asphyxiation is a relatively new trend which appears to be on the rise in recent years as demonstrated in few studies and case reports^{5, 6}. This method was popularised by the Right to Die societies and literature like "Final Exit"^{1-2, 4, 6}.

Bullock MJ et al⁶ observed a rising trend in suicide by plastic bag suffocation with 54.5% of individuals being over 60 years of age in Ontario, Canada. This popularity was attributed to easy availability of plastic bags, their ease of use and painless mechanism of death which they provide⁶. Martinez et al⁵ studied 23 cases of suicide by plastic bag suffocation in London over a period of five years with majority of the victims being elderly individuals. The present case differed from other studies as it involved a young male in his thirties. However, this is in accordance with the suicide trends prevalent in this region⁹.

Interview with the friends and colleagues from workplace did reveal that he was mentally disturbed, but we were unable to trace the exact reason for the individual to take the drastic step. The deceased did not have any known or documented medical ailments. There was no history of previous suicide attempts. In contrast to the present case, the study in Ontario showed 31.8% of the victims had attempted suicide earlier and 25.5% of the cases reported "stressors" like recent loss of loved one, marital problems and loss of job⁶. Few other cases reported cited failing health as a reason for suicide⁷. Studies conducted have shown that individuals who committed suicide by plastic bag suffocation had known medical ailment which was either life threatening or severely compromised their quality of life⁶. A thorough investigation regarding the medical history of the present

case failed to reveal such perpetuating factor. In one of the studies conducted, 80% of the individuals have committed the suicidal act at home and 56% of them had left a suicide note⁶. The current case, the individual committed suicide in his house but no suicide note was found.

The plastic bag was secured with some device in 105 cases and untied in 5 cases⁶. The devices used to secure the bag were shoelaces, telephone cord, ribbon, scarf, wires, belt, multiple rubber bands and velcro strap. In the case studied the individual had used belt to secure the open end of the plastic bag around his neck.

The external examination of the cases observed in London revealed minimal findings. Out of the 23 cases studied, 15 cases did not show external evidence of asphyxia. Conjunctival petechial haemorrhages and marked congestion of the eyes was observed in some cases⁵. Out of the 110 cases observed in Ontario, conjunctival petechial haemorrhages were noted in only 7 cases⁶. The most common internal finding at autopsy in both the studies was pulmonary oedema and visceral petechiae⁵⁻⁶.

Literature elaborates on the fact that deaths due to plastic bag suffocation do not reveal any specific findings at autopsy⁴. Knight's Forensic Pathology opines that death by plastic bag facial occlusion is a rapid cardio inhibition rather than a purely hypoxic process, thus explaining the minimal findings at autopsy².

The present case, the body was discovered in a closed room after 2-3 days in an advanced stage of decomposition. No pathognomonic external or internal findings regarding plastic bag suffocation could be observed as the findings were obscured due to decomposition. Bloodless layered dissection of the neck was unremarkable.

Toxicological analysis of the cases studied revealed the presence of ethanol, drugs like diphenhydramine, flurazepam, narcotic analgesics, secobarbital⁵⁻⁶. These are taken to help the individual to keep calm and reduce the restlessness or anxiety caused during the process. The analysis of blood and viscera in the present case

did not reveal the presence of sedatives or volatile substances.

Plastic bag suffocation cases present with a great deal of difficulty to the Forensic Pathologist. Thus an undisturbed scene of occurrence and corroborative evidence aid in reaching to a conclusion regarding the facts of the case.

CONCLUSION

The current case presented a daunting task, as deaths due to plastic bag suffocation are rarely encountered and reported in the country. Thorough analysis of scene of occurrence and preserving the body in the state it was found until the arrival of the Forensic Pathologists clinched the diagnosis of suicide by plastic bag suffocation.



Figure No. 1

Figure 1 The deceased found at the scene of occurrence

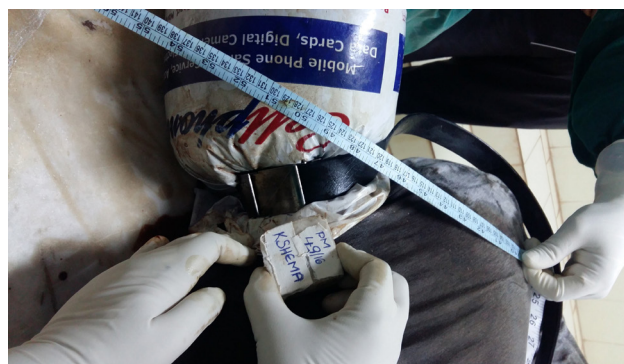


Figure No. 2

Figure 2 Plastic bag around the head fastened with belt



Figure No. 3

Figure 3 Hands of the deceased tied at the back with lock tie

Ethical Clearance: Obtained from Ethical Committee of Institution

Source of Funding: Self

Conflict of Interest: Nil

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Establishment of Cause of Death in Buried Dead Bodies: An Exhumation Based Study

Sudhakar Sugali¹, Mahesh Gajula²

¹Assistant Professor, Department of Forensic Medicine, Rajiv Gandhi Institute of Medical Sciences, Kadapa, Andhra Pradesh, ²Assistant Professor, Department of Forensic Medicine, Government Medical College, Anantapuramu, Andhra Pradesh

ABSTRACT

Background: The word exhumation literally means digging out of a buried body. The very purpose of the exhumation is to establish identity of the deceased or to know the cause of death or both especially when there is conflict before the law.

Aims and Objectives: The purpose of the study is to know how far the cause of death can be determined in exhumed bodies in relation to time of burial and positive opinion regarding the cause of death in addition to other ancillary parameters.

Material and Methods: The current prospective study was conducted over a period of 3 and half years from January 2003 to June 2006 at Gandhi Medical College, Secunderabad and include a total of 34 cases were studied. Standard methods were used for recording as well as analysis of data.

Observations and inference: cause of death could be opined in about 60% of exhumed bodies and opinion could not be given in eleven cases. Head injury is the leading cause of death with 8 (24%) followed by asphyxia with 4(12%).

Conclusion: The cause of death could be arrived at exhumation with a reasonable accuracy in the early periods and the feasibility of assessing cause of death will gradually decrease with increase in time since burial. It is suggested to follow standard protocol and procedures are required to increase the chances of establishing cause of death at exhumation.

Keywords: Cause of Death, Exhumation, Head injury, Homicide, Poly-trauma

INTRODUCTION

The term Exhumation means, ex - Out of, Humus – ground, Exhume -To bring in to light, especially after a period of obscurity or Burial¹. It is legal digging out of an already buried body from the grave². This term

is synonymous with ‘disinterment’, which means Bringing out of a buried body for medico-legal purpose^{3, 4}. The systematic exhumation of mass graves is becoming a frequent occurrence globally⁵. In most of the exhumations it is either identity of the dead or the cause of death which is contradicted before the law, and law requires reexamination of the body to prove or disprove the matter in question. It is quite difficult to determine the cause of death at exhumation as the time factor plays a major role as the evidence as to cause of death will slowly get masked off/vanishes as the putrefaction process advances. The current study on exhumation is principally aimed to know how far or in

Corresponding Author:

Dr. Mahesh. G.

Assistant Professor

Department of Forensic Medicine, Government Medical College, Anantapuramu, Andhra Pradesh

Email: dr.maheshgajula@gmail.com

Phone: +91 9441210084.

how many cases cause of death can be determined and if possible to deduce a co-relation between the positive determination of cause of death and time elapsed since burial be established.

Materials and Methods: The current prospective study was carried out at Department of Forensic Medicine, Gandhi Medical College, Secunderabad from July 2003 to June 2006 after obtaining clearance from institutional ethics committee. A total of 34 cases were conducted during study period of which 6 cases were done in 2003, 12 cases in the year 2004, 13 cases in the year of 2005, and 3 cases were done up to June 2006. The study encompassed 22 males and 11 females exhumed dead bodies and one case where sex could not be ascertained. The data obtained from the study was recorded in a pretested proforma and was analyzed using appropriate statistical methods.

OBSERVATIONS AND DISCUSSION

Exhumation vis a vis time since burial: It is evident from **Table No.1** that in 33% of cases out of a total 34 cases were exhumed within one week from the date of burial and 20% of cases within 1 month. Hence altogether in over 50% of cases exhumations were carried out within 1 month from the date of burial. In another 33% of cases the exhumations are carried out between 1 to 6 months after burial, the rests of cases are exhumed either after 6 months or undetermined. Time since burial from the date of exhumation is an important factor as it influences the chances of predicting time since death, cause of death as it is directly related to the decomposition process. Similar opinions were quoted in a study conducted by Mann et al⁶.

Table No.1: Exhumation in relation to time since burial

Time since burial	No. of Cases	Percentage (%)
Up to week	12	35.3
1 week to 1 month	7	20.6
2 months	6	17.6
3 months	3	8.82
5 months	1	2.95
Above six months	4	11.77
Undetermined	1	2.95

State of bodies at exhumation: **Table no. 2** shows that out of 34 cases, the dead bodies were in a state of moderate to advanced putrefaction in 17(50%) of cases, skeletonization of the dead body was evident in about 3 (9%), and mummification and adipocere formation was evident in one case each. In the rest of the 35% cases, combinations of postmortem changes were present such as putrefaction with mummified extremities, putrefaction with adipocere formation over fatty areas or mummification with skeletonization. Formation of adipocere increases the chance of prediction of cause of death as it preserves the features of injury and internal viscera. However sometimes it provides erroneous information as to time since death as its time taken for its formation is not quite stable and depends on several factors. A case of adipocere formation within 3 days has been reported by Mohan Kumar T.S. et al⁷.

Table No. 2: State of dead body at exhumation

State of dead body	No. of Cases	Percentage (%)
Putrefaction	17	48.6
Mummification	1	2.95
Adipocere	1	2.95
Skeletonization	3	8.82
Mixed Changes	12	35.29

Exhumed dead bodies and types of Injuries found: It is observed from **Table No.3** that injuries were found in about 19 cases amounting to 55.89% of total 34 cases of which soft tissue injuries were present in 11(32.35%) cases, skeletal injuries in 3(8.83%) of cases and both skeletal and soft tissue injuries were present in 14.70% of cases. Of these injuries contusions were the commonest type of injury found over the exhumed cadavers which were followed by abrasions and lacerations. This finding indicates that the contusions are preserved for a long time over soft tissues comparatively while skeletal injuries provide evidence as to cause of death for a long time. In the current study involving 34 cases, soft tissue injuries predominated the picture than skeletal injuries. In a study conducted by Łukasz Szleszkowski et al⁸ indicated that cause of death could be

opined even after sixty years in causes where the death of the deceased is ensued because of a skeletal injury. We are also of the opinion that the skeletal injuries form an important data for fixing up cause of death in exhumed bodies.

Table No. 3: Exhumed dead bodies and types of injuries found

Injuries	Number of Cases	Percentage (%)
Soft Tissue	11	32.35
Skeletal	3	8.83
Both	5	14.70
No Injuries	15	44.11

Visibility of soft tissue injury vis a vis time since burial: the soft tissue injuries were well visualized up to one week in the bodies exhumed within one week. The visibility of soft tissue injuries gradually decreased with increase in time since burial as indicated in **Table No.4**. This is probably because of advancement of putrefaction and gradual vanishing of the soft tissues over the dead bodies with prolongation of time interval. It can be inferred that the visibility of injuries will better in the bodies that are exhumed earlier than the bodies that are exhumed after longer periods of burial. These findings go against a study conducted by Breitmeier D etal⁹.

Table No. 4: Time interval since burial versus number of soft tissue injuries

Time Interval	No. of Soft Tissue Injuries
One Week	9
One Week to Month	5
Two months	2
More than two months	0

Exhumation and positive opinion as to cause of death: On perusal of **Table No. 5**, it is evident that out of 34 cases, exhumed during the 2003 to 2006 period, in 23 cases amounting to about 67.65%, the cause of death was established after exhumation. In 9 cases (26.47%) no opinion was arrived at exhumation and 2 cases were pending for want chemical analysis report

from Forensic Science laboratory. The success rate amounting to about 70% in establishing the cause of death speaks itself the value of exhumation in the given circumstances of advanced decomposition. Similar findings were noticed in a study conducted by Karger B et al¹⁰.

On the other hand, the comparative high incidence amounting to about 30%, where the exhumations yielded no result as to cause of death is also a matter of concern, but for the lack of corroborative evidence and advanced putrefaction in these cases.

Table No. 5: Exhumation and opinion as to cause of death

Opinion as to Cause of death	Number of cases	Percentage (%)
Positive opinion	23	67.65
No opinion	09	26.47
Opinion Pending	02	5.88

Cause of death established at Exhumation: **Table No. 6** points out that head injury was the commonest cause of death as identified in 23.52% of cases followed by poly trauma and asphyxia in about 12 % each of total cases. The other less common causes included electrocution, firearm injuries, lightening in 1% cases each and poisoning followed by natural diseases in 2% cases each.

In two cases, out of nine cases where opinion as to cause of death was not opined, wherein allegation of Homicide was made, the exhumation findings were neither helpful in confirmation nor to contradict the allegations made. Hence it can be inferred that exhumations have negative value rather than a positive value from Medico Legal point of view, because they can help to confirm with the suspicion but not to contradict the suspicion. In a study conducted by Wolfgang Grellner and Frank Glenewinkel¹¹, it is opined that the cause of death could be clarified with sufficient certainty in 78% of cases in their study is almost similar to the results observed in the current study.

Table No. 6: Final Opinion as to Cause of Death

Cause of Death	Total Number of cases	Percentage (%)
Head Injuries	8	23.52
Polytrauma	4	11.77
Asphyxial Deaths	4	11.77
Fire Arm Deaths	1	2.95
Electrocution	1	2.95
Lightening	1	2.95
Poisoning	2	5.88
Diseases	2	5.88
No Opinion	9	26.47
Pending	2	5.88

Exhumation and requirement of lab investigations: Analysis of Table no.7 indicate that in 14 cases (41.18%), the final opinion regarding the cause of death was given directly from the corporal findings immediately after exhumation, without any chemical, histological or laboratory investigations. A total number of 6(17.65%) cases demanded support of lab investigation for arriving at cause of death and only provisional diagnosis was expressed at exhumation. In another 6 cases, no opinion could be expressed regarding the cause of death immediately after exhumation. Conclusion as to cause of death could not be arrived in six cases even after arrival of lab investigations. These findings indicate that in majority of cases (42%) of the cases opinion as to cause of death was arrived straight away based on the lesions/injuries that were present over the exhumed dead bodies because the corporal evidence corroborated with history provided before investigation and hence procedural aspects and formulations prescribed for exhumation were not followed. However, it is strongly recommended that the procedural formulations are to be strictly implemented in all cases of exhumation specially in cases where lesions are minimal and compatible with life or if there are no lesions. In other words, the theory of exclusion

must be applied before concluding. A study conducted by Raffaella Bianucci et al¹² demonstrated that plague bacilli could be detected from bone fragments belonging to 16th century obtained by exhumation by using rapid diagnostic kits indicate the importance of laboratory investigations in establishing cause of death in exhumed dead bodies.

Table No. 7: Opinion as to cause of death and supportive investigations

Final opinion as to cause of death	Total Number of cases	Percentage (%)
Final Opinion with out Laboratory Investigations, etc.	14	41.18
No Opinion with out Laboratory Investigations, etc.	06	17.65
Provisional Opinion with Laboratory Investigations, etc.	06	17.65
No Opinion with Laboratory Investigations, etc.	06	17.65
Pending	02	5.88

CONCLUSION AND SUGGESTIONS

From the observations and discussions, the following conclusions and suggestions were made out:

1. The commonest postmortem change that was observed during the study was putrefaction which is leading to skeletonizing. Decomposition changes like adipocere and mummification are rare and mostly dependent on the depth and nature of soil of the grave. Red soils are found to initiate putrefaction, where as sandy soils are prone to initiate mummification in buried bodies.
2. The soft-tissue injuries over buried bodies can be made out as long as morphology of the region of body is maintained. Persistence of surface wounds and closed wounds like abrasions and contusions

is longer when compared to open wounds like lacerations and cut wounds.

3. The skeletal injuries usually give a positive conclusion regarding the cause of death and negative conclusion regarding the manner of death, and it is vice versa in case of soft-tissue injuries.
4. Head injuries are leading cause of violent deaths in exhumed bodies followed by polytrauma and asphyxias. This clearly establishes the need for careful examination and search of soft tissues for signs of trauma compared to skeletal injuries, which prolong them selves.
5. Establishment of the disease process is a Herculean task in exhumations, as most of the diseased process is confirmed to soft tissue only. Once the body undergoes extensive putrefaction the chances of identification of disease process is difficult except for skeletal lesions.
6. Conclusion of no opinion should be made before exhausting all available means like application of laboratory services, because the guilt and innocence of a person solely rest on medical opinion, as there is no witnesses and evidence in these cases. It is suggested to follow standard protocol and procedures are required to increase the chances of establishing cause of death at exhumation.

From the forensic pathologist point of view, an exhumation was nothing, but a case for establishment of identity and cause of death. However, the actual challenge lies beyond this if the corporal evidence is studied in a proper perspective to prove or disprove a matter in question by including the services of Forensic Science experts.

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Prognostic Value of Endoscopy in Paraquat Poisoning

Mehdi Torabi¹, Mohammad Mardiha Ahmad Abady², Azar Rastegari³

¹Assistant Professor of Emergency Medicine, Department of Emergency Medicine, Kerman University of Medical Sciences, Kerman, IRAN, ²Department of Emergency Medicine, Kerman University of Medical Sciences, Kerman, IRAN, ³Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of medical sciences, Kerman, IRAN

ABSTRACT

Objective: Since paraquat poisoning has a high mortality rate, determining the prognosis of the affected patients is of great importance. Although the gastrointestinal symptoms are the first and most common symptoms of paraquat poisoning, due to limited and contradictory studies, but the prognostic value of these symptoms and endoscopy has remained unclear.

Method: In this cross-sectional study, patients who were over 16 years old and suffering from paraquat poisoning were referred to the hospital in first 24 hours of poisoning and underwent endoscopy. These patients were investigated during five years. The hospital mortality rate was considered as the criterion for the evaluation of the patients' results.

Results: A total of 78 paraquat-poisoned patients were included in the study. The hospital mortality rate was observed to be 23.10%. According to the gastrointestinal endoscopic findings, the highest extent of the injury was Grade IV, which was observed in 44 patients (56.41%) and the most severe injury was Grade II-a, which was seen in 36 patients (46.15%). There was no significant relationship between the hospital mortality rate and the endoscopy findings in terms of neither the extent nor the severity of the injury.

Conclusion: Although the gastrointestinal system injury is first and the most common organic injury among the paraquat-poisoned patients, but gastrointestinal complications beside endoscopic findings have no prognostic value in determining the rate of hospital mortality. The amount of ingested toxin has significant values for predicting the mortality rate of the paraquat poisoned patients.

Keywords: Paraquat, Prognosis, Hospital mortality, Endoscopy, Gastrointestinal

Corresponding Author:

Mehdi Torabi

Assistant Professor of Emergency Medicine, Department of Emergency Medicine, Kerman University of Medical Sciences, Kerman, IRAN

Mobile : +98 9131992016

Fax: +98 3432474638

Email: mtorabi1390@yahoo.com

me_torabi@kmu.ac.ir

INTRODUCTION

Paraquat poisoning is a major medical health problem in Asia and other developing countries where, due to the lack of antidotes, it still contributes to the high mortality rate¹. This poison is a dipyridyl herbicide with a very high toxicity among human. In most cases, the poisoning occurs orally and a consumption of 3 to 6 grams is fatal. In Iran, paraquat exists in the form of 20% solutions. This toxin, through oxidative stress resulting from the production of superoxide anions, causes cell injury. Patients with mild poisoning (consumption of

7.5 ml of 20% solution) usually are either asymptomatic or show mild gastrointestinal symptoms and survive. Consumption of higher amounts leads to mortality through multiple organ failures^{2, 3}. Gastrointestinal symptoms are seen in the most patients who have consumed paraquat orally⁴⁻⁶. Immediately after the consumption, burn and corrosive lesions are observed in the mucosa of gastrointestinal system. Vomiting, the most common symptom, is followed by other common signs such as buccal lesions and dysphagia in the patients⁷⁻⁹. All cases of paraquat poisoning, even asymptomatic ones, should be investigated emergently. Therefore, an immediate endoscopy is recommended for determining the extent and severity of the gastrointestinal injury^{10, 11}. Usually, the lesions appear in the form of erosion and significant gastrointestinal bleeding might not occur^{12, 13}.

Determination of prognosis in paraquat poisoning is very important and several factors can be used in this regard. Among these factors, clinical symptoms¹⁴, hemodynamic instability^{15, 16}, demographic features¹⁷, laboratory findings¹⁸, and predicting scoring systems in the outcomes of critically ill patients^{19, 20} can be mentioned. One of these prognostic methods can be upper gastrointestinal endoscopy. Although the endoscopic scoring systems have been defined in determining the prognosis of the patients^{21, 22}, but there are limited and contradictory studies about endoscopic staging in the determination of prognosis^{22, 23}.

In this study, the endoscopic findings in paraquat-poisoned patients were investigated to find the severity and extent of the injury in the gastrointestinal system. Attempts have been made to answer this question: Do gastrointestinal complications and the severity and extent of gastrointestinal injury in endoscopy have any relationship with hospital mortality?

MATERIAL & METHOD

Study design: This cross-sectional study was performed on all paraquat-poisoned patients referred from April 20, 2011, till April 20, 2016, to the Afzalipour Hospital, Kerman, Iran. Afzalipour hospital

is the toxicology referral center in the southeast of Iran. Information about the medical files of the patients was collected by an emergency medicine resident and recorded in a previously designed questionnaire. A total of 138 paraquat poisoned patients were included. Patients, younger than 16 years, who had undergone an endoscopy later than the first 24 hours after the poisoning, or had not undergone any endoscopy or an incomplete endoscopy, had non-oral exposure to the toxin, and patients with insufficient information in their medical files were excluded from the study. Finally, a total of 78 patients were enrolled by the records of the medical files. Since there was no antidote for the treatment of the poisoning, all the patients were diagnosed and treated by a protocol designed by the same toxicologist. The study was supervised by an emergency medicine specialist. The endoscopy results that had been recorded in the medical files were graded according to the severity and location of the injury by the same gastroenterologist subspecialist (Table 1)^{22, 23}. Also, gastrointestinal complications were defined as follows: hematemesis, melena, hematochezia, and anemia [20].

This study was based on the Helsinki Accords (1975), revised in Hong Kong (1989), and was approved by the Ethics Committee of Kerman University of Medical Sciences (IR. KMU. REC. 1394.388). Informed consents were obtained from all the patients before participation.

Variables & outcome: The study variables included demographic features (age, sex, the amount of ingested toxin), endoscopy findings, and final gastrointestinal complications during the hospitalization that could potentially be associated with hospital mortality.

Statistical analysis: For describing the quantitative variables, mean and standard deviation (\pm SD) were used. For the qualitative variables, a percentage of frequency was used. The odds ratio (OR) and 95% confidence interval (CI) were used for expressing the severity of this association. A univariate analysis was done to find statistically significant associations ($p < 0.05$).

Table No. 1: Endoscopic findings of the upper gastrointestinal according to location OR severity of lesions

ENDOSCOPIC FINDINGS	
Based on location of lesion	
Grade I	oral or pharyngeal mucosa lesion
Grade II	oral cavity combined with focal esophageal lesions
Grade III	oral and diffuse esophageal lesions but without gastric lesions
Grade IV	oral and esophageal lesions accompanied by gastric lesions
Based on severity of lesion	
Grade 0	normal
Grade 1	edema, hyperemia of mucosa
Grade 2a	friability, blisters, hemorrhaging, erosions, whitish membrane exudates, an superficial ulcerations
Grade 2b	grade 2a plus deep discrete or circumferential ulcerations
Grade 3a	small areas of multiple ulcerations and areas of necrosis
Grade 3b	extensive necrosis

RESULTS

Basic characteristics: Among 78 patients, 45 patients were male (57.7%) and 33 patients were female (42.3%). Mean age (\pm SD) of the patients was 21.79 ± 5.95 years and the mean of ingested toxin was 41.83 ± 37.13 ml. The main GI symptoms of the patients were buccal pain (83.5%), vomiting (80.80%), dysphagia (34.20%), abdominal pain (19%) and diarrhea (11.40%). Hospital mortality was seen in 18 patients (23.10%) (Table 2).

Univariate analysis: Two the variables considered to have potential correlations with hospital mortality showed statistically significant associations. We performed an OR analysis with the same variables. There was a significant relationship between the amount of ingested toxin and hospital mortality, but not gastrointestinal complications (Table 3). The highest injury extent was Grade IV (56.41%) and the most severe injury was Grade 2a (46.15%). There was no significant relationship between hospital mortality and the endoscopy findings in terms of either the extent or the severity of injury (Table 4).

Table No. 2: Patients' characteristics

Variables	Number(%)
Gender	
Male	45(57.70)
Female	33(42.30)
Age(y), Mean \pm SD	21.79 \pm 5.95
Amount of ingested paraquat (mL)	41.83 \pm 37.13
Symptoms	
Buccal pain	66 (83.50)
Vomiting	63 (80.80)
Dysphagia	27(34.20)
Abdominal pain	15(19.00)
Diarrhea	9 (11.40)
Hospital Mortality	18 (23.10)

Table No. 3 : Univariate analysis of variables according to their association with hospital mortality

Variables	Mortality (Mean \pm SD)		OR (95%CI)	P Value
	NO	YES		
Amount of ingested paraquat (mL)	35.35 \pm 3.14	63.05 \pm 4.66	1.02 (1.004-1.35)	0.012
Gastro-intestinal complications N(%)	44 (55.70)		0.64 (0.26-0.77)	0.647

Table No. 4: Endoscopic findings of the upper gastrointestinal according to their association with mortality

Endoscopic Findings	Mortality, N(%)		OR (95%CI)	P Value
	No	Yes		
Based on location of lesion			1.48 (0.81-2.70)	0.196
Grade I	8(13.3)	0(0)		
Grade II	9(11.8)	2(11.1)		
Grade III	10(16.7)	5(27.8)		
Grade IV	33(55)	11(61.1)		
Based on severity of lesion			0.94(0.69-1.27)	0.695
Grade 0	8(13.3)	0(0)		
Grade 1	12(20)	0(0)		
Grade 2a	25(41.7)	11(61.1)		
Grade 2b	1(1.7)	1(5.6)		
Grade 3a	10(16.7)	6(33.3)		
Grade 3b	4(6.7)	0(0)		

DISCUSSION

According to the obtained results, it seems that the gastrointestinal complications and endoscopy findings could not have any significant prognostic value in determining the hospital mortality of the patients, who had been referred within the first 24 hours of poison ingestion and underwent endoscopy. The amount of ingested toxin posed significant values in predicting the hospital mortality in paraquat poisoning.

Several studies have been executed so far regarding the mortality predicting factors in paraquat poisoning, however, despite the fact that the most common symptoms of paraquat poisoning are gastrointestinal problems⁴, studies related the role of gastrointestinal injuries in predicting the mortality of these patients are very limited^{3, 9, 10}. In this study, like some other studies, buccal pain, vomiting, dysphagia, abdominal pain, and diarrhea were among the common gastrointestinal manifestations following the oral consumption of paraquat. However, these symptoms did not have any prognostic value for the hospital mortality of the patients.

Paraquat poisoning, due to produced free radicals, causes multiple organ failures (MOF). The mortality is higher among those with organ complications, especially pulmonary, liver and kidney failure that show poor prognosis^{18, 20, 21}. Unlike other complications, in this study, there was no association between gastrointestinal complications such as hematemesis, melena, hematochezia, anemia and hospital mortality. This shows that gastrointestinal complications play dim role in determining outcome.

In a case of poisoning through oral consumption, an immediate diagnostic endoscopy is recommended to determine the severity and the extent of injury²³. There are two predicting models for the involvement of the gastrointestinal tract, based on the endoscopy of upper GI - one shows the extent of involvement and the other the severity of injury^{24, 25}. The injuries are usually seen in the form of erosion in the gastrointestinal tract and it is probable that no significant gastrointestinal bleeding is seen^{12, 13}. These lesions are mostly seen in esophagus and stomach while the involvement of duodenum is rare^{24, 25}.

In this study, the results of the upper gastrointestinal tract endoscopy showed a variety of gastrointestinal injuries from mild to severe among all patients. In terms of the extent of injury, the most extensive GI involvement (grade 4) was in the form of generalized involvement from mouth to stomach (56.41%) and in terms of the severity of injury, the most severe injuries were ulcers, erosion, and exudates (grade 2a) reported in 46.5% of patients. In studying the relationship of these injuries with mortality, it was observed that although all these patients had gastrointestinal complications in the first 24 hours of referral, according to the statistical analysis, these injuries had no significant value in predicting the hospital mortality rate. It has been reported in one study that patients with the involvement extent of Grade III and IV have shown worse prognosis in comparison to those in Grade I and II. This indicates that gastric erosion is an ominous endoscopic sign, associated with high mortality. However, in our study, an increase in the injury extent was not associated with the increased mortality. Also, concerning the severity of the gastrointestinal injuries, the reports are contradictory and in some studies, high grade gastrointestinal injuries has not been seen due to the mild caustic agent²⁴. Despite other studies, in this research, high grade gastrointestinal injuries (Grade III-a, III-b) were also seen. Therefore, in paraquat poisoning, the results of endoscopy cannot be helpful in predicting the outcome of the patients. In gastrointestinal injuries with higher extent and severity, the probability of mortality may not be predictable with endoscopic findings.

Several studies have reported a relationship between the amount of ingested toxin and the mortality rate. The fatality of toxin has a significant relationship with the amount of ingested toxin^{3, 16, 17, 26}. In this study, patients who ingested more toxin had a higher mortality rate. It is expected that those who consume more than 40 ml paraquat would do higher mortality due to multiple organ failures²⁷. The significant relationship of the ingestion of more than 40 ml toxin with mortality proves this fact that this amount of toxin is fatal. This fact was proved in our study.

Limitations of the study: There were some limitations in this study. In our hospital, there was no possibility of serum paraquat measurement as confirmatory and prognostic test. Another limitation was selecting the patients from just one center but since this hospital is the only referral center for poisoned patients in the Southeast of Iran, this issue may have less importance. The incomplete information contained in the medical records files can be mentioned as another limitation of this study.

CONCLUSION

Although gastrointestinal symptoms are the first clinical manifestations of paraquat poisoning, but this injury beside endoscopic findings may have not prognostic value in determining the hospital mortality of the patients. The amount of ingested toxin has significant values for predicting the mortality rate of the paraquat poisoned patients.

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A Study of Pattern of Road Traffic Accident Cases—A Research Paper

Akshay Kumar Ramtake¹, Umesh S.R.²

¹Assistant Professor, Department of Forensic Medicine and Toxicology, Government Medical College, Ambikapur, Sarguja, Chhattisgarh, ²Professor & HOD, Department of Forensic Medicine and Toxicology, Gulbarga Institute of Medical Sciences, Kalaburagi, Karnataka

ABSTRACT

The aim of our study was to characterize the cases of RTA (Road Traffic Accident) admitted to the Basaveshwara Teaching & General Hospital (BTGH), M. R. Medical College, Kalaburagi. This is prospective study conducted at mortuary of Basaveshwara Teaching and General Hospital, Kalaburagi, Karnataka between November 2013 to August 2015, which included 48 cases of RTA. Out of 48 cases of RTA, (77.08%) cases were males and (22.92%) cases were females. Majority of the victims (54.17%) who died due to road traffic injuries were a motor cycle (two-wheeler) occupants. Most common offending vehicle involved in road traffic accidents was heavy motor vehicle (41.67%) cases. Most common body region involved was head and neck in (43.75%) cases. In majority of cases (45.83%) cause of death was due to head injury.

Keywords: RTA, Motor cycle (two-wheeler) occupants, Heavy motor vehicle, Head injury.

INTRODUCTION

Throughout the world, roads are bustling with cars, buses, trucks, motorcycles and other types of two and three wheelers. India has one of the largest highway and road network second only to road network of U.S. The total road length exceeds 3 million. By 2050, 267 million vehicles will be on Indian roads. Of the worldwide average of 7,00,000 RTA, 10% is in India. The latest annual statistics indicate over 80,000 are killed on Indian roads. Three lakh people sustain injuries every year. If current trends continue number of people killed and injured on roads will rise more than 60% between 2000 and 2020.¹

MATERIALS AND METHOD

This is prospective study conducted at mortuary of Basaveshwara Teaching and General Hospital, Kalaburagi, Karnataka between November 2013 to August 2015, which included 48 cases of RTA. The data is collected from Case papers, Inquest reports, post-mortem reports and from interviewing relatives and friends of deceased. The data thus obtained was analyzed and the study was done with respect to: age & sex wise distribution, status of victim, type of offending vehicle, body region involved and cause of death.

RESULTS

Distribution of RTA cases according to Age and Sex: Out of 48 cases of RTA, 37 (77.08%) cases were males and 11 (22.92%) cases were females, thus indicating that majority of victims were males. Male to female ratio was 3.4:1. Maximum number of victims 13 (27.08%) were in the age group of 21-30 years, followed

Corresponding Author:

Dr. Akshay Kumar Ramtake

Assistant Professor, Department of Forensic Medicine and Toxicology, Government Medical College, Ambikapur, Sarguja, Chhattisgarh-497001

by 11 (22.92%) victims and 08 (16.67%) victims were in the age group of 31-40 years and 51-60 years. Minimum numbers of victims were in the age group of less than 10 years 01 (2.08%).

Table No. 1: Distribution of RTA cases according to Age and Sex

Age (in Years)	Male	Female	Total No. of cases	Total Percentage (%)
<10	00	01	01	2.08
11-20	02	01	03	6.25
21-30	09	04	13	27.08
31-40	10	01	11	22.92
41-50	07	00	07	14.58
51-60	05	03	08	16.67
61-70	04	01	05	10.42
71-80	00	00	00	0
>80	00	00	00	0
Total	37 (77.08%)	11 (22.92%)	48	100%

Distribution of RTA cases according to status of the victim: Majority of the victims who died due to road traffic injuries were a motor cycle (two-wheeler) occupants comprising of 26 cases (54.17%) followed by Pedestrians 11 (22.92%) cases and occupants of light motor vehicle 06 (12.4%) cases and least cases were of pedal cyclist 01 (2.08%) case. Most of the two-wheeler occupants were riding the motor cycle.

Table No. 2: Distribution of RTA cases according to status of the victim

Status of Victim	Total No. of Cases	Total Percentage (%)
Pedestrians	11	22.92
Pedal cyclist	01	2.08
Motor cyclist	26	54.17
Light motor vehicle	06	12.4
Medium motor vehicle	02	4.17
Heavy motor vehicle	02	4.17
Animal drawn vehicle	00	0
Total	48	100%

Distribution of RTA cases according to type of offending vehicle: Most common offending vehicle involved in road traffic accidents was heavy motor vehicle 20 (41.67%) cases followed by light motor vehicle in 09 (18.75%) cases and least was of fall from a moving vehicle in 03 (6.25%) cases. In 05 (10.42%) cases some of the other factors were responsible like, hitting a bridge or wall, etc.

Table No. 3: Distribution of RTA cases according to type of offending vehicle

Type of offending Vehicle	Total No. of cases	Total Percentage (%)
Motor cycle	07	14.58
Light motor vehicle	09	18.75
Medium motor vehicle	04	8.33
Heavy motor vehicle	20	41.67
Fall from a moving vehicle	03	6.25
Others	05	10.42
Total	48	100%

Distribution of RTA cases according to body region involved: Most common body region involved was head and neck in 21 (43.75%) cases, followed by more than one region in 19 (39.58%) cases and extremity 05 (10.42%) cases. In minimum number of cases 02 (4.17%) and 01 (2.08%), abdomen & pelvis and thorax were involved.

Table No. 4: Distribution of RTA cases according to body region involved

Body region	Total No. of cases	Total Percentage (%)
Head & Neck	21	43.75
Thorax	01	2.08
Abdomen & Pelvis	02	4.17
Extremity	05	10.42
More than one region	19	39.58
Total	48	100%

Distribution of RTA cases according to cause of death: In majority of cases 22 (45.83%) cause of death was head injury, followed by hemorrhagic shock in 16 (33.33%) cases and others 08 (16.67%) cases including pulmonary embolism, fat embolism, etc as cause of death. In 02 (4.17%) cases spine injury was cause of death.

Table No. 5: Distribution of RTA cases according to cause of death

Cause of death	Total No. of cases	Total Percentage (%)
Head injury	22	45.83
Spine injury	02	4.17
Hemorrhagic shock	16	33.33
Others	08	16.67
Total	48	100%

DISCUSSION

Out of 48 cases of RTA, 37 (77.08%) cases were males and 11 (22.92%) cases were females, thus indicating that majority of victims were males. Male to female ratio was 3.4:1. Maximum number of victims 13 (27.08%) were in the age group of 21-30 years, followed by 11 (22.92%) cases and 08 (16.67%) cases were in the age group of 31-40 years and 51-60 years. Minimum numbers of victims were in the age group of less than 10 years 01 (2.08%).

Our result was similar to the observations made in the study conducted by Patil SS et al (2008)² in which males were 82.3% and females were 17.7%. Maximum numbers of victims 29.4% were in the age group of 20-29 years; by Sharma D et al (2011)³ in which males were 77.3% and females were 22.7%. Maximum numbers of victims 28.8% were in the age group of 21-30 years; by Singh P & Verma SK (2015)⁴ in which males were 79.9% and females were 22.1%. Maximum numbers of victims 33.2% were in the age group of 21-30 years.

Majority of the victims who died due to road traffic injuries were a motor cycle (two-wheeler) occupants comprising of 26 cases (54.17%) followed by Pedestrians 11 (22.92%) cases and occupants of light motor vehicle 06 (12.4%) cases and least cases were of pedal cyclist 01 (2.08%) case. Most of the two-wheeler occupants were riding the motor cycle.

The observations in our study were similar to the study done by Palimar V et al (2005)⁵ in which two wheeler occupants were the most common type of road user involved (39.6%), followed by pedestrians (37.4%); by Patil SS et al (2008)² where motorized

two-wheeler occupants were highest in number, i.e. 61 (35%); by Tandle RM & Keoliya AN (2011)⁶ in which the motor-cyclists (36.90%) were the commonest group of victims; by Kuchewar SV et al (2012)⁷ where mostly two wheelers were involved in 86 (39.8%) cases; by Akhade SP et al (2014)⁸ where two-wheeler drivers (59.4%) were the most vulnerable victims.

Most common offending vehicle involved in road traffic accidents was heavy motor vehicle 20 (41.67%) cases followed by light motor vehicle in 09 (18.75%) cases and least was of fall from a moving vehicle in 03 (6.25%) cases. In 05 (10.42%) cases some of the other factors were responsible like, hitting a bridge or wall, etc.

The findings in our study were correlated with the study done by Panda S et al (2009)⁹ where trucks (HMV) were found to be the major offending vehicle involved in 33.54% of incidences; by Tandle RM & Keoliya AN (2011)⁶ in which trucks (HMV) 59.81% being the commonest offending vehicles.

Most common body region involved was head and neck in 21 (43.75%) cases, followed by more than one region in 19 (39.58%) cases and extremity in 05 (10.42%) cases. In minimum number of cases 02 (4.17%) and 01 (2.08%), abdomen & pelvis and thorax were involved.

The observation was similar to the study done by Singh P & Verma SK (2015)⁴ in which head and face was the most common part of the body involved in (38.7%) cases.

In majority of cases 22 (45.83%) cause of death was head injury, followed by hemorrhagic shock in 16 (33.33%) cases and others 08 (16.67%) cases including pulmonary embolism, fat embolism, etc as cause of death. In 02 (4.17%) cases spine injury was the cause of death.

The findings in our study correlated with the study done by Tandle RM & Keoliya AN (2011)⁶ where the head injury was the commonest cause of death comprising 39.57% cases; by Kuchewar SV et al (2012)⁷ in which the head injury was major cause of death and was seen in 49.54% of victims; by Kyada HC

et al (2012)¹⁰ in which head injury (54.03%) followed by hemorrhagic shock (17.11%) were main causes of death; by Farooqui JM et al (2013)¹¹ in which majority of RTA victims (46.93%) died due to head injury; by Akhade SP et al (2014)⁸ where head injury alone was the sole cause of death in most of the cases (70.79%).

CONCLUSION

In our study we conclude that, Out of 48 cases of RTA, (77.08%) cases were males and (22.92%) cases were females. Majority of the victims (54.17%) who died due to road traffic injuries were a motor cycle (two-wheeler) occupants. Most common offending vehicle involved in road traffic accidents was heavy motor vehicle (41.67%) cases. Most common body region involved was head and neck in (43.75%) cases. In majority of cases (45.83%) cause of death was due to head injury.

Conflict of interests: The author declares that there is no conflict of interests.

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Ethical clearance: Yes

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Preparation and Characterization of Nanocomposite Silica Supported Silica Gel by Sol-Gel Surface Imprinting Technology

Mohamad Raizul Zinalibdin^{1,2}, Jafariah Jaafar¹, Zaiton Abdul Majid¹, Mohd Marsin Sanagi¹

¹Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia, ²Department of Chemistry, Johor Branch, Jalan Abdul Samad, 80100 Johor Bahru, Johor, Malaysia

ABSTRACT

In this study, a novel adsorbent material based on nanocomposite silica supported silica gel was successfully prepared and developed. This adsorbent material was prepared via sol-gel method using 3-(propylmethacrylate)trimethoxysilane/ nanocomposite silica (SN), acetic acid as catalyst, hippuric acid (HA) as template, acetonitrile as solvent and supported by silica gel. The nanocomposite silica was employed as an adsorbent for extraction of hippuric acid. The NS prepared using 800 μ L of 3-(propylmethacrylate)trimethoxysilane), (0.30 mmol/L of hippuric acid), 700 μ L acetonitrile as solvent and 600 μ L of acetic acid was found to exhibit better sorption for hippuric acid. The characterization of NS was observed using fourier transform infra-red (FTIR) while texture properties by N₂ adsorption analysis.

Keyword: Nanocomposite silica, hippuric acid, sol-gel.

INTRODUCTION

Destruction of adsorbent during extraction using micro-extraction packed sorbent technique is became serious problems. Biological samples such as plasma and urine sample can affect the adsorbent physical properties and the adsorbent can be deteriorated after handling of few samples. Therefore, preparing stable, durable and reusable adsorbents is an important challenge today^(1, 2) the MEPS sorbent bed is integrated

into a liquid handling syringe that allows for low void volume sample manipulations either manually or in combination with laboratory robotics. The key aspect of MEPS is that the solvent volume used for the elution of the analytes is of a suitable order of magnitude to be injected directly into GC or LC systems. This new technique is very promising because it is fast, simple and it requires very small volume of samples to produce comparable results to conventional SPE technique. Furthermore, this technique can be easily interfaced to LC/MS and GC/MS to provide a completely automated MEPS/LC/MS or MEPS/GC/MS system. This extraction technique (MEPS).

In the present study we present a new and robust adsorbent by modification of silica gel surfaces with nanocomposite silica sol-gel method. This adsorbent is robust, durable and can prevent formation of

Corresponding Author:

Mohamad Raizul Zinalibdin

Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

Email: mohdraizul@kimia.gov.my

imperfections in the adsorbents matrix during the extraction process. Nanocomposite silica on the account of their adsorbent properties, porous nature and increased surface area allow more effective extraction⁽³⁾.

Sol-gel imprinting methodology is used in this research, which can generate durable, reusable, porous and both thermally and chemically stable adsorbents from various precursors for sample preparation^(4,5). Therefore, sol-gel imprinting is appropriate for modifying a silica gel surface to create a selective extraction adsorbent. The sol-gel imprinting method is its ability to bind to surface through strong bonding, which increases the robustness and lifetime of the adsorbents became the great highlight in this research.

Silica gel was used as a supported in imprinting sol-gel process. Silica gel are widely used commercially because of their high mechanical, chemical and thermal stabilities. Moreover, they have an active site of Si-OH when activated it with strong acid and provide the covalent binding with nanocomposite silica^(6,7). This interaction can make a nanocomposite silica supported silica gel robust and suitable for multiple extractions.

Toluene has been the most widely used organic solvent in the industries in this decade^(8,9). It has been reported that exposure to high concentration of toluene will lead to a series of diseases such as acute and chronic respiratory effects, functional alterations of the central nervous system, mucosa and dermal irritations and chromosome aberrations (10–12). Inoue et al., (2007) defined the biomarker of toluene exposure excreted in urine are 82.3% hippuric acid, 0.06% *o*-cresol and 0.03% benzylmercapturic acid^(13,14). Therefore, studies were strictly concentrated on hippuric acid metabolite as this a higher metabolite excreted in urine sample.

To the best our knowledge here, the surface of a silica gel was modified with nanocomposite silica sol-gel method and subsequent used as a selective and durable adsorbent in dispersive solid phase extraction technique.

MATERIAL AND METHODS

Materials and chemicals: Hippuric acid (HA) and 3-(propylmethacrylate)trimethoxysilane (3-PMTMOS), with purity 98% were purchased by Sigma Aldrich (United State of America) while acetonitrile (ACN), acetic acid, hydrochloric acid (HCL), silica gel and sodium hydroxide were supplied from Merck (Darmstadt, German).

Silica gel Activation: The silica gel surfaces were activated by combination of 10 g of the silica gel with 100 mL of 6 mol/L hydrochloric acid. The resultant mixture was refluxed under stirring for 10 hours. The solid product was filtered and washed repeatedly with double deionized water to neutrality and dried at 110 °C for 10 hours^(6,7).

Synthesis of silica nanocomposite supported by silica gel : The sol-gel nanocomposite solution, which was used for modification of the silica gel was optimized carefully by adjusting the amount of the precursor and template amount as listed in Table 1. A mixture of 800 µL of 3-PMTMOS as precursor and 700 µL hippuric acid (HA) (0.3mmolL⁻¹) as template molecule was sonicated for 30 minutes to prepare the a nanocomposite silica (SN) sol-gel solution with the maximum binding probability. Then, (600µL) acetic acid was slowly added stepwise (200µL each step) and sonicated for another 10 minutes. This was followed by dropwise addition of 200µL distilled water to start hydrolysis process and the solution was kept in this state for 30 minutes. Finally, to form nanocomposite silica sol-gel layer supported onto silica gel, it was immersed in activated silica gel and leave it the solution two days to create the maximum binding between nanocomposite silica and silica gel. For polycondensation process, the nanocomposite silica supported by silica gel was subjected to a temperature at 105°C for 8 hours. After completing these steps, this nanocomposite silica supported by silica gel was washed with a mixture of methanol: acetic acid (9:1) by soxhlet extraction for 24 hours to remove the trapped and create a porous selective surface^(15–18) “given” :

Physical characterization of nanocomposite silica: Nitrogen adsorption porosimetry measurements

were performed on an ASAP 2010 accelerated surface area and porosimetry analyser (Micromeritics 3Flex Version 3.01 Instrument Corporation, Norcross, GA). Prior to measurements, 300-400 mg portions of sample were degassed overnight at 100°C under high vacuum. The specific surface areas (S) were calculated using standard BET method and specific pore volumes (V_p) and average diameters (d_p) using BJG theory. Fourier transform infrared spectra of activated silica, nanocomposite silica unleached and nanocomposite silica leached were done using potassium bromide (KBr) pellet technique and recorded in the range of 400-4000 cm^{-1} by Perkin Elmer spectrometer (model 707, Germany).

Adsorption and Desorption Study: A stock solution of hippuric acid at a concentration of 200 mg/L was prepared by acetonitrile-distilled water (10:90 v/v) and stored at 4°C in the refrigerator. 0.2 g of nanocomposite silica (SN) was weighed and used as an extraction medium. Prior conducting adsorption study, the SN was immersed with a mixture of methanol/acetic acid (8:2) for 1 hours to remove the hippuric acid template and activate the surface. The SN was placed in the stock solution (200 mg/L) and stirred for 15 minutes. The amount of hippuric acid bound to the SN was calculated by subtracting the amount of free hippuric acid from the initial amount added in the mixture (19). For the desorption procedure, SN was sonicated with several solvents on ultrasonic water bath for 10 minutes. The chromatographic system was equipped with a 150 mm x 2.0 mm i.d. reversed phase C18 column (Thermo Scientific, USA) using HPLC-UV Waters. Separation was carried out in isocratic mode using a mobile phase of distilled water, acetonitrile and acetic acid (84:16:0.025). The mobile phase flow rate was fixed at 1.0 mL/min. UV detection of analyte was at 225 nm (20).

RESULTS AND DISCUSSION

Characterization of Silica nanocomposite, Fourier Transform Infrared: The infrared spectra of activated silica, nanocomposite silica without template, nanocomposite silica unleached and nanocomposite silica leached was shown in Figure 1. The spectrum

was displayed almost a similar characteristic peaks, indicating similarity in the backbone structured of silica gel, however the intensity of absorbance was slightly different between the silica nanocomposite and activated silica. All silica nanocomposite were illustrated the parallel peaks around 1626-1634 cm^{-1} for O-H vibration, C=O stretching at around 1721-1729 cm^{-1} and the bands around 800 cm^{-1} resulted the Si-O vibrations. For, Si-O-Si stretching of activated silica, SN leached and SN without template showed similar peaks at around 1087-1092 cm^{-1} . In addition the similar O-H stretching peaks for activated silica, SN leached and SN without template were found at 3433-3438 cm^{-1} (15, 21).

The interesting of absorption bands for activated silica was found on O-H vibration at 1638 cm^{-1} because of activated silica gel not coated with any silane groups and no bonding was found on the spectrum. SN unleached displayed the interesting characteristics for Si-O-Si stretching vibration at 1099 cm^{-1} , absorption bands at 2962 cm^{-1} represented the stretching vibration of CH_3 and absorption band at 3473 cm^{-1} are assigned to the O-H vibration. This clearly prove that the template binding existed because of the shifting of absorption band for Si-O-Si (15, 22). However, for the O-H stretching shifting are very significant compared other spectrums. In addition, the CH_3 stretching absorption bands is very dominant. It can be conclude that the specific binding between template and propyl methacrylate group from precursor is exist.

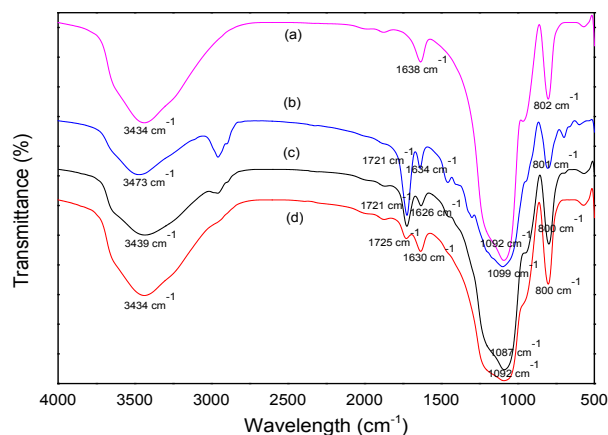


Figure No. 1: Fourier Transform Infrared (FTIR) spectrums of (a) activated silica, (b) SN unleached, (c) SN without template and (d) SN Leached.

Nitrogen Adsorption Analysis: According to the fundamental of physisorption, it is practical to categorize pores based on their sizes. Therefore, Table 1 describes that SN without template and SN leached was categorized as mesopores (2-50 nm). Surface area, pore

volume and pore diameter of SN without template were showed higher value than SN leached. Table 1 below was tabulated the BET surface area, external surface area, pore volume and pore diameter for SN without template and SN leached.

Table No. 1: Surface area and pore analysis of SN without template and SN leached by nitrogen adsorption

Silica nanocomposite	BET surface area, S_{BET} (m^2/g) ^a	External Surface area, S_t (m^2/g) ^b	Pore volume (cm^3/g) ^c	Pore Diameter (\AA) ^d
SN leached	179.2	163.6	0.1284	39.76
SN without template	181.3	151.1	0.2843	49.04

Nanocomposite silica supported onto silica gel using sol gel method: In the preparation process, some important parameters were carefully considered. Optimization of the proper ratio between template and precursor to create maximum binding network and

better selectivity for nanocomposite silica is a critical issue. The results of this investigation showed that a HA 0.3 mmol/L:800 μL precursor (SN C2 in Table 2) is the optimize ratio with the highest recovery and selectivity compared to other SN.

Table No. 2: Recovery result for preparation of silica nanocomposite supported onto silica gel with different amount of template and precursor.

Nanocomposite silica	Template (mmol)	Solvent ACN (μL)	Precursor (μL)	Water (μL)	Acetic acid (μL)	Recovery (%)
SN A1	-	700	1000	200	600	28
SN A2	0.3	700	1000	200	600	92
SN B1	-	700	900	200	600	25
SN B2	0.3	700	900	200	600	95
SN C1	-	700	800	200	600	20
SN C2	0.3	700	800	200	600	98
SN D1	-	700	700	200	600	19
SN D2	0.3	700	700	200	600	88
SN E1	-	700	600	200	600	18
SN E2	0.3	700	600	200	600	84

Based on the tabulated table 2 all the nanocomposite silica has been successfully synthesize by sol gel technique. The preparation procedure via sol-gel method occurred in simple step which is hydrolysis and condensation. However, some of nanocomposite silica was not form fully gel because of the amount of precursor is not equivalent with amount of template. Because of this reason, the colloidal suspension is not occurred while in the process of synthesize this nanocomposite silica^(5, 23). This material should be immersing deeply to capture all the silica gel was fully coated onto nanocomposite

silica sol-gel solution. The poly condensation process should executed with higher temperature to deliver sol-gel solution became solidify in the silica gel. Thus, the higher temperature will evaporate the water and acetic acid. Meanwhile, the bonding between 3-PMTMOS, hippuric acid and silica gel will be occur^(16, 18) the surface of a polysulfone membrane (PSM).

Adsorption study: To evaluate the ability of the nanocomposite silica supported by silica gel for extraction of hippuric acid. Prior conducting adsorption

study, the 0.2 g SN was immersed with stock solution and stirred for 15 minutes. For the desorption procedure, SN was sonicated with several solvents on ultrasonic

water bath for 10 minutes. The hippuric acid was extracted by SN using C18 HPLC column and detection at a wavelength of 225 nm by UV detector (Figure 2).

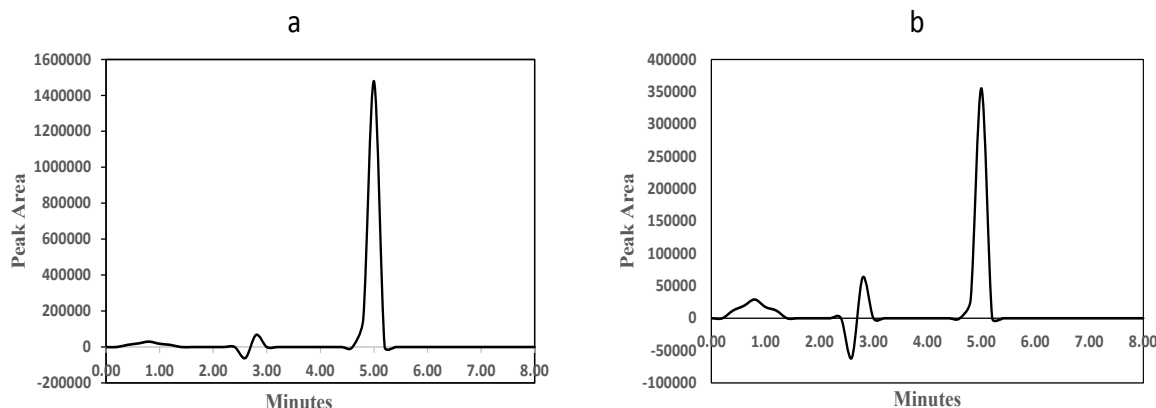


Figure No. 2: HPLC condition: isocratic, UV detector at 225 nm, mobile phase acetonitrile: distilled water: Acetic Acid (16:84:0.025); 1.0 mL/min flow rate. HPLC separation of silica nanocomposite supported by silica gel (a) extraction with 200 mg/L of hippuric acid standard (b) extraction of spiked with 100 mg/L hippuric acid in urine sample.

CONCLUSION

In this work, a novel 3-(propylmethacrylate) trimethoxysilane/silica nanocomposite (SN) supported by silica gel was developed via sol-gel method. BET results show higher surface area $179.2 \text{ m}^2\text{g}^{-1}$ and 3.97 nm pore diameter. From the characterization results, the nanocomposite silica supported silica gel has the ability to be the best adsorbent for the adsorption of hippuric acid.

This nanocomposite silica supported onto silica gel was applied for the selective extraction of hippuric acid. For future works, this nanocomposite silica would be applied for the extraction of hippuric acid in urine samples, whereby the real sample is collected from the medical surveillance sample.

Conflict of Interest: There are no conflict interests involved in this research.

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Ethical Clearance: Blank urine samples were taken by Department Chemistry of Malaysia, Johor Branch. Real urine samples will be taken by collaboration with Department of Occupational Safety & Health (DOSH).

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Pattern of Suicidal and Para-Suicidal Cases at J.N.M.C.H., A.M.U. Aligarh

Mohd. Kaleem Khan¹, Iram Khan², Abhishek Kumar Varshney³

¹Assistant Professor, Department of Forensic Medicine, ²Associate Professor, Department of Forensic Medicine, ³Assistant Professor, Department of Forensic Medicine

ABSTRACT

Intentional non-fatal acts which were aimed to end life are called Parasuicide acts. Because of under reporting of these cases and concealment of information about such attempted suicides, literature is scarce. Since, parasuicide survivor may be left with residual temporary or permanent disability, it should be dealt seriously. The only way to deal with parasuicide is by controlling risk factors for parasuicide, which will also be helpful in preventing completed suicides. This review presents the risk factors, socio-demographic profile and methods opted for parasuicide with an emphasis on the legal liabilities of parasuicide.

Key words: Disability, legal liabilities, parasuicide

INTRODUCTION

Suicide: An act with a fatal outcome, that is deliberately initiated and performed by the deceased himself in the knowledge or expectation of its fatal outcome, the outcome being considered by the actor as instrumental in bringing about the desired changes in consciousness and /or social conditions.¹ Suicide (Latin suicidium, from sui cadere, 'to kill oneself') is a leading cause of death among teenagers and adults under 35 years of age^{1,2}. It is one of the top 13 causes of death for all ages worldwide, as revealed by World Health Organization(WHO)³. It is believed that socioeconomic and behavioural factors are the fastest emerging cause of suicide in third world countries⁴.

Most commonly employed method of suicide in India was hanging 41% followed by poisoning in 2014. The highest incidents of 16,307 suicides were reported in Maharashtra followed by 16,122 suicides in Tamil Nadu.⁵

Parasuicide: An unusual act with non fatal outcome, that has been performed intentionally with the expectation of such an outcome, that causes self harm, or without intervention from others will do so, or consists of ingesting a substance fatal dosage, the outcome being considered by the actor as instrumental in bringing about the desired changes in expectancies and/or social conditions.⁶ It is defined as a conscious and voluntary act by an individual with intention to injure himself, and with the belief that he is unlikely to survive, but where the injury has not led to death.⁷ The incidence of parasuicide is greatly dependent on age, sex, race, religion, culture, marital status, habitat, climate and social systems.⁸ Erwin Stengel suggests that persons who 'attempt' suicide and those who 'commit' suicide, although represent two different categories, but, there do exists some 'overflow' from one to another.⁷ Ratio for suicide to parasuicide may vary from 1:3 to 1:10.3 and

Corresponding Author:

Dr. Iram Khan

Associate Professor, Department of Forensic Medicine,
Hind Institute of Medical Sciences, Safedabad,
Barabanki, U.P. India 225003
Email: driramkhan1011@gmail.com
Mobile: +91 8604624711

there are eight parasuicide for every suicide.^{8,9} Studies have revealed that young women attempt suicide more frequently than any other group.⁹

AIMS AND OBJECTIVES OF THE STUDY

This study was designed to study the suicide and parasuicide cases in terms of age, sex, method of attempt, possible precipitating factor and outcome of the event.

MATERIALS AND METHOD

- This retrospective study was conducted among victims of attempted suicides at JNCH Aligarh Uttar Pradesh from June 2015 to May 2016.
- A predesigned Proforma was used that included particulars of the victim, criterias of study and consent of the victim.
- History from patient and nearest attendant was considered.

Following Inclusion Criteria were considered

- Patient who presented to the emergency unit of J.N.M.C.H.; A.M.U. Aligarh with alleged history of suicide.
- Victims or patients who expired during treatment or discharged after treatment were also included.

Exclusion criteria

- Patient who did not give consent.
- Children less than 10 years of age were not considered.
- Patient more than 50 years were left out.
- Cases related to dowry death.
- Patients who did not complete their treatment.
- Patient who were referred for further treatment were also left out.

RESULTS AND DISCUSION

The cases of intentional deaths have always attracted the attention of the medical as well as the legal fraternity.

Although it is quite obvious that one has to 'attempt' suicide in order to 'commit' it, however, death is not the desired objective in all cases of suicide attempts.¹ All people with suicidal tendencies are not death seekers. In many cases it has been observed th the patient seek to communicate pain, to end loneliness, to avoid financial difficulties, to seek revenge and convey a whole lot of other meanings that are essentially individualistic.¹⁰

Overall, females are more susceptible to suicide attempt than males and it is in confirmation with other studies conducted.^{9, 10, 11} In our study (Table 1), females (53.01%) attempted more suicide as compared to males (46.99%). In the age group 11-20 more attempts of suicide were made (37.35%). Whereas, at higher age (41-50) attempts are few (8.43%). The female showed a lower propensity to suicide in middle ages 31-40 years as compared to males.

Table No. 1: Gender

Age groups	No. of cases		
	M	F	Total
11-20	12 (14.46%)	19 (22.89%)	31 (37.35%)
21-30	13 (15.66%)	16 (19.28%)	29 (34.93%)
31-40	11 (13.25%)	5 (6.02%)	16 (19.28%)
41-50	3 (3.61%)	4 (4.82%)	7 (8.43%)
	39 (46.99%)	44 (53.01%)	83

Table No. 1A: Suicide and Parasuicide Cases

Age group	No. of cases		
	Suicide	Parasuicide	Total
11-20	5 (6.02%)	26 (31.33%)	31 (37.35%)
21-30	12 (14.46%)	17 (20.48%)	29 (34.94%)
31-40	4 (4.82%)	12 (14.46%)	16 (19.28%)
41-50	3 (3.61%)	4 (4.82%)	7 (8.43%)
Total	24 (28.91%)	59 (71.08%)	83

Para suicide incidence (Table 1A) was about 71.08% as compared to suicide cases (28.91%). Parasuicide cases are more in 11-20 age group (37.35%), and about 72.28 % (60 cases) parasuicide cases were found between 11 to 30 years age group which is a young group as shown in a study by Platt et. Al¹². With age parasuicide is showing a decreasing trend.

Table No. 2: Suicide cases

Age group	No. of cases		
	Male	Female	Total
11-20	2 (8.33%)	3 (12.50%)	5 (20.83%)
21-30	5 (20.83%)	7 (29.17%)	12 (50.0%)
31-40	3 (12.50%)	1 (4.17%)	4 (16.67%)
41-50	1 (4.17%)	2 (8.33%)	3 (12.50%)
Total	11 (45.83%)	13 (54.17%)	24

Suicide was more common in females (54.17%) than males (45.83%) in almost all age groups (Table.3). It is in disagreement with almost all the studies done in India [13, 14, 15, 16, 18, 19, 20, 21, 22 and 23]. Parasuicide (Table 4) is more common in **females** about (52.54%) and most severe trend in 11-30 years group, i.e. 72.88 %, whereas the age advances the trend is similar in both age sexes [9, 10, 11 and 12]

Table No. 3: Parasuicide

Age group	No. of cases		
	Male	Female	Total
11-20	10 (16.95%)	16 (27.12%)	26 (44.07%)
21-30	8 (13.56%)	9 (15.25%)	17 (28.81%)
31-40	8 (13.56%)	4 (6.68%)	12 (20.33%)
41-50	2 (3.39%)	2 (3.39%)	4 (6.68%)
Total	28 (47.46%)	31 (52.54%)	59

Table No. 4: Method used

Method used	No. of cases	
	Para suicide	Suicide
Hanging	24	8
Organophosphorus compounds	6	5
Aluminium Phosphide	1	4
Other poisons	11	2
Firearm	3	4
miscellaneous	14	1
Subtotal	59	24
Total	83	

Hanging was the most preferred method (Table 5) of attempting suicide, which is about 38.55% and organophosphorous compounds 13.25 % the second most common method involved corresponding to the data by National Crime Records Bureau⁵. Hanging again the most common method leading to parasuicide about 40.67 %, followed by poisoning i.e 30.50.⁵

Table No. 5: Precipitating cause

Precipitating cause	Total
Failure in love affairs	17 (20.48%)
Chronic illness	9 (10.84%)
Psychiatric illness	5 (6.02%)
Family problems	36 (43.37%)
Unknown	16 (19.28%)
Total	83

Family dispute tops (Table 6.) as precipitating factor (43.37%) followed by Failure in love affairs (20.48%). Attempting suicide by some unknown causes (19.28%) was the third largest factor.

CONCLUSION

Parasuicide or attempted suicide is affecting the lives of a significant proportion of the population and needs attention, less; it will become a major problem. It should be considered equally dangerous as suicide, because of the residual temporary or permanent disability suffered by survivor.

Suicide is in itself a complicated issue because of the ethical, legal, sociological and psychological problems associated with it.

Both suicide and parasuicide are the problems of grave concern, which are impinging the lives of a significant proportion of the population. The major barrier that is affecting the management, understanding about why people attempt suicide and how it can be prevented is the stigma of shame leading to underreporting and concealment of information.

- There is no conflict of interest among authors and funding source involved.
- This paper has got all ethical clearance from the existing body of the college.

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Estimation of Stature by Direct and Indirect Length of Distal Phalanx of Thumb

More Raghunath¹, Royana Singh²

¹Assistant Professor, ²Professor Department of Anatomy, Institute of Medical Sciences, Banaras Hindu University.

ABSTRACT

Identification of person is one of the important aspect of forensic investigation. Many researchers were conducted studies for stature estimation from anthropometric measurements of different parts of body, however in available literature very few studies conducted on direct and indirect thumb measurements for the individual's stature estimation. Therefore attempt was to estimate stature of an individual in medicolegal cases where only finger prints and palm prints are available for analysis. The study was carried out 200 subjects. Measurements of distal phalanx of thumb directly with vernier caliper and indirectly by thumb print measurements were taken independently Stature of each individual was also recorded. These parameters were tabulated and analyzed. Males show higher mean values in each anthropometric dimension than females. The bilateral variation was insignificant for all the measurements. Linear regression equations for stature estimation were calculated and checked for their accuracy by comparing the estimated stature and actual stature.

Keywords: forensic science, Direct thumb length, thumb impression, stature estimation, distal phalanx, forensic.

Identification of skeletonised or mutilated body is important part of forensic investigations in medicolegal cases, it is also immensely needed by the medicolegal experts or medical jurisprudence and in the anthropological research¹ when there is complete dead body is there it is easy to identify the individual. but in case of murders, accidents or natural disasters it becomes very difficult. The ultimate aim of using anthropometry in forensic science is to help the law

enforcement agencies in achieving 'personal identity' in case of unknown human remains². Artist use dimensional relationships in depicting the ideas of beauty, and this resulted in creation of rules of body proportions. Applications of anthropological study are very vast anthropological measurements are utilized for designing proper equipments for industries, defense forces³. In management of patients of burns body surface area is calculated from height and weight where thumb length helps in estimation of height. This study can be useful in artificial limb centers in calculating appropriate length of prosthesis³. In criminal cases like robbery, homicidal cases where only thumb prints or hands prints are available no body parts or remains available to the forensic experts, in such cases stature estimation of criminal only from thumbprints will play very crucial role to arrest accused person.

Correspondence author:

Dr. Raghunath Shahaji More

Department of Anatomy, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005

Mobile: 8808628696

Email: psychiatry.more@gmail.com

Till date, most of the workers on stature estimation have used the length of bones such as femur, tibia, humerus, radius. Also some workers done for calculation of height from finger length also. But this study mainly focus on stature estimation not only from direct measurements of thumb but also from thumb impressions Hence attempt of this study will help immensely to forensic experts in investigations of criminal cases.

MATERIALS AND METHOD

The present study consists of a cross- sectional sample of 200 subjects consisting of male (100) and females(100). Students and staff of our medical college taken part in the study. Ethical clearance was given by institutional ethical committee. Anthropometric measurements viz. thumb length direct and indirect by thumb impressions taken independently the right and left side of each individual with vernier caliper. Stature of each individual was also recorded.

All the measurements were taken in a well lighted Room Before taking the measurements, each subject was asked to remove the shoes. The measurements were taken by one observer(AS) in order to avoid inter-observer error. All the measurements were taken at fixed time between 2.00 pm to 4.30 pm. The data were subjected to statistical analysis using statistical package for social sciences (SPSS) and regression formulae were calculated for various.

Measurements were taken as shown in fig-1, fig- 2, fig-3.fig.4.

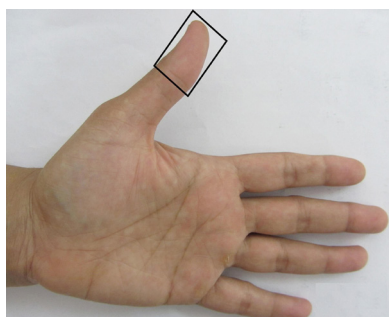


Figure No. 1: Showing part of thumb to be taken for measurements

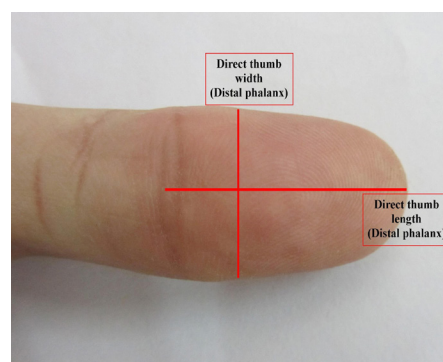


Figure No. 2: Showing Direct Thumb Length and Breadth Measurements

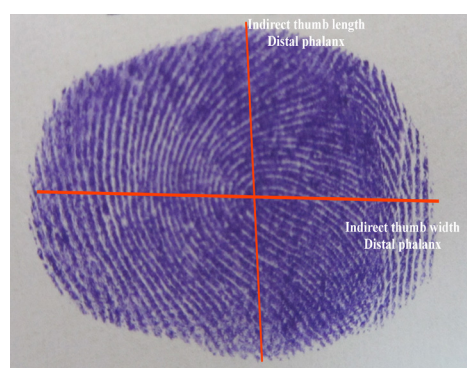


Figure No. 3: Showing Indirect Thumb Length and Breadth Measurements

Technique of height measurement

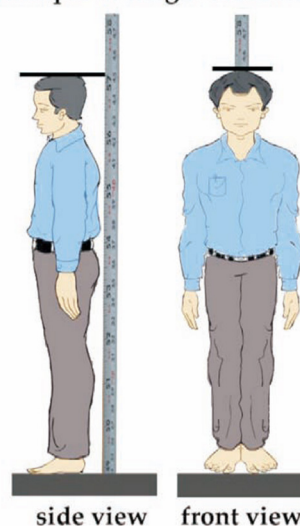


Figure No. 4: Showing Measurement of height

Inclusion criteria: Subjects between the ages of 18-60years of Indian origin.

Method of collection of data: Informed written consent was taken from the subject.

MEASURES

The measurements were taken using standard anthropometric instruments in centimeters to the nearest millimeter according to the techniques described by Vallois⁴.

- 1. Direct thumb length and width:** Each subject was asked to place his/ her hand on a white paper with the palm facing downwards keeping the fingers separated and separated with the thumb lying comfortably. To measure the length of thumb with digital vernier caliper of 30 cm length and 0.01 cm accuracy was used. Width of the thumb is taken As maximum width as shown in fig.1 and fig.2.
- 2. Indirect thumb length and width:** Each subject is asked to make thumb impression of right and left thumb on white paper. Procedure for thumb impression was followed as usually done in court cases for identification. Measurements length and width of thumb impression taken with help of scale. Shown in fig. 3
- 3. Measurement of height using Stadiometer:** It is the vertical distance between the point vertex and

the floor. The subject is made to stand in an erect posture and measurement is taken without any wear on head and foot. The subject should stand up against the wall, feet axis parallel or slightly divergent with head balanced on neck in F.H. (Frankfurt's horizontal) plane. As Shown in fig.4.

RESULTS AND DISCUSSION

Stature, direct and indirect thumb length and width of both sexes were taken. The data was tabulated, analyzed and subjected to statistical analysis using SPSS software windows (statistical package for social science version 11.0).

Estimation of stature is an essential pre- requisite in any medico-legal condition and anthropological study. The mean direct thumb length & breadth and the mean indirect thumb length and breadth are calculated in the present study. The measurements of right side are seen to be more than on left side, but there was no statistically significant difference. The mean height of males is 169.22 cm and of females is 154.80 cm.

Table No.1: Showing the measured parameters of males and females (cm)

Parameters	Males		Females	
	Right	Left	Right	Left
	mean and S.D	mean and S.D	mean and S.D.	mean and S.D.
Height	169.22 ± 5.61	169.22±5.61	154.80±6.59	154.80±6.59
Thumb length (direct)	2.95±0.30	2.85 ± 0.29	2.51±0.24	2.51±0.29
Thumb Width (direct)	1.81±0.23	1.76±0.29	1.51±0.75	1.51±0.22
Thumb length (indirect)	3.53±0.34	3.52±0.19	3.21±0.31	3.21±0.31
Thumb width (indirect)	2.30±0.23	2.26±0.28	2.06±0.18	2.06±0.18

The regression equations of direct and indirect measurements of male and females have been formulated

on the basis of multiplication factor and standard error of estimate, shown in Table No. 2.

Table No. 2: Regression equations derived to estimate stature from males and females direct and indirect thumb measurements

Sex	Parameters		Regression equations	Correlation Coefficient	SEE
Male direct	Thumb length	Rt	$stature = 150.12 + 6.47 RTL$	0.34	5.39
		Lt	$stature = 164.00 + 1.83 LTL$	0.10	5.71
	Thumb width	Rt	$stature = 157.66 + 6.37 RTW$	0.26	5.55
		Lt	$stature = 154.21 + 8.53 LTW$	0.29	5.49
Male indirect	Thumb length	Rt	$stature = 156.17 + 3.70 RTL$	0.22	5.60
		Lt	$stature = 153.51 + 4.44 LTL$	0.21	5.72
	Thumb width	Rt	$stature = 173.71 + -1.95 RTW$	-0.08	5.60
		Lt	$stature = 173.40 + -1.84 LTW$	-0.08	5.72
Female direct	Thumb length	Rt	$stature = 139.66 + 5.80 RTL$	0.21	6.55
		Lt	$stature = 153.51 + 0.51 LTL$	0.02	6.70
	Thumb width	Rt	$stature = 153.06 + 1.06 RTW$	-0.20	6.66
		Lt	$stature = 156.55 + -1.16 LTW$	-0.03	6.70
Female indirect	Thumb length	Rt	$stature = 133.78 + 6.50 RTL$	0.31	6.38
		Lt	$stature = 131.89 + 7.14 LTL$	0.34	6.30
	Thumb width	Rt	$stature = 152.53 + 1.10 RTW$	0.03	6.70
		Lt	$stature = 154.01 + 0.38 LTW$	0.01	6.70

The higher correlation of the measurement values both in male and female was suggestive of the fact that the stature estimated from the thumb length or thumb print length would be more reliable and nearer to observed value, shown in Table No. 3.

Table No. 3: Showing Comparison between mean and estimated height of males and females

Parameters used in regression equation	Males		Females	
	Mean Actual height (cm)	Mean Estimated height (cm)	Mean Actual height (cm)	Mean Estimated height (cm)
Direct Right thumb length	169.22	168.66	154.80	153.70
Indirect Right thumb length	169.22	168.85	154.80	153.73
Direct left thumb length	169.22	168.84	154.80	153.68
Indirect left thumb length	169.22	168.85	154.80	153.79
Direct Right thumb width	169.22	168.85	154.80	153.69
Indirect Right thumb width	169.22	168.84	154.80	153.68
Direct left thumb width	169.22	168.86	154.80	153.68
Indirect left thumb width	169.22	168.84	154.80	153.68

Abbreviations :

RTL- right thumb length LTL- left thumb length

RTW- right thumb width

LTW- left thumb width

Trotter and Glessner 1958 used the regression equation for predicting the stature in American whites⁵.

Estimation of stature from hand, finger and phalangeal length has been reported by Saxena 1984, Thakur and Rai 1987⁶. but very few studies have been reported related only to distal phalanx /thumb print length for stature estimation.

Lalit Kumar et al 2012 also done research on stature estimation from thumb length but he had considered whole thumb both proximal as well as distal phalanx⁷.

Sharma and Kapoor have reported this method. Therefore in the present study an attempt have been made to estimate the stature not only from phalangeal length but also with the help of their impressions⁸.

The thumb length and thumb print length does not vary from population to population so the stature estimated on the basis of this length may have relatively broader use.

It will be also useful for the police department in the stature estimation of individual if only finger print length is available.

CONCLUSION AND RECOMMENDATIONS

The results of the present study show that we can measure height only from direct thumb length and thumb print length which is helpful to the law enforcement agencies and forensic scientists. The only precaution which must be taken into consideration is that these formulae are applicable to the population from which the data have been collected due to inherent population variations in these dimensions which may be attributed to genetic and environmental factors like climate, nutrition etc. This study is help to provide database for biometrics. The data collected can be utilized for future anthropological studies.

Conflict of interest – No conflicts of interest

Source of Funding – self

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Homicidal Head Injury in Prison—A case report

A G Pathak¹, N A Devraj², K M Chaudhari³, R Y Thakur⁴ R K Gadhari²

¹Professor & Head, Dept of FMT, SBHGMC Dhule, ²Assistant Professor, Dept of FMT, SBHGMC Dhule,
³Associate Professor, Dept of FMT, SBHGMC Dhule, ⁴Assistant Professor, Dept of Pathology, SBHGMC Dhule

ABSTRACT

Brain damage as a result of head injury constitutes a major problem worldwide, and head injury is the most common emergency encountered in trauma units and casualty departments. Head injury forms an important aspect of both clinical and forensic work. From a medico-legal point of view, it is essential to determine whether death occurred due to head injury or its complications, and whether any resultant intracranial lesions were due to natural or unnatural causes. We are hereby presenting a unique case of homicide of the year 2016, in which inmate of a prison had been hit on head and posterior part of neck with a brick by fellow inmate in prison premises.

Keywords: homicide, prison, head injury, blunt weapon, skull fracture, sub-dural hemorrhage & sub-arachnoid hemorrhage, injury to spinal column.

INTRODUCTION

Head injury, as defined by the National Advisory Neurological Diseases & Stroke Council, “is a morbid state, resulting from gross or subtle structural changes in the scalp, skull and or the contents of the skull, produced by mechanical forces”. [1, 2]

Brain damage as a result of head injury constitutes a major problem worldwide, and head injury is the most common emergency encountered in trauma units and casualty departments. Multiple traumas in which head injury plays an important role is also the leading cause of death in any given population, especially in people less than 45years of age. [3]

Thus head injury forms an important aspect of both clinical and forensic work. From a medico-legal point of view, it is essential to determine whether death occurred due to head injury or its complications, and whether any resultant intracranial lesions were due to natural or unnatural causes.[4]

Hemorrhages within the cranial cavity have a particular significance in forensic medicine & they are the cause of many deaths & disability following head injuries.[5]

We are hereby presenting a unique case of homicide of the year 2016, in which inmate of a prison (70yr old male, known case of diabetes mellitus) who had been hit on head and posterior part of neck with a brick by fellow inmate in prison premises. The deceased was immediately taken to the nearest government district hospital where he was admitted and succumbed to injuries after 24 hrs and 25 mins of hospitalization.

Post-mortem examination was conducted at government medical college by team of forensic pathologists and following external and internal findings were noted. There was no evidence of custodial torture by the authorities during post-mortem examination.

Corresponding Author:

Dr. Nilesh A Devraj

Assistant Professor,
Department of Forensic Medicine & Toxicology,
Shri Bhausaheb Hire Medical College, Dhule
Maharashtra, India, 424001.
Email: nildev22@gmail.com

EXTERNAL INJURIES

- (1) Contused lacerated wound present over scalp at vertex in midline situated 11cm above the glabella of size $5 \times 3\text{cm} \times 0.25\text{cm}$, brownish-bluish scab present. Dry blood stains present at surrounding area. Evidence of stitches present. Stitches intact.



Photo No. 1: Contused lacerated wound present over scalp at vertex

- (2) Contused abrasion present 0.5cm lateral to injury no 1 of size $2 \times 1\text{cm}$, brownish-bluish in color. The surrounding area was depressed.

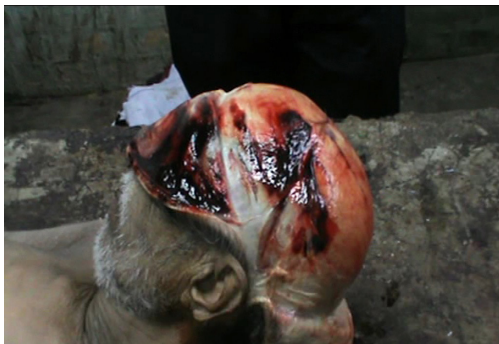


Photo No. 2: Under scalp hematoma present over left fronto-parietal region

- (3) Contused abrasion present over left frontal region situated 6cm above to left eyebrow of size $1\text{cm} \times 1.5\text{cm}$, brownish-bluish in color.

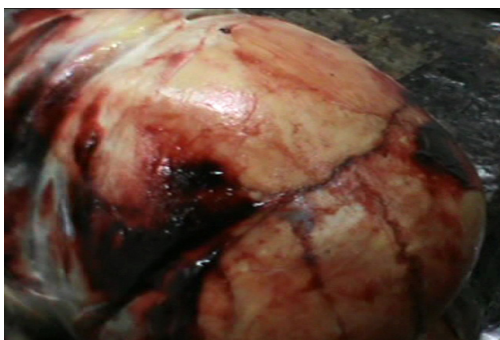


Photo No. 3: Linear fracture extending from coronal suture to left parietal region

- (4) Contused abrasion of size $0.5 \times 0.5\text{cm}$ situated 2cm below and lateral to injury no 3, brownish-bluish in color.

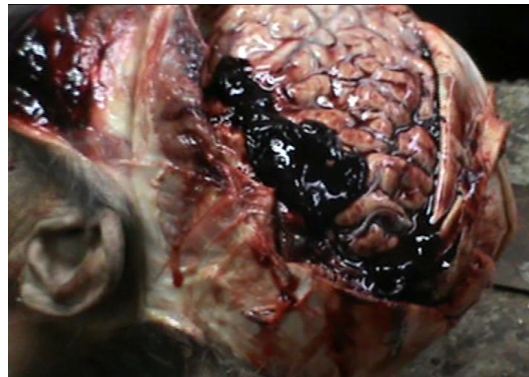


Photo 4: Subdural hematoma & sub-arachnoid hemorrhagic film present over left parieto-temporo-occipital region.

INTERNAL INJURIES

Head – scalp

- (1) Under scalp hematoma present over left fronto-parietal region, brownish in color.

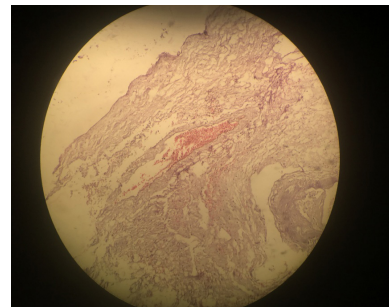


Photo 5: Slide showing congestion of Meninges

- (2) Separation of coronal suture present of length 8cm, consistent with injury no. 1 of External injuries.

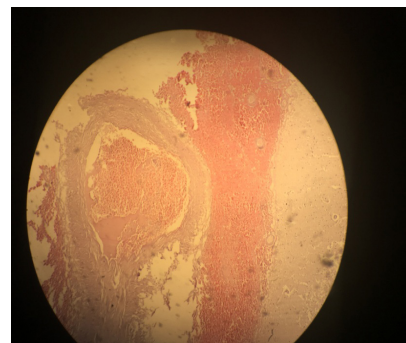


Photo 6: Slide showing brain parenchyma with hemorrhage

- (3) Linear fracture extending from coronal suture of length 5cm on left parietal region, consistent with injury no 1 of External injuries.

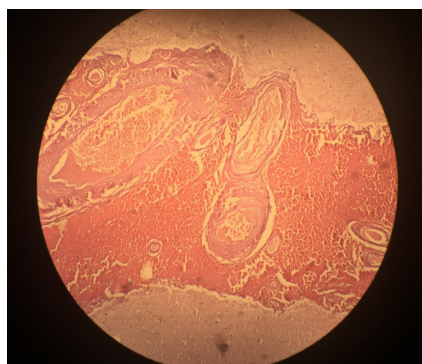


Photo 7: Slide showing brain parenchyma with hemorrhage

Evidence of infiltration of blood in fracture lines present.

BRAIN: Weight- 1500gms, congested and oedematous. Subdural hematoma & sub-arachnoid hemorrhagic film present over left parieto-temporo-occipital region. Traumatic subarachnoid hemorrhagic film present over right temporo-occipital region. Diffuse traumatic subarachnoid hemorrhagic film present over cerebellum.

As the deceased was known case of diabetes, his left anterior descending coronary artery showed atherosclerotic thickening and was calcified.

SPINAL COLUMN & SPINAL CORD: Intact. Hematoma present over posterior aspect of neck at 3rd, 4th & 5th cervical vertebral region, brown in color, of size 5cm x 4cm. Spinal cord intact.

We had preserved brain for histo-pathological examination. On histo-pathological findings (slide photograph no 5, 6 & 7) brain sections showed areas of hemorrhage and congestion of Meninges. Cerebrum showed areas of hemorrhages beneath the Meninges with intra parenchymal hemorrhages and focal necrosis.

DISCUSSION

In India, most scalp injuries are homicidal, and are generally produced by blunt weapons, for example, a lathi, a stone or wooden pestle.^[6] The head is the target

of choice in the great majority of fatal and non-fatal assaults.^[7] Injuries to the head are particularly important because of the brain's vital role in sustaining the life of the individual. The brain is protected within the strong, bony skull, but it is not well restrained within this compartment & injuries to the brain result from differences between the motion of the skull & the brain.^[8] The brain & its coverings are vulnerable to that degree of trauma as would rarely prove fatal, if applied to other parts of the body.^[9]

In the present case, as weapons are not available in the prison premises, the assailant used a brick (hard and blunt object having broad surface) to inflict injury on the head of the deceased. Our findings are consistent with findings reported by other Indian studies.^[10, 11, 12, 13, 14, 15, 16] It is probably thought by the assailants that blunt trauma to head is always fatal. Another reason why blunt weapons are commonly used is that they are easily available, cheap and when discovered afterwards, can be claimed to be household tools. In the present study, we noted involvement of all three head structures i.e. scalp, skull and intra-cranial structures. Our findings are consistent with findings reported by other Indian studies.^[17, 18, 19]

We noted fracture of skull as separation of coronal suture. A fracture of the vault occurs at the place of contact by direct violence.^[20] Our findings are consistent with this statement, as blow was given over the vertex by the brick in the present case.

Linear fracture extending from coronal suture, which was corresponding to the external injuries, was noted. Linear fractures are also seen in cases due to blows with a hard blunt object having a relatively broad striking surface.^[21]

Subdural hematoma was noted over left parieto-temporo-occipital region & sub-arachnoid hemorrhagic film present over both hemispheres at parieto-temporo-occipital region. As the assailant attacked with the a brick on the posterior part of neck, hematoma was noted over posterior aspect of neck at 3rd, 4th & 5th cervical vertebral region, brown in color, of size 5cm x 4cm. Spinal cord intact. This is unique findings in our case

as none of the homicidal head injury research report showed involvement of spine & spinal cord. In this case report defense injury was absent as the assailant attacked the victim from behind without any warning.

Correct interpretations of head / cranio-cerebral injuries are of great importance for saving the life in the living victim. It is also important for the purpose of accurate reconstruction of the events of injury in the dead. [22] Circumstantial evidence and post-mortem findings suggest that it was a case of homicidal assault as external & internal damage over vertex and posterior part of neck are rarely possible in suicidal and accidental head injuries.

Dr Ajit G Pathak et al has reported 2 cases of homicidal head injury in which one incidence occurred in prison due to while another incident occurred in police custody. In both these cases the persons died due to intracranial hemorrhage due to head injury.[23]

SUMMARY AND CONCLUSION

Homicide is a not uncommon in prison premises. Most commonly available instruments are used for killing fellow inmates by the prisoners. CCTV cameras should be installed in prison premises and prison guards should always be alert to prevent such unfortunate incidences. Minor problems amongst the inmates should be resolved amicably and time to time psychiatric counseling should be done of those who are showing aggressive/ homicidal tendencies.

Ethical clearance: Not needed in this case.

Source of funding: Self.

Conflict of interest: Nil.

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Profile of Autopsy Cases in a Tertiary Care Center in Raigarh, Chhattisgarh: A One Year Study

Pawan Tekade¹, Jaideo Ughade², Arunav Dutta³, Nityanand Kumar⁴, Suwarna Chahankar⁵

¹Associate Professor, Department of Forensic Medicine, ²Associate Professor, Department of Anatomy, ³Demonstrator, Department of Forensic Medicine, ⁴Assistant Professor, Department of Forensic Medicine, Late Lakhiram Agrawal Memorial Government Medical College, Raigarh, ⁵Pathologist, NMDC, Amravati

ABSTRACT

Profile of deaths is a need to evaluate social development as well as for policy making. In this retrospective observational study, conducted over the period of one year, total sample size is 561. Males dominated the sample size with male to female ratio of 1.89: 1. Number of cases peaked in age group of 21-30 years. Injuries were the major cause of death. Most deaths being un-natural, accidental manner was predominant. Lung diseases were dominant cause in natural while injuries were dominant in un-natural manner.

Key words: Autopsy profile.

INTRODUCTION

Though death cannot be avoided, it can be delayed with quality life. Profiling of deaths is an epidemiological need, to provide hypothesis concerning prevalence of various causes of death, either natural or un-natural. In the region like Raigarh, which is rapidly developing into an industrial hub of the region, large population migration from across the country mandates the profiling of deaths, as it will also be helpful to assess social changes and to avoid deaths due to preventable causes. This institute being the premier health facility and only state owned tertiary health center catering to population of about 1.5 Lakh, provides opportunity to study patterns of deaths. The purpose of this study is to evaluate data related to deaths by medicolegal autopsy.

MATERIAL AND METHOD

It is a retrospective observational study, conducted in Department of Forensic Medicine, Late Lakhiram Agrawal Memorial Government Medical College, Raigarh (Chhattisgarh). A study spanning over one year, from 1st January 2016 to 31st December 2016, includes all the autopsy cases brought to the mortuary of department and includes total 561 cases. The data was recorded from post-mortem reports and police requisition. The parameters of gender, age, cause of death, manner of death, injuries, and other relevant information was recorded. The data was tabulated and expressed in percentage and graphically.

RESULTS

Table No. 1: Agewise distribution of cases

S. No.	Age Group	Male	Female	No. of cases (N= 561)	Percentage
1	0-10	10	10	20	3.57
2	11-20	32	34	66	11.76
3	21-30	108	68	176	31.37
4	31-40	77	31	108	19.25
5	41-50	65	13	78	13.9
6	51-60	39	17	56	9.98
7	61-70	25	15	40	7.13
8	71-80	10	05	15	2.67
9	81- Above	01	01	02	0.36

Corresponding Author:

Dr. Pawan Tekade

Associate Professor, Department of Forensic Medicine,
Late Lakhiram Agrawal Memorial Government
Medical College, Raigarh
E-mail: tekade_pawan@yahoo.co.in

Total 561 cases presented to mortuary were taken into account. Out of these 367 were males and 194 were females. Male to female ratio was 1.89: 1. About half of the cases reported to the mortuary belonged to age group between 21 to 40 years. The number of cases tapered to both ends of distribution with peak in age group of 21 to 30 years. Six cases were of fetuses. The above finding are summarized in table no 1.

Table No. 2: Cause of death gender wise

Cause of death	Male	Female	Total (N=561)	Percentage
Opinion Reserved	68	29	97	17.29
Thermal Injury	39	55	94	16.76
Multiple Injury	62	30	92	16.4
Head Injury	73	18	91	16.22
Asphyxia	49	21	70	12.48
Natural	38	25	63	11.23
Electrocution	13	6	19	3.39
Other Injury	13	4	17	3.03
Animal Bite	9	6	15	2.67
Misc.	3	0	3	0.53

Out of 561 cases, no opinion as to the cause of death was given, at the time of autopsy in 97 cases. Out of 3 (0.53 %) cases in miscellaneous row, one was of death due to starvation and other two were skeletonized bodies. Total 63 deaths (11.23 %) were due to natural cause. Female outnumbered males in thermal deaths. Thermal (16.76%), multiple injury (16.4%) and head injury (16.22%) were leading causes of deaths followed by asphyxia (12.48%).

Table No. 3: Manner of death

Manner	Male	Female	Total	Percentage
Natural	38	25	63	11.23
Un-natural Suicide	61	43	104	18.54
Un-natural Homicide	12	10	22	3.92
Un-natural Accident	185	87	272	48.48
Undetermined	71	29	100	17.83

As manner of death was undetermined in opinion reserved and miscellaneous cases, it amounted to 17.83% of the study cases. The remaining were classified as natural and un-natural deaths. The 70.95% of cases, which were reported for autopsy was due to un-natural cause which included suicidal (18.54%), homicidal (3.92%) and accidental (48.48%) deaths. The natural deaths (11.23%) were mostly in cases of person found dead and unattended. The following findings are depicted in graphical manner and tabulated in table no 3.

Table No. 4: Cause of death in Natural manner

Cause of Death	Male	Female	Total (N= 63)	Percentage
Anemia and its complications	05	08	13	20.63
Coronary artery disease	09	02	11	17.46
Complications of pregnancy	00	04	04	06.35
Liver disease	04	01	05	07.94
Lung disease	12	05	17	26.98
Others	08	05	13	20.63

Table no. 4 shows various natural causes of death. Most common cause was involvement of lungs. While in females anemia was the dominant cause of death. The other (20.63%) causes included perforation peritonitis, renal diseases, malignancy and cerebral infarct.

Table No 5: Cause of death in Un-natural manner

Cause of death	Male	Female	Total (N=398)	Percentage
Thermal	39	55	94	23.62
Multiple Injuries	62	30	92	23.12
Head Injury	73	18	91	22.86
Asphyxia	49	21	70	17.59
Electrocution	13	6	19	4.77
Other Injury	13	4	17	4.27
Animal Bite	9	6	15	3.77

As depicted in above table no. 5, thermal (23.62%), multiple injuries (23.12%) and head injury (22.86%) collectively formed the bulk of un-natural deaths. Multiple injuries and head injury were prominent cause of death in males but thermal injuries were dominated by females.

DISCUSSION

The demographic profiling related to mortality is important in this region, as it is fast growing industrial city, a prototype of rapid urbanization and population migration. Data of autopsy carried out in Department of Forensic Medicine over the span of one year, was analyzed. Total 561 medicolegal autopsies were studied, out of which 367 were males and 194 were females. The gender difference was seen because of outdoor work pattern of males, who are exposed to various stresses, resulting in untimely and violent deaths. The similar pattern of gender differences were seen in most of the studies, Radhakrishna et al.¹, Sharma et al.², Wasnik³, Shrivastava et al.⁴, Zine et al.⁵, Qasim et al.⁶, Afandi,⁷ and Patel JB et al.⁸.

Most of the medico legal autopsies were conducted in the cases belonging to young age group predominantly 21 to 30 years. This young age group is the period for struggle to establish his own identity socially, economically and sexually. Similar observations were reported by Radhakrishna et al.¹, Sharma et al.², Wasnik³, Zine et al.⁵, Qasim et al.⁶, Afandi⁷ and Patel JB et al.⁸.

As per our study injuries were the most common cause of unnatural deaths. Thermal injuries were more frequent in females than males. Similar pattern was reported by Patel JB et al.⁸ in Surat and Bhullar DS et al.⁹.

Out of the medicolegal deaths reported, 11.23% were natural deaths. In 17.83% manner of death was undetermined. The maximum bulk was of unnatural deaths (total 70.94%), 48.48% of deaths were accidental deaths. The similar percentage of unnatural deaths was observed by Radhakrishna KV¹, Patel JB et al.⁸ and Bhullar DS et al.⁹ in their studies.

In case of natural deaths respiratory diseases were the major contributors followed by anemia and cardiac diseases respectively. Respiratory diseases were the major cause of natural deaths in study conducted by Patel JB et al.⁸, but cardiac diseases were more commonly observed in southwestern population followed by respiratory cause in study conducted by Radhakrishna KV¹. Raigarh and Surat are highly industrial region with

pollution as confounding factor and large working class population which may be the reason for more percentage of respiratory diseases.

LIMITATION OF STUDY

The study has limitation consider the fact 17.83% cases are grouped as undetermined cause and manner of death, the reasons being admission in hospital for longer period leading to disappearance of signs of antecedent causes mainly poisoning.

CONCLUSION

The study was conducted to evaluate the pattern of deaths in rapidly growing industrial district of Chhattisgarh. The study can be used as a baseline study for future evaluation by policy makers, health care programmers, judiciary and investigating agencies. The unnatural cause of deaths which was the major observation of the study, is one of the indicators of the level of social and mental health. Major reforms and preventive measures can be undertaken to check the rising burden of untimely deaths which main involves productive age groups.

Conflict of interest: None.

Source of Funding: None.

Ethical clearance: Yes. No ethical issues involved.

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CHEILOSCOPY: A Study on Lip Print Patterns among the Gujarati Population

Pooja Ahuja¹, Tejal P Butani², M. S. Dahiya³

¹Assistant Professor, ²Student, ³Director, Institute of Forensic Science, Gujarat Forensic Sciences University (GFSU) Campus, Sector 9, Near Air Force Base, Gandhinagar, Gujarat-382007, India.

ABSTRACT

Cheiloscopy, the study of lip prints, is a tool in forensic investigation technique that deals with identification of individuals based on lips patterns. The objective of this study is to determine predominant lip print pattern found among the Gujarati population, to evaluate whether any sex difference exists and to study the permanence of the pattern over 6 months duration. The study comprised of 100 healthy individuals (50 males and 50 females), in the age group of 18–25 years of Gujarati population of the Gandhinagar region of the Gujarat state, India. By using Suzuki and Tsuchihashi classification, Lip prints were then divided into four quadrants and also classified on the basis of peripheral shape of the lips. Materials used to record the lip prints were dark brown colored lipstick, cellophane tape and white bond paper. Lipstick was applied uniformly and Lip prints were taken on the glued portion of cellophane tape and then stuck on to a white bond paper. These lip prints were analyzed with magnifying lens and virtually with stereo microscope. On the analysis of the subject population, results showed Branched pattern Type II (29.57%) to be most predominant in the Gujarati population. Branched pattern Type II (35.60%) and long vertical Type I (28.28%) were most prevalent in males and females respectively and Large Full lips were most predominantly present in both the sexes.

Keywords: Cheiloscopy, Suzuki and Tsuchihashi classification, personal identification, lip pattern.

INTRODUCTION

Cheiloscopy, the study of lip prints, is a tool in forensic investigation technique that deals with identification of individuals based on lips patterns. The lip print of every person is unique and can be used to determine the personal identity. The term “Cheiloscopy”

is derived from the Greek words **cheilos** meaning ‘lips’ and **eskopein** meaning ‘to see’ and is defined as the study of the characteristic patterns of the wrinkles and grooves present on the labial mucosa called as lip prints. Lip prints are important because of their uniqueness and permanence, except in monozygotic twins like fingerprints, the lip grooves are never changed during life time.

At the crime scene, lip prints can be found on several physical evidences such as shirt, glass, cups, letters, cutlery, tissue paper/wipes, window panes, cigarette butts, handkerchief, clothing, photographs, and even biological materials such as skin. A lip print at the scene of a crime can be a basis for conclusions as to the character of the event, habits, sexes, number of the people involved, occupational

Corresponding Author:

Dr. Pooja Ahuja

Assistant Professor, Institute of Forensic Science,
Gujarat Forensic Sciences University, Sector 9,
Near Air Force Base, Gandhinagar,
Gujarat-382007, India

Email: pahuja159@gmail.com

Mobile: 9724304885

traits, cosmetics used, and the pathological changes of lips themselves.

The biological phenomenon of arrangements of furrows on the red part of human lips was first described by anthropologists, R. Fischer in 1902. In 1930, Diou de Lille developed some studies which are led to lip print use in criminology. Significance of Lip prints in individual identification and criminalization was first mentioned by Edmond Locard in 1932. Dr. Martins Santos in 1960 proposed that these lip characteristics could be used in forensic investigation and formulated a simple classification of lip prints. In 1950, Le Moyne Snyder, a forensic expert suggested the concept of wrinkles in lips to identify people in his book entitled "homicide investigation". In 1968-1971 two Japanese scientists, Y. Tsuchihashi and T. Suzuki studied 1364 (757 males and 607 females) individuals including males and females in Japan.

Mc Donnell in 1972 provided a study on lip prints among two identical twins and stated that two identical twins seemed to be indistinguishable by every other means but they had different lip prints. Renaud, in 1972, studied 4000 lip prints and confirmed the uniqueness of each lip print. In 1966, in Poland, the analysis started after lip traces had been found on a glass door at the scene of a murder. In 1976, the first personal identification by means of a lip print was made. During the period 2000–2013 that studies were carried out by some researchers in India and other countries. Various features of the lip prints like stability, age determination, sex determination and morphological patterns using lip prints between different groups of population were studied.

MATERIALS AND METHOD

Sample collection: The study comprised of 100 healthy individuals (50 males and 50 females), in the age group of 18–25 years of Gujarati population of the Gandhinagar region of the Gujarat state, India. Informed consent was obtained from all the subjects. Subjects birth by origin of Gujarat was only included in the research. The study was conducted during the months January to

April 2015. All the participants were informed about the purpose of the study and their lip prints were recorded with permission. The survey was carried out using a self-designed format. Lip prints were recorded on a white non-absorbent bond paper. The general information of the subjects like age, sex, occupation, name and signature were recorded on the consent form.

Lip print recording procedure: The subjects were asked to clean his/her lips with water and dry them with tissue paper. They were made to open the mouth and a dark colored, non-glossy, non-metallic lipstick was evenly applied on the lips up to the vermilion border. Then, the glued portion of cellophane tape strip was placed over the lips and a lip impression in the normal rest position of the lips by applying it in the centre first and then applying uniform pressure towards the corner of the lips; The cellophane tape strip was carefully lifted from the lip from one end to the other, to avoid smudge of the print. The cellophane strip was then stuck to the white bond paper (A4 size) for permanent record purpose and then evaluated using magnifying lens and stereomicroscope.

CLASSIFICATION USED

Classification On the basis of patterns: In this study, we used the classification of patterns of the lines on the lips proposed by Suzuki and Tsuchihashi. (Figure.1)

Type I: Long vertical (Clear-cut vertical grooves that run across the lips). (Fig 1 (A))

Type I': Short vertical (Partial length groove of type I). (Fig 1 (B))

Type II: Branched grooves (Branching Y-shaped pattern). (Fig 1 (C))

Type III: Intersected grooves (Criss-cross/'x' pattern grooves). (Fig 1 (D))

Type IV: Reticular pattern (Grooves that forms rectangular shape). (Fig 1 (E))

Type V: Mixed/Indefinite (Grooves that do not fall into any of the above categories, combination of two or more patterns and/or undetermined). (Fig 1 (F))

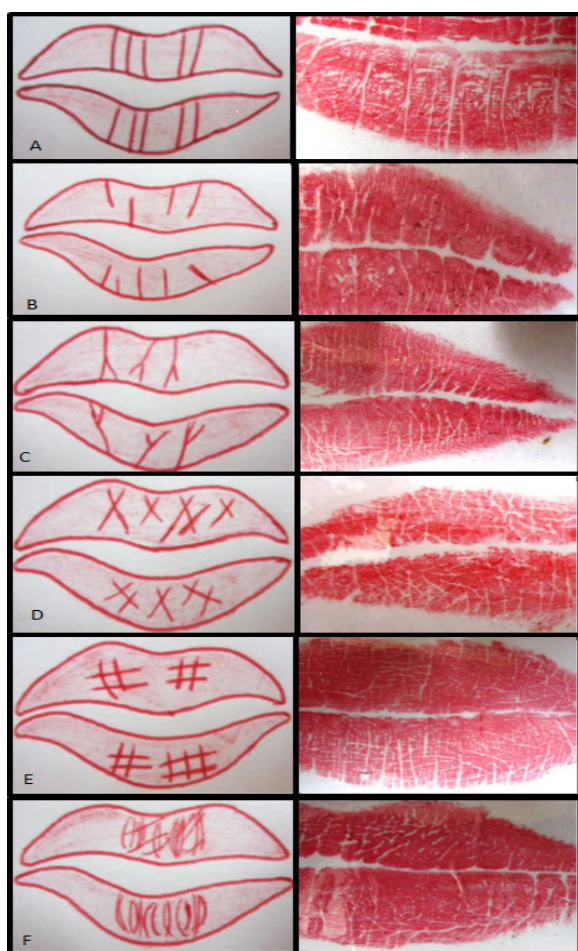


Figure No. 1: Classification on the basis of patterns

Classification On the basis of shapes:

1. Thin lower lip
2. Thin upper lip (Fig.2(A))
3. Thin lips (Fig.2(B))
4. Small lips (Fig.2(C))
5. Oval lips (Fig.2(D))
6. Downturned lips (Fig.2(E))
7. Sharp lips (Fig.2(F))
8. Large full lips (Fig.2(G))
9. Uneven lips (Fig.2(H))



Figure No. 2: Classification On the basis of shape

RESULTS

Table No. 1: Percentage distribution of lip patterns in the Gujarati population.

Lip print patterns	All quadrants Percentage
1. Long vertical (Type I)	22.53%
2. Short vertical (Type I')	22.53%
3. Branched (Type II)	29.57%
4. Intersecting (Type III)	7.04%
5. Reticulate (Type IV)	17.25%
6. Mixed/Indefinite (Type V)	1.05%
Total	99.97% (p < 0.001)

Table No. 2: Distribution of patterns among males and females

Lip print patterns	All quadrants Percentage	
	Females	Males
Long vertical (Type I)	28.28%	15.90%
Short vertical (Type I')	21.05%	24.34%
Branched (Type II)	24.34%	35.60%
Intersecting (Type III)	5.26%	9.09%
Reticulate (Type IV)	19.07%	15.15%
Mixed/Indefinite (Type V)	1.97%	-

Table No. 3: Distribution of lip shapes among females

Lip print shapes	Percentage
1. Thin lower lip	-
2. Thin upper lip	12%
3. Thin lips	8%
4. small lips	8%
5. Oval lips	8%
6. Downturned lips	16%
7. Sharp lips	18%
8. Large full lips	22%
9. Uneven lips	8%
Total	100%

Table No. 4: Distribution of lip shapes among males

Lip print shapes	Percentage
Thin lower lip	-
Thin upper lip	14%
Thin lips	-
small lips	12%
Oval lips	8%
Downturned lips	16%
Sharp lips	14%
Large full lips	20%
Uneven lips	16%
Total	100%

Considering the whole lip print together, in males the most common pattern found was type II and the least common pattern was type III, followed by type I', type I, type IV, type V. In females, the most common pattern present was type I and the least common pattern observed was type V, followed by type II, type I', type IV, type III. Type II (branched) and Type I (long vertical) lip print patterns were occurring predominantly in the entire samples.

DISCUSSION

Frequencies of patterns (200 quadrants) in males are II (35.60%) > I' (24.24%) > I (15.90%) > IV (15.15%) > III (9.09%) > V (null), Frequencies of patterns (200 quadrants) in females are I (28.28%) > II (24.34%) > I' (21.05%) > IV (19.07%) > III (5.26%) > V (1.97%).

In the present study, overall, Type II (Branched pattern) was the most frequently observed pattern in the examined subjects of the Gujarati population, while Type V (Undetermined) was observed to be the least common type. Type I (Long vertical) and Type II (Branched pattern) were found to be most frequently in both the sexes. Classification has also been done on the basis of the peripheral shape of lip, in that classification sharp lip shape, large full and downturned shapes were observed.

In the present study type II and type I patterns were found to be most predominant patterns. The result is in accordance with the result obtained by Amith HV et al (2011)^[2], Neeraj gupta et al (2013)^[6], Sharma S.M. et al (2013)^[7], Richa Gaba et al (2014)^[8], Dr. Tem peter (2014)^[9], Qudusia Sultana et al (2014)^[10], Sneha C Khanapure et al (2014)^[11], Karteek Durbakula et al (2015)^[23], in the population of Karnataka. Purna Gupta et al (2014)^[24] studied in the population of Hyderabad. L Vamsi Krishna Reddy et al (2011)^[3] studied in Haryana population, Suman Jaishankar et al (2010)^[4], Ninad Nagrale et al (2014)^[5], Neeti Kapoor et al (2013)^[1], Ashwinirani SR et al (2014)^[25], Vahanwalla and Parekh examined in population of Maharashtra. K. Randhawa et al (2011), Sandhu SV et al (2012)^[13] in Punjabi population. Rohit Malik et al (2011)^[25] in the population of uttar pradesh, Kumar GS et al (2012)^[21] studied in the population of Pondicherry. Yogesh Vats t al (2012)^[17] in the population of Delhi, Jeewanjot Sekhon et al (2013)^[22] in the north India region, T.N. Uma Maheswari et al (2010)^[14] in the population of Tamilnadu.

CONCLUSION

When personal identification is needed, Lip prints might be used as evidence, where generally used elements are not presented. Lip prints are varying in different parts of the lip. No two lip prints showed the exactly same pattern in male and female, which is studied by Tsuchihashi (1974) on 1364 Japanese subjects where no lip print showed the same pattern in the investigation. The distributions of lip prints are unique for males and females. This research involves the study of 100 lip prints in Gujarati population (50 lip prints of male and

50 of female) shows **branched (type II)** pattern and on the basis of lip peripheral shape **large full lips** present most in both the sexes.

Ethical clearance- Not applicable

Source of funding- Self

Conflict of Interest- Nil

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Study of Students' Perceptions towards Case based Learning in Forensic Medicine

Pragnesh Parmar

*Associate Professor, Forensic Medicine Department, GMERS Medical College,
Valsad, Gujarat, India*

ABSTRACT

Background: Case based learning is a very good method of teaching in medical as well as dental education. Forensic Medicine subject usually deal via traditional teaching so in present study case based learning has been tried and students' perceptions has been obtained to check its effectiveness and usefulness.

Materials and methods: Present study was conducted among 112 students of 2nd MBBS through educational intervention pre and post test design. Need assessment was done via focused group discussion with the students and topic was selected for case based learning was drowning. Preparation and validation of case scenario for drowning, pre test and post test questionnaire were done. Students' perceptions were taken for both traditional and case based learning on standard Likert's type scale ranging from 1 to 10.

Results: Total 112 students were participated in the study. Out of which 68 (60.7%) were male and 44 (29.3%) were female. 57 (50.9%) students were of age of 21 years, 33 (29.4%) students were of age of 22 years and rest 22 (19.7%) students were of age of 20 years. Comparison of students' perceptions towards traditional and case based learning was done by Wilcoxon Signed Rank analysis. Many students found case based learning method of teaching more satisfactory, interactive, without much confusion and stress compared to traditional method of teaching.

Conclusion: Forensic Medicine can be taught in a better way via case based learning instead of only traditional didactic lecture.

Key words: *Case based learning, Forensic Medicine, Drowning.*

INTRODUCTION

Field of education is keep on changing as time goes on and teaching in Forensic Medicine needs to be revolutionized via various innovative methods. Case based learning is very good student centred method of teaching in which student occupies the prime center stage of importance. Innovative approach of case based learning instead of traditional didactic lecture improves interest of students as well as their involvement in teaching learning process. Case based learning is very helpful to improve academic achievements as well as help future doctors to tackle various situations via true

case scenarios by application of knowledge acquired from book into true or simulating case situations. Extensive research has been carried out in the field of case based learning and existing evidence is also well summaries in various meta analysis and other literature studies ^[1-4] but less of information in field of Forensic Medicine.

MATERIALS AND METHOD

Present study was conducted among 112 students of 2nd MBBS through educational intervention pre and post test design. Need assessment was done via

focused group discussion with the students and topic was selected for case based learning was drowning. Preparation and validation of case scenario for drowning, pre test and post test questionnaire were done. Students' perceptions were taken for both traditional and case based learning on standard Likert's type scale ranging from 1 to 10. During practical session of two hours case based learning of drowning was implemented after obtaining students' informed written consent in four sessions. In session one, scenario was projected with learning outcomes outlined by the students. In session two, intra group discussion of students to gather information related to case was done. In session three, students of each group were presented all the collected information via intergroup discussion. In session four, summarization of topic via facilitator was done to clarify doubts. Data were collected and analyzed via SPSS software.

RESULTS

Total 112 students were participated in the study. Out of which 68 (60.7%) were male and 44 (29.3%) were female. 57 (50.9%) students were of age of 21 years, 33 (29.4%) students were of age of 22 years and rest 22 (19.7%) students were of age of 20 years (Table – 1). Comparison of students' perceptions towards traditional and case based learning was done by Wilcoxon Signed Rank analysis as per Table – 2, Table – 3 and Table – 4. Many of the students found to be happy and feel interested in case based learning without any confusion or lack of motivation. Most of them found curious to learn via case based learning and to be focused with well engaged scenario (Table – 2).

Most of the students clarified their doubts; got opportunities to learn via case based learning and made their concepts clear about topic while they also felt some innovation as well as application of new methods for teaching compare to traditional methods (Table – 3).

Many of them understood topic well with clarity of physiology of drowning, external and internal post mortem findings in case of drowning, application of diatoms study as well via case based learning approach (Table – 4).

Many students found case based learning method of teaching more satisfactory, interactive, without much confusion and stress compared to traditional method of teaching. Case based learning also improved their confidence in answering, made them motivated for learning and they preferred this case based learning should be adopted for regular teaching (Table – 5). Comparison of pre and post test responses via Wilcoxon's sign rank test was as per Table – 6 which found significant improvement in post test.

Table No. 1: Basic variables among student participants

Variables		Frequency (Percentage)
Age in years	20	22 (19.7%)
	21	57 (50.9%)
	22	33 (29.4%)
Sex	Male	68 (60.7%)
	Female	44 (29.3%)

Table No. 2: Wilcoxon Signed Rank Analysis on comparison of students' perceptions towards traditional and case based learning

Perceptions	Traditional	Case based learning	P value
	Median (IQ range)	Median (IQ range)	
Happy	4.0 (3.0-5.5)	9.0 (8.0-9.5)	P < 0.001
Interesting	5.0 (4.0-6.0)	8.0 (7.0-9.0)	P < 0.001
Confused	---	---	P < 0.001
Not motivated	---	---	P < 0.001
Engaging scenario	6.0 (5.5-6.5)	9.0 (8.0-9.5)	P < 0.001
Curious to experience CBL	5.0 (4.0-6.0)	9.0 (8.5-9.5)	P < 0.05
Not focused	5.0 (4.5-5.5)	8.0 (7.0-9.0)	P < 0.05

Table No. 3: Wilcoxon Signed Rank Analysis on comparison of students' perceptions towards traditional and case based learning

Perceptions	Traditional	Case based learning	P value
	Median (IQ range)	Median (IQ range)	
Clarify doubts	5.0 (4.0-6.5)	8.0 (7.0-9.0)	P < 0.001
Unable to relate concepts	6.0 (5.5-7.0)	4.0 (3.5-5.0)	P < 0.001
Well prepared topic	8.0 (7.0-9.0)	9.0 (8.0-9.5)	P < 0.001
Opportunities	6.0 (5.0-7.5)	7.0 (6.0-8.0)	P < 0.001
Good intervention	5.0 (4.0-6.0)	8.0 (7.0-9.0)	P < 0.001
Required innovation	8.0 (7.0-9.0)	7.0 (5.5-9.0)	P < 0.05
Instructions not clear	7.0 (5.5-9.0)	6.0 (5.0-7.5)	P < 0.001
Application of new methods	7.0 (6.0-8.9)	6.0 (5.0-7.5)	P < 0.05

Table No. 4: Wilcoxon Signed Rank Analysis on comparison of students' perceptions towards traditional and case based learning

Perceptions	Traditional	Case based learning	P value
	Median (IQ range)	Median (IQ range)	
Understood topic	7.0 (6.0-8.0)	9.0 (8.0-9.5)	P < 0.001
Definition and types of drowning	6.0 (5.5-7.0)	6.0 (5.5-6.5)	P < 0.001
Pathophysiology of drowning	5.0 (4.0-6.0)	8.0 (7.0-9.0)	P < 0.001
External examination in drowning	6.0 (5.5-6.5)	9.0 (8.0-9.5)	P < 0.001
Internal examination in drowning	7.0 (5.5-8.0)	9.0 (8.5-9.5)	P < 0.001
Application of diatoms study	6.0 (5.0-7.0)	8.0 (7.5-9.0)	P < 0.001

Table No. 5: Students' perceptions on the case based learning

Perception	Median (IQ Range)	Mean (SD)
More satisfying	9.0 (8.5-9.5)	9.12 (0.543)
Interactive and fun	8.0 (7.0-8.5)	7.82 (0.435)
Confusing	5.0 (4.0-6.0)	5.14 (0.865)
Stressful	4.0 (3.5-5.5)	4.32 (0.657)
Prefer this method	8.0 (7.0-9.0)	8.13 (0.598)
Holistic approach	6.0 (5.5-6.5)	6.16 (0.986)
Motivate learning	7.0 (6.0-8.5)	7.55 (0.875)
Gained confidence	8.0 (7.5-9.0)	8.74 (0.743)
Summarize and clarify doubts	8.0 (7.0-8.5)	7.67 (0.432)
Adopt this method	6.0 (5.0-7.0)	5.19 (0.954)

Table No. 6: Comparison of pre and post test responses via Wilcoxon's sign rank test

Test Statistics ^b	
	post - pre
Z	-7.313 ^a
Asymp. Sig. (2-tailed)	.000
a. Based on negative ranks.	

DISCUSSION

Traditional learning via didactic lecture is base of Forensic Medicine teaching since years but education reforms via training of medical teachers and utilization of various newer teaching methods has now changes the tradition. Case based learning is one of the very good methods to teach various topics. Case based learning helps health care professionals to use real case scenario or mimicking or simulating case scenario to teach under graduate as well as post graduate students in far better way to understand the subject in more detail.

Problem based learning, Case based learning and Project based learning in European Universities aims at promoting learners' capabilities for clinical reasoning and autonomous lifelong learning [5-8]. A benefit to

faculty was also reported as PBL tutorial facilitators were partially liberated from their traditional role and development of additional skills for facilitating ^[6]. Curriculum reform in medical education is a continuous process and it is now time to include case based learning as one of the prime component for teaching. Our study results support earlier findings ^[2-4].

Case based learning has been described as promising tool for medical as well as dental educators and recommendation has been made for its use for a promising andragogy for teaching ^[9]. When looking to the perceptions given by the students for both traditional and case based learning, it obvious that students preferred case based learning over traditional teaching. In a study conducted by Lin in Taiwan on nursing students, the group who received PBL as the training method showed more satisfaction, critical thinking and self-motivated learning. And it was shown that PBL training was more effective than conventional teaching ^[10].

CONCLUSION

Forensic Medicine can be taught in a better way via case based learning instead of only traditional didactic lecture. Case based learning as a method of teaching in Forensic Medicine helps students to understand subject better and overall to improve quality of education.

Source of support: Nil.

Conflict of interest: None declared.

Ethical clearance: It was obtained from Institutional Ethics Committee.

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A Gross and Histopathological Evaluation of Fracture Injuries – A Post Mortem Study

Rahul G. Peddawad¹, Ruta Bapat²

¹Associate Professor, Forensic Medicine Department, ²Assistant Professor, Dept of Anatomy,
Dr D Y Patil Medical college, Nerul, Navi Mumbai

ABSTRACT

Mechanical trauma of adequate force, whatever the nature of the agent, usually leads to a wound. The latter may be limited to the tissues covering the outer and inner surface of the body, namely skin and mucous membranes, giving rise to a superficial injury, or may involve as well one or more of the deeper structures like bone leading to fracture. Examination of an injury in both living and dead is an important medico-legal issue in the field of crime investigation to fix the liability. A doctor is required to date injuries specifically and individually while preparing an injury report. In this study the sequential Gross and Histopathological Changes at the Site of Fracture injuries were studied and compared the findings with available standard data.

Key Words: Injury, Fracture, Medico-legal

INTRODUCTION

Mechanical trauma of adequate force, whatever the nature of the agent, usually leads to a wound. The latter may be limited to the tissues covering the outer and inner surface of the body, namely skin and mucous membranes, giving rise to a superficial injury, or may involve as well one or more of the deeper structures like bone leading to fracture. **Fracture** is a complete or incomplete break in the continuity of a bone. Although in most fractures, there is a distinct history of trauma^{1,2}. Diagnosis of a Fracture¹ can nearly always be inferred from the history and clinical examination. However, clinical evidence must always be confirmed or refuted by radiological examination. A doctor is required to date injuries specifically and individually while preparing an injury report.

In all traumatic deaths where fractures were found over the body, it is important to find out whether these injuries were caused while alive and not after death of a person. Fracture age describes the time interval between the infliction of a fracture of bone and the time of death, and in living person till time of examination.¹ Though it will not be possible to give exact time of infliction of injury, yet approximate age of the injury can be made out from the reparative changes that occur after infliction of any injury; reaction to injury is immediate, and it continues until the repair is complete.²

OBJECTIVES OF THE STUDY

1. To study Gross and Histo-pathological changes at the site of Fracture.
2. To study the time since infliction of Fracture Injuries.
3. To compare gross changes with histo-pathological changes at site of fracture in relation to time.

MATERIAL AND METHOD

The study was carried out with an objective to study certain medico legal aspects of Fractures on the basis of

Corresponding Author:

Dr. Rahul Peddawad

Associate Professor, Department of Forensic Medicine,
Dr D Y Patil Medical college, Hospital & Research
Center, Nerul, Navi Mumbai-400406
E-mail: rahul.peddawad@dypatil.edu

its gross & histopathological examination at the time of postmortem.

Study Setting: The Study conducted at tertiary care hospital in Mumbai

Study Design: Cross Sectional Study. Descriptive study

Sample Size: During the study, a total no. of 78 Fracture injury cases were studied. The cases having mechanical injuries in the form fractures brought to PM centre attached to the tertiary hospitals for postmortem examination. All ante mortem and postmortem fractures of long bones in the body of deceased have been studied.

Inclusion Criteria: All 78 cases of fracture studied were having fracture of long bone in diaphysis i.e. at mid shaft & the exact time of infliction of injuries is known.

Exclusion Criteria: Bodies which are decomposed & Fractures over the deceased having history of vascular insufficiency, malnutrition, bone diseases, location other than long bone diaphysis & the cases where the exact time of infliction of injuries is not known.

Methodology: In all the cases detailed history was collected from relatives, police officer, and from the notes on indoor hospital papers by treating doctors in cases of hospital deaths. The study was conducted at department of Forensic Medicine in collaboration with department of pathology, at tertiary care hospital in Mumbai. The Study included gross & histopathological examination of long bone fractures. The formalin-fixed, paraffin-embedded samples of fracture ends and surrounding tissue were stained in hematoxylin and eosin & studied under microscope.

OBSERVATIONS AND RESULTS

Table No. 1: Age Distribution among Study Group

	No. of Cases	Minimum Age	Maximum Age	Mean Age	Std. Deviation
Age (years)	78	15	58	34.62	6.45

Table 1 : Table showing age distribution among study group of deceased having fractures. Total 78 fracture cases were studied with minimum age of deceased person 15 yrs and maximum age was 58 yrs with mean of 34.62 ± 6.45

Table 2: Gender Wise Distribution of Fracture Injuries

	No. of Cases	Percent
FEMALES	18	23.08
MALES	60	76.92
Total	78	100.0

Table 2 : Table showing gender wise distribution of fractures among deceased persons. Among 78 cases of fracture, 18 (23.08%) were females and 60 (76.92%) were males.

Table No. 3: Distribution of Fractures according to Location

LOCATION	No of Cases	Percent
MID SHAFT	78	100.0
PERI ARTICULAR	0	0
TOTAL	78	100.0

Table 3 : Table showing distribution of fracture cases according to their location. All 78 cases of fracture studied were having fracture of long bone in diaphysis i.e. at midshaft.

Table No. 4: Distribution of Fractures according to Pattern

PATTERN	No of Cases	Percent
COMMINUTED	12	15.38
TRANSVERSE	48	61.54
OBLIQUE	18	23.08
Total	78	100.0

Table 4 : Table showing distribution of fractures according to their pattern. 18 fractures (23.08%) were oblique, 48 fractures (61.54%) were transverse (single plane) type and 12 (15.38%) was comminuted type.

Table No. 5 : Distribution of Fractures according to Type of Fracture

TYPE OF FRACTURE		
TYPE	No of Cases	Percent
COMPOUND	14	17.94
SIMPLE	64	82.06
Total	78	100.0

Table 5 : Table showing distribution of fractures according to their type. Among 78 cases 64 (82.06%) were simple fractures and 14 cases (17.94%) were compound fractures.

**Table No. 6: Gross & histopathological examination findings (parameter*)
noted at the time of post mortem.**^{3, 4, 5, 6, 7, 8, 9, 10, 11}

STAGES IN FRACTURE HEALING	Gross examination findings at the time of post mortem (parameter*) found in these injuries	HISTOPATHOLOGICAL examination findings (parameter*) found in these injuries
Stage of hematoma	1. E/o extravasations of blood 2. E/o swelling of tissue around the fracture 3. E/o bruising of skin and tissue in and around the fracture / staining of the edges of fracture 4. E/o blood clots/ hematoma formation around the fracture a. soft in consistency b. firm in consistency	A. E/o RBC's infiltration into surrounding tissue. B. E/o Hematoma formation and fibrin deposition
Stage of Inflammation & granulation tissue formation	5. E/o local inflammatory response with exudation 6. E/o evidence of infection (Pus) 7. E/o evidence of ingrowths of granulation tissue	C. E/o necrosis of ends of bone D. E/o inflammatory cells and phagocytic cells E. E/o formation of capillaries, fibroblasts, osteoblasts, soft granulation tissue F. E/o granulation tissues
Stage of callus formation	8. E/o soft tissue callus formation 9. E/o woven bone callus formation	G. E/o soft tissue callus (i.e. procallus) H. E/o osteoblastic activity seen at periosteal and medullary region. I. E/o conversion of procallus to fibrocartilagenous callus and woven bones. J. E/o chondroblast, chondrocytes or developing cartilage in the callus
Stage of remodeling & modeling	10. E/o osseous callus formation (lamellar bone)	K. E/o replacement of fibrocartilagenous callus by osseous bone (lamellar bone)

Table No. 7: Comparison of Age of Fracture from History with Gross Examination and H.P. Examination Findings

S. No.	Age of injury as per history		Gross examination parameter* found in these injuries		HP examination parameter* found in these injuries	
	No. of Fracture	Age	No. of cases	parameter*	No. of cases	parameter*
1	26 (33.33%)	Less than 24 Hours	19 (24.36%)	1, 2, 3, 4a, 5	19 (24.36%)	A, D
			7 (8.97%)	1, 3, 4a, 5	7 (8.97%)	A, C, D
2	22 (28.20%)	24 to 72 Hours	17 (21.79%)	1, 2, 3, 4a/4b, 5	17 (21.79%)	A, B, C, D
			5 (6.41%)	3, 5, 6	5 (6.41%)	A, C, D
3	9 (11.53%)	4 day to 7 day	8 (10.25%)	2, 3, 4b, 7	8 (10.25%)	A, B, C, D, E
			1 (1.28%)	5, 6	1 (1.28%)	C, D
4	5 (6.41%)	8 day to 14 day	4 (5.13%)	5, 7	4 (5.13%)	D, E, F
			1 (1.28%)	6, 7	1 (1.28%)	D, E
5	4 (5.13%)	15 day to 30 day	4 (5.13%)	7, 8	4 (5.13%)	E, F, G
6	3 (3.85%)	31 day to 45 day	3 (3.85%)	7, 8	3 (3.85%)	F, G, H
7	2 (2.56%)	> 45 days	2 (2.56%)	8, 9	2 (2.56%)	G, I
8	7 (8.97%)	ADI	3 (3.85%)	1	3 (3.85%)	-----
			4 (5.13%)	-----	4 (5.13%)	-----

(* - refer Table no.1, ADI – Injuries inflicted after Death)

Tables 6 and 7 shows result of Gross & Histopathological examination findings which are compared with time of their infliction as per history.

DISCUSSION

The Healing of fractures is in many ways similar to the healing of soft-tissue wounds, except that the end result is mineralized mesenchymal tissue, i.e. bone.³ The cellular components of bone consist of osteogenic precursor cells, osteoblasts, osteoclasts, osteocytes, and the hematopoietic elements of bone marrow.^{4,5}

Healing occurs in overlapping stages of : 1) Stage of hematoma; 2) Stage of Inflammation & granulation tissue formation; 3) Stage of callus; 4) Stage of remodelling & modelling (Consolidation)^{7, 8, 9}. **Stage of haematoma:** This stage lasts for 7- 10 days. When a bone is fractured, blood leaks out through torn vessels in the bone and forms a haematoma between and around the fracture.^{10, 11} **Stage of Inflammation & granulation tissue formation :** This stage lasts for about 2-4 weeks. In this stage, Inflammatory cells macrophages, monocytes, lymphocytes, and polymorphonuclear cells and fibroblasts infiltrate the bone under prostaglandin mediation. The sensitised precursor cells produce cells which differentiate and organise to provide blood vessels, fibroblasts, osteoblasts

etc. Collectively they form a soft granulation tissue in the space between the fracture fragments. **Stage of callus (Woven bone) Formation:** This stage lasts for about 4-12 weeks. In this stage, the granulation tissue differentiates further and creates osteoblasts. This results in formulation of the callus, also called woven bone. The callus is the first sign of union visible on X-rays, usually 3 weeks after the fracture. **Stage of remodeling & modelling (Consolidation):** in this stage, the woven bone is replaced by mature bone with a typical lamellar structure. Adequate strength is typically achieved in 3 to 6 months.⁸

In present study, death has occurred within 24 hours of infliction of fracture in 26 (33.33%) cases. Out of these 26 (33.33%) cases 19 (24.36%) were of simple fracture & 7 (8.97%) were of compound fracture. On Gross examination, 19 (24.36%) cases of simple fracture have shown [P1] – extravasation of blood, [P2] – swelling of tissue around the fracture, [P3] – bruising of skin and tissue around the fracture & staining of the edges of fracture, [P 4a] - Blood clots or soft hematoma & [P 5]- signs of inflammation and remaining 7 (8.97%) fractures were compound and have shown all above finding but there was no visible swelling & no hematoma formation around fracture ends. On Histopathological examination, all 26 (33.33%) cases

have shown [P-A] – RBC infiltration in the surrounding tissue and in fracture ends & [P-D]- Inflammatory cells. Inflammatory reaction with necrosis of fracture ends [P-C] is more evident in open wounds i.e. in compound fracture than the cases of simple fracture.

22 (28.20%) cases where death has occurred after 24 hours but within 72 hours of infliction of fracture. Out of these 22 cases, 17 were of simple fracture & 5 were of compound fracture. On Gross examination findings are almost similar as in above 18 cases except hematoma is much more organized and firm in consistency in simple i.e closed fractures while pus formation is more evident in compound fracture. On Histopathological examination of these fracture inflammatory cells & phagocytic cells are more evident.

9 (11.53%) cases where death has occurred between 4 to 7 days of infliction of fracture. Out of these 9 cases, 8 (10.25%) were of simple fracture & 1 (1.28%) were of compound fracture. On Gross & Histopathological examination, all 9 cases have shown diffuse bruising of tissue around the fracture, organized hematoma & granulation tissue.

5 (6.41%) cases where death has occurred between 8 to 14 days of infliction of fracture. Out of these 5 cases 4 were of simple fracture & 1 was of compound fracture. On Gross examination, 4 cases of simple fracture have shown in growth of granulation tissue, while 1 compound fracture of age 14 days have shown inflammatory signs with exudation along with granulation tissue & purulent discharge at places. On Histopathological examination

of simple fractures have shown osteoblastic activity with granulation tissue.

4 (5.13%) cases of simple fracture where death has occurred between 15 to 30 days of infliction of fracture. On Gross examination all these fractures have shown in growth of granulation tissue & Soft Callus bridging the gap of fracture ends. On Histopathological examination granulation tissue & Soft tissue callus was evident.

3 (3.85%) cases of simple fracture where death has occurred between 31 to 45 days of infliction of fracture. On Gross examination all these fractures have shown in growth of Soft Callus bridging the gap of fracture ends. On Histopathological examination granulation tissue & Soft tissue callus was evident.

2 (2.56%) cases of simple fracture where death has occurred later than days of infliction of fracture. Gross & Histopathological examination have shown woven bone callus formation.

7 (14%) cases have not shown any change at fracture ends on gross & Histopathological examination, where fracture were inflicted after death.

There is no similar study is available to compare our findings except literature on bone healing that mentioned in standard textbooks.

Limitation of Study: Factors affecting healing process are not studied in this study as all cases selected for this study are healthy individuals.

Initial events after fracture of a long bone diaphysis:



Fig. No. 1: Fracture of Left Femur 6 days old, swelling can be seen.



Fig. No. 2: Hematoma formation around the fracture can be seen on X-ray 6 days old.



Fig. No. 3: Soft tissue callus formation seen on X-ray 30 days old fracture injury.

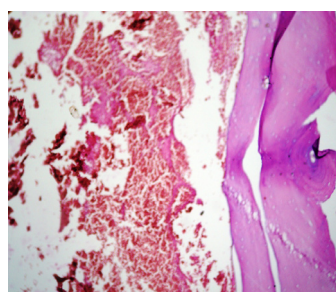


Fig. No. 4: Inset showing Histopathology of 24 hrs old fracture, showing cortical bone along with hematoma. (H & E, - X100). (H & E, - X100)

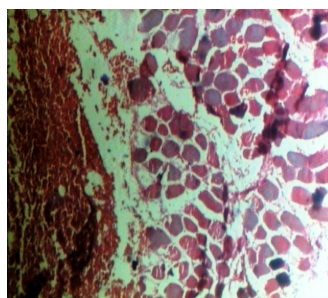


Fig. No. 5: Inset showing RBC's infiltration due to hemorrhage within striated muscle 72 hour old fracture. (H & E, - X100)

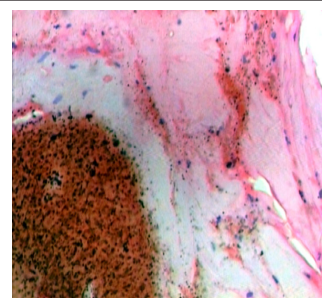


Fig. No. 6: Histopathology of fracture ends of bone showing well organized hematoma adjacent to bone 6 days old. (H & E, - X100)

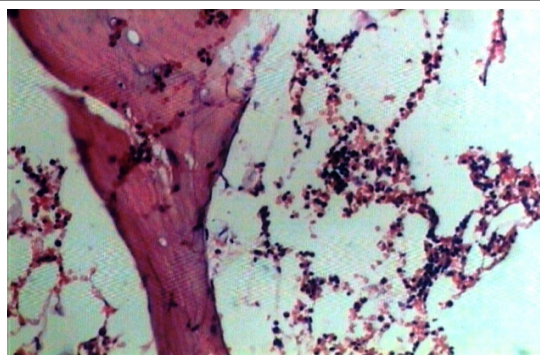


Fig No. 7: Histopathology showing bone along with hemorrhage and infiltration of chronic inflammatory cells & phagocytic cells in surrounding adipose tissue in 4 days old compound fracture. (H & E, X200)

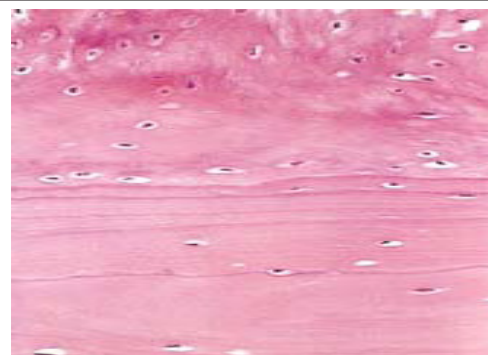


Fig. No. 8: Woven bone (top) deposited on the surface of pre-existing lamellar bone (bottom) in >60 days old fracture (H & E, X400)

SUMMARY AND CONCLUSION

Medico legal autopsy is an important part of an examination for scientific determination of age of Fracture. Careful gross examination study of fracture site can be helpful to arrive at conclusion about their antemortem or postmortem nature in most of the cases. However in few cases, there are limitations to gross examination to conclude antemortem or postmortem nature of fracture & to decide age of injury. Histopathological study to determine the age of injury is useful and advanced method which is helpful for investigation and proper administration of justice. Proper selection of tissue samples with proper preservatives and qualitative technology is necessary for perfect microscopic observation and

conclusions. Histopathological examination is further helpful to give closer range of timing of infliction of fracture as compared to only gross examination. On histopathological examination of fractures of age of few hours revealed RBC's infiltration and delayed cases, callus and woven bone formation noted. Age of injury is important in disputed insurance settlement, road traffic accident claim, prisoners died in police custody and in homicidal deaths.

Ethical Clearance- Taken from Ethical committee of 'Grant Medical College & Sir J J group of Hospital, Mumbai'.

Source of Funding – Self.

Conflict of Interest – Nil

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Aluminum Phosphide Poisoning: A Rare Presentation

Raj kumar.M.G¹, Srinivasa Reddy.P², Kiran J³

¹Postgraduate, ²Professor, ³Professor and HOD, Department of Forensic Medicine and Toxicology, Sri Devaraj Urs Medical College, Kolar

ABSTRACT

Aluminum phosphide (ALP) is extremely lethal and invariably suicidal in nature.¹ It is a major cause of suicidal poisoning in many countries.^{2,3} Toxicity by ALP is caused by the liberation of phosphine gas, which causes cell hypoxia due to inhibition of oxidative phosphorylation leading to circulatory failure.³ Treatment of ALP toxicity is mainly supportive as there is no specific antidote. Mortality with ALP poisoning is very high, ranging from 37% to 100%.^{4,5} A 40-year-old female was admitted to R.L Jalappa hospital kolar with complaints of nausea, vomiting and epigastric pain h/o after ingestion of 7 to 8 tablets of unknown composition and 20 tablets of cetirizine. She had a history of bronchial asthma. On arrival, she was alert and hemodynamic status with pulse rate of 130 beats /min and blood pressure 110/70 mm/hg. There was not any abdominal tenderness or guarding, no cyanosis, jaundice or edema of feet. Gastric lavage initiated, but after 2 hour her condition deteriorated with cardio toxicity, resistant hypotension, tachycardia, epigastric pain, generalized tonic-clonic seizure (GTCS), Arterial blood gas (ABG) showed severe metabolic acidosis. Electrocardiogram (ECG) showed extensive inferolateral ST elevation myocardial infarction (STEMI). After few hours of admission, rhythm became ventricular fibrillation (VF) and cardiopulmonary resuscitation (CPR) began but it was unsuccessful. As aluminum phosphide poisoning leads to fatal condition, early diagnosis and proper management is warranted, this can be reduce the morbidity and mortality. But sometimes early diagnosis may not save the victim as in our case. We present a case wherein the victim succumbed to death due to acute respiratory failure and bleeding diathesis following consumption of aluminum phosphide.

Key words: Aluminium phosphide (ALP), bleeding diathesis, cardiotoxicity, acute respiratory failure.

INTRODUCTION

Aluminum Phosphide is a solid type of fumigant which is available in tablet and powder form. In one study it was found to be the most common cause of acute poisoning in India. As the Lethal Dose of

Aluminium Phosphide is 150-500 mg for an adult even a single tablet of 3 gm can cause mortality.⁶ Therefore, ingestion of Aluminium phosphide tablet or inhalations of phosphine gas are considered as two ways for possible poisoning. The mortality rate of 30% to 50% has been reported in several articles and prognostic factors are still on research.^{6,7,8} In a study conducted by Siwach and Gupta, aluminium phosphide poisoning was found to be the most common cause of acute poisoning in India.⁹

When phosphides are ingested or exposed to moisture, it release phosphine gas (PH₃). Phosphine is a colourless, flammable and toxic gas with garlic or decaying fish like-odour. Phosphine impairs myocardial

Corresponding Author:

Dr. Raj kumar M G

Postgraduate,
Department of Forensic medicine and Toxicology,
Sri Devaraj Urs Medical College, Kolar - 563130

Mobile: +91 8892712458.

E-mail: drraajmbbs@gmail.com.

contractility and fluid loss which results to pulmonary oedema. Hence, metabolic acidosis, respiratory alkalosis and acute renal failure occur. Other reported features include disseminated intravascular coagulation, hepatic necrosis and hypo or hypermagnesemia.¹⁰
¹¹ Here we report case of intentional poisoning with AIP to emphasize the importance, possible clinical manifestation and postmortem findings.

CASE REPORT

A 40-year-old female was admitted to the emergency department of hospital with complaints of nausea, vomiting, and epigastric pain after ingestion of 7-8 tablets of unknown composition (? rodenticide) and 20 tablets of cetrizine. Her symptoms abruptly started from 4 hours before admission and progressed afterwards. She had a positive history of bronchial asthma but did not use any medication regularly. On arrival, she was alert, without any apparent distress. Vital signs included pulse rate 135 beat per minute, blood pressure 110/70 mm Hg, oral temperature 36.8°C and respiratory rate 24 breaths per minute and oxygen saturation 94% in room air. On physical examination, there was no positive finding except mild epigastric tenderness there was no signs of cyanosis, jaundice, or edema of feet. Electrocardiogram (ECG) revealed mild sinus tachycardia. Some measures aimed at symptomatic treatment were performed. After subsequent 2 hour, epigastric pain became more severe and blood pressure decreased to 70/60 mm Hg and pulse rate increased to 138 beats per minute. Her level of consciousness also decreased. Laboratory tests, blood gas analysis, gas. Arterial blood gas (ABG) analysis showed severe metabolic and respiratory acidosis: PH 7.02, HCO₃ 10.9 mEq/L, PCO₂ 41.2 mm Hg. Blood urea 22mg/dl, creatinine 1.6mg/dl, RBS 98mg/dl, serum total bilirubin 0.93mg/dl, direct bilirubin 0.85mg/dl, SGOT 61U/L, SGPT 43U/L, ALP 147U/L, total protein 7.0g/dl, albumin 4.3g/dl, globulin 2.8g/dl, magnesium 7.5mg/dl, pseudo choline esterase 7439U/L, PT 19sec, INR 1.58, PPTT 35.2 sec, leukocytosis was noticed.

Despite fluid administration, the patient's condition deteriorated and blood pressure dropped to 60/40 mm Hg and pulse rate increased to 138 beats per minute within 4

hours of admission. Secondary laboratory test results in worsened acidosis. An ECG was performed again after noticing tachycardia, and it showed ST depression in lead 1, 2 and AVF and ST elevation in V2 to V6, T wave depression V3- V6. So cardiopulmonary resuscitation (CPR) began and rapid sequence intubation (RSI) was performed. After an hour resuscitation and reversing of spontaneous circulation (ROSC), the patient was about to be transferred to the intensive care unit for peritoneal dialysis to reverse the severe acidosis. Unfortunately, on the next hour she had one episode of GTCS, bradycardia, and patient was drowsy blood pressure could not be recordable, but CPR was unsuccessful and death occurred.

Body was examined by conducting post mortem, external findings revealed rigor mortis all over the body, post mortem staining was present over back and it was fixed, blood stained froth in mouth and nostrils, contusion measuring 4 x 3 cms was present over anterior aspect of left shoulder externally (see fig.1). On internal examination there was extravasation of blood into neck structures and para esophageal structures (see fig.2 &3). Parts of cranium, skull, larynx, trachea, pericardium heart, coronary arteries and veins were intact. Brain showed subdural hemorrhage (see fig.4), on cut section of lungs oozing frothy fluid was present, on examination of stomach it was intact and contained 100ml of fluid with garlic like odour, mucosa was hemorrhagic, small and large intestine, liver and spine was intact and congested. Kidney, bladder, organs of external and internal genitalia were intact.



Fig. No. 1: Showing contusion 4 × 3 cms over anterior aspect of left shoulder



Fig. No. 2: Showing extravasation of blood on Neck dissection



Fig. No. 3: Showing extravasation along paraesophageal structures



Fig. No. 4: Showing brain with subdural hemorrhage (SDH)

As there was contusion present over anterior aspect of left shoulder, extravasation of blood into neck structures, paraesophageal structures and subdural hemorrhage it gave rise to suspicion of consumption of aluminum phosphide. After forensic science laboratory (FSL) examination of blood, viscera, the report turned up positive for presence of aluminum phosphide.

The final opinion was given based on FSL report, autopsy findings and case sheet extract as follows; I am of the opinion that death is due to respiratory failure and bleeding diathesis as a result of consumption of aluminum phosphide.

DISCUSSION

Aluminum phosphide is a easily available, low-cost highly-toxic rodenticide. It is freely available in the market under various brand names such as Celphos, Alphos, Quickphos, Phosphotex, etc. ALP is very effective as a fumigant pesticide to protect grains, and is also capable of killing rodents.¹² After accidents and maternal mortality; suicide is the leading cause of death among the young in India, with an average age of 34 years for male and just 25 years for female. It has a high prevalence in rural areas. It could soon become the leading cause of death among young women in India. Ingestion of agrochemical compounds is the principle mode for suicide. Of the 1.87 lakh people who committed suicide in India in 2010, around half (49% men and 44% women) consumed poison, mainly pesticides.¹³ Their poisoning is typically suicidal, at times accidental and rarely homicidal in nature.¹⁴ In developing countries, the mortality is much greater with high-case fatality up to 46% (generally more than 15%)¹⁵ With no known antidote, ingestion of 'unexposed' (fresh) tablets has greater risk of fatal outcome. Severe poisoning causes death in about 3 hrs, ranging between 1 - 48 hrs. Clinical presentation depends upon the time elapsed from the time of ingestion. Qualitative silver nitrate paper test (turns black on reaction) or liquid gas chromatography can confirm presence of phosphine in gastric fluids and exhaled breath.

Aluminum phosphide is a lethal compound. Its lethal characteristic is attributed to the fact that in the presence of moisture, it releases phosphine gas absorbed easily by inhalation, ingestion or through dermal contact.¹⁶ Although the exact mechanism of phosphine toxicity is not clearly known, low oxygenation and consequently the failure of cellular respiration (non-competitive inhibition of cytochrome oxidase of mitochondria) and formation of highly reactive hydroxyl radicals has been identified as the culprit.⁸ Phosphine gas has systemic toxic effects on heart, liver, kidney, lung with manifestations of severe intractable shock, cardiac arrhythmias, acidosis and pulmonary edema. Cardiovascular manifestations include profound hypotension, arrhythmias, congestive heart failure, blocks, myocardial injury.¹⁸ But its Ingestion releases Phosphine (PH₃) gas which is rapidly absorbed via lungs and gut and is responsible for its toxic effects. Phosphine gas can get absorbed by direct inhalation, dermally, or by the gastrointestinal tract.¹⁹ Intentional or unintentional exposure to this compound can result in nausea, vomiting, abdominal pain, diarrhoea, thirst, arrhythmia, sino-atrial block, chest tightness, decreased EF on echocardiography, dyspnoea, pulmonary edema, muscle pain, fatigue, chills, stupor, syncope, vertigo, paresthesia, electrolyte imbalance, burning sternal pain, and renal and liver damage.^{19, 20} Rare manifestations include muscle wasting and tenderness and bleeding diathesis, due to widespread capillary damage.¹¹ Biochemical and histopathological findings in post-mortem cases revealing pulmonary oedema, asphyxial lesions in the pulmonary parenchyma, gastrointestinal mucosal congestion, and petechial haemorrhages on the surface of liver and brain. Desquamation of the lining epithelium of the bronchioles, vacuolar degeneration of hepatocytes, dilatation and engorgement of hepatic central veins, sinusoids and areas showing nuclear fragmentation.^{6, 21}

CONCLUSION

Aluminum phosphide poisoning cases have increased sharply over the past two decades to reach the present magnitude and require more extensive clinical and autopsy studies. People handling this fumigant must

be aware of its lethal aspects. An important preventive measure lies in better regulated supply of ALP, which otherwise is an excellent and safe fumigant as it leaves little residue on grain. Legislative and administrative measures have been suggested to restrict and modify its supply in India. Unfortunately there has been a failure in their implementation. Except the largest producer of it in India, it has been marketed as granulated powder in 10 g plastic sachets. Vendors and shop keepers should not sell the tablets to young people and children without proper verification and confirmation. The conclusion from this case is that although incidence of bleeding diathesis following Aluminum phosphide poisoning is rare but it requires an in-depth study to understand mechanism of action, uncommon complications and to assess and formulate an appropriate treatment in these cases. Therefore, it is important that health professionals, particularly those involved in emergency care and postmortem examination, be aware of complications of ALP poisoning.

Ethical clearance: Taken from Institutional ethical committee.

Source of funding: Self.

Conflict of Interest: Nil.

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A Two Years Study of Deaths due to Vehicular Accidents in North Maharashtra Region

Ajit G. Pathak¹, Ramesh K. Gadhari², Kapileshwar M. Chaudhari³, Nilesh A. Devraj²

¹Professor & Head, ²Assistant Professor, ³Associate Professor, Department of Forensic Medicine & Toxicology, S.B.H. Government Medical College, Dhule, Maharashtra, India

ABSTRACT

Amongst all traffic accidents, road traffic accidents claim largest toll of human life and tend to be the most serious problem world over. Worldwide, the number of people killed in road traffic accidents (RTA) each year is estimated at almost 1.2 million, while the number of injured could be as high as 50 million. The present study has been carried out to study the distribution, nature and types of injuries received during fatal RTAs, and to suggest possible preventive measures.

Key words: death, road traffic accidents, head injury

INTRODUCTION

Amongst all traffic accidents, road traffic accidents claim largest toll of human life and tend to be the most serious problem world over. Worldwide, the number of people killed in road traffic accidents (RTA) each year is estimated at almost 1.2 million, while the number of injured could be as high as 50 million¹. Currently motor vehicle accidents rank 9th in order of disease burden and are projected to be ranked third in the year 2020. Nearly three quarter of deaths resulting from motor vehicle crashes occur in developing country^{2,3}. In India, over 80000 persons die in the traffic crashes annually, over 1.2 million injured seriously and about 3,00,000 disabled permanently. In India, for individuals more than 4 years of age, more life years are lost due to traffic crashes

than due to cardiovascular diseases or neoplasm^{3,4}. The problem appears to be increasing rapidly in developing countries^{5,6,7}.

Due to heavy casualties of human life on roads, in every country each year, extensive investigative research works have been done and are still being done on the possible preventive aspects. Road Traffic Accidents involve a good many complexities which to a large extent is known to all concerned. But, in practice the investigation of individual cases is far from satisfactory, rather often it is just perfunctory in nature and it is more so in countries like ours.

The present study has been carried out to study the distribution, nature and types of injuries received during fatal RTAs, and to suggest possible preventive measures.

MATERIAL AND METHOD

The study of deaths in vehicular accidents was carried out from January 2014 to December 2015 for 2 years in Dept. Of Forensic Medicine & Toxicology, S.B.H. Govt. Medical College, Dhule. Information regarding cause of accident, involvement of the vehicle was collected from police inquest. Condition of the patient before death was noted from indoor case papers of the hospital. In all the

Corresponding Author:

Dr. Ramesh K. Gadhari

Assistant Professor

Department of Forensic Medicine & Toxicology,
SBH Government Medical College & Hospital
Dhule, Maharashtra - 424001, India

E-mail: drrams13@gmail.com

cases, post-mortem was conducted & all detail findings were noted in post-mortem report & final cause of death was confirmed.

OBSERVATIONS AND RESULTS

In this study, total number of cases were 374, out of which 314 (84%) were males and rest 60 (16%) females.

Table No. 1: Showing distribution of vehicular accident cases in relation to sex

Sex	No. of Cases	Percentage
MALE	314	84%
FEMALE	60	16%
TOTAL	374	100%

Predominantly, most common age group was 21 to 40-No. of cases-198 (52.9%), followed by 41 to 60 – No. of cases-102 (27.3%), 0 to 20 –No. of cases-54 (14.5%); 61 & above- No. of cases-20(5.3%)

Table No. 2: Showing distribution of vehicular accident cases in relation to different age groups

Age	No. of Cases	Percentage
0-20	54	14.5%
21-40	198	52.9%
41-60	102	27.3%
61 & Above	20	5.3%
TOTAL	374	100%

Most common vehicle involved was four-wheeler-294 cases (78.6%), followed by Two-wheeler, railway & pedestrians.

Table No. 3: Showing distribution of vehicular accident cases in relation to vehicle involved

Type of Vehicle	No. of Cases	Percentage
Two-wheeler	57	15.2%
Pedestrian	17	4.6%
Light Motor Vehicle	70	18.7%
Heavy Motor Vehicle	224	59.9%
Railway	06	1.6%
Total	374	100%

Injury to head alone or associated with other body parts were in 307 cases (82%) followed by involvement of abdomen & other body parts which was seen in 166

cases (44.4%), followed by involvement of thorax with other body parts in 156 cases (41.7%); upper & lower extremities in 11 cases (3%). However involvement of only thorax was not observed in any case.

Table No. 4: Showing distribution of vehicular accident cases in relation to part of the body involved

Body Part	No. of Cases	Percentage
Head	167	44.7%
Thorax	----	-----
Abdomen	11	3%
Head +Thorax	05	1.3%
Head + Thorax + Abdomen	106	28.3%
Thorax + Abdomen	45	12%
Upper & Lower extremities	11	3%
Head + Extremities	14	3.7%
Total	374	100%

Most common cause of death was Head Injury-181 cases (48.4%), followed by shock & haemorrhage due to multiple injuries, followed by injury to vital organs & crush injuries.

Table No. 5: Showing distribution of vehicular accident cases in relation to cause of death

Cause of Death	No. of Cases	Percentage
Haemorrhage & shock due to multiple injuries	153	40.9%
Haemorrhage & shock due to injury to vital organs	33	8.8%
Head Injury	158	42.2%
Crush Injury	07	1.9%
Head injury with multiple injuries	23	6.2%
Total	374	100%

DISCUSSION

Total no. of cases were 374 out of which males 314 (84%) & females 60 (16%) with male to female ratio of 5:1. Predominantly, most common age group was 21

to 40 with 198 (52.9%) cases, could be due to this age group males are moving around frequently on road for their work.

In the present study, a preponderance of males over females M/F ratio 5:1 have been observed. Our findings are in general agreement with those of Kochar et. al.,⁸ who have reported that maximal fatal accidents have occurred in the age group of 31-40 years and a preponderance of males 85%. This is in contrast to ratio of 9:1 as has been observed by Singh and Dhatarwal⁷. Children below 10 years of age are least involved so also is the case with persons beyond 65 years of age. Similar findings have been reported by other workers in the field^{6,7}.

Most common vehicle involved was four-wheeler-294 cases (78.6%). It could be due to three national high-ways passing through Dhule city & most of the fatal accidents occur on high-ways & common vehicle running on high-ways is four-wheeler. The finding are in conformity with Singh & Dhatarwal⁷. Our findings are in variance with EkeN et.al.,⁶ who have observed that car and buses are commonly involved in the casualties followed by motorcycles, lorries etc. Gerberich et.al.⁹

Injury to head alone or associated with other parts were in 307 cases (82%) followed by involvement of abdomen & other body parts. Cases were noted 166 (44.4%), followed by involvement of thorax with other body parts in 156 cases (41.7%); upper & lower extremities in all cases (3%). A great majority of fatal RTA victims have received multiple external injuries. Singh & Dhatarwal have also recorded involvement of multiple body parts in each case. Abrasion, laceration, fractures, dislocation, head and visceral injuries were more commonly observed in fatal RTA. Our finding are in general agreement with those of other.¹⁰

In our study involvement of only thorax was not observed in any case could be as the chest is elastic & cause alternate compression & decompression due to trauma.

Most common cause of death was Head Injury-181 cases (48.4%), followed by shock & haemorrhage due

to multiple injuries, followed by injury to vital organs & crush injuries. Srivastava AK and Gupta RK reported intracranial haemorrhage as the leading cause of death in their study of fatal RTA cases accounting for 56 cases (66.66%), followed by 18 cases (21.42%) of hemorrhagic shock, 5 cases (5.952%) of septicemia, 4 cases (4.761%) of spinal cord injury, and one pulmonary embolism case (1.19%). Similar findings were noted by other authors.

CONCLUSION

In vehicular accidents driver, condition of the vehicle & condition of the roads are responsible. Hence, for prevention of the accidents, it is necessary to educate the driver for proper driving of vehicle with traffic rules. It is also necessary to wear the helmet for two-wheelers, to use seat-belts for four-wheelers (cars) & speed limits in all the cases. It is equally important to improve the condition of the roads.

Further, road traffic accidents should be investigated by a team of experts which in addition to an experienced investigating police officer should also include automobile expert & medico-legal experts.

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Histopathological Outlook of Myocarditis in Medico-Legal Heart Autopsy—A Study in a Tertiary Care Hospital

Sarita Nibhoria¹, Kanwardeep Kaur Tiwana², Rajiv Joshi³, Manmeet Kaur Punia², Sahil Chhabra⁴,

¹Professor, ²Associate Professor, ³Professor, Department of Pathology, ⁴Junior Resident,
Department of Forensic Medicine, G.G.S. Medical College & Hospital BFUHS, Faridkot

ABSTRACT

Histopathological examination of heart autopsies is routinely done in medico-legal cases to ascertain the cause of death. Cardiovascular disease is the leading cause of deaths worldwide. Myocarditis is clinically and pathologically defined as inflammation of the myocardium. Autopsy studies have reported an incidence of 3.5% to as high as 10%. In the present study comprising of 235 heart autopsies, the diagnosis of myocarditis is made in only two cases which constituted 0.8% of the total heart autopsies. This rate of myocarditis in our autopsy study is far lower than the published studies. The aim of our study is to assess the frequency of fatal course myocarditis in a consecutive series of autopsies and to describe the histologic features of the disease.

Key words: Myocarditis, Neutrophilic myocarditis, Giant cell myocarditis

INTRODUCTION

The Clinical presentation of myocarditis is highly variable and histopathology is thus considered to be the cornerstone of diagnosis. ^[1]Although myocarditis has been known for almost two centuries, data in regard to its incidence have varied widely. Autopsy studies have reported an incidence of 3.5% to as high as 10%. The main reason for such diversity of data appears to be the lack of unanimity as to what constitutes myocarditis. ^[2] Myocarditis refers to an inflammatory response within the myocardium that is not secondary to ischemic events or cardiac rejection in the setting of transplantation.

Dallas criteria defined it as an inflammatory infiltrate of the myocardium with necrosis and /or degeneration of adjacent myocytes not typical of ischemic damage associated with coronary artery disease. ^[3, 4] Histologically some overlap exists among categories of myocarditis and no finding is specific for a single etiology. In general the histologic patterns can be divided into lymphocytic (including viral and autoimmune forms), eosinophilic (in which hypersensitivity myocarditis is the most common, followed by cases of hypereosinophilic syndrome), granulomatous (sarcoid and giant cell myocarditis [GCM]), Neutrophilic (bacterial, fungal, and early forms of viral myocarditis) and reperfusion type/contraction band necrosis (present in catecholamine induced injury and reperfusion injury)

Corresponding Author:

Dr. Sahil Chhabra

MBBS, PG Resident (Pathology)
Department of Pathology
GGS Medical College & Hospital,
Sadiq Road, Faridkot, India – 151203
Email: drsahil137@gmail.com

MATERIALS AND METHOD

The present study is a prospective study done between the periods of 2009 – 2014 in which 235 heart autopsies received in the department of pathology were studied. The heart autopsies were received in 10% formalin solution.

In each case the important information such as age, sex, clinical findings, suspected cause of death and post-mortem findings were provided by forensic experts in the post mortem papers.

Special emphasis was given on the gross examination of heart autopsy adopting the traditional method of opening the heart in the direction of flow. The important parameters recorded were weight of heart, left ventricular wall thickness, right ventricular wall thickness, condition of valves, condition of main vessels including right & left coronaries, aorta & pulmonary trunk, assessment of chamber size and assessment of papillary muscles & chordae tendinae. Representative sections were taken for histopathological examination. Then after subjecting the tissue sections to routine tissue processing, staining with haematoxylin & eosin was done.

RESULTS

The study is conducted in the Department of Pathology between the period of 2009 – 2014, in which medicolegal heart autopsies received in 10% formalin were studied.

The age range in the present study was wide and included heart autopsies from one day old to 100 years old. Maximum heart autopsies were received between 2nd- 4th decade with mean age being the 42±2 yrs (table no.1).

Table No. 1: Age wise distribution of heart autopsies

Age (years)	Total No. of Cases	Percentage of cases
0-9	08	3.4%
10-19	04	1.7%
20-29	50	21.3%
30-39	45	19.1%
40-49	50	21.3%
50-59	31	13.1%
60-69	28	11.9%
70-79	12	5.1%
80-89	05	2.1%
90-100	02	0.8%
Total	235	100%

Though a wide spectrum of heart diseases (table no. 2) were diagnosed during the study which revealed maximum cases of myocardial infarction-old & recent (19.1%) followed by mural thrombus (06%), cardiomegaly (3.8%), and fatty infiltration (3.8%) but our special focus went on to two rare incidental diagnoses of neutrophilic & giant cell myocarditis

Table No. 2: Distribution of cases according to histopathological diagnosis

S. No.	Diagnosis	No. of cases	Percentage
1.	Myocardial Infarction (old & recent)	45	19.1%
2.	Mural Thrombus	14	6.0%
3.	Cardiomegaly	09	3.8%
4.	Fatty Infiltration	09	3.8%
5.	Giant cell myocarditis	01	0.42%
6.	Neutrophilic myocarditis	01	0.42%
7.	Congestion	152	64.6%
8.	Autolysed	04	1.7%
Total		235	100%

Myocardial Infarction (19.1%) was the most common diagnosis with more of old infarcts (62.2%) than the recent infarcts (37.8%). Atherosclerotic changes were evident in the coronary vessels in all the cases (fig 3).

Next followed the mural thrombus (06%). The diagnosis was made on gross examination and was confirmed microscopically.

Cardiomegaly and fatty infiltration made up equal percentage i.e. (3.8%). Both had important gross as well as microscopic findings.

The five year medico-legal heart autopsy comprising of 235 heart autopsies showed only two cases of Myocarditis with one case each of neutrophilic and giant cell myocarditis (0.42% each) (table no.3)

Table No. 3: Clinico-pathologic outlook of Myocarditis in the present study

S. No.	Type of Myocarditis	Age	Sex	Clinical history
1.	Giant cell myocarditis	65	F	None
2.	Neutrophilic myocarditis	25	M	Chest pain

The heart autopsy with histopathological incidental diagnosis of Neutrophilic myocarditis was from 25 years young male prisoner with a brief history of chest pain. The heart was unremarkable on gross examination. Microscopic examination of heart from both ventricular walls showed inflammatory infiltrate consisting primarily of neutrophils with foci of micro abscesses with minimal myocyte damage. Sections from lungs exhibited dense neutrophilic exudates and congestion highlighting the possibility that lungs may be the contiguous source of exudates in the myocardium (fig 1)

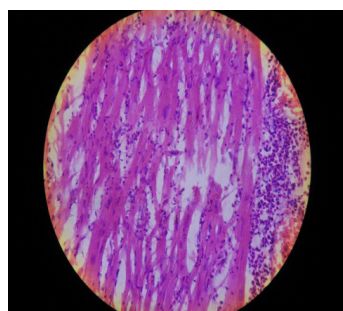


Fig. No. 1: Sections from myocardium showing inflammatory infiltrate consisting predominantly of neutrophils with foci of micro abscesses (H& E X100)

The heart autopsy with histopathological diagnosis of Giant cell myocarditis was from a 65 year old female with a history of sudden death and no previous ailment. Gross examination of the heart autopsy specimen was again unremarkable. Multiple sections examined from ventricular walls showed presence of diffuse inflammatory infiltrate comprising of lymphocytes, plasma cells, histiocytes and multinucleated giant cells along with degenerated myocytes (fig 2). No epithelioid cell granulomas or caseous necrosis noted. Acid fast

bacilli were not seen. Sections from atria, valves and coronaries were unremarkable.

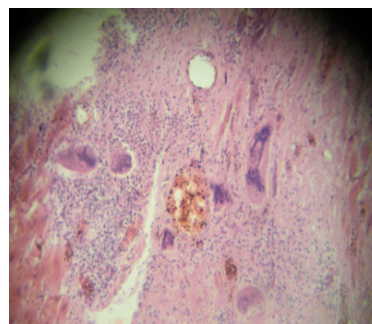


Fig. No. 2: Section shows diffuse inflammatory infiltrate, multinucleated giant cells and reactive changes in myocytes and no granulomas (H&E, x100)

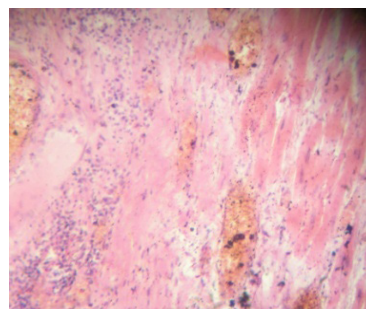


Fig. No. 3: Myocardial Infarction: Sections showing areas of necrosis & infiltrate consisting predominantly of lymphocytes (H&E X100)

Four heart autopsies received were found to be partially or completely autolysed and major cause was lack of use of proper fixative.

DISCUSSION

Myocarditis is a challenging diagnosis due to the heterogeneity of clinical presentations. [5-7] The actual incidence of myocarditis is also difficult to determine as endomyocardial biopsy (EMB), the diagnostic gold standard [5-7] is used infrequently. [6, 7]

Autopsy studies report a frequency of myocarditis ranging from 0.11 to 5.5% in the general population. Myocarditis is often undiagnosed and the incidence of fatal course myocarditis has never been evaluated.

Elisa Carniel, Gianfranco Sinagra and et al did a study on 2560 autopsies and found 143 cases (5.6%) of active myocarditis.^[8]

In an another 10 year study by Gravanis MB and Sternby NH applying the newly proposed histologic criteria, the diagnosis of myocarditis constituted 1.06% of the autopsy population studied.^[2]

The present study also showed a percentage of 0.8% i.e. only two cases of myocarditis out of 235 autopsies and this is far less as compared to the published studies. The histopathologic examination of heart autopsies showed one case each (0.4%) of Giant cell myocarditis and Neutrophilic myocarditis.

Giant cell myocarditis is rare, morphologically distinct form of myocarditis with a fulminant and fatal course.^[9, 10] In a Japanese autopsy registry, the reported incidence was 0.007% (25 out of 377841 cases).^[11] It was first described by Saltykow in 1905 in a 37 year old man who died suddenly after surgical drainage of an abscess.^[12] In early part of twentieth century, the term giant cell myocarditis was used to describe both granulomatous and diffuse inflammatory myocardial infiltrates that contained multinucleated giant cells.^[13, 14] Teslak first distinguished the term and called it giant cell myocarditis.^[15] It is a pathological diagnosis which on histopathological examination consists of diffuse or multifocal inflammatory infiltrate with presence of lymphocytes, plasma cells, histiocytes, eosinophils and numerous multinucleated giant cells and absence of true granulomas.

Neutrophilic myocarditis is a rare and a specific entity with very low incidence. Berry GJ and Atkins KA described that in developed countries infectious causes of heart muscle inflammation are uncommon in immunocompetent individuals.^[16] Patients with Acquired immunodeficiency syndrome (AIDS), transplant associated immunosuppression to prevent allograft rejection and advanced cases of malignancy are susceptible to bacterial, viral, fungal, protozoal & rickettsial infections. In contrast in developing countries neutrophilic myocarditis due to infectious causes remains a significant cause of morbidity and mortality.

^[16] We are in a developing country but still the diagnosis is very rare despite higher incidence in comparison to developed countries.

The major problem being that neutrophilic myocarditis has to be differentiated from myocardial infarction as in both conditions patients present with similar sign and symptoms while they can be differentiated only on histopathological grounds.^[17-19]

In neutrophilic myocarditis there is seen neutrophilic infiltration and micro abscesses in the myocardium with minimal myocyte damage. There is absence of coagulative necrosis and coronary artery disease. The classic mechanism of myocardial dissemination include septicemia or localized infection from a contiguous source such as infected lung.

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CONCLUSION

Myocarditis is a rare mostly incidental diagnosis made on autopsy. It is a challenging diagnosis with variable clinical presentation and histologic features.

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Role of Menstrual Cycle and Other Predisposing Factors in Female Suicide – An Autopsy Study

N.A. Balaram¹, S.R. Saritha²

¹Professor and Head, ²Associate Professor, Department of Forensic Medicine,
Govt. Medical College, Thrissur, Kerala

ABSTRACT

The mysterious menstrual cycle which has a lunar periodicity, deserves a detailed study as majority of females committing suicide are in the menstrual age group. Emotional balance in females seems to become unstable in the premenstrual phase. Objectives of the present study is to find out relation of completed suicides with menstrual phases and other predisposing factors.

This was a descriptive study on females belonging to age group 15 to 45 years. The study was conducted in the Department of Forensic Medicine, Medical College, Thiruvananthapuram during the period 2004 to 2005. Ninety five cases of suicide brought for autopsy during the study period were included.

Proliferative and secretory phases have an almost equal distribution in completed suicides (45.3% and 46.3% respectively). Hence premenstrual syndrome could not be the precipitating factor in the present series. Predisposing factors for the suicides were mental illness, family problems, physical illness, financial problems, educational problems, dowry related problems, loss of employment. Most of the completed suicide did not reveal any specific cause for their act.

Key words: Female suicide, menstrual cycle, predisposing factors, autopsy study.

INTRODUCTION AND BACK GROUND

The term suicide is applied to all cases of death resulting directly or indirectly, from a positive or negative act of the victim which he knows will produce this result. This phenomenon which appears to be statistically significant has never been satisfactorily explained. In this century the trend has been towards an increase in the rate of suicide in women nearly everywhere, relative to that of men. During the first five decades of life suicide rate in men decreased and that

of women increased. The mysterious menstrual cycle which has a lunar periodicity, deserves a detailed study as majority of females committing suicide are in the menstrual age group.

It has long been realized that menstruation and mental illness are linked¹. Vivid descriptions and social stigma associated with menstrual related mood and behavioural changes date back to Hippocrates. The Talmud, the Bible and ancient African tribal cultures also had described these aspects². As early as 1827 menstrual mood disorder was used as a defense in filicide. In 1850s Briere de Boismont and Schlager carried out the first surveys showing that between 20% and 30% of women suffered a mood disorder before or during the menses¹. Premenstrual tension was first described by Frank 1931. He described this tension in both physical and psychological sense, in

Corresponding Author:

Dr. S. R. Saritha. MD (FM), DPH

Associate Professor,

Department of Forensic Medicine,

Govt. Medical College, Thrissur, Kerala

Email: sarithasr2010@gmail.com

several women and attributed it to oestrogen excess, which he thought, was the consequence of diminished urinary oestrogen excretion which occurred during the premenstrual phase³. In 1964, Dalton derived the term 'Premenstrual Syndrome' to encompass all the possible changes associated with significant disturbances in the premenstrual phase³. Sutherland and Stewart suggested that any combination of emotional or physical features which occur cyclically in a female before menstruation and which regress or disappear during menstruation constitute the premenstrual syndrome. Premenstrual syndrome appears to be a stable diagnosis over time⁴.

Apart from menstrual cycle various other factors also contributing to female suicide such as higher prevalence of depression, greater occurrence of eating disorders, postpartum psychosis, pregnancy, abortion, marriage related problems, child hood abuse, domestic violence etc^{5,6}. The present study was undertaken with objectives to find out relation between completed suicides and the menstrual phases and also to find influence of other predisposing factors for female suicide in this region of Kerala.

MATERIALS AND METHODS

The present study was a descriptive study on females belonging to age group 15 to 45 years. The study was conducted in the Department of Forensic

Medicine, Govt. Medical College, Thiruvananthapuram during the period of 2004 to 2005. Ninety five cases of suicide brought for autopsy during the study period were included. Bodies of pregnant women, with survival for more than 24 hours, decomposed bodies and unknown bodies were excluded from the study.

The data was collected in a closed questionnaire prepared for this purpose which contained the relevant baseline data. The other data collected were the approximate time of death, the method adopted for committing suicide and the history of the case from the investigating officer and the close relative.

During postmortem examination the genital organs were removed intact after careful examination insitu. Macroscopic features were noted. A bit of the uterus 5mm in width involving its whole thickness from endometrium to serosa was taken from the fundal portion of the anterior wall as the material obtained from lower uterine segment cannot be dated because it does not have the same cyclic development as the fundal endometrium. The tissue bit so collected was fixed in 10% formalin for 2 days and subjected to routine histological examination with haematoxylin and eosin stain. Histological phasing of the endometrium was done as shown in the table given below.

Table No. 1: Dating of endometrium

S. No.	Phases of menstruation	Days	Histological changes
I	Menstrual phase	1 to 3 days	Haemorrhagic endometrial stroma, lytic glands, neutrophils
II	Proliferative early phase	Post menstrual 4 to 7 days	Punched out lumen, straight tubular glands, columnar epithelial cells
III	Mid phase	8 to 10 days	Tubular glands, columnar epithelium, edema in stroma
IV	Late phase	11 to 14 days	Coiled glands, columnar epithelium, no oedema
V	Early secretory phase	Post ovulatory 15 to 18 days (1) 15 th day (2) 16 th day (3) 17 th day (4) 18 th day	Sub nuclear vacuolation Peri nuclear vacuolation Supra nuclear vacuolation Vacuolation disappear
VI	Mid secretory phase	19 to 21 days	Edema in stroma (appear and disappear), glandular dilatation with secretion
VII	Late secretory phase	22 to 28 days	Budding of epithelium, stroma with spiral arterioles, predecidual changes

The histological dating as given in, Surgical Pathology of Endometrium by Cove H (1981)⁷, could not be done in the sample collected at postmortem due to loss of nuclear features. The inevitable time gap between death and medico legal postmortem examination could have been the reason for the loss of details of nuclear features in the samples studied. In this series only patterns could be made out. Dating was therefore done to the extent of identification of phase as above (Table No. 1).

The study was conducted after obtaining institutional ethical committee clearance. Analysis done using the software SPSS (Statistical Package for Social Services).

FINDINGS

Females belonging to 15 to 45 years of age group were included in the present study as they comprised the reproductive age group. The phases of the menstruation were divided into nine phases and the age groups were grouped into six of five years interval to obtain a greater spread. This division was made in order to look for final detailed phase difference if present, with better accuracy in the age groups.

AGE DISTRIBUTION

The youngest was 15 years and the oldest 45 years. Maximum number of subjects were included in the age group 15-20 years (27.4%) and minimum between 36-40 years (9.5%).

ENDOMETRIAL PHASE AND AGE DISTRIBUTION

The phases of menstruation were divided histologically into menstrual, early proliferative, mid proliferative, late proliferative, early secretory, mid secretory, late secretory, undetermined proliferative and undetermined secretory.

Maximum number of cases were found in the late secretory phase (22%) (Fig. No. 2) followed by early proliferative phase was seen in 18.9%

(Fig. No. 1). Proliferative and secretory phases along with corresponding undetermined stages constituted 43 cases (45.3%) and 44 cases (46.3%) respectively indicating almost equal distribution of both phases in the study group. So a definite role could not be attributed to any of the phases even on statistical analysis. The chi square test was done to find out the association between the endometrial phase and age and it was found to be not significant ($\chi^2 = 40.6$, $P = 0.927$).

When the phases were analysed according to histological dating, the late secretory phase showed a marginal increase compared to early proliferative phase, though no significance could be attributed to any of the phases. Among the cases studied, 27.4% of cases were in the paramenstrum which includes last four days of premenstrum and four days of menstrum. According to MacKinnon and MacKinnon about half of all attempted and completed suicides occurred during this period of paramenstrum⁸. In the study conducted by MacKinnon, MacKinnon and Thomson (1959) completed suicides were found in more than 50% of the study groups in midluteal or late secretory phase⁹. But in the present study mid luteal and late secretory constituted only 37.9% of cases and is not in agreement with the above studies.

In this study, 11.6% of the cases in the proliferative phase belonged to 15 to 20 years age group. The undetermined secretory phase was detected in 3.2% cases. Resting endometrium, lytic endometrium and cystic atrophy were seen in 1 case (1.1%) each. They belonged to 16 years, 18 years and 25 years of age. Hirsutism was seen along with cystic changes in ovaries in the case belonging to cystic atrophy (Fig. No. 3). Histological changes like resting endometrium, lytic endometrium and cystic atrophy were not found described in the previous studies. According to Cove⁷, cystic atrophy can be a mark of hormonal imbalance as evidenced by hirsutism and cystic changes in the ovary. Lytic endometrium was seen in an 18 year old female and in this person the cycles might have been anovulatory.

The undetermined secretory phase was seen exclusively in the age group 15 to 25 years (3.2%), whereas the undetermined proliferative phase was spread among the age group 21 to 40 years (5.3%).

This might have been due to the hormonal changes that occurred during the various phases of the reproductive age group. A detailed hormonal assay is needed for the confirmation of this fact (Table No. 2).

Table No. 2: Distribution of phases of menstruation and age

Phase	Age groups in completed years						Total	Percentage
	15-20	21-25	26-30	31-35	36-40	41-45		
Menstrual	2	1	1	1	-	-	5	5.3
Early proliferative	5	3	3	4	1	2	18	18.9
Mid proliferative	3	1	2	3	2	3	14	14.7
Late proliferative	3	1	-	1	-	1	6	6.3
Early secretory	-	2	2	-	1	-	5	5.3
Mid secretory	3	3	-	2	2	5	15	15.7
Late secretory	6	5	4	2	2	2	21	22
Undetermined secretory	2	1	-	-	-	-	3	3.2
Undetermined proliferative	-	1	1	2	1	-	5	5.3
Resting endometrium	1	-	-	-	-	-	1	1.1
Lytic endometrium	1	-	-	-	-	-	1	1.1
Cystic atrophy	-	1	-	-	-	-	1	1.1
Total	26	19	13	15	9	13	95	100

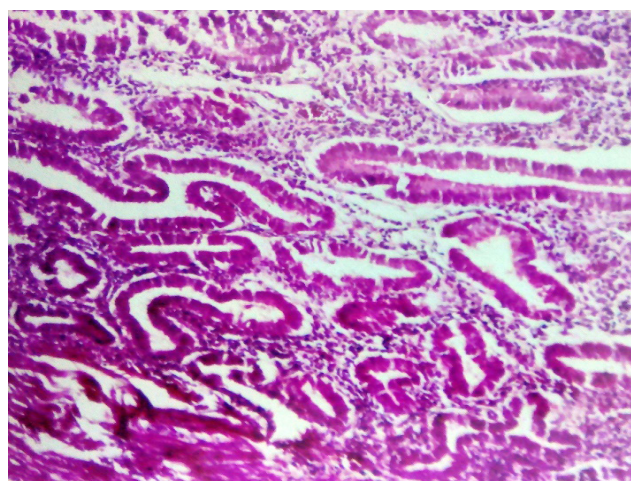


Fig. No. 1: Early proliferative phase showing punched out lumen, straight tubular glands, columnar epithelium

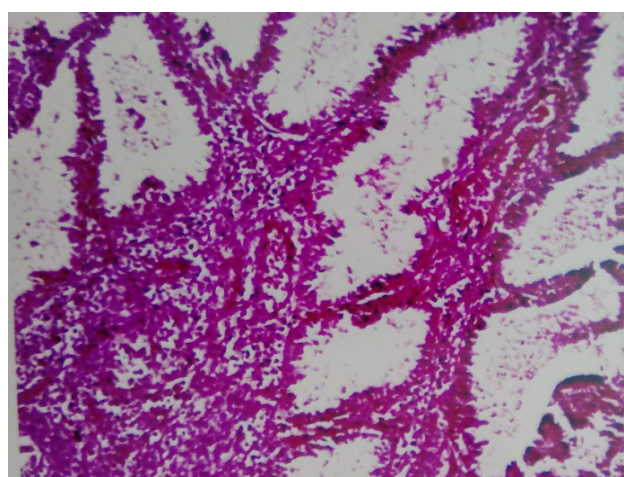


Fig. No. 2: Late secretory phase showing stromal decidualization

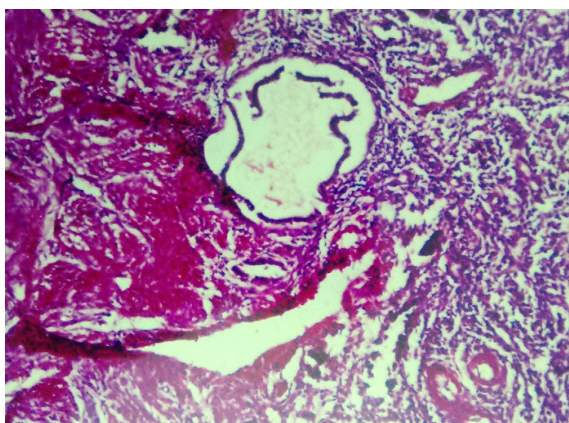


Fig No. 3: Endometrium showing cystic atrophy

METHODS ADOPTED FOR SUICIDE AND AGE DISTRIBUTION

The various methods adopted for committing suicide were hanging, poisoning, burns, drowning

and rail traffic occurrence. Hanging was selected as the method of suicide in 54 cases (56.8%). Of these, maximum number (22 cases) belonged to 15 to 20 years age group and minimum number (2 cases) were seen in 36 to 40 years group. Poisoning was selected as the method of choice by 24 subjects (25.3%) and they found distributed among all age groups, the maximum number of 7 being in the 21 to 25 years age group and minimum number of 2 in 15 to 20 years age group. Burns was the cause in 9 cases (9.5%) and it was seen distributed in all age groups except 41 to 45 years. Drowning was the cause in 6 cases (6.3%) and this method was selected by all age groups except 15 to 20 and 31 to 35 years. Among the cases studied, 2 subjects committed suicide by jumping before train (2.1%), 1 each in 31 to 35 and 36 to 40 years age group (Table No. 3).

Table No. 3: Frequency distribution of methods of suicide and age

Method	Age groups in completed years						Total	Percentage
	15-20	21-25	26-30	31-35	36-40	41-45		
Hanging	22	10	7	7	2	6	54	56.8
Poisoning	2	7	3	4	3	5	24	25.3
Burns	2	1	2	3	1	-	9	9.5
Drowning	-	1	1	-	2	2	6	6.3
Railway Occurrence	-	-	-	1	1	-	2	2.1
Total	26	19	13	15	9	13	95	100

PREDISPOSING FACTORS

Family problem was the predisposing factor seen in 33 cases (34.7%), financial problems and mental illness was the reason in 8 each (8.4%). Physical illness was the factor in 6 cases (6.3%). Dowry related problems and loss of employment were the reasons in 1 case each and both belonged to the age group 21-25 years. Educational problem was the factor in 2.1% of cases.

A good number of cases who committed suicide did not reveal any specific cause for the act (37.9%). Either no specific cause (37.9%) or family problems (34.7%)

were described as common causes for committing suicide in all groups (Table No. 4).

PREDISPOSING FACTORS AND METHODS OF SUICIDE

Of those who had given a history of mental illness as a risk factor for suicide, 3 each selected hanging and poisoning, 2 cases resorted to drowning. Among those who had given a history of family problems as a cause for committing suicide, majority selected hanging (18) as the method of choice, 11 resorted to poisoning, one each selected burns and drowning, 2 selected of rail

run over as the method of their choice. In those cases where physical illness was cited as motivational factor, 3 had died of hanging, one each by poisoning, burns and drowning. Financial problems played a role for committing suicide by hanging in 6 cases and 1 case each by poisoning and burns. Educational problems were given as the cause of suicide by 2 persons and both selected hanging as a means to end their life. There was only one dowry related death and that was by drowning. Majority of the females who committed suicide for no

specific cause, accomplished it by hanging (21 cases). Of the remaining, 8 had resorted to poisoning, 6 had died of burns and 1 due to drowning. Only one female committed suicide due to loss of employment and that was by hanging.

Hanging was the most common method projected for suicide. As the death in these cases have a very short fatal period, the determination to terminate one's lives could be the reasons to resort to such methods (Table No. 4).

Table No. 4: Frequency distribution of motivational factors and method selected

Motivation	Hanging	Poisoning	Burns	Drowning	Rail Traffic Occurrence	Total	Percentage
Mental illness	3	3	-	2	-	8	8.4
Family problems	18	11	1	1	2	33	34.7
Physical illness	3	1	1	1	-	6	6.3
Financial problems	6	1	1	-	-	8	8.4
Educational problems	2	-	-	-	-	2	2.1
Dowry related problems	-	-	-	1	-	1	1.1
No specific history	21	8	6	1	-	36	37.9
Loss of employment	1	-	-	-	-	1	1.1
Total	54	24	9	6	2	95	100

SUMMARY AND CONCLUSION

From the analysis of the present study we could only arrive at a conclusion that proliferative and secretory phases have an almost equal distribution in completed suicides (45.3% and 46.3% respectively). Hence premenstrual syndrome could not be the precipitating factor in the present series. Dr. John Pollitt was of opinion that success rate of suicides committed during the premenstrual phase was low. The women who were in this phase tended to be careless, thoughtless, forgetful and absent minded. He attributed this inefficiency as a cause for poor success rate.

Predisposing factors for the suicides found in the present series were mental illness, family problems, physical illness, financial problems, educational problems, dowry related problems and loss of employment.

Most of the completed suicide did not reveal any specific cause for their act. As suicide is a taboo even now they may not have wanted their family or near ones to be blamed for their death or stigmatised thereafter. Hence they might not have revealed the real fact, even if it would have been there.

Declaration of Conflict of Interests: The authors declare that there is no conflict of interest real and perceived.

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Ethical Clearance: The study was conducted after obtaining institutional ethical committee clearance.

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Morphometric Sex Difference in the Innominate Bone using Acetabulum—Pubic Index

**Bhaskaran SathyaPriya¹, Purushothaman Lakshmanan², Jinu Merlin Koshy³,
William Moses Johnson⁴, Gunapriya Raghunath⁵, Vijayalakshmi⁶**

¹Reader, Department of Anatomy, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education & Research, Chennai, Tamilnadu, ²Consultant Orthodontist, Apollo Hospitals & Apollo White Dental, Chennai, Tamilnadu, ³Reader, Department of Anatomy, Sree Balaji Dental College & Hospital, Bharath Institute of Higher Education & Research, Chennai, Tamilnadu, ⁴Professor & HOD, Department of Anatomy, Sree Balaji Medical College & Hospital, Bharath Institute of Higher Education & Research, Chennai, Tamilnadu, ⁵Professor & HOD, ⁶Professor, Department of Anatomy, Saveetha Medical College & Hospital, Saveetha University, Chennai, Tamilnadu

ABSTRACT

The pelvic or the innominate bone is the one of the most reliable sex indicator of the skeletal remains during a medicolegal investigation followed by cranium and long bones. The present study was conducted 9 pelvis articulated with known sex and 30 unknown hip bones were selected for the present study. 9 pelvis articulated with known sex was studied using manual vernier calipers to investigate the sexual dimorphism of well established acetabulum – pubis index. In an articulated male pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis (XY) and the total width of the acetabulum (YZ). In an articulated female pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis (XY) and the total width of the acetabulum (YZ). Then the same measurement was carried in the individual hip bone of unknown sex. The data collected were tabulated and evaluated as shown in table 1 and table 2. The outcome measures of 9 pelvis showed that XY=YZ in male and XY>YZ in female. Using this scale, out of 30 individuals 22 were male and 8 were female. This study concluded that acetabulum-pubic index could be used for determination of sex.

Keywords: *Acetabulum - Pubis index, Medicolegal investigation, Pubic symphysis, Sexual dimorphism.*

INTRODUCTION

Ascertaining a biological profile from the skeleton is a vital component in both forensic and archaeological settings. Anatomists are frequently consulted for identification of skeletal remains found under suspicious

circumstances. Visual impressions of the bones can seldom be as accurate because of the many pitfalls associated with subjective assessments of the observer. Sexual dimorphism is simply the physical difference between males and females within a species in either overall body size or in specific feature shape. Many species show exaggerated sexual dimorphism, such as the gorilla, as males are often twice the size of females^[1, 2]. In contrast, human females are on average roughly 10% smaller than males^[3]. Typically, these size differences emerge after puberty when sexual maturity is reached^[2]. Size is not the only factor that influences physical differences between the sexes. Variation in shape and morphology of a feature or group of features can vary between the sexes^[4].

Corresponding Author:

Bhaskaran Sathya Priya

Reader, Department of Anatomy,
Sree Balaji Dental College & Hospital,
Bharath Institute of Higher Education & Research,
Chennai, Tamilnadu
Mobile: 96000 33301
Email: dr.sathyapriyalakshmanan@yahoo.com

Sexual dimorphism can be best observed primarily on pelvic or innominate bone, the cranium and the long bones. The distinctive morphology of pelvic bone and its clear sexual dimorphism make it of interest from anatomical, anthropological & forensic points of view^[4]. Along with the common features of sex differences in the skeleton, additional sex differentiating features are considered in case of pelvic girdle because of its reproductive functions mainly influenced by the sex hormones^[5]. In the more than 100 years since Fehling (1876) first noticed sexually dimorphic differences on the sub adult pelvic bones^[6]. In the human innominate, several features are known to differ sufficiently between males and females so that sex can be determined from one trait alone, although the combination of several features provides higher levels of accuracy^[7]. These features include the greater sciatic notch, subpubic angle, and ventral arc^[7-13]. In general, male bones are identifiable by their greater robusticity, but this is a question of relativity. The sex classification of a bone is possible with a degree of certainty only when it can be compared to a series of known sexual dimorphism^[4]. Traditional methods involving many measurements, indices & observations are cumbersome & frequently unreliable. A simple method which will determine the sex of a majority of skeletons is based on the acetabulum-pubic index (A-P Index). The pubic bone of adult female is longer than that of the male. On the other hand, the male ischium is longer than that of female. The acetabulum- pubic index takes an advantage of these relations, and is an efficient indicator of sex.

AIM

The aim of the present study is to determine the morphometric sex difference in the innominate bone using acetabulum - pubic index.

MATERIALS & METHOD

Study design: Experimental

Sample selection: 9 pelvis articulated with known sex and 30 hip bones of unknown sex from the anatomy department of Sree Balaji Medical college & Hospital, Chennai were selected for the present study. The bones were undamaged and showed no pathological changes.

Apparatus required: Vernier caliper, Recording sheets

PROCEDURE

Acetabulum – pubis index is one of the reliable criteria for sex differentiation of human hip bone. 9 pelvis articulated with known sex was studied using manual vernier calipers to investigate the sexual dimorphism of well established acetabulum – pubis index (Figure 1). The distance between pubic symphysis and acetabulum and acetabular diameter were measured, and A-P index was calculated. In an articulated male pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis(XY) and the total width of the acetabulum (YZ) where XY was equal to YZ (Figure 2, 3 & 4).. In an articulated female pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis(XY) and the total width of the acetabulum (YZ) where XY was more than YZ (Figure 5, 6 & 7). Then the same measurement was carried in the 30 individual hip bones of unknown sex (Figure 8, 9, 10 & 11). The data collected were tabulated and evaluated.

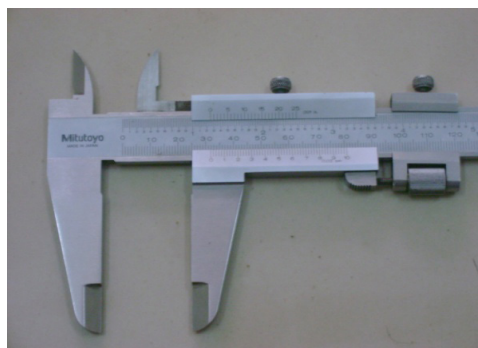


Figure 1 : Vernier Caliper



Figure 2 : Articulated Male Pelvis

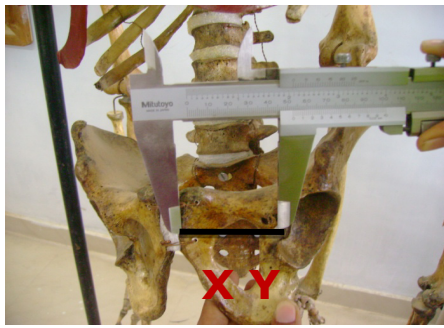


Figure 3 : Measurement of XY in Articulated Male Pelvis



Figure 7 : Measurement of YZ in Articulated Female Pelvis

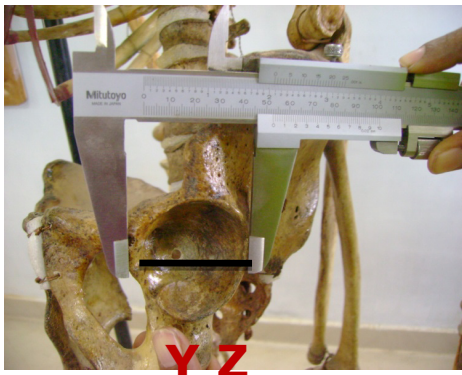


Figure 4: Measurement of YZ in Articulated Male Pelvis

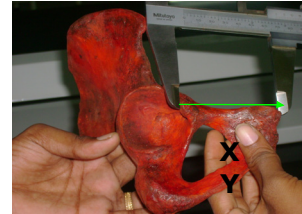


Figure 8: Measurement of XY in Unknown Pelvis (showing XY=YZ)

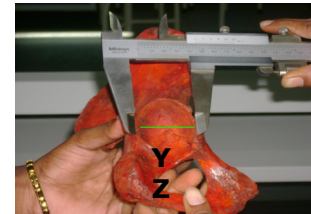


Figure 9 : Measurement of YZ in Unknown Pelvis (showing XY=YZ)



Figure 10: Measurement of XY in Unknown Pelvis (showing XY>YZ)

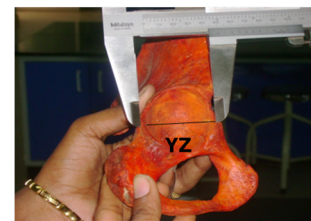


Figure 11: Measurement of YZ in Unknown Pelvis (showing XY > YZ)



Figure 5 : Articulated Female Pelvis

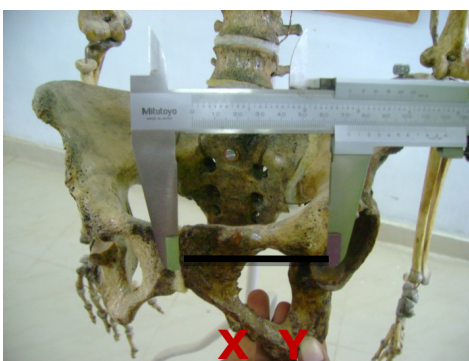


Figure 6 : Measurement of XY in Articulated Female Pelvis

RESULTS

9 pelvis articulated with known sex and 30 unknown hip bones were selected for the present study. 9 pelvis articulated with known sex was studied using manual vernier calipers to investigate the sexual dimorphism of well established acetabulum – pubis index. In an articulated male pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis (XY) and the total width of the acetabulum (YZ). In an articulated female pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis (XY) and the total width of the acetabulum (YZ). Then the same measurement was carried in the individual hip bone of unknown sex. The data collected were tabulated and evaluated as shown in

table 1 and table 2. The outcome measures of 9 pelvis showed that $XY=YZ$ in male and $XY>YZ$ in female. Using this scale, out of 30 individuals 22 were male and 8 were female.

Table No. 1: Acetabulum-Pubic Index of articulated pelvis of known sex

S. No.	Acetabulum-Pubic symphysis (XY) (mm)	Acetabulum diameter (YZ) z(mm)	Male/Female
1	50	50	M
2	50.4	50.4	M
3	40.9	40.9	M
4	50.2	50.2	M
5	50.7	40.7	F
6	50.4	50.4	M
7	60.1	50.3	F
8	40.8	40.8	M
9	40.9	40.9	M

Table No. 2: Acetabulum-Pubic Index of unknown pelvic bone

S. No.	Acetabulum-Pubic symphysis (XY) (mm)	Acetabulum diameter (YZ) (mm)	Male/Female
1	50.9	50.9	M
2	50.3	50.3	M
3	40.9	40.9	M
4	60.3	60.3	M
5	70.1	50.1	F
6	40.4	40.4	M
7	40.8	40.8	M
8	50.0	50.0	M
9	50.4	50.4	M
10	60.8	40.6	F
11	50.6	50.6	M
12	70.3	50.3	F
13	40.9	40.9	M
14	60.3	60.3	M
15	50.1	50.1	M
16	60.4	40.4	F
17	40.8	40.8	M
18	60.0	60.0	M
19	50.1	50.1	M
20	60.3	40.3	F
21	50.6	50.6	M
22	50.3	50.3	M
23	60.9	40.9	F
24	60.3	60.3	M
25	50.1	50.1	M
26	50.4	40.4	F
27	40.8	40.8	M
28	45.0	45.0	M
29	70.1	50.1	F
30	40.3	40.3	M

DISCUSSION

Sexual dimorphism in the human pelvis are well clear in a massive literature which includes contributions from anatomists, anthropologists and gynaecologists^[14]. In the present study 9 pelvis articulated with known sex and 30 hip bones of unknown sex were selected. 9 pelvis articulated with known sex was studied using manual vernier calipers to investigate the sexual dimorphism of well established acetabulum – pubis index. In an articulated male pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis (XY) and the total width of the acetabulum (YZ). In an articulated female pelvis, the A-P index was derived from the measurement of the distance between the anterior rim of acetabulum and pubic symphysis (XY) and the total width of the acetabulum (YZ). Then the same measurement was carried in the individual hip bone of unknown sex. The data collected were tabulated and evaluated as shown in table 1 and table 2. The outcome measures of 9 pelvis showed that XY=YZ in male and XY>YZ in female. Using this scale, out of 30 individuals 22 were male and 8 were female.

Steyn and Iscan observed that acetabulum diameter was the most dimorphic characteristic^[15]. This is in contrast to our study, where A-P index was the most dimorphic followed by pubic symphysis - acetabulum while the acetabulum diameter is the least dimorphic variable. Kanika Sachdeva et al showed pubic length is always more in females as compared to males in the North Indian population^[16-18]. Washburn (1948) stated that since pubic region is most responsive to sex hormones, the pubic length is the best indicator of sex determination of a skeleton, the other indicators like subpubic angle, height of pubic symphysis and shape of obturator foramen being secondarily dependent upon it^[13]. As the pubic length increases; the subpubic angle becomes wider, height of symphysis decreases and obturator foramen becomes more triangular. The pubic bone in its selective deposition & remodeling of the pelvis, affects both sagittal & transverse diameters of inlet. The pubis, more than any other bone, causes sex

differences in these dimensions, for it is most responsive to female sex hormone^[14, 19].

Schultz (1949) compared the acetabulum-pubic index in a primate series and as in humans found it to be more in females in all of them except sub-adult chimpanzee^[20]. It was concluded that sex of over 98 % of skeletons could be determined using acetabulum-pubic index.

Ethical clearance- Taken from. Institutional Ethical committee

Source of funding- Self

Conflict of Interest- Nil

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The Effect of Integrative Approach (Schema Therapy and Imago Therapy) on Girls' Love Addiction in Isfahan

Zahra Ghaemi¹, Ozra Etemadi¹, Fatemeh Bahrami¹, Maryam Fatehizade¹

¹Department of Counseling, Faculty of Education & Psychology, University of Isfahan, Isfahan, Iran.

ABSTRACT

The objective of this study was to investigate the effect of integrative approach (Imago therapy and schema therapy) on girls' love addiction in Isfahan. The method of this study was of semi experimental and pretest-posttest type with control group. The statistical society of this study included girls referred to consultation and cultural center of Isfahan. Among these individual 30 persons who obtained the required mark in Pibody' addiction to love questionnaire; were selected and 15 individuals assigned to experimental group and the other 15 to control one. The study hypotheses was as follow: integrative approach (imago therapy and schema therapy) is effective on girls' love addiction. The dependent variable was girls' love addiction which were evaluated using Pibody' addiction to love questionnaire. The independent variable was integrative approach (imago therapy and schema therapy) which was enforced in one experiment group and 8 individual sessions. The data were analyzed with covariance analysis by SPSS software. The results showed that integrative approach has improved girls' love addiction.

Keywords: *Integrative Approach, Imago Therapy, Schema Therapy, Love Addiction*

INTRODUCTION

Effective relationships play a major role in human life. Love is one of the most important kind of relationships and people expect it can satisfy their emotional needs ¹. Healthy love is characterized by real intimacy (physical and emotional), honesty, flexibility, belief, respect, security and real commitment ².

When people lose their healthy love, they are usually entangled in one or two styles of communication against themselves. Some people seriously fall in love with their romantic partner; others are the opposite; they show defensive behaviors and even avoid the healthy relationships. However, both of them may finally stuck in

“love addiction”. Love addiction may be considered as a kind of behavior for satisfying the passions for security, excitement, strength, belonging and purposiveness ³; in which there is a harmful obsession and attachment that are defined by a number of the poisonous patterns such as interest in relationship, rejection, love and hatred, intimacy and sadness ².

Halpern believes that the love addiction is rooted in ‘severe attachment hunger’. People who grow up with this kind of attachment, dramatically need a person to attach him or her and suppose that if they are alone, they will die! If this kind of feeling is so strong, people struggle to keep their relationship with their partners at any price. In fact, severe attachment hunger and growing up in an unstable environment (including family, peers and so on) shows a significant relationship between deprivation in childhood and addictive love ⁴. In this regard, the results of research performed by Khalaj Abadi and Mahyar (2010) suggest that strict parental control during adolescence, liberal attitudes of parents

Corresponding Author:

Ozra Etemadi

Department of Counseling, Faculty of Education & psychology, University of Isfahan
Email: O.etemadi@edu.ui.ac.ir

and little respect for the parents' recommendations are the most important predictors of these destructive relationships with the opposite sex within the family⁵. On the other hand, Mardani et al. (2013) investigated the prevalence of obsessive love and its relationship with attachment style. The results showed 17.9% of obsessive love among the people and that the anxious-avoidant attachment style can significantly predict obsessive love. The results also demonstrated that the performance of the attachment system is not limited to childhood but its effects and emotional attachments such as friendships and romantic relationships affect the whole life⁶. Improper occasional changes that adversely affect the people are of common signs of a love addiction⁷⁻⁸. Imago therapy helps these people to: recognize and get insight into their own image, discard their improper childhood beliefs, re-parent themselves and replace their improper behaviors and defensive strategies by proper ones⁹⁻¹⁰.

Schema therapy model is a combination of cognitive model, dynamic psychotherapy, attachment and Gestalt. Although the cognitive and behavioral components are necessary for therapy in this approach, it focuses on emotional change, experiential techniques and therapeutic relationships. Brevity and contemplation are some advantages of schema therapy model¹¹. Schema therapy helps the therapist to examine precisely the love addicts' problems and organize it in an understandable way¹².

In this regard, Acevedo and Aron (2009) concluded that romantic love in healthy loving relationships is associated with experiencing good feelings, high self-esteem and marital satisfaction¹³. Costa et al (2015) conducted a research to determine romantic relationship characteristics, emotional and personality dimensions and social adjustments focusing on the pathological jealousy and compared them with a control group. Those with pathological jealousy were significantly more jealous and anxious and showed ambivalent attachment pattern and manic love style, low self-control, low sense of cooperation, high level of impulsivity and anxious features and weak social adjustments¹⁴.

Since love addiction is rooted in childhood and people's relationship with their family, approaches that help them to re-parent their inner child, play an important role in the treatment. In this regard, Brenda (1994) explored drama therapy based on object relations theory on female love addicts. The results showed that drama therapy mainly contributes to improving the love addiction process¹⁵.

Tangedall (2004) focuses on using imago therapy in comprehensive addiction training, organized by Carner and Mellody, as an effective method for treatment of the love addicts¹⁶.

Since love addicts do not have a proper loving attitude in their life, their attitudes need to be modified. Imago therapy plays an important role in reconstructing the people's imago of their romantic partner and modifying their loving attitudes. Tayi et al. (2012) fulfilled a research to determine the effect of imago therapy group training on loving attitudes of the couples. The results showed that this imago therapy group training increases loving attitude among couples¹⁷.

Maladaptive schemas in love addicts make them to choose improper communication styles and people are entangled in these styles in their marital relationships with no knowledge and effective intervention. Zolfaghari et al. (2008) examined the relationship between early maladaptive schemas and dimensions of the marital intimacy in the marital relationship. The results showed that there is a significant negative correlation between early maladaptive schemas and dimensions of marital intimacy. These findings indicated the important role of the schema therapy approach on communication patterns and dimensions of the marital intimacy¹⁸. Hamidpour (2008) carried out a research on three students using the purposive sampling to evaluate the effectiveness of schema therapy in the treatment of love failures. The results showed that in most schemas, the recovery of clients was more than 50%¹⁹.

Undoubtedly, a healthy romantic love is a beautiful phenomenon, but this is not the case in addictive love. In fact, when people are involved in unhealthy obsessive love, they tend to display catastrophic behaviors such

as drug addiction, alcoholism, compulsory gambling games, sex addiction and etc. Love addicts face the same overall outcomes that drug addicts and other patients of this kind experience, such as depression, anxiety, low self-esteem, destructive relationships, compatibility or academic problems, reduction of physical and emotional well-being, financial problems, loss of interest in family, friends, entertainment and other pleasurable activities and etc ²⁰.

METHOD

Population, sample, sampling method: This study aimed to investigate the effectiveness of integrative approach (imago therapy and schema therapy) on love addiction and used the semi experimental method and pretest-posttest type with experimental and control group, each of 15 people.

The experimental group were effected by integrative approach (imago therapy and schema therapy) but the control group received no intervention. The statistical population of this study consisted of all girls who had attended clinics and cultural centers in Isfahan. The conditions of exit from the group were also assigned by the researcher in the first interview by candidates according to DSM-IV diagnostic criteria. These conditions are as follows: acute cognitive psychology disorders such as psychotic disorders, use of psychiatric and psychoactive drugs, drug addiction and alcoholism.

Table No. 1: Mean and standard deviation of age

Groups	Mean	standard deviation
Experimental	21.46	4.56
Control	22.53	6.7
Total	21.99	5.63

Table No. 2: Sample Distribution of education

Education	Control		Experimental		Total
	N	Percent	N	Percent	
High school	1	7	1	7	2
Diploma	8	53	7	46	15
Advanced Diploma	1	7	1	7	2
Bachelor	5	33	6	40	11
Total	15	100	15	100	30

METHODOLOGY

After sampling and dividing them randomly in two experimental and control groups, integrative approach (imago therapy and schema therapy) sessions were held for experimental group but not for the control group. These sessions were consisted of one two-hour group session and eight individual sessions which were held for 45 to 60 minutes twice a week. Due to the volume of materials and time limit, all training sessions of treatment were prepared and held in the format of worksheet. In group sessions, general descriptions were given about love and its different kinds, attractiveness, physiology of love, love addiction and its kinds. After this session, individual session began by the coordination of members. Content syllabus of integrative approach (imago therapy and schema therapy). Modes of integrative imago therapy and schema therapy were conducted in this way that the imago therapy approach was used in the first four sessions and schema therapy in the next four sessions; so that, at first, by means of imago therapy approach, childhood sources of love addiction were investigated, existing deficiencies and shortcomings of initial attachments were recognized, an insight of the imago of themselves and their romantic partner were given, the cons and pros of initial forms of communication were found and after that by means of schema therapy approach, ineffective schemas and modes were recognized in order to identify existing weaknesses in tendency towards intimate relationships and unhealthy dependencies and to designate more efficient coping modes. After all these sessions, love addiction test was conducted again for both experimental and control group as posttest.

RESEARCH INSTRUMENT

In this study, love addiction questionnaire was used for collecting data. Love addiction questionnaire was designed by Peabody 2005 for assessing love addiction. The questionnaire translated by the researcher and confirmed by an English language expert. In order to examine the content validity of the questionnaire, four family counseling specialists at Faculty of Education, University of Isfahan approved it. This questionnaire has

32 items. Each item is marked by the rating scale of three-point Likert Scale (most of the time = 2, sometimes = 1, almost never = 0). The score range of questionnaire is between 0 and 64. Scores from 0 to 16 means the individual is not involved in love addiction and scores more than 16 means the love addiction of the person is increasing. To determine the reliability of love addiction scale, this questionnaire was conducted on a pilot study comprising of 45 girls. Cronbach Alpha coefficient is calculated 83% which indicates the acceptable reliability of this scale²¹.

FINDINGS

Descriptive Findings: addiction pretest in control group was 36.06 and in experimental group was 36.13 and in posttest in control group was 36.40 and in experimental group was 16.60.

Table No. 3: Mean and standard deviation

Groups	Test phase	M	SD	N
Control	Pretest	36.06	9.38	15
	Posttest	36.40	8.55	15
Experimental	Pretest	36.13	9.47	15
	Posttest	16.60	9.18	15

Inferential findings: To investigate the differences between pretest scores of both groups, independent t-test was used. The results are shown in Table 4.

Table No. 4: Mean Compare in two groups in the pretest

Groups	N	M	SD	t	df	p
Experimental	15	36.13	9.47	-2.0	28	0.99
Control	15	36.06	9.38			

The results of independent T test showed that there is no significant relationship between the scores of pretest in two love addict groups. Finding confirms the pre-hypothesis of the equal variances of the scores of the control and experimental groups ($p=0.12$).

Table No. 5: Kolmogorov-Smirnov

Variable Statistic		Kolmogorov-Smirnov ^a	
		Sig.	
Love Addiction	Experimental	.54	.92
	Control	.64	.80

Table No. 6: Summary of covariance analysis results of comparison the Love Addiction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	imp-act	Partial Eta Squared
Pretest	1103.79	1	1103.79	27.05	0.00	0.501	0.99
group	2953.46	1	2953.46	72.40	0.00	0.72	1.00

DISCUSSION

Intimacy is the necessity of a healthy relationship. Love addiction, in any case, is the antidote of any intimacy. Love addiction do not show a true love. Love addiction is the result of fear of rejection and a false sense of identity. Female love addicts frequently encounter with other problems besides having addictive relationships with men. It would be a fertile ground for many infatuated women to become drug addicts, alcoholics or dependent of any kind. They want to eliminate one addiction but they would stuck in another unwanted addiction²².

In this regard, this study aimed to examine the role of integrative approaches sessions (imago therapy and schema therapy) on girls' love addiction. The current results showed that participation in therapy sessions is effective in reducing love addiction in individuals. In this regard, in spite of the researcher's findings in many Persian and Latin literature, similar researches exactly assessing the influence of integrative approach (imago therapy and schema therapy) on girls' love addiction were not found. These findings can be compared with other results of the studies conducted in similar fields and be considered along with records. The results of this study are consistent with research findings of Brenda¹⁵, Tangedall¹⁶, Tae¹⁷, Zolfaghari¹⁸ and Young²³.

Since sources of love addiction should be found in childhood wounds and the individual's communication styles with parents and others, then interventions at first should be used to identify injuries and gaps in the treatment of this disease. In this regard, Brenda (1994) carried out a research and examined the usage of drama therapy based on object relation therapy on female love

addicts. The techniques of group were mother-child role playing which is in the stages of a child's mental growth. Drama therapy indicates the origin of the love addiction to the people and helps them in re-parenting the child. The results showed that drama therapy is very effective in the treatment of love addiction ¹⁵.

The results of this study show that the integrative approach (imago therapy and schema therapy) is very effective in reducing girls' love addiction through presenting strategies for recognizing the imago and dysfunctional patterns of life, identifying and arousing early maladaptive schemas and using the cognitive, behavioral and experiential techniques related to these approaches. Since recognition and treatment of the important issue of love addiction requires broader and deeper studies in this field, the following areas are suggested for future research. Since this study has been done in Isfahan, it is suggested to be done by researchers in other cities, by taking into account this fact that cultural-social factors are effective in people's beliefs and lifestyles, and the results can be compared with those of this research. It is suggested that this approach is applied among boys with love addiction, too.

Ethical approval: Related departments should be assured about the confidentiality of the results of questionnaires.

Conflict of interest: The authors report no conflict of interest.

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The Effectiveness of Child-Centered Play Therapy on Social Anxiety and Communication Skills of Preschool Children

Shiva Gholamalizadeh¹, Farhad Asghari², Abdolhasan Farhangi¹

¹Department of Counseling, North Tehran Branch, Islamic Azad University, Tehran, Iran,

²Department of Counseling, University of Guilan, Rasht, Iran

ABSTRACT

Aim: This study is conducted to determine the effectiveness of child-centered play therapy on social anxiety and communication skills of the children who are between 5 to 6 years old.

Method: The research design is semi-experimental with pretest-posttest and control group. The study population has been consisted of the girl and boy children of kindergarten who are between 5 to 6 years old from the Lahijan city in the year of 2016. In order to conduct this research, after the implementation of Social Anxiety Inventory for children and the Vineland Social Maturity Scale, a total of 48 subjects who had a high social anxiety and low social development have been identified and 30 subjects have been randomly selected from this population. They have been randomly assigned into two groups (15 children in the study group, (15 children in the control group). The data have been analyzed by the covariance analysis method.

Results: The results have shown that play therapy was effective on reducing social anxiety and increasing communication skills and there is a significant difference between study group and the control group ($P < 0.01$). Child-centered play therapy can reduce social anxiety and increase communication skills in the preschool children.

Key words: play therapy, social anxiety, communication skills, child-centered therapy

INTRODUCTION

Children's emotions can be awakened through playing and children can express their feelings in this way and this is a natural mean of expressing "oneself". We can teach the rules and regulations to the children through playing and we can also modify their incompatibilities. The children who have anxiety also will experience stress and concern and they are not able to do anything or make a decision and even thinking

about the surrounding issues¹. People with social anxiety sometimes refrain from communicating with others because they do not see enough ability in themselves to influence others and they are afraid of being mocked by others². Anxiety disorders are one of the most common disorders in children that lead to the disruption in academic performance, social adjustment, family life and relationships with peers³. It has the greatest effect on the etiology of the biological, psychological and social disorders. But among these factors, the social and environmental factors have a more prominent role⁴. This is one of the most common disorders of childhood and adolescence, so that it has been observed in 1/1 to 3/7% of the total population of children and adolescents⁵. The investigation of the prevalence of this disorder in Iran in 2010 has indicated the incidence rate of 1.10% with the higher rate of the women with social anxiety⁶.

Corresponding Author:

Farhad Asghari

Department of Counseling,

University of Guilan,

Rasht, Iran

Email: farhad.asghari@gmail.com

In addition, the researchers have found that people with social anxiety have attentional bias, memory bias and interpretation bias, and these orientations play a role in the development of social anxiety problems and even in maintaining them. In social situations these people are expecting negative results⁷.

In the meantime, given that human being is a social creature that needs to communicate with others in a way that many of his/her transcendental needs and talents and creativities would be fulfilled through the interpersonal interactions and social connections; so, the need for the trainings of the improvement of social skills is so important⁸. One of the factors that can affect one's self poor assessment is the poor communication skills. Poor communication skills will lead to the poor communication with others⁹; communication skills are essential for life and continuing this path. These skills can be effective on our relationships with others and any shortcomings in this area will lead to the creation of problems in the interpersonal relationships¹⁰.

Also, Spence and Berchman (1999) have stated that people with social anxiety have not the necessary social and communication skills, and the researches have shown that they have the shortage of these skills since their childhood¹¹. Also, Herbert et al (2005) in a research have found that communication and social skills' training can reduce social anxiety of the subjects, and also the cognitive-behavioral group therapy can help the training of communication and social skills in reducing social anxiety. In order to have a better understanding of the children's world, they should be observed when they are playing. Game is a good method for therapists to enter the world of the children, so through them they can know them and understand their problems better. None of the children's activities in the games are controlled by the adults. In play therapy, the children will have the opportunity to use their power, creativity and decision-making¹². Games for children are like the speech for adults, games are a mean to express feelings, establishing relationships, describing the experiences, revealing wishes and self-actualization. Since children have a low level of abstract thinking, they are not able to

express their emotions, so the repression of emotions and lack of the skill of expressing the emotions especially the negative type will endanger the children's mental health¹³. During the game activities, children take advantage from the behavior modification strategies to positively strengthen their adaptive behaviors; they also use the game situations to teach the structural problem solving skills, coping skills and dealing skills¹⁴.

Play therapy is an ongoing relationship between a trained therapist and a child who has emotional and behavioral problems. By using the diverse activities in the game that lead to the treatment improvements in the subjects; play therapy is a creative work in child psychotherapy¹⁵. Shafer by quoting from Thompson & Rudolph (1992) believes that breaking the resistance in children; creating merit and ability; refinement; creative thinking; emotional discharge; role playing; making fantasies; symbolic education; creating and developing relationships and attachments; and positive emotion and overcoming the fears of growth period are some of the benefits of play therapy for children¹⁶. Lewick¹⁷ and Johnson et al¹⁸ in their research have uttered that play therapy and children therapy are the effective methods to directly provide services for the immigrant people and they have addressed the needs of children, families, teachers and immigrant staff; they also have studied the effect of Play Therapy on the immigrant population and its effectiveness have been observed. Until now, the effect of play therapy has been studied on social and psychological adjustment of children¹⁹, anxiety and depression and increase of self-esteem²⁰; the results have indicated that play therapy is able to improve the mentioned factors. Landreth, Ray & Bratton (2009) have uttered that child-centered play therapy has a positive effect on behavior and emotions²¹. Baggerly and Parker (2005) have discussed that play therapy helps to improve social skills, self-esteem, self-acceptance and accepting others and reduction of depression and other disorders in children²². The results of the study of Li (2008) have indicated that play therapy in an appropriate and effective intervention in preparing children to take surgery. The results have shown that child-centered play therapy has reduced anxiety in this

sample. According to the positive role of play therapy in the projection of children's negative emotions, it can be used as an effective treatment method to reduce the damaging effects of emotional and behavioral disorders. Therefore, evaluation of this issue can be helpful to reduce social anxiety and improve children's communication skills²³. In this regard, the aim of this research is to study the effectiveness of child-centered play therapy on the reduction of social anxiety and increase of communication skills in children.

METHOD

This research is a semi-experimental study with pretest-posttest and control group. In this research, the child-centered play therapy has been conducted in the study group, and the results have been compared with the data of the control group. This project has been composed of two subject groups that both of the study and the control groups have been evaluated twice. The first measurement has been conducted by implementing a pretest, and the second measurement has been conducted on both of the study and control groups after applying the independent variable in the study group with a posttest. For the formation of the study and control groups, the subjects have been selected by the convenience sampling method and half of the subjects have been assigned into the first group and the other half of the subjects have been assigned into the second group. By using the random replacement, the subjects have been assigned into the similar groups and the measurement of the dependent variable for both of groups has been performed at a same time and under the same conditions.

RESEARCH TOOLS

Weiland social development Inventory : In order to measure the level of social development, the subjects' scores have been obtained in the social development scale of Weiland (1953). The reliability and test-retest coefficients of 620 subjects have been reported 92% with the explanation that the test-retest interval was from one day to nine days.

Social Anxiety Inventory for children : In order to measure the social anxiety scores of the research subjects, the revised form of the social anxiety scale for children²⁴, has been used. This test has 18 questions and it is designed to measure children's social anxiety. The test answers are set on a 5-degree Likert scale (never, rarely, sometimes, often or always). This test has the reliability of test - posttest ($r = 0.67$) and a satisfactory internal consistency ($r = 0.67$)²⁴

Research Design : One of the rooms of the kindergarten of Lahijan city has been selected to implement the play therapy program. After the implementation of Social Anxiety Inventory for children and the Vineland Social Maturity Scale, a total of 48 subjects who had a high social anxiety and low social development have been identified and 30 subjects have been randomly selected from this population. They have been randomly assigned into two groups, 15 children in the study group, and 15 children in the control group. Then, in accordance with the planned educational programs, the educational interventions have been designed and implemented. The study groups' training has been conducted by the researcher in the total of 9 sessions that each session has lasted for 45 minutes and they had 3 sessions per week.

Results : The descriptive indicators of the study and control groups before and after the tests are given in the following tables. The study group and the control group members were the girl and boy children who are between 5 to 6 years old.

Table No. 1: Statistical indicators of the dependent variables of the study and control groups in the post-test

Variable	Group	Mean	SD
Social anxiety	Study	27.74	1.78
	Control	35.67	1.78
Communication skill	Study	0.95	0.02
	Control	0.84	0.02

Table No. 2: The test of the level of combined effect based on Wilks Lambda

Test	Value	F	df1	df2	Sig	η^2
Wilks Lambda	0.39	19.43	2	25	0.001	0.61

Table No. 3: the results of the effect of child-centered play therapy on the level of children's communication skills

Sources of changes	Sum of squares	Degree of freedom	Mean squares	F	Level of significance	Level of effect
	Ss	df	MS			η
Communication skills	0.06	1	0.06	20.25	0.001	0.44
deviation	0.08	26	0.003			
Social anxiety	356.25	1	365.25	8.72	0.100	0.25
deviation	1087.37	26	41.89			

DISCUSSION

This study was aimed to determine the effectiveness of child-centered play therapy on the level of social anxiety and communication skills of children. The main hypothesis of this research is that child-centered play therapy is effective on the level of social anxiety and communication skills in children. The results of the covariance analysis (MANCOVA) method have been used and they have shown that the mean of the dependent variables was different in the study and control groups and child-centered play therapy was effective on the level of children's social anxiety and communication skills. This research is consistent with the research of Azad et al ²⁵ that has been conducted to assess the effectiveness of child-centered play therapy on the level of anxiety disorders and depression in the children of primary school. The results have shown that play therapy intervention was effective on reducing the symptoms of depression and anxiety for children with this disorder. These findings are consistent with the study of Zare and Ahmadi ²⁶ which examines the effectiveness of play on reducing behavioral problems of children; because, one of the behavioral problems of the children is the lack of social skills. Barrett (1976) has conducted a study on the effect of play therapy on social and psychological adjustment in the children who were between 5 to 9 years old. The results have shown that play therapy is effective on the social and psychological adjustment of children ²⁷. Given to the above issues, it is clear that the children with anxiety disorder, like other disorders need to be considered and they should not be simply ignored. Given that children still have not the abstract thinking to be able to express their emotions, so we should find a way by which the children could be able to express

their positive and negative emotions. Playing is an appropriate mean for expressing emotions, establishing the relationships, describing the experiences, revealing the aspirations and self-actualization, and also, it can make a relationship between children's inner thoughts and their outside world.

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Knowledge and Attitude of Medical Students towards People Living with HIV and AIDS

Ekta Sharma¹, Shubhi Agarwal², Somshekhar Sharma³

¹Consultant Dentist, ²Student, ³Tutor, Dept. of Forensic Medicine, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly.

ABSTRACT

The Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) are a major public health problem with reaching effects on both the affected and the healthcare personnel providing care. There is a ethical and legal implications involved in treating a patient with HIV as well a aspect of ending discrimination and apathy in attitudes of healthcare providers towards such afflicted individuals. This study was aimed at ascertaining the knowledge and attitudes of various levels of medical students towards the disease and the afflicted with a view to understand what can be done to improve the present scenario. The study concluded that there is in fact a lacunae on what is an ideal knowledge requirement and what is found on the ground, It emphasized that medical students must be better acclimatized with bedside requirements and attitude shift that must be brought about when dealing with HIV Patients.

Key Words: HIV, Medical Students, Transmission, Medical education

INTRODUCTION

Infection with human immunodeficiency virus type 1 (HIV-1) and the resultant acquired immune deficiency syndrome (AIDS) is a major public health challenge of modern times ⁽¹⁾. There are estimated 33.4 million people living with HIV, including 2.7 million new-infected with HIV, and AIDS deaths were two million in 2008 all over the world ⁽²⁾. Since 2000, the rate of diagnosed new cases of HIV reported per million population has more than doubled, from 44 per million in 2000 to 89 per million in 2008, based on the 43 countries that have consistently reported HIV surveillance data.⁽³⁾

Due to workload or other reasons, HCWs are frequently exposed to needle stick injuries (NSIs) which pose a serious threat to their psychological and physical health. The average risk of acquiring HIV infection from different types of occupational exposure is low compared to the risk of infection with hepatitis B virus (HBV) or hepatitis C virus (HCV).

In terms of occupational exposure, the important routes are needle stick exposure (0.3% risk for HIV, 9%-30% for HBV, and 1%-10% for HCV) and mucus membrane exposure (0.09% for HIV). The risk of infection transmission is proportional to the amount of HIV transmitted, which depends on the nature of exposure and the status of the patient.⁽⁴⁾

Corresponding Author:

Dr. Somshekhar Sharma

Tutor, Dept. of Forensic Medicine,
Shri Ram Murti Smarak Institute of Medical Sciences,
Bareilly, Uttar Pradesh.
Email: som.sharmax@gmail.com

A sentinel organization which heralds the diagnosis, treatment and prevention of discrimination against HIV- AIDS infected individuals in India is the National AIDS control organization (NACO). It has recently implemented a programme called as the National AIDS control programme (NACP-IV).

The objectives of NACP-IV are to reduce new infections and provide comprehensive care and support to all People Living with HIV (PLHIV) and treatment services for all those who require it. The five crosscutting themes that are being focused under NACP-IV are quality, innovation, integration, leveraging partnerships and stigma and discrimination.⁽⁵⁾

As per the 2014-15 annual report of the NACO, it is reported that 1,142,036 (as on September '15) HIV positive individuals are under medical care on OPD or IPD basis in India. These individuals are in direct contact with doctors or supportive staff and thus are identified as individuals having HIV or AIDS.

Another agency has reported that there are an estimated 2,100,000 individuals with HIV and AIDS in India out of which only an estimated 2,000,000 are diagnosed with the disease whereas the rest are unaware of their serological status⁽⁶⁾.

In a recent case of discrimination against a female pregnant- HIV positive woman in a government hospital in North India, it was found that she was made to clean her own utensils, bedsheet etc in the hospital premises and was made to occupy a bed with an obvious and visible label bearing the words "HIV POSITIVE", in blatant disregard of patient confidentiality guidelines⁽⁷⁾. The event made the society aware of the need to educate medical staff at the nascent level as regards to the rights and duties that the fraternity holds towards such vulnerable group of patients. It was concluded this incident arose due to lack of information about rights of HIV-AIDS patients among medical staff.

The present study aims to assess what the knowledge level is amongst medical students in clinical semesters with regards to rights of HIV patients and the attitude that they hold towards HIV in the society.

MATERIAL AND METHOD

The study was carried out in a tertiary care teaching hospital Bareilly, Uttar Pradesh for a period of 3 months. Institutional Ethical committee clearance was obtained and documented prior to start of data collection. The

individuals selected as subjects were asked to submit a filled questionnaire copy. The Questionnaire was anonymous in nature. The subjects were asked to fill details such as age, sex and the academic semester in which they are at the present moment. The questionnaire was deposited with the respective class representatives and collected on the next day to allow all students adequate time for reading and replying to the topics. Sample size for data collection was 200 students. An attempt was made to include equal number of males and females i.e. 100 each.

No identification data such as name, enrollment number, roll number etc. was to be written on the submitted questionnaire. Any other data apart from that which is requested in the questionnaire was grounds for exclusion from study.

Inclusion Criteria:

1. Medical students of undergraduate and postgraduate courses in the institution.
2. Individuals of both genders were included in the study.
3. Only subjects giving voluntary consent were included.

Exclusion criteria:

1. Non medical/ Paramedical students were excluded from the study
2. Faculty/ Doctors were excluded from the study.

The questionnaires once all completed were filed. The details of the answers were uploaded to a Excel data sheet. The data analysis was conducted in consultation with institutional statistician.

OBSERVATIONS

A total of 200 medical students were participants in the study. The males comprised 114 subjects while females constituted 86 subjects. The participants were from second to final (fourth) years of M.B.B.S course. The divisions of the students are as tabulated below.

**Table No. 1: Distribution of Students
based on Year and Gender**

	Second Year	Third Year	Final Year	Total
Males	47	46	21	114
Females	15	33	38	86

In terms of Knowledge regarding the transmission of the virus through various routes 84% (n = 168) of the subjects were able to correctly identify the routes of transmission with a marginal incline in favor of the females who accounted for a higher percentage i.e. 89.5% as compared to male candidates who accounted for 79.8% of all correct entries regarding transmission of the virus. 23 male subjects and 9 female subjects gave one or more incorrect answers regarding transmission. The incorrect answers were mostly in terms of whether breast feeding and kissing causes transmission of the virus. Final Year students gave no incorrect entries regarding knowledge about transmission and maximum incorrect entries came from second year students.

In terms of diagnostic tests that were employed in detecting HIV and the confirmatory tests employed for the same, the knowledge of final year students was higher with a score of 100% students giving correct entries. Surprisingly, the third year students had a total of 11 incorrect entries while second year students had only 9 entries corresponding to 13 % and 14 % of their respective population subsets. No significant difference was observed between males and females in this aspect.

The attitude of students showed a shift towards the negative when asked about option of treating a HIV infected individual when compared to a non sero-positive individual. Final Year students were more inclined to refuse treatment and to transfer the patient as compared to second year students. Of the 59 final year students a staggering 48 (81%) reported wishing to avoid treating the patient. In terms of whether there should be a bold warning on the beds of HIV infected patients disclosing the serological status of the patient, 26% (n=52) of the entire students in the study reportedly agreed to it being present. There was no significant differences between the males and females in this respect. As far as

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

DISCUSSION

In a study conducted in the United Kingdom, in the year 1993, it was reported that a majority of medical students who had completed their rotations in clinical wards were still unaware of the risks impounded by needle stick injuries with reference to HIV. The same study detailed that many students devoted less than 10 hours to study about HIV in totality. The attitude of the students was evidently of a prejudiced nature as 67 % of those in the study reported that HIV was a disease due to the carelessness of the patient and 74 % of the responders admitted to avoiding patients with HIV.⁽⁸⁾ This is an old research article and reflects that there was some misconceptions regarding HIV and the treatment that should be meted out to the patients afflicted towards it. The findings of the above are in contrast with our study which reports that though there may be some perceptions that still needed to be corrected; the overall attitude is showing improvement.

In recent times, a study conducted among medical students in a medical college in Karnataka stated that though the overall knowledge among the students was good, few minorities of the students held some misconceptions. There is a strong need for imparting HIV related education right from the beginning of medical curriculum so as to demystify misconceptions among students. Another area that needs to be addressed is the attitude of students towards people living with HIV. There is a need for medical colleges to foster an environment that is conducive to the development of appropriate student attitude towards HIV. Further such studies must be conducted involving all branches of health care so as to prepare health science students to handle HIV/AIDS patients better and also contribute to health education in society.⁽⁹⁾

The authors are finding similar features in our study also and state that there was an increase in knowledge as we moved from second year students towards final year

students, however there was a shift in attitude that must be addressed. There must be education of the medical graduates from the second year itself in how to treat and address the patients from these disease spheres.

CONCLUSIONS

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

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

Conflict of interest: Nil

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Organophosphorus Poisoning in a Tertiary Care Teaching Hospital of Warangal District, Telangana—Epidemiological Study

Shaik Khaja Mohiddin¹, K. P. Vasanth Kumar¹, Raju Badisha²

¹Assistant Professor; ²Professor and HOD, Department of Forensic Medicine, Kakatiya Medical College, Warangal, Telangana

ABSTRACT

Background : Organophosphorous compounds are extensively used as pesticides in agriculture in India. Organophosphorus and aluminum phosphide are the commonest cause of suicidal poisoning in India. Poisoning both accidental and intentional is significant contributor to mortality and morbidity throughout the world

Objective : To assess the epidemiological profile of organophosphorus pesticide poisoning cases at a Tertiary Care Teaching Hospital of Warangal District, Telangana.

Methods : Two hundred and five (n=205) patients with organophosphorus poisoning admitted to MGM Hospital, Warangal were included to this study. History of ingestion, clinical signs & symptoms and survival time in case of death were recorded to diagnose the OP poisoning.

Results : Out of 205 OP cases, 46.13 % of OP patients were aged between 16-30 years, followed by 31-45 years (32.68%) Based on different OP pesticides, Methyl Parathion showed highest consumption (54.67%) among patients. Majority of the admitted cases were of suicidal and women were the main sufferer.

Conclusion : Suicide by agrochemical compounds are increasing day by day in this country. Illiteracy is a major problem to deal with the situation. Proper emphasis should also be given for safe use of pesticides to avoid accidental poisoning.

Key Words: Organophosphorus, Poisoning, Suicide

INTRODUCTION

Poisoning with OP compounds is a worldwide phenomenon. An estimated three million cases of pesticide poisoning with 2000 deaths occur worldwide, each year ¹⁻⁴. According to the World Health

Organization (WHO), one million serious unintentional poisonings occur every year and an additional two million people are hospitalized for suicide attempts with pesticides.

In India, OP compounds are among the most commonly used agents for suicidal poisoning. Systematic community based data on the epidemiology of poisoning are not available from India. Hospital-based data suggest that barbiturates and copper sulfate were the commonly used agents in the years, 1972-1977; however, later they were replaced by OP compounds and aluminum phosphide. In 1995, National Poison Information Center

Corresponding Author:

Dr. Shaik Khaja Mohiddin

Department of Forensic Medicine,
Kakatiya Medical college, Warangal,
Telangana-50600, India

(NPIC) was established at the All India Institute of Medical Sciences, New Delhi. Data on the pattern of poisonings in North India accumulated at this center suggest that suicidal poisoning with house-hold agents is the most common modality of poisoning⁵⁻⁸.

The common house-hold agents included OPs, carbamates, pyrethrinoids, rodenticides, detergents, and corrosives. Agricultural pesticides accounted for 12.8% all cases of poisonings. Likewise, OPs caused most self-poisoning deaths in South and Central India⁹⁻¹². In a study from Andhra Pradesh, two-thirds of the patients were young adults aged less than 30 years, more than half were males, and attempted suicide was the most common intent for poisoning. Majority of deaths were due to poisoning with monocrotophos and endosulfan (an organochlorine)¹¹. Another study from Sri Lanka showed that young age, lower socioeconomic strata, unemployment, unstable emotional relationships, psychiatric disorders, and alcohol abuse were the risk factors associated with self-intentional or suicidal pesticide poisoning and suicidal intent accounted for almost 85% cases of pesticide poisoning¹³.

Intoxication due to OP compounds may also occur by accidental exposure to agricultural pesticides while spraying, through skin and inhalational route. Other potential modes of OPs poisoning include ingestion of adulterated fruit, flour, or cooking oil, and wearing contaminated clothing^{14, 15}. Choudary et al., reported a food-borne outbreak of OP compound poisoning¹⁶. The kitchen, in which, food was prepared had been sprayed earlier with malathion. So the objective of the study was to look in detail regarding the epidemiological profile of pesticide poisoning cases admitted at MGM Hospital, Warangal.

METHODS

In this study 205 cases of organic phosphorus (OP) poisoning admitted to the casualty of MGM Hospital, Warangal, Telangana, during January 2012 - December 2015 were evaluated. This prospective study was conducted, which included 75 male (M) and 130 female (F) consecutive patients. The study was approved by

institutional ethics committee. All consecutive patients presenting in the emergency department of the hospital with history and clinical evidence of OP poisoning during the study period were considered eligible for participation in the study.

Patients attending the emergency department with history of exposure to OP compounds were initially evaluated and resuscitated for maintaining airway, breathing, and circulation. Informed consent was obtained from eligible patients/legally authorized representatives (if the patient was unconscious). After completing the medicolegal formalities careful history was taken from the patients/legally authorized representatives (in case the patient was unconscious).

History of ingestion, availability of bottles and typical clinical symptoms and signs help to diagnose the OP poisoning. Many organophosphorous agents have a characteristic petroleum or garlic – like odour, which may be helpful in establishing the diagnosis. The age, sex, cause of ingestion, compound involved, time beyond between ingestion and admission to the hospital, duration of hospital stay, need for assisted ventilation, cardiac manifestations at the time of presentation, and during the in-hospital stay were recorded. The values were expressed in number (n) and percentage (%).

Table No. 1: Distribution of Sex amongst patients of OP poisoning

Sex	Number	%
Male	75	36.50
Female	130	63.14
Total	205	100

Table No. 2: Distribution of Age amongst victims of OP poisoning

Age	Number	%
0-15	23	11.21
16-30	96	46.82
31-45	67	32.68
46-60	19	9.23
Total	205	100

Table No. 3: Types of different OP compounds consumed

OP compounds	Number	%
Methyl Parathion	112	54.67
Baygon Spray	52	25.38
Malathion	15	7.37
Dichlorovos	18	9.38
Unknown	8	3.95
Total	205	100

Table No. 4: Cause of poisoning

Cause of Poisoning	Number			
	Male	%	Female	%
Accidental	7	9.66	-	-
Suicidal	68	90.33	130	100
Homicidal	Nil	-	Nil	-
Total	75	100	130	100

RESULTS

Table No. 1 describes that out of total 205 studied cases females were dominant with 63.41%. The number of male victims was 36.50%. According to Table No. 2, OP poisoning was very common in age group of 16-30 years (53.11%) followed by 31-45 years (35.76%). Methyl Parathion shows highest consumption (59.12%) for suicide (Table 3). As per the Table No. 4, it showed that the victims of OP poisoning used it for suicidal purpose (n=83). No homicidal case was recorded. Only two male children (6 years) were treated with a history of accidental poisoning.

DISCUSSION

In the present study, majority of the patients belonged to the young age group and females showed a clear preponderance over male. This finding is in agreement with studies conducted in Turkey¹⁸, Nepal¹⁹.

In India females are main working group both indoor and outdoor field, hence prone for stress. The reason may be that this is the main working age group and have the whole responsibility of their family and also exposed

to OP compounds while working in cultivation, which is at par with the study conducted in Turkey (housewives 47.3% of total sample)¹⁷.

As per the availability and use of different OP compounds in India incidences of poisoning by those insecticides seen commonly. Methyl Parathion showed highest consumption for suicide in this study. This study is in congruence with studies conducted in Nepal¹⁹, Turkey¹⁸, Gulbarga²⁰ where poisoning with suicidal intent accounts for 95.24%, 75.9%, and 97.25% of total cases of OP poisoning respectively. Moreover, the study period accounts to main harvesting season in India and the use of insecticides were common. Therefore due to the easy availability of material hence it increases the incidence of suicide. No previous study has recorded till date on the seasonal incidences of poisoning in India. So, the incidences of poisoning due to these compounds may suddenly increase during harvesting season. Females are the main working mass in the society and face the stress more from daily activities in comparison to male. Therefore these pesticides are becoming main suicidal agents.

CONCLUSION

The present study showed that majority of the patients was of young age with females outnumbering males. Poisoning with suicidal intent was more common than accidental. However, further detailed study is needed in different zones of India to evaluate and control the incidence of poisoning cases by OP compounds.

Conflict of Interest: Nil.

Source of Funding: Nil.

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A Prospective Study of Profile of Burn Deaths in Ranga Reddy District, Telangana

V. Chand Basha ¹, Bharathi Rama Rao², K.Sudhakar Reddy ³

¹Professor, ²Associate Professor, ³Professor and HOD, Department of Forensic Medicine, Bhaskar Medical College, Yenkapally (V), Moinabad (M), R.R. Dist., Telangana

ABSTRACT

Introduction: Burns are considered as one of the most destructive injuries, which cause not only deaths but also major economic and psychological impacts and long term somatic sequelae.

Objective: To access the magnitude of the fatal burn injuries among the victims who came to hospital.

Methods: A total of 188 patients with burn injury admitted to the Bhaskar Medical College and Hospital during July 2011 to July 2015 were assessed and subsequently there were 48 in-hospital deaths. Autopsies on the dead burned patients were performed at Osmania General Hospital, Hyderabad

Results: Around three fourths of the cases were women, with 58.4% of the total cases in 21-30 age group. Accidental deaths accounted for 76.5% of the cases, while 22.1% of the patients having more than 90% of burns on their body surface. The days of survival of the burn victims was, 72 hours in most of the cases, out of which many died within 48 hours. The leading cause of death was septicemia.

Conclusion: Most burn deaths may be preventable with better airway management and more aggressive but precise resuscitative efforts. However, sepsis, due to multi-drug resistant organisms, may continue to impede efforts to increase survival if we cannot develop strategies to fight these organisms.

Keywords: Burns, autopsy, accidental, suicidal

INTRODUCTION

Fire is one of the most useful agent of day to day life, nevertheless, it is one of the most natural destructive agent. It destroys property, kills thousands of people every year and causing a lot of wastage of human resources. Burn injuries are caused due to contact with dry heat over the body surface¹⁻³. By law all dry heat lesions have been designated as burns⁴. Electric spark,

discharges, flashes and lightening leads to electric burns⁵.

Burns are considered as one of the most destructive injuries, which cause not only deaths but also major economic and psychological impacts and long term somatic sequelae^{6, 7}. It involves a number of morbidity and mortality. It also involves a long hospitalization and rehabilitation and costly wound and scar treatment if the victim survives⁸.

Correspondence Author:

Dr. V. Chand Basha

Professor,
Department of Forensic Medicine,
Bhaskar Medical College,
Yenkapally (V), Moinabad (M), R.R. Dist.,
Telangana – 500075

Burns are known to be one among the most serious injuries that effect a human being⁹. Accident is the most common cause of flame burns in modern society^{10, 11}. Other than accidental deaths, it is also one of the common modes of suicides and homicides all over the world. It is reported to be the fourth most common types of trauma worldwide¹². According to the WHO, 238000 people

died of fire related burns in 2000 and 95% of them were from the low and middle income countries^{13, 14}. So the objective of this study was to ascertain the magnitude of the fatal burn injuries.

METHOD

A 188 patients with burn injury admitted to the Bhaskar Medical College and Hospital from July 2011 to July 2015, there were 48 in-hospital deaths. Autopsies were performed on all burned patients that died at Osmania General Hospital, Hyderabad. The details of the cases were collected from the police records, inquest reports, forensic reports and hospital records.

The history of the patients regarding the age, sex, marital status, manner of death and any past illness was

noted from the relatives of the patients, as entered in our hospital records during admission as was the duration of survival and nature or percentage of burns.

All burn patients with preexisting organ diseases were excluded from the study.

RESULTS

38 (72.1%) of the victims comprised of females and only 10 (29.9%) were males.

The most common age group was 21-30 years followed by 11-20 years age group. No incidence was seen in the elderly above 70 years of age (Table:1). Maximum number of females were the victims in 21-30 years age group followed by 31-40 years.

Table No. 1: Incidence of burns according to the age group

Age group	Males N=10	Females N=38	Total N=48
0 – 10 years	1 (5.3%)	0	1 (1.5%)
11 – 20 years	3 (15.8%)	2 (4.1%)	5 (7.4%)
21 – 30 years	8 (42.1%)	31 (63.3%)	39 (58.4%)
31 – 40 years	3 (15.8%)	8 (16.3%)	11 (16.2%)
41 – 50 years	2 (10.5%)	4 (8.2%)	6 (8.8%)
51 – 60 years	1 (5.3%)	3 (6.1%)	4 (5.9%)
61 – 70 years	1 (5.3%)	1 (2.1%)	2 (2.9%)
> 70 years	0	0	0

The nature of burn injury was accidental in most of the cases accounting for 52 out of 68 (76.5%) cases and 12 (17.6%) being suicides. 4(5.9%) of the cases were homicides (Fig: 1).

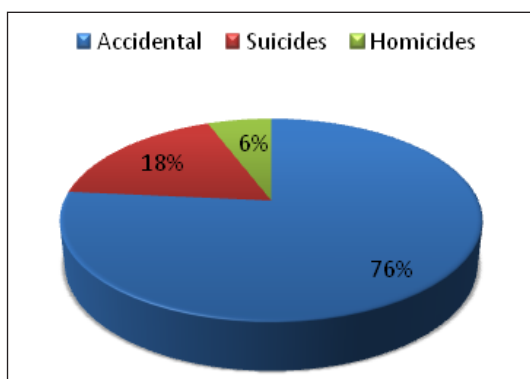


Fig. No. 1: Nature of burn injury

Many of the patients had more than 90% of burns in the surface area, followed by 50-60% area.

The days of survival of the burn victims was, 72 hours in most of the cases, out of which many died within 48 hours.

Most of the burns were infected leading to septicemia, resulting in death. 14 (20.6%) of the patients died of hypovolemic shock. Only 1 patient died of neurogenic shock (Fig 2).

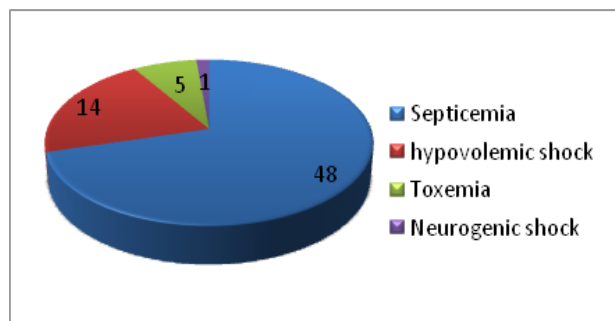


Fig. No. 2: Cause of death in burn patients

DISCUSSION

Most of the victims in our study were females which accounted to almost three-fourths of the cases. The reason for this was the women were involved in cooking and thus more prone to accidents in the kitchen. Similar was the case in another study by Karaddi et al where the women out numbered the males by 3:1 ratio¹⁵.

The common age group where burns were observed was 21-30 years with 58.4% of the cases. This was probably because this was a marriageable age where the women were just married, new and inexperienced near the fire, or were working and do not follow the safety measures near the fire in their hurry. Similar results were observed by Das et al¹⁶, Buchade et al¹⁷ and Nath et al¹⁸. Karaddi et al¹⁵ reported a total of 44.84% of the victims in the same age group thereby corroborating our study.

Most of them were accidental cases though we observed a few suicides and 4 of the deaths occurred due to homicides, 3 of which were dowry deaths.

More than 90% of the burns on the body surface area was the most common amount of burns on the patient with 22.1% followed by 51-60% burns. 90-100% of body burns were observed in other studies by Muzumdar et al¹⁹, Das et al¹⁵, and Nath et al¹⁷. It was reported that due to saree, or salwar kameez catching fire resulted in burns as it was very difficult to remove the cloths.

Septicemia was the most cause of death in these patients, which was similar to studies by Dasgupta et al²⁰, Alam et al²¹, and Chawla et al²². This was in contrast to other studies by Olaitan et al²³ and Yan et al²⁴, who reported asphyxia to be the most probable cause of death in burns patients. Multi Organ failure was responsible for around 25% of cases in studies by Reig et al who observed respiratory complication to be the major cause of death in adults²⁵.

The survival rate of > 8 days was seen only in 4 patients and all these patients had <30% surface burns on their body. Most of the patients who had more than 50% burns died within few hours of admission. This was expected as was observed in studies by Chawla et

al²² and Buchade et al¹⁶. Less than 48 hours death was observed by Reig et al²⁵ and Bloemsma et al²⁶.

CONCLUSION

The data suggested that while most severe burn injuries are survivable, delays in resuscitation, inadequate resuscitation (leading to inadequate tissue perfusion), poor airway management, and inappropriate or inadequate anti-microbial coverage lead to increased morbidity and mortality in these patients. Advances and improvements in airway management, and resuscitative efforts have led to a decrease in deaths caused by those deficiencies, but deaths due to multi-drug resistant organisms still represent a challenge. Also, more studies need to be conducted to examine the potential gender differences in the response to sepsis, and the response to therapy.

Conflict of Interest : Nil

Source of Funding : Nil

Ethical Clearance : Taken from Institutional Ethics Committee

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Medicolegal Study of Drowning Cases in Ranga Reddy District, Telangana

Bharathi Rama Rao¹, V. Chand Basha², K.Sudhakar Reddy³

¹Associate Professor, ²Professor, ³Professor and HOD, Department of Forensic Medicine,
Bhaskar Medical College, Yenkapally (V), Moinabad (M), R.R. Dist., Telangana

ABSTRACT

Background : Accidental drowning occurs often in India, nearly 40, 000 Indians die annually from drowning. It occurs occasionally among swimmers due to their rashness in swimming, but it occurs mostly in non-swimmers who venture to go beyond their depth in the sea, rivers, canals and lakes. Many lives are lost during floods, which are so frequent.

Objective : To study autopsy finding in drowning and conclude manner of death from Ranga Reddy district, Telangana

Methods : A 3 years prospective study (January 2013 to December 2015) on 60 drowning cases brought to the Bhaskar Medical College and Hospital, R.R. District, Telangana were assessed. Subsequently, the medico legal autopsy was performed at mortuary of Osmania General Hospital, Hyderabad. This present study is directed to study the medico-legal aspects of violent asphyxial deaths special reference to drowning.

Result : It is found that higher frequency of age group is present in the 21-30 years which is 29.1 % of cases, male predominated and 41.14% were accidental in nature. Regarding the postmortem findings drowning cases, out of the total of 60 cases of drowning, cyanosis was observed in 47 (78.35%). Oozing of whitish to pinkish froth, copious in amount from mouth and nostrils was found in 53 (88.32%) cases. All the drowning cases, there were presence of heavy, voluminous, oedematous, congested lungs with weight of either lungs above 500 gm & cupious froth oozing on cut sections

Conclusion : This study showed that majority drowning cases belonged to male, adolescent age group & accidental in nature. The findings of the study could be useful to develop accessible infrastructures to improve drowning intervention programs in this region.

Keywords : Drowning, autopsy, accidental.

INTRODUCTION

Drowning may be one of the leading causes of death in areas having large number of water bodies,

however the availability of limited informative data may be a matter of concern for the interested researchers and medico-legal experts. In 2012, the World Health Organization (WHO) reported an estimate of 3,72,000 human drowning cases worldwide. According to data provided by Statistics Canada, the drowning has also been reported the 4th most common cause of death in Canada from 1991 to 2000. Patterns of drowning have been found varying according to the geographic area¹. Earlier studies have analyzed drowning to determine their relationship with age, race, alcohol, pre-existing

Correspondence Author:

Dr. Bharathi Rama Rao

Associate Professor,
Department of Forensic Medicine, Bhaskar Medical
College, Yenkapally (V),
Moinabad (M), R.R. Dist., Telangana – 500075

disease and other factors². A study covering twelve years (1988–2000) has revealed that 50 children younger than 5 years drowned in private swimming pools in the Western Australia³.

Literature survey of drowning cases from India has also disclosed some informative data. In a report based on all India survey published by Bureau of Police Research & Development (BPR&D) concluded that 20.7% cases of deaths which was also highest in number (27,079) happened due to drowning in the year 1969⁴. In India, the drowning was also reported to be one of the most common causes of death⁴. A total number of 536 cases of drowning were reported in the State of Punjab in 2005-06⁵. A study reported 28 cases of drowning in year 2011 from Rohtak district which was 11.6% of a total of 240 drowning cases analyzed in the Forensic Science Laboratory, Madhuban (Haryana)⁶. So objective of this study was to ascertain the manner of death and categories whether the form of asphyxial deaths were accidental, suicidal or homicidal in nature in Ranga Reddy district, telangana

METHODS

The present study was a 3 year prospective study on 180 asphyxial deaths from were analysed, studied and tabulated. Asphyxial death cases were brought to Bhaskar Medical College and hospital, R.R. District, Telangana during period from January 2013 to December 2015. However, medico legal autopsy was performed at Osmania General Hospital, Hyderabad.

In summation, the present study is directed to study the medico-legal aspects of violent asphyxial deaths special reference to drowning, keeping in mind its practical applicability and the effort we can take to help the investigating authorities

RESULTS

The present study has been performed on 180 cases of total asphyxial deaths which were brought to Bhaskar Medical College, R.R. District, Telangana and consequent routine medico legal autopsy performed at Osmania Medical college and General Hospital, Hyderabad.

Table No. 1: Showing sex wise distribution of cause and manner of asphyxial deaths

Sr. No.	Number of Cases Studied	Male	Percentage	Female	Percentage	Total
1	Asphyxial Deaths	119	(72.12 %)	46	(27.88%)	160
2	Drowning	50	(71.43%)	20	(28.57%)	60

Table No. 1 showing sex-wise distribution of cause and manner of asphyxial deaths, Out of total of 180 cases that were studied, 151 (83.12 %) were males & 29 (16.11%) were females. Thus it is obvious that the majority of cases reported for postmortem examination were males.

Drowning cases accounted for 60 (33.32%) of cases. Out of the total of 60 cases of drowning, 45 (75.43%) were males & 15 (25.17%) were females.

Out of the total of 60 cases of drowning, it was found that 26 cases (37.14%) were accidental, 19 cases (27.14%) were suicidal and in 25 cases (35.72%) the police could

not ascertain the manner of death (table no. 2).

Significantly we did not find any case of homicidal drowning. When the suicidal % accidental manner of death was compared with other manner of deaths in cases of drowning by applying chi square test, it was found to be statistically highly significant ($p < 0.0001$) indicating that majority of cases of drowning are accidental or suicidal in nature.

Thus the maximum number of cases studied belonged to the age group of 21 – 30 yrs. and the minimum number of the cases were reported in age group of 81 – 90 yrs.

Table No. 2: Showing Cause and Manner of Death in drowning cases

Sr. No.	Cause & Manner of death	Accidental	Suicidal	Homicidal	Not ascertained	Total
1	Drowning	25 (41.14%)	10 (16.64%)	0 (0%)	25(41.14%)	60

Table No. 3: The postmortem findings in 60 cases of drowning

S. No.	Postmortem Findings	No. of Cases (n=60)
1	Cyanosis	47 (78.85%)
2	Oozing of whitish or pinkish froth from mouth & nostrils	57 (81.42%)
3	Postmortem lividity over face neck and front of trunk	14 (20%)
4	Purging of urine or semen or faeces	29 (41.42%)
5	Cutis Anserina	25 (35.71%)
6	Washer woman's hands & feet	23 (32.85%)
7	External petechial haemorrhages over conjunctivae	9 (12.85%)
8	Internal petechial haemorrhages over pleura, pericardium, under scalp and lungs.	46 (65.71%)
9	Presence of heavy, voluminous, oedematous, congested lungs with weight of either lungs above 500 gm & copious froth oozing on cut sections.	60 (100 %)
10	Presence of water in stomach & small intestine	51 (72.85%)

Table No. 3 Showed the postmortem findings drowning cases, out of the total of 60 cases of drowning, cyanosis was observed in 47 (78.35%). Oozing of whitish to pinkish froth, copious in amount from mouth and nostrils was found in 57 (88.42%) cases.

Postmortem lividity was found typically over face, neck & front of trunk in 14 (20%) cases. Purging of urine or semen or faeces was observed in 29 (41.42%) cases. Cutis anserine was observed in 25 (35.71%) cases and washer woman's hands & feet were observed in 23 (32.85%) cases. The presence of petechial haemorrhages, externally over conjunctivae was found in 9 (12.85%) cases. Internal petechial haemorrhages over pleura, pericardium, under scalp and over lungs in the interlobar areas were found in 46 (65.71%) cases. In all the 60 cases we observed the presence of heavy,

voluminous, oedematous and congested lungs with weight of either lung above 500 gm with presence of copious amount of whitish, fine, leathery froth oozing out freely on cut section. This study did not find any case of dry drowning. The presence of water in stomach and first part of small intestine was observed in 51 (72.85%) of cases.

DISCUSSION

Drowning is defined as the impairment of tissue oxygenation consequent to submersion in a fluid medium. According to Mason JK⁶, the precise number of drowning fatalities on a world wide basis is uncertain but is probably around some 140, 000 people per year. The trend is increasing world wide due to increase in water transport, and adventure water sports.

Modi⁷ observed that in India drowning occupies the first position of all models of committing suicide. In his study of 231 cases of suicide, 90 were due to drowning. Indian females, even on the least provocation, commit suicide by jumping into a well or a tank in the neighbourhood.

In our study of total of 60 cases of drowning, 45 (75.43%) were males & 15 (25.57%) were females. In all age groups males predominated. Similar findings of male predominance were also noted in observations made by Sayed ZAT⁸ (75.68%), Chormungeet al⁹ (73.53%), Amandeep Singh et al¹⁰ (67.56%), Salachin et al¹¹ (75.6%), Gross VA et al¹² (90%), Momanchand et al¹³ (80.3%), and Srinivasa Reddy P¹⁴ (59.14%).

When the suicidal and accidental manner of death was compared with the others in cases of drowning by applying chi square test, it was found to be statistically significant ($P < 0.001$) indicating that majority of cases of drowning are accidental or suicidal in nature. Homicidal drowning is rare.

Our observations in this regard are consistent with observations of Singh B et al¹⁵, Bernard Knight¹⁶, Mason JK⁶, Modi JP⁷, Mukherjee JB¹⁷ and Nandy¹⁸.

Our study showed that the incidence of drowning was found to be less in very young age, it increases from

adolescence to late middle age and again it drastically falls in old age.

The probable explanation to the above may be that as drowning deaths are mostly suicidal and accidental in nature, the age group 11- 50 yrs. are more vulnerable as this age is more prone to accidents in water during adventure sports, travels and swimming. The challenges and struggle for livelihood in adolescents, frustrations due to failure of high ambitions and in love affairs makes them more prone for suicide.

Our observations in this regard are consistent with the observation of Singh B et al¹⁵. This was similar to findings of the study done by Sayed ZAT et al⁸, Chormunge et al⁹, Dattarwal JK et al¹⁹ and Srinivasa Reddy P et al¹⁴.

In our study, we have examined 60 cases of drowning in detail. The following were the salient features of Drowning observed, Cutis Anserina i.e the appearance of 'gooseflesh' due to contraction of the erector muscles of hair is well known phenomenon. In our study we observed cutis anserine in 25 (35.71%) cases.

Washer women's hands and feet-a-change of prolonged immersion leading to whitening and wrinkling of skin, particularly on the palmar surfaces of hands and soles of feet. In our study, we found washerwoman's hands and feet in 23(32.85%) cases.

Our findings in this regard are consistent with Mason JK⁶, Bernard Knight¹⁶, Mukherjee JB¹⁷, Modi JP⁷ and Nandy¹⁸. In drowning, because the center of gravity of the body is towards the head, the body of a drowned victim usually floats partly head down in water. Dependent lividity may then develop over face, neck and upper part of trunk if the body is floating in such head down position and the lividity which gets fixed in 5 – 6 hrs. But, if the body is recovered and laid in supine position, before the fixation of postmortem lividity then such a typical pattern of lividity may not be found. In our study, we found postmortem lividity over face, neck and front of trunk in 14 (20%) cases.

Another significant finding of antemortem drowning is the presence of white coloured or slightly

blood tinged, fine frothy and tenacious foam oozing out. The froth consists of a whipped up mixture of drowning medium, air and secretions from bronchial mucous glands. The amount of foam evident externally may increase in volume for a brief period after death as rigor mortis compresses the chest. In our study, we had found the same in 57 (81.42%) cases. During the postmortem examination when the chest was compressed, the typical thin, leathery, tenacious froth of drowning came out from mouth and nostrils in remaining 13 cases (18.58%).

On postmortem examination the lungs were found to be heavy, voluminous, oedematous and congested with weight of either lung above 500 gms. On cut section there was copious amount of whitish, fine leathery froth oozing out freely.

Our findings in this regard are consistent with Mason JK⁶, Bernard Knight¹⁶, Modi JP⁷, Mukherjee JB¹⁷ and Nandy¹⁸. The presence of water in stomach and small intestine was observed in 51 (72.85%) cases. Purging of either urine, semen and faeces was observed in 29 (41.42%) cases.

Other findings like cyanosis in 44 (62.85%) cases, external petechial haemorrhages over conjunctiva in 9(12.85%) cases, internal petechial haemorrhages over lungs, pleura, pericardium and under scalp in 46 (65.71%) cases persistent fluidity of blood was observed in all the 60 cases, are consistent with that of death due to asphyxia.

As we have discussed earlier the importance of petechial haemorrhages in asphyxia. A noteworthy point in this regard is that the external petechial haemorrhages were observed over face, forehead and conjunctiva in drowning is observed in 9 (12.85%) cases. Similar finding like Wet body and cloths, Presence of mud and sand on, Copious fine leathery white froth, Lungs voluminous, edematous, Presence of mud and sand in GIT also found in study of M H Chowdhary et al²⁰.

CONCLUSION

This study showed that majority drowning cases belonged to male, adolescent age group & accidental in nature. The findings of the study could be useful to

develop accessible infrastructures to improve drowning intervention programs in this region

Conflict of Interest : Nil

Source of Funding : Nil

Ethical Clearance : Taken from Institutional Ethics Committee

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Estimation of Age from Wrist Ossification Centres among Subjects in Anantapur District—Andhra Pradesh

M. Srinivasa Naik¹, Rajasekhar. V²

¹Associate Professor, Dept of Forensic Medicine and Toxicology, Government Medical College, Anantapur-Andhra Pradesh, ²Assistant Professor, Dept of Forensic Medicine and Toxicology, Kurnool Medical College, Kurnool – AP

ABSTRACT

Identification of both the living and the dead is of paramount importance for variety of reasons in forensic practice routinely. Identification of an individual either living or dead is usually carried out by the police. However, where medical expertise is needed for elucidation of disputed facts, a medical man may be consulted.¹

There are several criteria's which are used for identification. One such criterion is the determination of age of an individual. Determination of age of a person is a common problem that demands forensic expertise and is an important criterion in the establishment of identity of an individual². In addition to identification of a person, age is an important feature in day to day legal system, in both civil as well as criminal cases.³

Keywords: Age Estimation, Ossification Centres, Identification, Wrist Joint

INTRODUCTION

Determination of age in civil cases is required in situations like making of wills, attainment of majority, marriage, voting rights, employment etc. In criminal cases, determination of age is important in cases of rape, kidnapping, prostitution, criminal abortion, infanticide and criminal responsibility etc.

The important age groups with legal implications are 1, 5, 7, 10, 12, 14, 15, 18 and 21 years etc. Of these the most common age groups involved in civil and criminal

cases are 16 and 18 years. The age of appearance and fusion of ossification centres of various bones is of great value in determining age as the epiphysis of bones unites during a period which is remarkably constant for a particular epiphysis.

The age at which the epiphysis of bones fuse varies depending on health, hereditary, nutritional, endocrine and environmental factors.⁴ Therefore it is not possible to make any hard and fast rule for estimation of age from epiphyseal union for the entire India.⁵

Hence the present study was taken up in Government Medical College, Anantapur, Andhra Pradesh, to estimate the age of individuals. The data obtained from this study should be of great help to the medical experts, law enforcing authorities and judiciary of this region in arriving at a fairly accurate opinion regarding the age of a person concerned with legal matters.

Corresponding Author:

Dr. Rajasekhar. V

Assistant Professor

Dept of Forensic Medicine and Toxicology,

Kurnool Medical College, Kurnool – AP 518002

MATERIALS AND METHODS

The study comprised of 120 subjects from in and around Government Medical College, Anantapur, Andhra Pradesh. Out of these 60 were boys and 60 were girls. The age group of study ranged from 15-19 years. The subjects were chosen from different schools and colleges of Anantapur, Andhra Pradesh.

The selection of subjects was based on the following criteria :

A. Inclusion criteria

1. Subjects are domicile of any village, town or city in and around Anantapur district of Andhra Pradesh.
2. Age proof in the form of either birth certificate or school / college admission register.
3. Subjects of sound health at the time of investigation.
4. Should voluntarily consent for the study procedures.
5. Other criteria like subject belonging to different religion and socio economic status were included in study.

B. Exclusion criteria

1. Subjects with musculo skeletal disorder, fractures at the joint to be examined, nutritional disorders and chronic illness were excluded from the study.
2. Subjects without proof of birth record.

The subjects were categorised into four age groups at an interval of 12 months. Thus among the total of 120 subjects, 30 (25%) of them were selected in each of the four different age groups.

Table No. 1: Provides the age and sex wise breakdown analysis of the study population

Age group (in years)	No of case		Total (n)
	Males	Females	
15.1 – 16	15	15	30
16.1 – 17	15	15	30
17.1 – 18	15	15	30
18.1 – 19	15	15	30
Total	60	60	120

Informed consent was taken from every individual, prior to examination in the prescribed consent form. Radiograph of left hand including wrist joint was taken by a single exposure, in the department of Radiology, Government Medical College, Anantapur, Andrapradesh. The subjects were radiographed for hand and wrist joint which included the lower end of radius and ulna, all the carpal bones, metacarpal bones and the phalanges.

Results: In the present study, the radiographs (PA view) of left hand including wrist joint of all subjects were studied and following observations were made. The age at which 75% of the cases show fusion is taken as the average age of epiphyseal union for the corresponding centre.

Table No. 2: Showing the fusion and non fusion of base of 1st metacarpal, distal end of ulna and distal end of radius in both sexes in different age groups

Age in years	Sex	Total No	Base of 1 st Metacarpal		Distal end of Ulna		Distal end of Radius	
			Not Fused	Fused	Not Fused	Fused	Not Fused	Fused
15.1 – 16	M	15	07	08	11	04	15	00
	F	15	01	14	02	13	08	07
16.1 – 17	M	15	03	12	07	08	13	02
	F	15	00	15	01	14	03	12
17.1 – 18	M	15	01	14	04	11	09	06
	F	15	00	15	00	15	01	14
18.1 – 19	M	15	00	15	01	14	03	12
	F	15	00	15	00	15	00	15

Table No. 3: Showing average age of fusion of base of 1st metacarpal, distal end of ulna and radius in both sexes.

Epiphysis	Average age of fusion in girls (in years)	Average age of fusion in boys (in years)
Base of 1 st metacarpal	15-16	16-17
Distal end of ulna.	15-16	18-19
Distal end of radius.	16-17	18-19

The average age of fusion of base of 1st metacarpal bone is 15-16 years in case of females, where as it is 16-17 years in case of males.

The average age of fusion of distal end of ulna is 15-16 years in case of females, where as it is 18-19 years in case of males.

The average age of fusion of distal end of radius is 16-17 years in case of females while it is 18-19 years in case of males. Indicating that the fusion of epiphysis taking place earlier in females when compared with males.

Table No. 4 : Showing fusion and non fusion of base of 1st metacarpal.

Sex	Age in years	Total No	Not fused		Fused	
			No	%	No	%
Male (n=60)	15-16	15	7	47	8	53
	16-17	15	3	20	12	80
	17-18	15	1	7	14	93
	18-19	15	-	-	15	100
Female (n=60)	15-16	15	1	7	14	93
	16-17	15	-	-	15	100
	17-18	15	-	-	15	100
	18-19	15	-	-	15	100

In case of males, 53% showed fusion of base of 1st metacarpal bone between 15-16 years of age. There is gradual increase in the number of subjects showing fusion as the age advances. Between 16-17 years of age 80% showed fusion, between 17-18 years of age 93%

and between 18-19 years of age 100% of the subjects showed fusion of base of 1st metacarpal bone.

- ✓ Average age of fusion is 16-17 years as 80% of them showed fusion.
- ✓ The youngest subject showing fusion is 15 years and 2 months old.
- ✓ The age of eldest subject showing non fusion is 17 years and 4 months old.

In case of female subjects, 93% of them showed fusion of base of 1st metacarpal bone in the age group 15-16 years, while 100% of them showed fusion in rest of the age groups involved in the study i.e., 16-17, 17-18 and 18-19 years.

- ✓ The average age of fusion is 15-16 years as 93% of them showed fusion.
- ✓ The age of the youngest female showing fusion is 15 years and 1 month old.
- ✓ The eldest female showing non fusion of base of 1st metacarpal is 15 years and 2 months old.

DISCUSSION

In India 16 years of age is significant for a girl as for as consent for sex is concerned, in alleged cases of rape. Similarly in number of cases false representation of age is made, particularly with respect to the age 18 years. In India 18 years is the age for attainment of majority. At this age the individual enjoys a number of privileges like entry into a government job, making a valid will, voting power and in case of females it is the minimum age for marriage.

Many workers of India and abroad have conducted the studies and recorded appreciable variation in the time of union of epiphysis with their respective diaphysis. It was also observed by them, that the age at which epiphyseal union in bones occurs is influenced by climatic condition, hereditary, nutritional, socioeconomic factors and geographical location.

As India is a vast country with diversity of afore mentioned factors, so it is not possible to make uniform standards for the entire country.

Keeping in view all the above factors an attempt is being made in the present study to estimate the age among the population in and around Anantapur district i.e., Andhra Pradesh by the fusion of epiphysis around wrist joint.

In the present study, epiphyseal union of distal end of ulna, radius and base of first metacarpal bone are studied.

The average age of fusion of base of 1st metacarpal observed in the present study is 15-16 years in case of females and 16-17 years in case of males.

Patil DT -Worked on the population of north Karnataka and observed the fusion of base of 1st metacarpal bone at 15-16 years in males and 14-15 years in females which is 1 year early when compared to the observations of the present study⁶.

Sheetal Jain - conducted study on population of Rajasthan and observed the fusion of base of 1st metacarpal at 17-18 years in both males and females which is 1 year late when compared to the present study⁷.

Patil DT -worked on the population north Karnataka and showed the age of fusion as 17-18 years in males, which is 1 year early when compared to the present study which is 18-19 years⁶.

Suresh Sankhyan -studied population of Himachal Pradesh and observed age of fusion of distal end of ulna as 21 years in males and 20 years in females. This is 3 years late to that of males in our study, while in case of females it is 5 years late. But in the present study we observed 1 year range for the fusion i.e., 18-19 years for males and 15-16 years for females⁸.

Suresh Sankhyan - observed the age of fusion of lower end of radius at 21 years in males and 20 years in females, which is 3 years late in males and 4 year late in females when compared with the present study i.e., 18-19 years and 16-17 years respectively⁸.

Patil DT - studied on population of north Karnataka and observed the age of fusion of lower end of radius at 17-18 years in males which is 1 year early when compared to that in the present study⁶.

Sheetal Jain and Banarjee -observed the age of fusion at 19-20 years in males which is 1 year late when compared to the observations of present study^{7,9}.

A study of estimating the age of adolescent subjects by the union of epiphysis around the wrist joint i.e., lower end of ulna and radius, base of 1st metacarpal bone was conducted in the department of Forensic Medicine and toxicology, Kurnool Medical College, during 2013-2016 by radiological examination.

CONCLUSION

Following are the conclusions drawn from the observations made during the present study.

Radiological examination is the important and reliable method of visualizing the epiphyseal union of the bones. Even though exact and precise age of the individual cannot be stated, but a reasonable age range can be assessed by the timings of the epiphyseal union.

The fusion of epiphysis is subjected to variabilities as it occurs at different age in different countries, in same country at different regions. It is observed that the fusion of epiphysis is late in north Indian population when compared to our study.

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Autopsy Based Study on Female Victims of Burn Injury with Special Reference to Period of Survival

Biplab Shee¹, Sujash Biswas², R.N.Karmakar³

¹Associate Professor, Dept. of FMT, Murshidabad Medical College, West Bengal; ²Assistant Professor, Dept. of FMT, Medical College, Kolkata; ³Professor and Head, Dept. of FMT, ICARE Institute of Medical Science and Research, Haldia, West Bengal

ABSTRACT

Burn injury is one of the most common causes of unnatural death worldwide. While survival after occurrence of burn injury has drastically increased in past decades especially in developed countries, it has not made an impact in developing countries like India till now. Though both males and females may be victims of burn, females are more susceptible as they are more involved in household activities. Victims may die due to neurogenic shock, hypovolemic shock, suffocation, sepsis, renal failure, electrolyte imbalance and other reasons. Some victims die within short time and some survive longer. In this study we have tried to highlight period of survival and its relation with total body surface area (tbsa) involved among different age groups of 115 female victims of burn injury.

Key words: burn, survival, total body surface area (tbsa), shock, sepsis

INTRODUCTION

In India, fire is considered as one of the leading causes of death. High mortality in young married women from burns has already become an alarming and continuous medical problem in India. About one third of burn injuries occur due to use of loose garments particularly synthetic (mostly females) while working in the kitchen with open flame, which may even lead to fatality, because a burning dress can even produce a temperature of about 1000° C. The open fire used for warming hands in cold weather, and the burning kerosene stove placed on the floor add further fuel to the problem. Congested living condition in big cities, use of kerosene stoves, kerosene lamps, and leaking liquid petroleum gas (LPG) cylinders are considered to be the major sources of causation of burn injuries^[4].

Burn injuries in cases of housewives are usually accidental in nature. In many cases it is evident from inquest reports and also from declarations of relatives of burnt females that burn injury can also occur as a result of suicidal attempt having underlying causes including dowry, and some are frankly homicidal.

As advocated by most of the authors, the extent of the body surface area (BSA) involved in burn injuries is a very important factor in the mortality of such patients. Estimation of BSA is performed using the classic “rule of nine”. However, there are limitations of this rule. The extent of involvement of body surface area in many cases is not made out by the simple application of “rule of nine”. Many authors consider large buttocks, abdomen, and thighs may change the percentage significantly.

For evaluation of the condition of the patient, one should also remember that the mortality of the burn case is closely related to age, sex, BSA and general built and nutrition of that patient. While many young healthy patients with burns of 50% to 90% of BSA are now being successfully saved by modern management and

Corresponding Author:

Dr. Sujash Biswas

Assistant Professor,
Dept. of FMT, Medical College, Kolkata

aggressive early excision and grafting, even much minor and less extensive (15% – 20%) burns may be fatal in high percentage in adults over 60 years of age and in infants & children up to about 4 years.

Determination of the type of burn (e.g. dry heat or flame) is also important to establish prognosis, which also dictate adoption of immediate care to avoid unexpected complications. A careful search for evidence of concomitant mechanical trauma is absolutely crucial for survival. Many patients sustain burns along with other mechanical injuries in the process of escaping from fires. It is especially important to determine the presence or absence of mechanical injuries like head injury, thoraco-abdominal, orthopaedic injury including evidences of torture.

MATERIALS AND METHODOLOGY

In the present work materials consists of dead female subjects with history of burn injury. Criteria for case selection:

1. Only female burn victims are taken into consideration.
2. All age groups are included in this study.
3. All types of burn are included.
4. Burn patients associated with other injury are taken into consideration.

Data was collected in following way –

1. From inquest report – address, particulars of the patient, marital status, place and time of occurrence, date and time of admission and death, H/O torture.

2. From family members – H/O familial disharmony, any physical and mental illness or medication.

3. From treatment sheet - Complete treatment line up of the admitted patients and also body surface area involved

4. From autopsy examination – External as well as internal findings whether corroborated with informations obtained before and also evidence of other injury or disease.

115 female victims of burn were studied and following informations were collected for each victim –

- Built, nutritional status of the individual
- Age of the individual
- Date and time of occurrence of burn
- Whether hospitalised or not
- Date and time of admission
- Line of treatment
- Date and time of death
- Evidence of associated injury
- Total body surface area involved

The above noted informations were studied to obtain following result ^[7, 10]

RESULT

Out of 115 victims, maximum (58) were between 21 to 30 years of age. It was 50.43% of total study population. It was also observed that 54 (46.96%) cases had medium built with nutrition. 24 (20.87%) cases were poor built & nutrition and 37 (32.17%) cases had good built & nutrition.

Table No. 1: Age wise distribution of cases

S. No.	Age (years)	No of patients	Percentage
1	<10	1	0.87
2	10 – 20	27	23.48
3	21 – 30	58	50.43
4	31 – 40	17	14.78
5	41 – 50	3	2.61
6	51 – 60	5	4.35
7	61 – 70	3	2.60
8	71 – 80	1	0.87
Total		115	

Table No. 2: Built and Nutrition of victims in respect of age

Sl No	Age (years)	Poor	Medium	Good	Total No of victim
1	<10	0	0	1	1
2	10 – 20	6	11	10	27
3	21 – 30	10	32	16	58
4	31 – 40	2	9	6	17
5	41 – 50	1	1	1	3
6	51 – 60	2	1	2	5
7	61 – 70	2	0	1	3
8	71 – 80	1	0	0	1
Total		24	54	37	115

It was seen that most victims (101) were married, of which 93 (80.87%) victims had their husbands living and rest 8 cases were widow. 14 (12.17%) cases were unmarried. it was also noticed that 67.83% (78) incidences happened within kitchen while 31 cases (26.96%) took place outside kitchen but within the premises of house e.g., bedroom, bath room etc. Diurnal variation of the cases is shown in the table below:

Table No. 3: Diurnal variation of cases

S. No.	Time of incidence	Number of victim	Percentage
1	6 AM – 1 PM	22	19.13
2	1PM – 5 PM	30	26.09
3	5PM – 11 PM	42	36.52
4	11 PM – 6 AM	21	18.26
Total		115	

Out of 115 victims, 114 were hospitalised and only one victim died before hospitalisation. Period of survival among these hospitalised victims is presented bellow -

Table No. 4: Victims as per period of survival

S. No.	Period of survival	Number of victim	Percentage
1	< 6 hrs	7	6.09
2	6 – 12 hrs	12	10.43
3	12 – 24 hrs	11	9.57
4	1 – 3 days	16	13.91
5	3 – 7 days	22	19.13
6	7 – 15 days	27	23.48
7	15 – 30 days	14	12.17
8	>1 month	5	4.35

From the following table it is observed that 35 (30.43%) had 90% or more involvement of total BSA. There was no victim with less than 20%. BSA. 22 cases (19.13%) with BSA 80% - 90%, 18 cases (15.65%) with BSA 70%-80%, 17 cases (14.78%) with BSA 60%-70%, 6 cases (5.22%) with BSA 50%- 60%. 13 cases (11.30%) with BSA 40%-50%. Only 3 cases (2.61%) with BSA 30-40%.Lastly only one case (0.87%) was found where BSA 20%-30%.

Table No. 5: Victims according to Total body surface area involved

S. No.	TBSA (%)	Number of victim	Percentage
1	< 20	0	0.00
2	20 - < 30	1	0.87
3	30 - < 40	3	2.61
4	40 - < 50	13	11.30
5	50 - < 60	6	5.22
6	60 - < 70	17	14.78
7	70 - < 80	18	15.65
8	80 - < 90	22	19.13
9	≥ 90	35	30.43
Total		115	

As involvement of total body surface area increases, mean survival period decreases and is shown in the table below:

Table No. 6: Survival range according to total body surface area involvement

S. No.	% of TBSA	Survival range	No of victims	Mean survival period (days)
1	0 – 20	-	1	11
2	21 – 40	12 hrs – 47 days	9	19
3	41 – 60	12 hrs – 75 days	26	9
4	61 – 80	12 hrs – 30 days	36	7
5	81 - 100	12 hrs – 27 days	42	4

DISCUSSION

In this study 115 cases have been observed for the duration of one year. The results of observation has been analyzed in the tabular form and compared with available studies of other workers to bring out the similarities and

dissimilarities in different aspects. Most victims were between the age group of 21 – 30 years followed by age group between 11 – 20 years and age group between 31 – 40 years. Study done in *Alexandria, Egypt in 1997*, most of the cases (86.7%) were ≤ 40 years of age. Study by Singh D, Singh A, Sharma AK, Sodhi L revealed that most burn deaths in females occurred in the age group 21 – 40 years (67 percent). In the study by *Batra AK*, of all burn death cases, 71.9% belonged to the young age group of 21 – 40 years. As the females of this age group are mostly involved in domestic activities, they are more vulnerable^[8].

It is observed that maximum cases were medium built with nutrition. Their total number is 54 (51.37%). Next category is good built & nutrition status. Their total number is 37 (33.25%). Lastly 24 (22.80%) cases were poor nutritional status. Among poor category more prevalent age group is 21 – 30 years and their total number is 10 out of 24. It is the child bearing age in present days, when nutrition should be well maintained.

Time of occurrence of incidence as follows- Maximum 42 cases (36.52%) happened between 5 Pm to 11 Pm. 30 cases (26.09%) are founded within 1 Pm to 5 Pm. Approximately equal number of cases happened within 6 Am to 1 Pm and 11 Pm to 6 Am as 22 (19.13%) & 21 (18.26%) in number respectively. *Singh D, Singh A et al* stated that in females peak incidence of burns was observed between 5.01 am and 11 am (38%). Present study does not corroborated with the observation of other authors^[1].

One case (0.87%) was 'brought dead'. Rest 99.13% victims were given treatment and gave the opportunity to save their lives. Among treated patients, most victims survived 7-15 days. It supports the study of Subrahmanyam M., Joshi A.V. et al. 35 cases (30.43%) with Total Body Surface Area involvement (TBSA) were more than 90%, no fatality in recorded below 20% of BSA^[3]. Only few cases had 20% – 40% of BSA involvement. Mortality range had increased when BSA is 50% or more. This observation in the present study agrees with the observation of *Maya Nater et al*, studied that 15 – 50% of body surface was burnt in 40.15%

female victims and 50% or more in 35.9% of female victims. *Kumar et al*, reported that 85.52% burnt wives had more than 50% of body area involvement while in 14.47% victims it was less than 50%^[9].

This study showed relationship with TBSA and period of survival after receipt of injury. Here range of period of survivability started from 12 hours and it showed mean survival period decreases with increase of % of BSA. This study supports the previous observation of *Kumar V, Tripathi CB*. Similar body surface area involvement of different victims has also affected their period of survivability depending upon their built and nutritional status and gap between their receipt of injury and hospital admission^[2]. Regarding period of survival, study of Afify M M et al showed that 82% survived up to one week but this study reveals approximately 60% survived less than a week^[5]

CONCLUSION

From this study we have observed that young ages girls and early middle aged women are mostly affected. Many of them commit suicide by burning themselves. Proper counselling of this vulnerable age group girls can diminish the attempt of suicide. Moreover timely admission in the hospitals and early management may decrease the fatality and increase the survivability. Proper carefulness in the home during activities involving fire may lower the accidental burn injuries.

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Pattern of Injuries in Homicidal Ligature Strangulation – A Retrospective Autopsy Based Study

Sujith Sreenivas C

Associate Professor & Dy. Police Surgeon, Dept. of Forensic Medicine, Govt. Medical College, Idukki

ABSTRACT

Ligature strangulation is the process of applying constrictive force around the neck by a ligature, the constricting force being an external force of the assailant. Death usually occurs by occlusion of air passage resulting in asphyxia. Pressure effect on vital structures of neck like carotid body or vagus may result in vasodilation, hypotension and vagal inhibition of heart¹.

Key word: *Ligature strangulation*

INTRODUCTION

During the process of Ligature strangulation, compression of the carotid arteries or jugular veins result in cerebral ischemia, compression of the larynx or trachea results in asphyxia and stimulation of the carotid sinus reflex or vagus nerve results in hypotension and bradycardia². When the constricting force is continued till death in a uniform manner without waxing and waning, the underlying soft tissues will be devoid of bruising. This usually occurs in the absence of resistance or struggle on the part of the victim or when the victim is not in a position to offer resistance. Correlation of the autopsy findings helps in reconstructing the probable mechanism of death due to ligature strangulation³. Constricting forces producing vagal inhibition is unlikely to produce any autopsy findings as the loss of consciousness will be instantaneous, often associated with sudden arrest of respiration and circulation. However venous obstruction

will result in muscular weakness, vertigo and clouding of consciousness. Congestion and petechiae may be evident during autopsy. However all the haemorrhagic findings of asphyxia will be reduced in the presence of arterial obstruction. Compressive pressure applied suddenly on the trachea so as to occlude the air passage may render the victim powerless and insensible. Partial closure of air passages results in a violent asphyxial death and marked cyanotic changes⁴.

AIMS AND OBJECTIVES

Evaluation of pattern and nature of injuries of neck in death due to homicidal ligature strangulation.

MATERIALS AND METHOD

It is a retrospective study over a period of seven years (2005-11). Homicides by ligature strangulation were analysed by perusal of office records of the Department of Forensic Medicine, Govt. Medical College, Kozhikode. The external ligature mark, injuries to deeper structures of neck including subcutaneous tissues, muscles, cartilages, bones, and neurovascular bundles were evaluated

INCLUSION CRITERIA

Medicolegal autopsies conducted by layer dissection of neck in a blood less field (modified Schrader's technique) is considered for the evaluation of the study.

Corresponding Author:

Dr. Sujith Sreenivas. C

Associate Professor & Dy. Police Surgeon,
Govt. Medical College, Idukki.
'Srinivas', P.T.Usha Road,
Kozhikode – 673 001, Kerala, India
Mobile: 9847005239
E-mail : drsujithsc@rediffmail.com

OBSERVATIONS**Table No. 1: Autopsy findings in Ligature strangulation 2005**

Age/ Sex	S/C Hae- morrhage	LM Continuous/ non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F 6/12	Nil	Continuous Transverse	Thyroid Cartilage	Normal	Normal	Normal	Normal	Nil
M/9	Nil	Continuous Transverse	Thyroid Cartilage	Normal	Normal	Normal	Normal	Nil
F/32	Present	Continuous Transverse	Thyroid Cartilage Slip mark + Cricoid	Normal	Contused	Normal	Contused	present
F/11	Nil	Non cont. transverse Lt.(Back)	Thyroid cartilage Slip mark + Cricoid	Normal	Contused STCM + Rt.	Normal	Contused	Present
F/9	Present	Non cont. transverse Lt.(Back)	Thyroid Cartilage Cricoid Trachea	Normal	Contused STCM + Rt. Muscles over thyroid gland	Normal	Contused	present
F/24	congested	Continuous Transverse	Thyroid cartilage	Normal	Normal	Normal	Normal	Nil

Table No. 2 : Autopsy findings in Ligature strangulation 2006

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/ 23	Nil	Continuous Transverse	Thyroid cartilage	normal	Normal	Normal	Normal	Nil
F/30	present	Non Cont. transverse (Back)	Thyroid cartilage cricoid cartilage	Contused on front	Contused strap muscles over thyroid gland	Thyroid cartilage # Lt upper horn	Contused	present
F/60	present	Non cont. transverse (Back)	Thyroid cartilage	Present on Lt. side	present Contusion Lt.STCM	Thyrohyoid membrane Both sides	Normal	Nil
M/9	Nil	Continuous Transverse	Thyroid cartilage	Normal	Normal	Normal	Petechiae	Nil
F/28	present	Non Cont. transverse (back) Slip mark +	Thyroid cartilage Cricoid Tracheal rings	present on Rt.side	present Rt. STDM	Thyrohyoid membrane contused on Rt. Side	Petechiae	Present

Table No. 3 : Autopsy findings in Ligature strangulation 2007

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/8	present	Non cont. transverse	Crico Thyroid cartilage	Normal	STDM contused	Cricoid# Lower pole of thyroid of gland contused	Mucosal petechiae	Present
M/7	Nil	Continuous Transverse	Thyroid cartilage	Normal	Normal	Normal	Normal	Nil
F/26	present	Non cont. transverse (Back)	Thyroid cartilage	Normal	STDM+	# upper Lt horn thyroid cartilage Thyro hyoid membrane Contused Rt. Side	present	Present
F/21	present	Non cont. Transverse (Lt.Back)	Crico Thyroid	Rt. Front contused	normal	Rt side. thyro- hyoid membrane	normal	Present
F/58	Nil	Continuous transverse	Thyroid cartilage	Normal	normal	normal	normal	Normal

Table No. 4 : Autopsy findings in Ligature strangulation 2008

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/38	present	Non cont. transverse	Thyroid cartilage	Contused	Thyrohyoid membrane contused	Lt.upper horn of thyroid cartilage#	Normal	Nil
F/10	present	Continuous Slip + transverse	Thyroid cartilage	normal	Normal	Normal	Post. wall contused	Present
F/27	absent	Non cont. transverse	Thyroid cartilage	Contused	STDM contused T H mem. contused	Normal	Post. wall contused	Nil
F/35	absent	Non cont. transverse	Thyroid cartilage	normal	STDM contused TH mem. contused	Normal	Contused	Present
F/18	absent	Continuous Transverse	Thyroid cartilage	normal	normal	normal	Normal	Normal

Table No. 4 Contd...

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/38	absent	Non cont. transverse	Thyroid cartilage	normal	Strap muscle on front contused	normal	normal	Present
F/35	absent	Continuous transverse	Thyroid cartilage	normal	Strap muscle contused	normal	Normal	Normal
F/4	absent	Non cont. transverse	Thyroid cartilage	normal	normal	normal	normal	Normal
F/55	absent	Continuous transverse	Thyroid cartilage	normal	Thyroid gland & contused strap muscles	normal	Contused	Present

Table No. 5 : Autopsy findings in Ligature strangulation 2009

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non C	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/43	present	Continuous transverse	Crico thyroid	normal	Normal	Normal	Petechiae	present
F/38	present	Non cont. transverse (absent back)	Thyroid cartilage	Contused	STDM + THM	Sup. horn of thyroid cartilage	absent	present
F/22	present	Non cont. Transverse	Thyroid Cartilage	Contused	STDM + Lower part of thyroid gland Strap muscle thyrohyoid membrane	Thyroid cartilage upper horn	Contused	Present
F/19	absent	Non cont. Transverse	Thyroid Cartilage	Contused	Normal	Normal	Congested	absent
M/56	absent	Non cont. Transverse	Lower part of neck	contused	Normal	normal	Normal	absent
F/NB	absent	Non cont. Transverse	Lower third of neck	Contused	Contused strap muscle	normal	Normal	absent

Table No. 6: Autopsy findings in Ligature strangulation 2010

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/24	present	Non-cont. transverse (Back Rt)	Crico Thyroid	Normal	Lt.STCM Overlying thyroid	Left upper horn of thyroid cartilage# Thyrohyoidmemb. contused	Contused	present
F/8	absent	Continuous Transverse	Thyroid	Normal	Normal	Normal	Petechiae congested	absent
M/6	absent	Continuous Transverse	Thyroid	Normal	Normal	Normal	normal	absent
F/62	present	Non cont. (Lt Back) Transverse	Crico- Thyroid	contusion Rt. front	STDM + Rt.front Thyroid gland Lower pole Rt	Normal	Large contused post pharynx wall	present
F/42	present	Non cont. (Back) Transverse Slip mark	Thyroid cartilage	present	Strap muscle over thyroid	Normal	Petechiae	present
F/30	present	Non cont. (Back) Transverse	Crico thyroid	normal	Thyroid gland and overlying strap muscles	Cricoid #	Larynx contused	present

Table No. 7: Autopsy findings in Ligature strangulation 2011

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
F/4	absent	Non cont. transverse	Thyroid cartilage	normal	Normal	Normal	Normal	Nil
F/36	present	Non cont. transverse	Thyroid cartilage	Contused	STDM Contused	Normal	Contused	Present
F/15	present	Non cont. transverse	Thyroid cartilage	absent	STDM Contused strap muscles over thyroid cartilage	Upper horn of thyroid cartilage #	Contused	Present

Table No. 7 Contd...

Age/ Sex	S/C Hae- morrhage	LM Continuous/ Non	LM Position Level	S/C Tissues LM	Muscles	Bone/ Cartilage	Larynx	pulm oedema
M/6	absent	Continuous transverse	Thyroid cartilage cricoid	absent	absent	absent	Absent	Absent
F/29	present	Non cont. transverse	Thyroid cartilage	Contused	STDM contused	absent	Petechiae	Present
F/40	present	Non cont. transverse Slip +	Thyroid cartilage	Contused	STDM + Strap muscle over cartilage	Upper horn of thyroid cartilage	Contused	Present

In the year 2005, four cases had a continuous ligature mark around the middle of neck at the level of thyroid cartilage. Subconjunctival haemorrhage was seen only in one case where there was underlying contusion of soft tissues. Two of the cases which had a non-continuous ligature mark around the neck had underlying soft tissue contusion involving sternocleidomastoid muscle and thyroid gland and in one case overlying strap muscles was contused. Laryngeal contusion was present in both the cases. Acute pulmonary oedema was seen in all the cases with deeper soft tissue contusions and contusion of larynx. None of the cases showed injuries to the bones and cartilages of the neck.

In the year 2006. Two cases presented with continuous ligature mark around the neck out of which both the cases had normal deeper structures of the neck. Subconjunctival haemorrhage was absent in both the cases. All the cases with non continuous pressure abrasion around the neck was associated with subconjunctival haemorrhage and contusion of underlying subcutaneous tissues. In two cases there was contusion of sternocleidomastoid muscle underneath the ligature mark and in one case strap muscle overlying the thyroid gland was contused. The thyrohyoid membrane was contused in all the three cases having non continuous pressure abrasion. All the pressure abrasions were along the middle third of neck overlying the thyroid cartilage. There was fracture of upper horn of thyroid cartilage in one case which had contusion of thyrohyoid membrane.

Acute pulmonary oedema was seen in two cases where there was a non-continuous ligature mark with contusion to deeper soft tissues of the neck.

In the year 2007. Two cases presented with a continuous ligature mark all around the neck. Deeper injuries to neck structures were absent in both the cases. All the three cases having non continuous pressure abrasion around the neck showed subconjunctival haemorrhage and contusion of sternocleidomastoid muscle. Thyrohyoid membrane was contused in two of the cases. Cricoid cartilage was fractured in one of the cases which also showed contusion of lower pole of thyroid gland. Upper horn of thyroid cartilage was fractured in one case which had contusion of thyrohyoid membrane. Acute pulmonary haemorrhage was present in all the cases with non-continuous ligature mark and deeper soft tissue contusions.

In the year 2008, four of the cases had a continuous ligature mark all around the neck at the level of thyroid cartilage, of which two cases had contusion of underlying strap muscles and in one case there was contusion of thyroid gland. In one case where there was slipped ligature marks, there was subconjunctival haemorrhage, acute pulmonary oedema and contusion of posterior wall of larynx. Five cases had non continuous ligature mark out of which one case had subconjunctival haemorrhage, contusion of thyrohyoid membrane, and fracture of upper horn of thyroid cartilage. In two of the cases, there was contusion of sternocleidomastoid

muscle and thyrohyoid membrane and in one case there was contusion of the strap muscles. In one case (4 year old), the underlying soft tissues, bones and cartilage appeared normal. Acute pulmonary oedema was seen when there was contusion of underlying soft tissues, in cases where the ligature mark was non continuous and when there was a slippage of ligature material.

In the years 2009, one of the case with a continuous ligature mark all around the neck at the level and below thyroid cartilage presented with subconjunctival haemorrhage, laryngeal petechiae and acute pulmonary oedema. All the other cases had a non-continuous ligature mark three of which at the level of thyroid cartilage and two along the lower part of neck. The subcutaneous tissue was found contused at places in all the cases with non continuous ligature mark. The sternocleidomastoid muscle was found contused in two of the cases along with the contusion of thyrohyoid membrane and fracture of upper horn of thyroid cartilage where ligature mark was non continuous. The lower pole of thyroid gland and overlying strap muscles were contused in one of them. Strap muscle contusion was seen in one of the case with non continuous ligature mark which had subcutaneous tissue contusion. Larynx was found contused only in one of the case with non-continuous ligature mark. Acute pulmonary oedema was seen in both the cases with deeper soft tissue contusion and fracture of thyroid cartilage and also in the case with continuous ligature mark along the lower border of thyroid cartilage overlying the cricoid cartilage.

In the year 2010, two cases had a continuous ligature mark around the neck. Both the cases which had a continuous mark were below 10 years and was having underlying normal looking soft tissues and bones/ cartilages of the neck. Two of the cases with non-continuous pressure abrasion around the neck had contusion of sternocleidomastoid muscle. The other two cases with non-continuous ligature mark had contusion of the thyroid gland and overlying strap muscles. Three of the cases with non continuous mark had contusion of the larynx and the other one had only petechiae within the laryngeal mucosa. All the four cases showed

evidence of acute pulmonary oedema out of which three cases had the ligature mark overlying the cricothyroid and the other case showed slippage of pressure abrasion.

In the year 2011, one case (6yrs old) had a continuous pressure abrasion around the neck. The underlying soft tissues, bones and cartilage appeared normal. Out of the five cases having non-continuous ligature mark around the neck, four of them had subconjunctival haemorrhage, and subcutaneous tissues were contused in three of the cases. Sternocleidomastoid muscle was contused in four of the cases, strap muscles of the neck contusion in two of the cases. The upper horn of thyroid cartilage was fractured in two of the cases (above 40yrs). The larynx was contused in three of the cases and a fourth case had laryngeal petechiae. Four of the cases had acute pulmonary oedema. One case which had non-continuous ligature mark was devoid of deeper soft tissues or bone/ cartilage damage (4 years old).



Photo No. 1: ligature strangulation using synthetic shawl

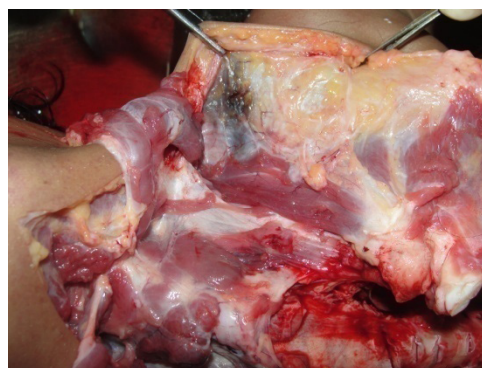


Photo No. 2: Contusion underneath ligature mark



Photo No. 3: subconjunctival haemorrhage



Photo No. 4: Sternothyroid muscle contusion

DISCUSSION

There was a preponderance of female homicide by ligature strangulation. It also appear to be a method of killing small children in dyadic death involving the entire family. The absence of injuries to the deeper soft tissues of the neck, bone and cartilage in small children suggests the minimal resistance put up by the deceased person during the process of constriction of the neck by the ligature and the cartilaginous nature of bones and cartilages will resist fracture. The constricting force around the neck appear to have been continued till the death or the onset of cardiac arrest, resulting in the absence of blood infiltration underneath and around the ligature mark. In almost all the deaths the ligature mark was seen transversely around the middle third of the neck over the thyroid cartilage, however in a few cases the mark was extending along the lower margin of thyroid cartilage overlapping the cricoid cartilage also. The transverse nature of the mark indicates that the weight of the body has not been transmitted or

contributed as the constricting force around the neck. The deeper injuries appear to be due to waxing and waning nature of the constricting force, as the injuries to the deeper tissue of the neck were underlying the pressure abrasion (ligature mark). The slipped ligature mark appear to be overlying the thyroid cartilage on the front of neck possibly due to slipping of ligature along the prominence of thyroid cartilage. The subcutaneous tissue underneath the ligature mark was seen contused when the pressure abrasion was non continuous. The blood infiltration was seen diagonally opposite the area of discontinuity on the ligature mark of ligature strangulation, possibly because of the site being the area of maximum pressure effect and simultaneous grazing movement of the ligature while applying the constricting force. The traction and movement of the thyroid cartilage during the application of constricting force appear to have resulted in the movement of the cartilage in relation to the hyoid bone resulting in blood infiltration within the thyrohyoid membrane. The contusion of soft tissues was also seen more commonly when the ligature mark around the neck was non continuous. Commonest muscle contused was sternocleidomastoid underneath the ligature mark diagonally opposite the non continuous portion of the pressure abrasion. When the ligature mark was overlying the cricothyroid region there was a greater incidence of contusion of lower pole of thyroid gland and overlying strap muscles. Fracture was seen more commonly involving the upper horn of thyroid cartilage and was associated with contusion of thyrohyoid membrane. The pressure at the level of the relatively firm thyroid cartilage appear to have prevented obstruction of air passage, as only the pressure effect due to non-continuous ligature mark and that below the thyroid cartilage was associated with acute pulmonary oedema. The presence of slip marks on the pressure abrasion was also associated with greater damage to underlying soft tissues and signs of violent asphyxia death. The fracture of cartilages was also influenced by the increasing age of the victim, probably because of advanced ossification.

CONCLUSION

During the medicolegal autopsy the forensic pathologist should be able to differentiate a death by ligature strangulation, by observing the pattern and nature of ligature mark and injuries to deeper soft tissues of the neck, bone and cartilages.

Ethical clearance: IRC/Protocol/2012/90 (research project approved)

Conflict of Interest : NIL

Source of funding : Self

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A Study of Fingerprints in Relation with Gender & Blood Group among Medical Students in Hyderabad, India

Khazi Mudabbir Ahmed¹, Iqbal Banu Hussain², Sultan Rizwan Ahmad³

¹Associate Professor, Dept. of Forensic Medicine, ²Professor and HOD, Dept. of Forensic Medicine,

³Associate Professor, Dept. of Community Medicine, Department of Forensic Medicine and Toxicology, Deccan College of Medical Sciences, Hyderabad, Telangana

ABSTRACT

Back ground: Finger print identification is undoubtedly the most reliable and acceptable evidence till date in the court of law. Fingerprints can be used to identify an unknown victim, witness, or a suspect. Therefore, an attempt has been made to study the association of fingerprint pattern with gender & blood group.

Methodology: A cross sectional study was conducted among the medical students of MBBS of either gender. A total of 176 students were participated in study. Finger prints were taken on white paper and blood group were also noted on same paper. Data were analyzed as frequency and chi square test.

Results: Loops were the most common fingerprint pattern. B+ve and A+ve were common blood group. Association between loops with Blood group A+ve and of whorls and arched with B+ve was found to be statistically significant.

Conclusion: Knowledge of finger pattern could help in the prediction of blood group in medico-legal investigations.

Key Words: Arches, Blood Group, Finger print, Loops, Medical students, Whorls

INTRODUCTION

The fingers of a person contain small ridges, which are nature's way of allowing one to grip objects. The ridges form a pattern that is genetically determined, unique and remain unchanged from birth till death. Those ridges contain sweat pores from which perspiration, salts and oils are excreted. The oils that are left on a surface are known as fingerprints.¹ Fingerprints can be used to identify an unknown victim, witness, or a suspect. Finger print identification is undoubtedly the most reliable and

acceptable evidence till date in the court of law.² Two person having identical fingerprints is about one in 64 thousand millions.³ There are four types of patterns observed in the fingers—loops, whorls, arches and composite.¹ Arches are the simplest patterns and also the rarest. In this the ridge lines flow into the print from one side, rise in the middle of the pattern, and flow out to the other side of the print. The loop is the most common of all the patterns. Loops are formed by ridge lines that flow in from one side of the print, sweep up in the centre like a tented arch, and then curve back around and flow out or tend to flow out on the side from where they entered. Second common pattern is whorl. In these patterns they have at least two deltas and one or more of the ridge lines curves around the core to form a circle or spiral or other rounded, constantly curving form. The term composite is used for combination of patterns that does not fit into any of the above classifications.⁴⁻⁵

Correspondence Author:

Dr. Iqbal Bano Hussain

House no-1-5-260, Mushirabad,

Zamistanpur, Hyderabad, 5800020,

Mobile: 9490995385

Email: nabilanaseer@gmail.com

A reliable personal identification is critical in the subject of forensics as it deal with many situations like civil, criminal, commercial and latest in financial transaction frauds, where the question of identification becomes a matter of paramount importance. Fingerprint biometry is also one of the most heavily used and actively studied biometric technologies as cost is low, more acceptable by user and can be deployed easily across any kind of environment compare to other biometric methods.⁶ Due to the immense potential of fingerprints as an effective method of identification, an attempt has been made to study the association of fingerprint pattern with gender and blood group. This correlation between fingerprint pattern and these parameters may help in using fingerprints as an important aid in sex and blood group determination and vice versa, thus, enhancing the authenticity of fingerprints in detection of crime and criminals.

MATERIALS AND METHODS

A cross sectional study was conducted among the medical students of MBBS first and second year, in the department of Forensic Medicine and Toxicology, Deccan college of Medical Sciences, Hyderabad. Study was approved by ethical committee of the institute. Purpose and procedure of the study was explained to the students. Students with scar on thumbs, any deformity, birth defect, disease or bandage over thumbs were excluded from the study. Students absent on the day of data collection and those who did give consent were also excluded from study. There were 300 students of first and second year MBBS, out of which 176 participated in study. Informed consent was taken from the participants. All the participants were asked to wash and dry their

hands. They were then instructed to press the thumb on the stamp pad provided and then to the paper to transfer the fingerprint impression. The details of their age, sex and blood group were also noted on the same sheet of paper on which the fingerprints were taken. Care was taken to avoid sliding of fingers to prevent smudging of the print. The fingerprint patterns were then studied, with the help of a magnifying lens, and were classified as, Loops, Whorls, Arches and Composites based on the appearance of ridgelines. Data was analyzed and expressed by frequency and chi square test.

RESULTS

A total of 176 students participated in study among which male were 36 (20%) and female were 140 (80%). Most common pattern was loops (46%), second common was whorls (36%) and arches was 12% and least was composite (4.5%) (fig.1). If we see sex wise distribution, whorls were common among male and loops were common among female but this difference was statistically not significant. (table 1) Regarding blood groups, maximum number of students (33%) had B+ve blood group and second common was A+ve and least common was AB -ve (2%) while no student had O -ve blood group. (fig.2) In relation to sex, commonest blood group among male was A+ve and among female was B+ve. (table 2). Among Loops, common blood group was A+ve, B+ve and O+ve (24% each). While among Whorls commonest was B+ve followed by A+ve and O+ve, 40%, 31% and 18% respectively. This difference is statistically significant. Among Arches also B+ve was commonest blood group followed by A+ve, and O+ve, 45%, 38% and 9% respectively. This difference is statistically significant. (table 3).

Table No. 1: Sex distribution of finger print Patterns

Sex	Loops	Whorls	Arches	Composite	Total
Male	14 (38.3%)	16 (44.4%)	4 (11.1%)	2 (5.5%)	36 (20.4%)
Female	68 (48.5%)	48 (34.2%)	18 (12.8%)	6 (4.2%)	140 (79.6%)
Total	82 (46.5%)	64 (36.3%)	22 (12.5%)	8 (4.5%)	176 (100%)

$$X^2 = 1.5, df = 3, p = 0.66$$

Table No. 2: Sex Distribution of Blood Groups

Sex	A+ve	A-ve	B +ve	B-ve	O +ve	AB+ve	AB-ve	Total
Male	18 (50%)	0 (00)	12 (33.3)	2 (5.5)	0 (00)	2 (5.5%)	2 (5.5%)	36 (20.4%)
Female	32 (22.8%)	2 (1.4%)	46 (32.8%)	4 (2.8)	36 (25)	18 (12.8)	2 (1.4%)	140 (79.6)
Total	50 (28.4%)	2 (1.1%)	58 (32.9%)	6 (3.4)	36 (20.4)	20 (11.3)	4 (2.2%)	176 (100)

$X^2 = 21.3$, $df = 6$, $p = 0.002$

Table No. 3: Distribution of fingerprint patterns according to blood groups

Pattern	A+ve	A-ve	B +ve	B-ve	O +ve	AB+ve	AB-ve	Total
Loops	20 (24.3%)	0 (00)	20 (24.3%)	4 (4.8%)	20 (24.3%)	16 (19.5%)	2 (2.4%)	82 (46.5%)
Whorls*	20 (31.2%)	2 (3.1%)	26 (40.6%)	0 (00)	12 (18.7%)	2 (3.1%)	2 (3.1%)	64 (36.3%)
Arches*	8 (36.3%)	0 (00)	10 (45.4%)	2 (9%)	2 (9%)	0 (00)	0 (00)	22 (12.5%)
Composite	2 (25%)	0 (00)	2 (25%)	0 (00)	2 (25%)	2 (25%)	0 (00)	8 (4.5%)
Total	50 (28.4%)	2 (1.1%)	58 (32.9%)	6 (3.4%)	36 (20.4)	20 (11.3%)	4 (2.2%)	(100%)

*Statistically significant

DISCUSSION

The purpose of classifying fingerprints is that they can be filed and retrieved when needed. The present study shows that there is an association between distribution of fingerprint patterns, blood group and gender. The general distribution pattern of the fingerprint shows that most common pattern was loops, followed by whorls, arches and least common was composite. This is in accordance with the study conducted by Bharadwaja et al,⁷ Prateek Rastogi,⁸ Mada,⁹ Raloti et al.¹⁰ We found that whorls were common among male and loops was common among female but this difference was statistically not significant. A study by Prateek Rastogi⁷ also found that whorls among male and loops among female were significantly high, while in a study in Malaysia by Nayak¹¹ it has been observed that loops have the highest occurrence among males and whorl was the most common type among females. So we can say there is variation in finding in relation of gender with sex. In our study also we did not find any significant association, this may be because we have only 20% male participants.

In this study we found that B+ve was most common blood group and second common was A+ve.

While study in Karnataka by Prateek Rastogi,⁸ Mada in Hyderabad⁹ and in Gujarat by Raloti¹⁰ found that O+ve was the commonest blood group followed by B+ve and A+ve. This difference may be because we had small sample size. In relation to sex we found that commonest blood group among male was A+ve and among female was B+ve while in a study by Mada O+ve was most common among both the sexes.⁹ Raloti also found equal incidence of B+ve and O +ve but A+ve blood group was found to be more in males.¹⁰ Commonest blood group among Loops was A+ve, while among Whorls and Arches commonest was B+ve. This is in accordance with Prateek and Mada studies.⁸⁻⁹

CONCLUSION

As we know that each finger print is unique which can be used as evidence for identification. As association was found between fingerprint and blood group we can conclude that knowledge of fingerprint could help in prediction of blood group in medico legal investigation with confidence.

Source of Funding: Self

Conflict of interest: Nil

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Study of Road Traffic Accident Cases Attending Tertiary Care Hospital, in Hyderabad, India

Khazi Mudabbir Ahmed¹, Iqbal Banu Hussain², Sultan Rizwan Ahmad³

¹Associate Professor, Dept. of Forensic Medicine, ²Professor and HOD, Dept. of Forensic Medicine,

³Associate Professor, Dept. of Community Medicine, Department of Forensic Medicine and Toxicology, Deccan College of Medical Sciences, Hyderabad, Telangana

ABSTRACT

Background: Road traffic accidents (RTA) is an important cause of death among young people in India. Cost of treatment or death of young people cause considerable economic losses to victims and their families.

Objectives: The purpose of this study was to study the characteristics of injuries from road traffic accidents in Hyderabad, India.

Methodology: A study was conducted from January 2016 to June 2016 in Owaisi Hospital of Deccan College of Medical Sciences, Hyderabad. Data was collected on cases admitted due to RTA in Emergency Department of Owaisi Hospital. A total of 204 RTA cases were studied from the case records of the medical records section admitted during study period. The information collected consists of personal identification data, time, date, place, and type of injury, vehicles involved in RTA.

Results: In this study 76.4% were males, common age group involved was of 20-39 years. Motorcyclists were 63% among population involved in RTA. Accidents were more on weekends. 70% of injuries were in both limbs.

Conclusions: Most of the victims of road traffic accidents were young males and Motorcycle was common vehicle involved in accident.

Key Words: Autorickshaw, Injury, Motorcyclist, Pedestrian, Road Traffic Accident.

INTRODUCTION

The mounting toll of road traffic accidents (RTA) in India constitutes a public health problem, which requires urgent attention, since these accidents are preventable. Globalization has improved the socio-

economic status resulting in more use of vehicles and the travel, further resulting in increased number of RTAs. Rapid urbanization, modernization and industrialization have all exacerbated and accentuated the pre-existing problem of traffic congestion and road traffic accidents. Motorization refers to the influx of motor vehicles, including high performance cars, trucks, and motorcycles, without concomitant changes in roads, pedestrian patterns and traffic enforcement capabilities.¹⁻² Injuries represent 12% of the global burden of disease. Globally, more than half of the total accidents that occur are with drivers between the age of 15 and 44 years. The severity of road traffic accident injuries is influenced by a number of variables. Prominent among these are

Correspondence Author:

Dr. Iqbal Bano Hussain

House no-1-5-260, Mushirabad,

Zamistanpur, Hyderabad, 5800020,

Mobile: 9490995385

Email: nabilanaseer@gmail.com

population and vehicle densities which could be used to assess accident rate.

Since road users are not a uniform population, drivers, motorcyclists, pedestrians and passengers are exposed to different hazards and will therefore present different epidemiological patterns. According to national crime records bureau 2013 maximum number of accidents occurred during May (43,064) followed by January (39,185) while least number of road accidents were reported in the month of August (33,698). On the basis of time hours maximum road accidents occurred during 1800 hrs to 2100 hrs (night) (78,981).³ Susceptibility is increased by the effect of alcohol and other drugs as well as physiological state such as fatigue. Lastly, a majority of accidents are preventable. The pattern of injuries sustained in these accidents has received relatively little attention in India. Hence we selected this study to analyze the age, sex and anatomical distribution of injuries due to RTA in Hyderabad, India.

MATERIALS & METHODS

The present study is a retrospective record based study, conducted from January 2016 to June 2016 in Owaisi Hospital of Deccan College of Medical Sciences, Hyderabad. Data was collected on cases admitted due to RTA in Emergency Department of Owaisi Hospital. Study was approved by ethical committee of the Institute. A total of 204 RTA cases were studied from the case records of the medical records section admitted during study period. The information collected consists of personal identification data, time, date, place, and type

of injury, vehicles involved in RTA. For the purpose of the study a road traffic accident (RTA) was defined as accident which took place on the road between two or more objects. Without involvement of a vehicle (e.g. a person slipping & falling on the road were excluded from the study. Cases with incomplete records were also excluded. The age, gender, population, the extent of injuries were extracted for analysis. Interpretation of the collected data was done by using appropriate statistical methods like percentage & proportions & application of test of significance chi-square test by using SPSS version 11.

RESULTS

In this study we selected 204 cases, of these, 156 (76.4%) were males and 48 (23.6%) were females giving a ratio of 3:1. RTA was common in age group of 20-29 (39%) and 30-39 (23%). The age and gender distribution of the cases is as shown in Table 1. In this study, the highest incidence was in the second and third decades of life with gradual fall in the preceding and succeeding decades in both sexes. Motorcyclists were common (63%) among population involved in RTA and second common was pedal cyclist (15%) among male while pedestrian (25%) were second common among female. (Table 2). Motorcycle (60%) and Autorickshaw (22%) were commonly involved in RTA, followed by cars (10%). (Table 3) Both sexes were susceptible to accidents to a greater extent during the weekends (Saturday and Sundays). (Table 4) Injuries to the limbs (70%) and head (13%) were common followed by the face, chest, spine and abdomen.(Fig 1).

Table No. 1: Age and Sex Distribution of RTA

Age groups	Males (%)* [%]**	Females (%)* [%]**	Total (%)*
15-19 years	20 (71.4) [12.8]	8 (28.6) [16.6]	28 (13.7)
20-29 years	60 (75) [38.4]	20 (25) [41.6]	80 (39.2)
30-39 years	32 (68) [20.5]	15 (32) [31.2]	47 (23)
40-49 years	24 (96) [15.3]	1 (4) [2]	25 (12.2)
50-59 years	12 (80) [7.6]	3 (20) [6.2]	15 (7.3)
60 and 60+ years	8 (88.8) [5.1]	1 (11.2) [2]	9 (4.4)
TOTAL	156 (76.4) [100]	48 (23.6) [100]	204 (100)

$X^2 = 8.5$, $df = 5$, $p = 0.13$

*Row Percentage. ** Column Percentage.

Table No. 2: Population Distribution of Road Users Involved

Category	Males	Females	Total
Pedestrians	12 (7.6%)	12 (25%)	24 (11.7%)
Motorcyclists	100 (64.1%)	30 (62.5%)	130 (63.7%)
Pedal cyclists	24 (15.3%)	2 (4.1%)	26 (12.7%)
Motor Vehicle Drivers	20 (12.8%)	4 (8.3%)	24 (11.7%)
TOTAL	156 (100%)	48 (100%)	204 (100%)

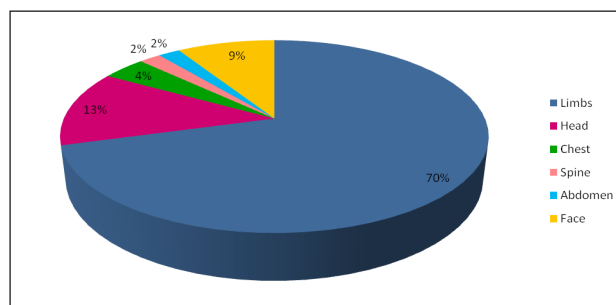
$X^2 = 13.6$, $df = 3$, $P = 0.003$

Table No. 3: Types of Vehicles involved in Accidents

Vehicles	Number of Victims
Cars	22 (10.7%)
Motorcycles	124 (60.7%)
Lorries and Buses	8 (3.9%)
Bicycles	4 (1.9%)
Autorickshaw	46 (22.5%)
TOTAL	204 (100%)

Table No. 4: Distribution of Accidents according to Months

Days	Males	Females	Total
Monday	19 (79.1%)	(20.9%)	24 (11.7%)
Tuesday	21 (75%)	7 (25%)	28 (13.7%)
Wednesday	19 (79.1)	5 (20.9%)	24 (11.7%)
Thursday	21 (75%)	7 (25%)	28 (13.7%)
Friday	20 (74%)	7 (26%)	27 (13.2%)
Saturday	29 (76.3%)	9 (23.7%)	38 (18.6%)
Sunday	27 (77.1%)	8 (22.9%)	35 (17.1%)
TOTAL	156 (76.4%)	48 (23.6%)	204 (100%)

Table No. 5: Anatomical Distribution of Injuries and Association with Fractures

DISCUSSION

The present study was conducted to know the epidemiological profile of RTA cases. In the present study it was found that 76% of the cases were males. Many studies from across the India also found male predominance in RTA.⁴⁻¹⁰ This preponderance of males may be attributed to their greater exposure to traffic because of more outdoor activities and risky behavior like hanging on the side of bus, aggressive driving, and drinking alcohol prior to driving. It was also found that maximum cases were in the 2nd and 3rd decades of their life, which is in conformity with studies by Khare (2012)⁶, Soanki (2015)⁷ and Verma (2015)⁹. These are people at the peak of their lives thus constituting a great manpower loss in terms of productivity. Motorcyclists were the common people got injured in RTA and motorcycle and autorickshaw were common vehicle involved in accident. Similar finding were also reported from studies by Urfil (2013)⁵, Khare (2012)⁶, Soanki (2015)⁷ and Verma (2015).⁹ It is observed that female pedestrians are more susceptible to injuries RTA. This can readily be explained by the fact that they are more involved in the hawking of wares along our streets and given the poor conditions of our road where one hardly finds Zebra crossings. Also given the very rickety vehicles on the roads, it is no wonder that they get knocked down.

We found that RTA was more at weekends which is similar to the finding of study by Sonalinki.⁷ This increase in RTAs on weekends can be explain as these are the days of relaxation in a week and our common culture of travelling for social functions and some time mixing driving and alcohol drinking. We found that

limbs were the common site of injury followed by face and chest. Similar result was also found in a study by Anantharaman in Chennai.⁴ Considering all the factors encountered above, attention should be directed at defining the roles and responsibilities of all the human and environmental factors involved in RTA.

CONCLUSION

It was concluded that there is an urgent need to address the epidemic of roads traffic accidents. The roles of road users and agents responsible for keeping the roads safe should be defined so that responsibility for mishaps can be apportioned.

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Medicolegal Aspects of Investigation of Burns in Dowry Deaths

Suraj Sundaragiri¹, Mohd Nazeerulla Shaik², Chaitanya Mittal³

¹Senior Resident, ²Assistant Professor, Forensic Medicine and Toxicology, RVM Institute of Medical Sciences, Mulugu, Medak, Telangana, India, ³Junior Resident, Forensic Medicine and Toxicology, Jawaharlal Institute of Postgraduate Medical Education & Research, Puducherry, India

ABSTRACT

In India, the traditional custom of dowry not only encouraged parents to be gender selective and greedy husbands and in-laws to torture brides, it also curtailed women status drastically. This resulted in the increasing trends in dowry deaths. Deciding the nature of death as accidental, suicidal and homicidal mainly holds on the autopsy surgeon and the investigation officer. This paper discusses various medicolegal aspects of the investigation of burns in dowry deaths.

Key words: Bride, Bride burning, Medicolegal aspects, Accident, Suicide, Homicide, Scene of the Crime

INTRODUCTION

The existence of laws against dowry is dysfunctional due to lack of awareness, illiteracy, economic and socio-cultural factors^{1, 2, 3, 4}. These factors contribute to dowry deaths^{5, 6}. The determination of the manner of death as accidental, suicidal, homicidal in bride burning is important in its outcome for the reputation of the deceased, her family and for those implicated. This relies on the inquiry drawn by investigating officer from motivated accounting processes *i.e.* the resources available from treating doctors, and interest and resources obtained from victims, victim families and the victim's husband and his family which may sometimes lead to biases in bringing justice to victims and alleged offenders^{7, 8}. This paper mentions how to deal important

medicolegal aspects of the investigation of burns in dowry deaths which deserve merited attention to ponder over such ticklish situations.

LITERATURE

Many types of research suggest that in dowry deaths, accidents are responsible for a majority of burns, followed by suicide and finally by homicide^{9, 10, 11}. In some instances, the injuries by other causes of death are also altered by postmortem burns^{12, 13, 14, 15}. In such circumstances, opinion depends on the expertise of a forensic pathologist^{16, 17}.

MEDICOLEGAL ASPECTS

Police should register promptly all cases of suspected dowry deaths, and visit the scene of the crime immediately to avoid demolition of vital clues and also prepare first information report without delay^{18, 19}. The careful examination of the scene of the crime for evidence helps in determining the actual cause and manner of death²⁰. Recording the evidence of the minor children or domestic servants if present at the crime scene deserves special attention²¹. Where the victim is alive, all efforts should be made to record a dying declaration. However, in certain situations, victim furnishes false

Corresponding Author:

Dr. Suraj Sundaragiri

H.No: 4-9-848/ 2,

Lecturers Colony,

Hayathnagar, Hyderabad,

Telangana. India. 501505

Mobile: 091-9908267327

Email: drsurajfm@gmail.com

information, particularly if she is severely depressed or continuously tortured, threatened, pressurized or wants to protect the future of her children or convinced by the relatives to make a statement favorable to the husband and/or in-laws. In such circumstances, the law should acknowledge and give preference to the scientific facts and not to the dying declaration^{22, 23}. Where the victim is dead, the investigating officer must consider their dressing i.e. sarees or dupatta, the role of family members in extinguishing the fire, activities like pouring water, providing first aid, calling emergency care providers etc. when such incident occurs²⁴. An inquest by a senior police officer or a magistrate should be compulsorily done in all dowry death cases with consideration of mental and physical torture and harassment imparted on the victim by the husband and/or in-laws which resulted in such incident^{23, 24}. Investigations by all the necessary experts are essential beginning from the scene of the crime to the DNA fingerprinting including forensic medicine specialist, forensic science specialist, fire examiner/inspector, etc. All modern techniques shall be used for proper and prompt investigation of all alleged dowry death cases. A visit by the forensic medicine specialist along with forensic science expert to the scene of the crime should be made mandatory^{25, 26}. The presence of a lady doctor in the autopsy team should be made mandatory to visualize and investigate in all angles. It is not unusual that the husband's relatives first sexually assault and then strangle or burn her particularly young married victims. Hence in these critical situations, it is the prime duty of forensic medicine experts to determine the exact cause of death. Strict adherence to the prescribed standards for the conduct of postmortem examination in such cases will be helpful in finding out the cause, manner of death and time of death^{27, 28}. Other relevant facts must also be derived from the medicolegal point of view to determine whether the burn is antemortem or postmortem in nature from features like vital reactions, red line of demarcation on morphological examination, with vacuolization and elongated nuclei in epithelial cells on histopathological examination in antemortem burns, the content of protein and chlorides in the fluids etc.^{29, 30, 31}. Soot particles

adherent to the lining of the trachea is also a common indication of antemortem burning³². In cases, where the victims are unknown or abandoned in areas like fields, important information pertaining to their identity should be obtained from the teeth for comparing in dental records or DNA fingerprinting in excessive charring^{33, 34, 35}. The skeleton and organs must be carefully examined for evidence pertaining to the race, age and sex³⁶. Individual features, like evidence of disease, dental prosthesis, implanted medical devices, deformities or previous operations must be noted for comparing with antemortem records^{37, 38, 20}. The bony fragments must be examined thoroughly especially in cases of burnt remains or charred bodies for any bullet injury marks, cut marks etc.²⁰. Radiography of the entire skeleton may be of considerable value. Such cases must be registered for further comparison and look up in the missing persons' database³⁹. The signs of assault like gunshot, strangulation, stab injuries, head injuries, poisonings etc. should be carefully looked for in the cases of burns where the death is on the spot of the incident^{12, 13, 14, 15, 40}. Repeated episodes, certain patterns of burning (such as well-defined contact burns), and burns associated with bruises or fractures are all suspicious. He should apply his expertise, knowledge thoroughly instead of relying upon the history given by the police or relatives. Carboxyhaemoglobin detection from the victim's blood is the most important laboratory finding to differentiate antemortem and postmortem burning. More than 10% blood hemoglobin saturation with carbon monoxide usually indicates that the victim inhaled smoke and was alive at the time of the fire⁴¹. Fires which sometimes produce alterations of the tissues called artifacts like heat ruptures, heat fractures or heat hematoma after deaths which are difficult to differentiate from injuries produced before death, have to be considered and ruled out^{31, 42}. Burns caused by electrocution must also be ruled out⁴³. Virtual autopsy using multidetector computed tomography is also found to be effective for postmortem investigation in charred bodies⁴⁴. Forensic molecular diagnosis of antemortem burn can be done by using aquaporin QP3 gene expression⁴⁵.

CONCLUSION

Justice for the poor victim of bride burning is possible only by proper investigation of the scene of the crime and interrogation of the persons concerned by the investigation officer, a meticulous autopsy of the victim by a team of forensic doctors and collection and analysis of the evidences collected from body and the scene of the crime by forensic scientists with utilization of advanced forensic lab techniques.

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S100b Level of Post Mortem Cerebrospinal Fluid and Serum in Blunt Head Trauma Cases

Rika Susanti¹, Eryati Darwin², Dedi Afandi³, Yanwirasti⁴, Syahrudin Said⁵,
Taufik Hidayat¹, Zelly Dia Rofinda⁶

¹Forensic and Legal Medicine Department, Faculty of Medicine, Andalas University, Padang, ²Histology Department, Faculty of Medicine, Andalas University, Padang, ³Forensic and Legal Medicine Department, Faculty of Medicine, Riau University, Pekanbaru, ⁴Anatomy Department, Faculty of Medicine, University of Andalas, Padang, ⁵Biotechnology Laboratory of LIPI Cibinong, West Java, ⁶Clinical Pathology Department, Faculty of Medicine, Andalas University, Padang

ABSTRACT

Blunt head trauma is the leading cause of death in criminal cases. Various efforts have been made to find an alternative autopsy method to determine the cause of death. S100B level has been used as a biomarker in blunt head trauma for the living victims. The purpose of this study was to analyze the postmortem level of S100B in cerebrospinal fluid and serum particularly in determining the cause and the time of death. This experimental study used post test only group design. The treatment groups were divided into 8 groups. The samples of each group were 6 adults of *Rattus novergicus variant sprague dawley*. The S100B level was checked at 0 hour, 1 hour, 2 hours and 3 hours post mortem. Analysis of postmortem level of S100B in cerebrospinal fluid and serum used the general linear model repeated measure test. There is an elevation level of postmortem S100B in cerebrospinal and serum on the death due to blunt head trauma and acute ketamine poisoning. There is no significant difference of postmortem S100B level in cerebrospinal fluid and serum in the case of death due to blunt head trauma and acute ketamine poisoning.

Keywords: blunt head trauma, S100B, cause of death, time of death

INTRODUCTION

The incident of the death caused by blunt head trauma is high worldwide and become a problem in forensic medicine. The cause of death is scientifically determined by the autopsy of the deceased and in some cases it is usually rejected by the family. Determining

the time of death estimation is a difficult thing to do and there has not been any satisfying answer to overcome this problem yet. The advantage of the time of death estimation is being able to help the determination the time of crime. Several body fluids and enzymes have also been examined to assist the time of death estimation but have not given satisfactory results yet. According to Coe and Maeda *et al.*, postmortem biochemical examination of the body fluids can help to estimate the time of death and to determine cause of death. Determination cause of death through biological markers due to blunt head trauma has never been conducted before.^{1, 2, 3, 4, 5, 6, 7, 11, 16}

Head injury will cause some disorders such as ischaemic brain, brain edema, metabolic disorders, changes in permeability of blood vessels, decreased

Corresponding Author:

Rika Susanti

Forensic and Legal Medicine Department,
Faculty of Medicine,
Andalas University, Jl. Perintis Kemerdekaan No.94
PO. Box 49 Padang 25127
Mobile: +62 81372593763
E-mail: rikasusanti1976@yahoo.com

blood flow, inflammation, extensive axonal injury and increased intracranial pressure. The changes will cause damage and even death of brain cells and other tissues. Damage of the cells will increase some enzymes. One of the enzymes elevated in blunt head trauma is S100B. This research was conducted to analyze the effect of the manner of death (blunt head trauma and acute ketamine poisoning) to the level of S100B in postmortem cerebrospinal fluid and serum based on the time of death.^{17, 18, 19}

MATERIAL AND METHODS

This study was an experimental study with post test only group design. Samples were 48 adult males of *Rattus norvegicus varriant sprague dawley*, age approximately 3 months old and weight 250-260 grams. The samples were divided into 4 groups for each treatment. Each group consists of 6 mice. The treatment for the first group was a blunt head trauma by the implication of modified Marmarou's weight drop model. After the mice died, the sample of their cerebrospinal fluid and serum were taken at 0 hour, 1 hour, 2 hours and 3 hours after the death. The treatment for the second group was euthanasia method by injecting lethal dose of ketamine. Animal nursing care and sampling were conducted at the Laboratory of Biotechnology-LIPI Cibinong, Indonesia.

The laboratory examination of S100B level in all groups were performed by sandwich ELISA technique with cloud-clone, corp products and SE C030Ra Enzyme-Linked Immunosorbent Assay (ELISA) kit for S100B. Enzymes tests were conducted at Biomedical Laboratory, Faculty of Medicine, Andalas University. Data analysis were performed by using general linear model repeated measure test for two groups, for normal data distribution. Shapiro-Wilk test were used to identify the normality of data distribution.

FINDINGS

In acute ketamine poisoning, the time between the ketamine injection and death takes place in 5-7 minutes, whereas death due to blunt head trauma, the duration from blunt trauma to death is 30-60 minutes.

Table No. 1: S100B level at death due to blunt head trauma and acute ketamine poisoning based on time of death

Time of Death	Group	N	Mean±SD (ng/ml)
0 hour	Acute ketamine poisoning	6	50, 2±34,8
	Blunt head trauma	6	58, 6±21,6
1 hour	Acute ketamin poisoning	6	81, 5±49,4
	Blunt head trauma	6	80, 5±17,9
2 hours	Acute ketamin poisoning	6	42, 0±11,1
	Blunt head trauma	6	92, 5±41,0
3 hours	Acute ketamine poisoning	6	60, 3±22,8
	Blunt head trauma	6	57, 9±13,4

The mean of S100B level in cerebrospinal fluid is higher in death due to blunt head trauma rather than acute ketamine poisoning at 0 and 2 hours time of death, whereas at 1 hour and 3 hours SB100 level in cerebrospinal fluid are higher in death caused by acute ketamine poisoning rather than by blunt head trauma.

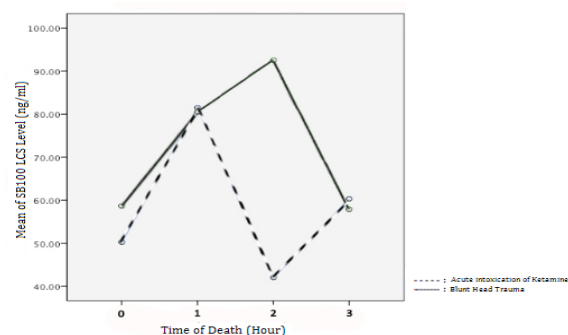


Figure No. 1: Changes in S100B level in cerebrospinal fluid based on time and manner of death.

The data normality test have been conducted by Shapiro Wilk formula and p value > 0.05 in 6 groups, p < 0.05 in death from acute ketamine poisoning at 1 hour and death due to blunt head trauma at 3 hours. The data were not normally distributed, so the test of general linear model (GLM) for continuous observation of two groups can not be conducted.

To see the difference level of S100B in cerebrospinal fluid between death due to acute ketamine poisoning and death of blunt head trauma at 0 hours and 2 hours (normal data distribution), the unpaired t test was conducted.

Table No. 2: Difference S100B Level in Cerebrospinal Fluid based on group of the Death

Time of Death	Groups	N	Mean±SD (ng/ml)	P
0 hours	Acute ketamine poisoning	6	50,2±34,8	0,626
	Blunt head trauma	6	58,6±7216	
2 hours	Acute ketamine poisoning	6	42,0±11,1	0,016
	Blunt head trauma	6	92,5±41,0	

In the table 2 at 0 hour, there is no significant difference of cerebrospinal fluid S100B level between group of death due to acute ketamine poisoning and death from blunt head trauma ($p = 0.626$) and at 2 hours there is significant difference of cerebrospinal fluid S100B level between the group of death by acute ketamine poisoning with death from blunt head trauma ($p = 0.016$).

Table No. 3: Serum S100B level in death due to blunt head trauma and acute ketamine poisoning by the time of death

Time of Death	Groups	N	Mean±SD (ng/ml)
0 hours	Acute ketamine poisoning	6	7,5±0,4
	Blunt head trauma	6	6,9±0,5
1 hour	Acute ketamine poisoning	6	5,9±1,4
	Blunt head trauma	6	5,6±1,4
2 hours	Acute ketamine poisoning	6	6,3±1,1
	Blunt head trauma	6	5,7±1,9
3 hours	Acute ketamine poisoning	6	5,9±1,5
	Blunt head trauma	6	7,2±0,5

Table No. 3: Shows the mean of serum S100B level. S100B level is higher in death due to acute ketamine poisoning than death from blunt head trauma, except at 3 hours time of death

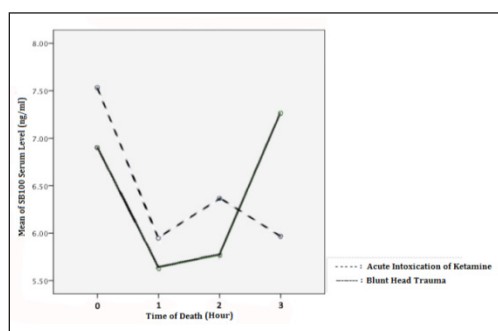


Figure No. 2: Changes in serum S100B level based on the time and manner of death

Furthermore, with data normality test by Shapiro Wilk, it is obtained $p < 0.05$ in death due to acute ketamine poisoning at 0 hour, and the data were not normally distributed. general linear model (GLM) test for continuous observation of two groups can not be conducted. For normal distributed data, the unpaired t test were conducted to know relationship between groups.

Table No. 4: Difference of serum S100B level based on manner of death

Time of Death	Groups	n	Mean±SD (ng/ml)	P
1 hour	Acute ketamine poisoning	6	5,9±1,4	0,712
	Blunt head trauma	6	5,6±1,4	
2 hours	Acute ketamine poisoning	6	6,3±1,1	0,54
	Blunt head trauma	6	5,7±1,9	
3 hours	Acute ketamine poisoning	6	5,9±1,5	0,083
	Blunt head trauma	6	7,2±0,5	

In the table 4, the p value is > 0.05 so there is no significant difference between the serum S100B level due to acute ketamine poisoning with death cause by blunt head trauma at 1 hour, 2 and 3 hours time of death. In this study, the researchers obtained the mean of cerebrospinal fluid S100B level is higher in the death due to blunt head trauma than acute ketamine poisoning at 0 and 2 hours time of death. Cerebrospinal fluid S100B level increased in both of groups. Berger *et al.* described the average level of cerebrospinal fluid S100B level in children after getting blunt head trauma was 1.67 ng/ml. Somer *et al.* got the cerebrospinal fluid S100B level in normal human ranges between 2.5 ± 0.52 ng/ml and for the victim of head injury was about 7.34 ± 4.87 ng/ml. Some researchers like Stroick *et al.*, Ingebrigtsen and Romner, Kotlyar, Borg *et al.*, have found that level of S100B increased soon after either mild or severe trauma^{21, 22, 23, 24}

The changes of mean of cerebrospinal S100B level based on the time of death can not be used to estimate time of the death. In this study, the mean of postmortem serum of S100B is higher in death due to acute ketamine poisoning than blunt head trauma, with a significant difference between the two groups. In both treatment groups there are increased level of serum S100B. Rothoerl *et al.* got normal serum S100B level in mice was approximately 0,19-0,77 ng/L. Korfias *et al.* have obtained serum S100B level of blunt head trauma patient's was about 0.15 -32.9 ng/L. Serum S100B level in infant with head trauma and died after trauma ranges from 0,1 to 31.2 ng/L. S100B serum in living human is considered as normal when in the level of ± 0.06 ng/L Zahra *et al.*, had been conducted a study to

patients with head injury and obtained serum S100B level had a correlation with the severity of the brain injury. According to Korfias *et al.*, and Olivecrona *et al.* the head injury patient's had increased the serum S100B level immediately after trauma. Research by Korfias *et al.* obtained the high level of serum S100B, has a lower survival rate in a short period of time. Rothoerl *et al.* concluded that high level of S100B had been founded at earlier time of examination. The similar thing was found in study with human samples by Nylen *et al.*^{25,26,27,28,29,30}

Changes in mean of S100B serum level based on the time of death can not be used to estimate the time of death. This study revealed the elevation level of S100B in cerebrospinal fluid and serum. Cerebrospinal fluid S100B level is 11 times higher than serum. The elevation level of S100B is derived from brain damage which caused by direct trauma to the cells. Normally, the S100B level usually low or undetectable with ratio in serum/cerebrospinal fluid is 1:18. The existence of S100B is not only in intracellular but also in extracellular, where small amounts of S100B have neurotrophic effects. S100B has a role in the stimulation of astrocytes after acute injury and involved in the regulation of homeostasis and calcium regulation. Mechanism of high S100B level in the cell is similar with the mechanism at the cellular level in head injury patient's. S100B is released into cerebrospinal fluid and enter peripheral blood circulation via the blood-brain or the blood-cerebrospinal fluid barrier. The increased of S100B level has a correlation with the level of neurophysiological disorders and severity of the brain damage. S100B level can be used as biomarkers to death with blunt head trauma.^{27, 28, 30}

CONCLUSION

There is an increased of post mortem cerebrospinal S100B level on a death due to blunt head trauma and acute ketamine poisoning, but it is not significant based on time of death. There is an increased of post mortem serum S100B level on a death due to blunt head trauma and acute ketamine poisoning, but it is not significant based on time of death.

Conflict of Interest: Nil

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Ethical Clearance: This study has been approved by ethical research committee of Faculty of Medicine, Andalas University, Padang, West Sumatera, Indonesia.

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A Research Study on Maternal Deaths which Occurred in Govt. General Hospital, Chittoor, Andhra Pradesh from January to December 2016

V. Jayashankar¹, Chaitanya. R.²

¹Associate Professor, Department of Forensic Medicine, The Apollo Medical College (AIMSR), Murakambattu, Chittoor, Andhra Pradesh, ²Associate Professor, Dept. of Forensic Medicine & Toxicology, VIMS, Ballari, Karnataka

ABSTRACT

Maternal death is defined by the World Health Organization (WHO) as “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

The world maternal mortality rate has declined 44% since 1990, but still every day 830 women die from pregnancy or childbirth related causes. Most of these deaths and injuries are entirely preventable. The United Nations Population Fund (UNFPA) estimated that 289,000 women died of pregnancy or childbirth related causes in 2013. The global maternal mortality ratio has fallen from 380 maternal deaths per 100,000 live births in 1990 to 210 deaths per 1,00,000 live births in 2013, and many countries halved their maternal death rates in the last 10 years.

In India, 45,000 women die every year during childbirth according to WHO. The number of deaths in India during childbirth accounts for 17 per cent of such deaths globally. The World Health Organisation (WHO) said the major cause of maternal deaths is Post-Partum Haemorrhage (PPH), which is often defined as the loss of more than 500-1,000 ml of blood within the first 24 hours following childbirth. Based on the World Health Statistics (WHS) 2016, the MMR (Maternal Mortality Rate) of India is 174/100,000 live births. Minister of State for Health in a written reply in Indian Parliament, had recently said MMR of India has shown a decline from 212 per 1,00,000 live births in 2007-09 to 167 per 1,00,000 live births in 2011-13, as per the latest report of the Registrar General of India, Sample Registration System (RGI-SRS). India had earlier said its MMR registered a 5.7 per cent decline and, if it continues to fall at this rate, the country will achieve its Millennium Development Goal (MDG) of MMR of 139 per 100,000 live births.

Public health, technological and policy approaches are steps that can be taken to drastically reduce the global maternal death. The maternal deaths can be decreased by Improving access to antenatal care in pregnancy, skilled care during childbirth, improved asepsis, fluid management & blood transfusion, and better prenatal care. Most maternal deaths are avoidable, as the health care solutions to prevent or manage complications are well known. Other approaches include avoiding pregnancy at too young of an age or too old of an age and spacing births. Access to primary care for women even before they become pregnant is essential along with access to contraceptives.

Key Words: Maternal Mortality, Sepsis, Hemorrhage, Pre-eclampsia, Postpartum, Abortion, Obstructed Labour etc.

Corresponding Author:

Chaitanya. R., M.D.

Associate Professor, Dept. of Forensic Medicine & Toxicology VIMS, Ballari, Karnataka - 583104

Affiliated to Rajiv Gandhi University of Health Sciences, Karnataka

Mobile: +91 9008735628

Email: fmchaitanya@gmail.com

INTRODUCTION

India accounts for the maximum number of maternal deaths in the world to about 17 per cent or nearly 50,000 of the 2.89 lakh women who died as a result of complications due to pregnancy or childbearing in 2013. Nigeria is second with nearly 40,000, stated the UN report on maternal deaths. In contrast, China with the largest population in the world reported 5,900 maternal deaths in 2013 mainly due to its “one-child policy”, the report added. Despite India progressing noticeably in curbing the maternal mortality rate (MMR) of 65 per cent drop reported since 1990, the country is lagging behind the UN-mandated Millennium Development Goal (MDG) of bringing a 75 per cent decline in the MMR till 2015.¹

There are number of causes that contribute to maternal deaths occurring in India. These include – Obstetrical Hemorrhage is one of the leading causes of maternal mortality through out the world. Class I includes hemorrhage to the level of 1000 ml of blood loss or 15% volume deficit. Class II includes hemorrhage to the level of 1500 ml of blood loss or 20 to 25% volume deficit. Class III includes hemorrhage to the level of 2000 ml of blood loss or 30 to 35% volume deficit. Class IV includes hemorrhage to the level of 2500 ml of blood loss or exceeding 40% volume deficit. Postpartum hemorrhage is an obstetrical emergency which is a major cause of maternal mortality. Early causes of PPH i.e, those occurring within 24 hours of delivery includes 1. Uterine atony, 2. Lower genital tract lacerations (which includes perineal, vaginal, cervical, periclitoral, periuretral & rectal) 3. Upper genital tract lacerations (broad ligament) 4. Lower urinary tract lacerations (bladder, urethra) 5. Retained products of conception (placenta, membranes) 6. Invasive placentation (placenta accreta, increta, percreta) 7. Uterine rupture 8. Uterine inversion 9. Coagulopathy. Late causes of PPH i.e, those occurring from 24 hours to 6 weeks after delivery includes 1. Infections 2. Retained products of concetion 3. Placental site subinvolution 4. Coagulopathy.²

Hypertension is the most common medical problem encountered in pregnancy. Among the hypertensic disorders, pre-eclampsia is most dangerous. It is

also the most common cause of maternal mortality in India. According to International Society for the Study of Hypertension in pregnancy, hypertension is defined as systolic blood pressure > 140 mm of Hg or a diastolic blood pressure > 90 mm of Hg on atleast 2 occasions taken 6 hours apart. Pre-eclampsia is gestational hypertension in association with significant proteinuria. Eclampsia is defined as seizures that cannot be attributed to any other cause in a woman with pre-eclampsia. Risk factors includes 1. Genetic factors i.e, family history of pre-eclampsia 2. Obstetric factors like primiparity, extremes of maternal age, previous history pf pre-eclampsia, multiple pregnancy, hydrops fetalis with large placenta, hydatiform mole and triploidy 3. Medical factors like diabetes, obesity, renal disease, antiphospholipid antibody syndrome & inherited thrombophilias, connective tissue disorders like SLE, PCOD, hyperhomocysteinaemia, chronic infection. One third of woman may experience eclampsia before development of hypertension and proteinuria.³

Obstructed labour is seen when the progressive descent of the presenting part is arrested due to mechanicalobstruction despite good uterine contractions. It is due to mismatch between fetal size, more precisely, the presenting part of the fetus and the mothers pelvis. The mismatch may be due to genuine disproportion as when the vertex is in the occipioanterior position or relative disproportion due to deflexion and malposition. It is a condition where further progress of labour is not possible without assistance. Without relief of obstruction, continued contractions in the mother in the presence of hypoxia and myometrial energy depletion leads to myometrial oedema and necrosis thus contributing to uterine rupture and this can be seen in mothers whose age is more than 35 years or is a grand multi para. Uterine rupture is a serious obstetrics complication with high mortality rate.⁴

Direct obstetric deaths which accounts for 80% of maternal deaths result from obstetric complications of pregnancy from interventions, ommissions, incorrect treatment or from a chain of events resulting from any of the above. These includes hemorrhage, sepsis, eclampsia, obstructed labour and complications of abortion. Indirect

obstetric death results from pre-existing medical diseases or those developing during pregnancy and where are not due to direct obstetric causes but are aggravated by the physiological effects of pregnancy. These includes amaemia, cardiovascular diseases, hepatitis and diabetes accounting for 20% of all maternal deaths.⁵

Sepsis remains one of the most important causes of maternal mortality world wide. It causes death by DIC, multiorgan failure and adult respiratory distress syndrome. The main risk factor for development of sepsis are prolonged rupture of membranes with subsequent development of chorioamnionitis, postpartum endometritis, emergency caesarean section or retained products of conception after delivery. Other causes includes pyelonephritis, chorioamnionitis, toxic shock, ruptured appendix, ruptured ovarian abscess, necrotising fascitis and bacterial endocarditis. A wide variety of organs has been associated with septic shock which includes *Escherichia Coli*, *Klebsella*, *Proteus Mirabilis*, *Pseudomonas Aeruginosa*, *Staphylococcus Aureus* and *Bacteroides*. Group B *Streptococci* may be responsible for puerperal septicemia.⁶

Embolism is one of the causes of postpartum maternal collapse. Venous thrombosis and embolism leading to pulmonary thromboembolism remains the cause of such collapse. Therefore all health care professionals looking after pregnant woman must be aware that pulmonary embolism can present in the post natal period. Amniotic fluid embolism is a rare obstetric condition but a catastrophic syndrome which causes sudden maternal collapse with high mortality rate.⁷

Cardiac arrest incidence occurs one in 30,000 late pregnancies, but the survival from such an event is exceptional. Cardiac arrest during the postpartum period could result from pre-existing cardiac condition, local anesthesia toxicity, spinal anesthesia, electrocution or trauma. Signs like hyperventilation, ketotic breath, tachycardia, hypotension, dry mucous membranes, disorientation and coma leading to death may be seen in diabetic ketoacidosis.⁸

Induced criminal abortion appears to be practised even in married in all classes of society. Nearly all

criminal abortions take place at about the second or third month when woman is confirmed about her pregnancy from cessation of her periods and on experiencing morning sickness. With abortion stick, sepsis may ensue with or without rupture of membranes. With semi skilled interference, death may occur from shock, hemorrhage, air embolism or from the absorption of poison.⁹

MATERIALS

Hospital Medical Records, Clinical Case Sheets, Academic Autopsy Reports, Statistical Data

FINDINGS

Total number of recorded maternal deaths in govt. general hospital, chittoor, andhra pardesh during january to december 2016 is 46

Table No. 1: Estimates of causes of maternal deaths (Chittoor, A.P.)

S. No.	Cause of Maternal Death	Incidence
1.	Postpartum Hemorrhage	35%
2.	Pre-eclampsia & Eclampsia	18%
3.	Sepsis & Infection	08%
4.	Abortion	09%
5.	Other direct causes	11%
6.	Indirect causes	18%
7.	Embolism	01%

Table No. 2: Maternal age group affected in maternal deaths cases (Chittoor, A.P)

S. No.	Maternal age group	Incidence
1.	15 to 20 years	35%
2.	21 to 25 years	14%
3.	26 to 30 years	12%
4.	31 to 35 years	18%
5.	Above 36 years	21%

CONCLUSION

India is the second most populous country of the world and has fast changing socio-political-demographic patterns that have been drawing global attention in recent years. The health status of Indians, is still a cause of grave concern, especially that of the rural population.

Beside-direct, indirect, and co-incidental causes, there are also logistic causes which affects maternal mortality is failure in the health care system, lack of transport, lack of manpower and apathy towards patient care. And behind this are all the social cultural and political factors which together determine the woman status and their awareness towards health. To improve this scenario, the problem of the rural health is to be addressed at the village, mandal, district, state and national levels.

To reduce maternal mortality in India, Women must have access to skilled care before, during and after they give birth. Health providers must be trained in emergency obstetric care. Health centers and clinics must have surgical supplies to handle complications. Maternal health-care systems must be strengthened, and communities mobilized and educated to improve deliveries in birth clinics. Skilled community-based birth attendants should be trained and posted to increase maternal coverage in remote areas. Give incentives to health providers to motivate them to do their job effectively. Contract with private organizations to deliver maternal health-care services. This will ensure rural areas are covered and will reduce supply shortages—but attention must also be paid to the quality of service provided. Educate and empower women and girls about maternal health issues. They compose two-thirds of the world's illiterates and 70 percent of the world's poorest people. Educated and empowered women can lead healthy lives and can lift their families out of disease. They usually marry later, and have fewer and healthier children who are more likely to attend school. Empower women's groups so they can deliver political success and tangible health outcomes. Launch professional, well-informed advocacy groups to call for action on maternal health. Implement streamlined and evidence-based maternal health interventions. Implement evidence-based strategies to increase utilization of maternal health-care services. Remove user fees for maternal health care services and provide transportation services to maternal health centers which alone can double the utilization of the centers' services. Evaluate and monitor maternal and child health policies. Make sure that the appropriate government ministries are accountable to the

public about the performance of investments in maternal health. Create strategic alliances between groups representing maternal health, as that will open doors to political and financial support. Currently, maternal health communities have many leaders but no leadership. Make child and maternal survival a core national and global health concern. Implementing the above strategies is not only the right thing to do, it is the economically smart thing to do. Women and girls are a driving force in our economies, and when women are healthy, they play a crucial role in the development of countries

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Department of Obstetrics & Gynecology (AIMSR), Govt. General Hospital, Chittoor, A.P

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A Research Study on Deaths due to Poisoning which were brought to Govt. Medical College Mortuary, Ananthapuram, Andhra Pradesh During 2016 Year

Venati Jayashankar¹, M. Srinivas Naik²

¹Associate Professor, Department of Forensic Medicine & Toxicology, Apollo Institute of Medical Sciences & Research (AIMSR), Murakambattu, Chittoor, Andhra Pradesh

Affiliated to Dr. N.T.R University of Health Sciences, Andhra Pradesh, ²Associate Professor, Department of Forensic Medicine & Toxicology, Government Medical College, Anantapuram, Andhra Pradesh

ABSTRACT

It has been estimated that some form of poison directly or indirectly is responsible for more than 1 million illnesses worldwide annually and this figure could be just the tip of the iceberg since most of the poisoning actually go unreported especially in developing countries. The incidence of poisoning in India is among the highest in the world. It is estimated that more than 50,000 people die every year from toxic exposure. While in developed countries the rate of mortality from poisoning is as low as 1 to 2%. In India it varies from a shocking 15 to 35%. This study was conducted on deaths due to poisoning in ananthapuram region of andhra pradesh which were brought for postmortem examination at government medical college mortuary. This study was done to know the poisoning which lead to death, age group affected, sex distribution among deaths due to poisoning, demographragic pattern of deaths due to poisoning.

Keywords: *Poisoning deaths, suicide, organophosphorous compounds, postmortem examination, poison analysis report etc*

INTRODUCTION

Many of the unnatural death cases, where post-mortem examination of the dead body is performed, are cases of death due to poisoning or where some poisoning is an associated factor in the process or the circumstance of death. There is no legal definition of poison. Anything

which when used internally or on the body surface in a dose or in repeated doses if acts chemically and pathologically causing disturbance of body functions and leads to disease or death is called as POISON.¹

The commonest cause of poisoning in India and other developing countries is pesticides, the reasons being agriculture based economics, poverty and easy availability of highly toxic pesticides. Occupational poisoning due to pesticides are also common in developing countries, due to unsafe practices, illiteracy, ignorance and lack of protective clothing. In India, Organophosphorous form the largest bulk of pesticide poisoning. Since 1985, aluminium phosphide poisoning has been reported as the commonest cause of intentional poisoning in northern parts of India, viz., Haryana, Punjab and Rajasthan. Mortality varies from

Corresponding Author:

Dr. M. Srinivas Naik, M.D.

Associate Professor, Department of Forensic Medicine & Toxicology, Government Medical College, Ananthapuram, Andhra Pradesh - 515001.

Affiliated to Dr. N.T.R University of Health Sciences, Andhra Pradesh.

Mobile: +91 9440288408

Email: dr.srinivas.male@gmail.com

country to country depending on the nature of poison and availability of facilities and treatment by qualified persons.²

Poisoning cases being invariably medicolegal in nature, if the patient dies, an inquest will have to be done, followed by post-mortem examination by a forensic pathologist. This is for the purpose of ascertaining the circumstances in which poisoning occurred and to establish the exact cause and manner of death. The general procedure of examination is the same as for any medicolegal autopsy, with particular attention being paid to those aspects which can afford a clue to the detection of and identification of the poison involved. In every case of death due to poisoning, an attempt must be made to demonstrate the presence of poison by standardised analytical methods. For the purpose, the pathologist conducting the autopsy must collect certain viscera and body fluids and despatch them through police to the nearest forensic science laboratory.³

Diagnosis of death due to poisoning has to be made from 1. Post-mortem appearances 2. Chemical analysis. On external examination of PME, emission of a peculiar smell may be noted. The surface of the body and clothes show the stains or marks of vomit, faeces or the poison itself. Skin may be coloured in some poisonings. Natural orifices (mouth, lips, rectum, and vagina) may show the presence of a poisonous material or evidence of corrosive changes. On internal examination, the GIT especially stomach may show changes of hyperaemia, softening, ulceration or even perforation. Modern methods of chemical analysis useful in toxicology are 1. Colour test 2. X-rays 3. Infrared analysis 4. Ultraviolet analyzers 5. Chromatography 6. Mass spectrometry 7. Spectrophotometry 8. Immunoassay 9. Neutron activation analysis.⁴

Medical officers should forward the materials for analysis to the chemical examiner or forensic science laboratory through police constable. Requisition may be given to station house officer who will depute a constable for the transmission of viscera and other material secured during post-mortem examination. Chemical analysis of all the material objects are carried out in the

chemical examiners laboratory or chemistry division of the forensic science laboratory. The certificate of analysis issued by the chemical examiner or the forensic scientists is used as evidence.⁵

The poison information centre (PIC) movement started first in Netherlands in 1949 followed by United States in 1950's. These created a sentience of need and information of similar centres in other parts of the world and rendering invaluable service of promoting awareness on poisons and poisoning promoting diagnostic and the therapeutic assistance to the physician in managing poisoning cases as needed through these centres. The primary role of PIC is to get the public's primary access to the poison centre services through a network of toll-free telephone systems. Poison centre toxicologists and information specialists are consulted here daily. Basically the centre has to play a preventive role of poison centres.⁶

MATERIALS AND METHOD

All the post-mortem examinations conducted in Ananthapuram government medical college mortuary on deaths due to poisoning during 2016 year were analysed. The data regarding poison analysis report, age group affected, statistics of deaths among both the sex were collected. The study was conducted with the assistance of medical records section and autopsy surgeons reports who have done post-mortem examination.

OBSERVATIONS AND RESULTS

There were 184 deaths due to poisoning reported to government medical college mortuary, Ananthapuram, Andhra Pradesh for which post-mortem examination were conducted during the year 2016.

Poison analysis report: Based on the poison analysis report got from forensic science laboratory by sending viscera for poison analysis, death due to Organophosphorous compounds consumption was seen in 54 % cases. The deaths due to aluminium phosphide consumption accounted for 16 % cases. Deaths due to benzodiazepines consumption accounted for 8% of cases. Deaths due to sulphuric acid consumption accounted for

6% of cases. Death due to arrack poisoning accounted 9% for Rest of the 7% cases, unknown plant poison was the cause of death.

Table No. 1: Poison detected in deaths due to suspected poisoning

S. No.	Poison causing death	Incidence
1.	Organophosphorous compounds	54%
2.	Aluminium phosphide	16%
3.	Arrack	9%
4.	Benzodiazepines	8%
5.	Unknown plant poison	7%
6.	Sulphuric acid poisoning	6%

Month wise distribution of deaths due to poisoning: If the month wise deaths are analysed during the year 2016 in Ananthapuram region of Andhra Pradesh, the months of December (17 cases), January (14 cases) and may (12 cases) witnessed more deaths while February (04 cases), April (05 cases) and November (04 cases) months witnessed fewer deaths.

Table No. 2: Month wise distribution of deaths due to poisoning

S. No.	Month	Deaths due to Poisoning
1.	January	14
2.	February	04
3.	March	06
4.	April	05
5.	May	12
6.	June	06
7.	July	08
8.	August	09
9.	September	08
10.	October	07
11.	November	04
12.	December	17

Age wise distribution of total deaths due to poisoning: The incidence of deaths due to poisoning among 15 to 25 years age group was 18% while the same was 42% in 26 to 36 years age group followed by 26% incidence of deaths in the age group of 36 to 50 years. The incidence of deaths due to poisoning was 14% in the age group of above 50 years.

Table No. 3: Age wise distribution of total deaths due to poisoning

S. No	Age Group	Incidence
1.	15 -25 years	18%
2.	26 - 35 years	42%
3.	26 - 50 years	26%
4.	>50 years	14%

Sex wise distribution among deaths due to poisoning: While the incidence of deaths was little more in males accounting for 54%, the incidence was 46% in females.

Table No. 4: Sex wise distribution among deaths due to poisoning

S. No	Sex	Incidence
1.	Males	54%
2.	Females	46%

All cases of poisoning were of suicidal nature only. No homicidal and accidental poisoning was noticed. While the incidence of death due to poisoning was 74% on rural side of Ananthapuram region while poisoning caused death in 26% on its urban side.

Table No. 5: Incidence of deaths due to poisoning in rural and urban side

S. No.	Population	Incidence
1.	Rural	74 %
2.	Urban	26 %

DISCUSSION

The leading cause of death due to poisoning in Ananthapuram region of Andhra Pradesh was by consuming Organophosphorous poisoning followed by aluminium phosphide, arrack, benzodiazepines, unknown plant poison consumption and lastly by poisoning due to sulphuric acid. Maximum number of poisoning cases were noted during the months of December, January and May. The incidence of poisoning deaths was seen more in the age group of 26 to 35 years followed by 36 to 50 years age group with lowest incidence seen in age group above 50 years. A difference of only 8% more male deaths noted when

compared to female deaths due to poisoning. All cases of death by poisoning were suicidal only and no cases of either homicidal or accidental poisoning were reported and noticed. Death by poisoning was more on rural population of Ananthapuram when compared to urban population.

CONCLUSION

Poisoning used for causing death to self is common all over the world. In India, committing suicide by consuming poison is very common especially on the rural population side. In India, pesticides followed by plant poisons are commonly consumed for committing suicide, more so by the rural population especially farmers. Death due to arrack consumption is also more in rural population. Urban population commit suicide by consuming benzodiazepines, aluminium phosphide and sulphuric acid in addition to consuming pesticide. To decrease the morbidity and mortality due to poisoning, more and more poison information centres, toxicology laboratories and poisoning managing facilities should be arranged in all the hospitals and should be made accessible to all the people especially the rural population.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Casualty, Govt. Medical College Hospital, Ananthapuram

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Association between Degree of Left Ventricular Hypertrophy and Severe Coronary Artery Disease at Autopsy of Hypertensive Individuals

Werasak Charaschaisri

Department of Forensic Medicine, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand

ABSTRACT

Background: It is believed that severe coronary artery disease (Severe CAD) is the major cause of death in hypertensive deceases presented with left ventricular hypertrophy (LVH). However, detailed autopsy studies on a series of hypertensive deceases that died suddenly have not been performed.

Objective: This study aims to analyze the relationship between LVH and Severe CAD in autopsy findings of the Thai population.

Material and Method: The research team identified 111 cases of Sudden Cardiac Death (SCD) with history of hypertension. Within these subjects, 83 cases had LVH and 66 cases had LVH with Severe CAD. The LV wall thickness and coronary artery disease (CAD) were evaluated and compared using Chi-square test (χ^2). The correlation analysis was used to evaluate the interrelationship between Severe CAD (1, 2, 3-vessel disease) and LVH.

Results: The result showed that 74.8% of the hypertensive cases had LVH and 59.5% had LVH with Severe CAD. There was an increased prevalence of Severe CAD coexisting with LVH deceases compared with Normal LV wall deceases group. The finding observed is statistically significant ($p = 0.048$). Deceased individuals with LVH Grade 1 and 1-vessel disease (19.7%) was the highest prevalence compared to other groups. Observing the total cases of all LVH grades combined, severe 1-vessel diseases was the prominent form of the disease (43.9%). In the aspect of all 1, 2, 3-vessel disease combined, it was observed that the highest prevalence of LVH cases was found in deceased individuals with LVH Grade 3 (36.4%). Considering the prevalence of 3-vessel disease, it was also significantly more frequent in LVH Grade 3 group compared to that of LVH Grade 2 and Grade 1 groups (16.7%, 7.6% and 1.5% respectively). Regarding the degree of LVH and its association with the presence of Severe CAD, it was observed that the greater the thickness of LV, the greater the proportion of cases with Severe CAD is found. This association between degree of LVH and Severe CAD (1, 2, 3-vessel disease) in positive correlation was statistically significant ($p = 0.001$).

Conclusion: LVH may also be an important marker of CAD and reflects a prolonged exposure to hypertension. This requires a commitment to the early treatment of hypertension before hypertrophy develops.

Keywords: *Hypertension, Left ventricular hypertrophy, Coronary artery disease*

INTRODUCTION

Hypertension is one of the most common noncommunicable diseases in the world. Left ventricular hypertrophy (LVH), which is the usual

complication of hypertension, promotes a decrease of 'coronary reserve' and increases myocardial oxygen demand. Both mechanisms contribute to myocardial ischaemia⁽¹⁾. The relationship between hypertension and

CAD is of complex nature. Generally, consequences of hypertension and CAD are difficult to distinguish. Former mechanism involves increased myocardial oxygen demand associated with comparatively reduced coronary blood flow from LVH and micro vascular disease while later results in reduced myocardial blood supply due to occlusive atherosclerotic epicardial arterial disease⁽²⁾. However, some studies suggested that CAD has its own natural progression, but hypertension facilitates this process⁽³⁾. Numerous studies have shown that the presence of LVH increases the risk of CAD⁽⁴⁻⁷⁾.

Although it is believed that Severe CAD is the major cause of death in hypertensive deaths presented with LVH, detailed autopsy studies on a series of hypertensive deaths that died suddenly have not been performed. The purpose of this study was to analyze the relationship between LVH and Severe CAD in autopsy findings of the Thai population. These data may increase our understanding of the morphological substrates for Sudden Cardiac Death in individuals with hypertension.

MATERIAL AND METHOD

In a retrospective examination of autopsy reports from January 2012 to December 2016, all those who died in Sudden Cardiac Death (exclusion of any other potentially lethal noncardiac or toxicological cause of death) including those who had history of hypertension (using data obtained from relatives and/or medical records) were selected from the archives at the Department of Forensic Medicine and Faculty of Medicine from Srinakharinwirot University, Thailand. Victims who were in the subset of hypertensive individuals who had underlying tumors, vascular or endocrine disorders that caused secondary hypertension, tumors or infectious valve disease that could interfere with the thickness or volume of the heart chambers were excluded from the study and therefore did not influence the results.

Autopsies were conducted and the data were compiled on the decedent demographics, LVH and CAD.

Patterns of hypertrophy were defined in accordance with the previous published methods^(8,9). Wall thickness was measured at the level of the mitral valve and the papillary muscles in each of the four myocardial segments. Maximum left ventricular wall thickness was defined as the greatest thickness in any single segment. LV thickness was considered **Normal** up to 1.5 cm. Thus, we defined LV hypertrophy (LVH) when the thickness of any of the LV walls reached values above 1.5 cm. LVH individuals were classified in three grades on the basis of maximum wall thickness (**Grade 1**: LV thickness from 1.6 to 1.8 cm; **Grade 2**: LV thickness from 1.9 to 2.1 cm; **Grade 3**: LV thickness from 2.2 to 2.4 cm). This was in relation to other autopsy findings.

Within the LVH subjects, the autopsy cases were classified as **Non CAD** (0% cross-sectional luminal narrowing of all epicardial arteries), **Non severe CAD** (<75% cross-sectional luminal narrowing of one or more epicardial arteries), and **Severe CAD** ($\geq 75\%$ cross-sectional luminal narrowing of one or more epicardial arteries). Severe CAD was then categorized to 1-, 2-, and 3-vessel diseases.

The data were analyzed by using a statistical package SPSS 14.0 for Windows. The statistical association between the proper variables was performed by Chi-square test (χ^2). A p-value < 0.05 was considered statistically significant. The correlation analysis was used to evaluate the interrelationship between Severe CAD (1, 2, 3-vessel disease) and LVH.

RESULTS

In the study, there were 111 autopsy cases with history of hypertension. The age ranged from 37 to 82 years, with mean and standard deviation of 59.5 and 12.4 years respectively. The age group of 60-69 years old represented the highest percentage with 47.8% of individuals. Sixty-eight cases (61.3%) were deceased male and 43 (38.7%) were deceased female. Male to female ratio was 1.6:1 (Table No. 1).

Table No. 1: Personal data in deceased cases classified according the history of hypertension

Age	Male (n)	Female (n)	Total (n,%)
< 30	-	-	-
30-39	1	-	1 (0.9%)
40-49	10	6	16 (14.4%)
50-59	12	9	21 (18.9%)
60-69	37	16	53 (47.8%)
70-79	7	12	19 (17.1%)
80-89	1	-	1 (0.9%)
Total (n %)	68 (61.3%)	43 (38.7%)	111 (100%)
Age (years); mean \pm SD (range) : 59.5 \pm 12.4 (37-82)			

Out of these 111 deceased cases, 83 (74.8%) had LVH (LV wall thickness > 1.5 cm). The prevalence of LVH was highest in deceased individuals aged 60-69 years (56.6%) and also higher in males (62.7%) compared to females (Table 2).

Table No. 2: Personal data in deceased classified according to LVH (LV wall thickness > 1.5 cm)

Age	Male (n)	Female (n)	Total (n,%)
< 30	-	-	-
30-39	1	-	1 (1.2%)
40-49	5	3	8 (9.64%)
50-59	8	6	14 (16.9%)
60-69	32	15	47 (56.6%)
70-79	5	7	12 (14.5%)
80-89	1	-	1 (1.2%)
Total (n%)	52 (62.7%)	31 (37.3%)	83 (100%)

Table 3 shows the comparison between the present of CAD with LV wall thickness in autopsy cases. Severe CAD was found in 66 of 83 LVH cases (77.6%) and in 17 of 28 Normal LV wall cases (60.7%). The presence of Severe CAD in the total of all groups (1, 2, 3-vessel disease) was 74.8%. The deceased cases who had Non severe CAD were 12 (10.8%) and Non CAD were 16 cases (14.4%). Non severe CAD and Non CAD combined accounted for 25.2% of all cases in the study.

Table No. 3: Comparison between CAD with LV wall thickness

CAD	LV wall		Total	P-value
	Normal	LVH		
Non and Non severe (n%)	11 (9.9%)	17 (15.3%)	28 (25.2%)	p < 0.048
Severe (n,%)	17 (15.3%)	66 (59.5%)	83 (74.8%)	
Total (n,%)	28 (31.5%)	83 (68.5%)	111 (100.0%)	
Severe CAD (\geq 75% cross-sectional luminal narrowing of one or more epicardial arteries)				
Non severe CAD (<75% cross-sectional luminal narrowing of one or more epicardial arteries)				
Non CAD (0% cross-sectional luminal narrowing of epicardial arteries)				

Interestingly, LVH were found in 59.5% of cases in the Severe CAD group, but in only 15.3% from Non CAD and Non severe CAD groups combined. On the other hand, Normal LV wall cases of 15.3% were present in Severe CAD and 9.9% in Non CAD and Non severe CAD groups combined. The difference was statistically significant ($p = 0.048$). This finding indicates a predictive usefulness of LVH for Severe CAD.

Table No. 4 shows the comparison between grades diagnosed with LVH and 1, 2, 3-vessel disease. It was

observed that the highest prevalence of LVH was found in deceased individuals with LVH Grade 3 (36.4%). This prevalence was lower in LVH Grade 2 (33.3%) and LVH Grade 1 (30.3%) respectively. In Severe CAD, the highest prevalence was found in deceased individuals with 1-vessel disease (43.9%). This prevalence was lower in 2-vessel disease (30.3%) and 3-vessel disease (25.8%) respectively.

Amongst the coexistence of LVH and Severe CAD, the highest prevalence was found in deceased individuals with LVH Grade 1 and 1-vessel disease (19.7%).

Once the LV values were graded according to the thickness and compared to Severe CAD cases in all groups (1, 2, 3-vessel disease), we observed that the left ventricular wall became thicker in proportionate

correlation with the increase of the 1, 2, 3-vessel disease. The association between grades of LVH to 1, 2, 3-vessel disease in positive correlation was statistically significant ($p = 0.001$).

Table No. 4: Correlation between Severe CAD (1, 2, 3-vessel disease) and LVH

Severe CAD	LVH			Total	P-value
	Grade 1	Grade 2	Grade 3		
1-vessel disease (n,%)	13 (19.7%)	10 (15.2%)	6 (9.1%)	29 (43.9%)	p = 0.001
2-vessel disease (n,%)	6 (9.1%)	7 (10.6%)	7 (10.6%)	20 (30.3%)	
3-vessel disease (n,%)	1 (1.5%)	5 (7.6%)	11 (16.7%)	17 (25.8%)	
Total (n,%)	20 (30.3%)	22 (33.3%)	24 (36.4%)	66 (100%)	
The measurements observed in the LV wall was divided into grades:					
• Normal: LV wall thickness ≤ 1.5 cm;					
• Grade 1: LV thickness from 1.6 to 1.8 cm;					
• Grade 2: LV thickness from 1.9 to 2.1 cm;					
• Grade 3: LV thickness from 2.2 to 2.4 cm.					

DISCUSSION

LVH, which is the usual complication of hypertension, promotes a decrease of 'coronary reserve' and increases myocardial oxygen demand. Both mechanisms contribute to myocardial ischaemia⁽¹⁾. In this evaluation, it was observed that 74.8% of the hypertensive cases had LVH and highest prevalence was found in deceased individuals age group of 60-69 years (56.6%). The prevalence was also higher in males (62.7%) compared to females. This percentage is consistent with the maximum rates reported in the literature, in which up to 75% of hypertensive patients had LVH and dominant risk factors were found in the older male group^(10,11).

The association of hypertension and CAD is frequently found. Generally, consequences of hypertension and CAD are difficult to distinguish. Former mechanism involves increased myocardial oxygen demand associated with comparatively reduced coronary blood from LVH and micro vascular disease while later results in reduced myocardial blood supply due to occlusive atherosclerotic epicardial arterial disease⁽²⁾. However, some studies suggested that CAD has its own natural progression, but hypertension

facilitates this process⁽³⁾. Numerous studies have shown that the presence of LVH increases the risk of CAD⁽⁴⁻⁷⁾. In our study, 85.5% of LVH cases coexisted with CAD (Non Severe CAD and Severe CAD) and 79.5% of LVH cases had Severe CAD. This study indicates LVH as an important factor that effects the development of CAD. The finding is in correlation with results of other studies^(12,13).

This study, represents an analysis of the relationship between LVH and Severe CAD in autopsy findings of the Thai population. In this study, we demonstrated that hypertensive deceases with LVH who died suddenly had Severe CAD coexisted in 59.5% of autopsy cases. This number is higher than such condition found in hypertensive deceases with Normal LV, which is 15.3%. Overall, there would be an increased prevalence of Severe CAD coexisting with LVH deceases compared with Normal deceases group. The finding observed is statistically significance ($p = 0.048$).

When comparing LVH grades with the number of vessels affected in Severe CAD group of cases, the highest prevalence was found in deceased individuals with LVH Grade 1 and 1-vessel disease (19.7%). Observing the total cases of all LVH grades combined,

severe 1-vessel diseases was the prominent form of the disease (43.9%). Likewise, previous study indicated that the prevalence of 1, 2, 3-vessel diseases was reported to be 34%, 16%, 14% respectively⁽¹⁴⁾. In the aspect of all 1, 2, 3-vessel diseases combined, it was observed that the highest prevalence of LVH cases was found in deceased individuals with LVH Grade 3 (36.4%). Considering the prevalence of 3-vessel disease (the most severe form of Severe CAD), it was also significantly more frequent in LVH Grade 3 group compared to that of LVH Grade 2 and Grade 1 groups (16.7%, 7.6% and 1.5% respectively). Based on these results, it suggests that the presence of Severe CAD is related to more severe hypertensive disease. Regarding the degree of LVH and its association with the presence of Severe CAD, it was observed that the greater the thickness of LV, the greater the proportion of cases with Severe CAD is found. This association between degree of LVH and 1, 2, 3-vessel disease in positive correlation was statistically significant ($p = 0.001$).

It is well known that hypertension accelerates the development of atherosclerotic plaque, possibly because of hemodynamic effects of increased shear stress on the endothelial surface of epicardial arteries⁽¹⁵⁾. The high incidence of LVH and Severe CAD in this study corroborates data indicating that LVH could be the key factor that increases the risk of ventricular arrhythmias in patients with Severe CAD^(5-7,16,17). In addition to LVH, epicardial coronary atherosclerosis may cause myocardial ischemia and arrhythmias in hypertensive individuals. Reduced coronary reserve may make hypertensive patients more susceptible to the ischemic effects of severe epicardial coronary narrowing⁽¹⁸⁾. These data suggest that the myocardium that had coexisting conditions of LVH and Severe CAD is more susceptible to arrhythmias, which probably lead to sudden death.

CONCLUSION

Our study emphasizes that hypertensive individuals should have a complete evaluation of risk factors for atherosclerosis, damage of arterial territories, and of the extension and severity of coronary artery involvement. Moreover, LVH may also be an important marker of

CAD and reflects a prolonged exposure to hypertension. This requires a commitment to the early treatment of hypertension before hypertrophy develops.

Conflicts of Interest: The author declare that there is no conflict of interests relevant to this article.

Funding: Self-funding.

Ethical Clearance: Research was retrospective and the data used was secondary data obtained from already existing inform consented autopsy reports readily available for clinical use.

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A Retrospective Study of Profile of Poisoning Cases Reported to District Hospital, Chamarajanagar for a Period of 3 Years

Yadukul S¹, Srinivas K², Shashi Kumar³, Megha Madyastha³

¹Assistant Professor, Department of Forensic Medicine & Toxicology, ²Associate Professor, Department of Pharmacology, ³Tutor, Department of Pharmacology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar

ABSTRACT

Background: Poisoning is a major public health problem worldwide, with thousands of deaths occurring every year, mainly in the developing countries. India, holding 70% of agricultural land, accounts for one third of pesticide poisoning cases in the third world, the farm workers being the worst affected. Most of the poisonings occur due to deliberate self-ingestion of the poison. Organo-phosphorus (OP) compounds occupy the greatest burden of poisoning related morbidity and mortality. The present study was aimed to know the profile of various poisoning cases admitted to Emergency Department in District Hospital, Chamarajanagar.

Objectives: The main objectives of this study were to determine the profile of poisoning cases reported to District Hospital, Chamarajanagar and to assess their pattern and outcome.

Methodology: A record based retrospective study for a period of 3 years i.e., from 1st January 2012 to 31st December 2014 was conducted in the District Hospital, Chamarajanagar and the data regarding Age, Gender, Residence, Time elapsed after intake, Type of poison, Manner and route of poisoning, Duration of hospitalization and Outcome were collected in a pre-structured proforma. The data was analyzed using standard statistical methods.

Results: Total number of medico-legal cases reported to the Casualty, District Hospital, Chamarajanagar during the study period was 7653. Out of the 7653 cases, 960 cases were due to poisoning, which accounts to 12.5%. Among the 960 cases studied, 64.7% were males (n=621) and the age group between 19yrs to 30yrs constituted the major contributors (48.5%) for poisoning cases. Irritant poisons (70.3%) were the most common type of poisons encountered in our study, with Organo-phosphorus compounds (23.3%) being the commonest sub-type.

Conclusion: This study highlights the trends of poisoning cases admitted to the District Hospital, Chamarajanagar which clearly indicates the high risk population involved and the common poisons encountered in these region.

Key Words: Poisoning; Trends; Chamarajanagar.

Corresponding Author:

Dr. Yadukul. S

Assistant Professor, Department of Forensic Medicine & Toxicology, Institute of Medical Sciences, Chamarajanagar

Mobile: +91 9986510681

Email: yadukul.mysuru@gmail.com

INTRODUCTION

Poison is a substance that causes damage or injury to the body and endangers one's life due to its exposure by means of ingestion, inhalation or contact¹. Poisoning is a major public health problem worldwide, with thousands of deaths occurring every year, mainly in the developing countries. In the last few decades, owing to tremendous advances in the fields of agriculture, medical

pharmacology and industrial technologies, there is a remarkable change in the profile of acute poisoning, where new poisonous substances have come to the forefront. In the developed world, household chemical agents and prescribed drugs have been the most common poisoning agents, whereas in the developing countries, agro-chemicals, in spite of their invaluable contribution in increasing the food production and pest control, are the most common offenders²⁻⁵. Acute poisoning due to Accidental and suicidal exposure causes significant mortality and morbidity throughout the world. According to World Health Organization (WHO), globally more than three million of acute poisoning cases with 2,20,000 deaths occur annually⁶. It has been estimated that, in India five to six persons per lakh of population die due to acute poisoning every year⁷.

Rapid Industrialization, Introduction of newer range of drugs for treatment and massive use of pesticides in agriculture has increased the incidence of poisoning. In advanced countries, it has been observed that poisoning deaths are mainly due to cleansing agents, detergents, paracetamol, carbon monoxide and other cosmetic products⁸. In India, as agriculture is the main occupation, insecticides and other agrochemical fertilizers are used to a greater extent and the poisoning with such products are more common⁹.

Knowledge of general pattern of poisoning in a particular region will help in early diagnosis and treatment of cases, thus decreasing the rate of mortality and morbidity. Information available in our locality with regard to acute poisoning is limited. Hence this present study was carried out with the objective to find out the pattern of poisoning cases in District Hospital, Chamarajanagar.

METHOD AND MATERIALS

The present retrospective study was conducted in the Casualty department of District Hospital, Chamarajanagar attached to Chamarajanagar Institute of Medical Sciences, Chamarajanagar for a period of 3 years i.e., from 1st Jan 2012 to 31st Dec 2014. Ethical clearance had been taken from the Institutional Ethical Committee prior to taking up the study. All the poisoning cases documented in the Casualty Department during the study period were included in the study. A

detailed information regarding the Age, Sex, Time of consumption of poison, Type of poison, Mode of transport to the Hospital, Reason for poisoning, amount of poison taken, route of entry into the body, time interval between the consumption and hospitalization, outcome and other parameters were noted down in detail in the proforma prepared prior to the study. Statistical analysis was carried out using latest statistical software.

OBSERVATION AND RESULTS

Total number of medico-legal cases reported to Casualty department, District hospital, Chamarajanagar during the study period was 7653. Out of the 7653 cases, 960 cases were due to poisoning, which accounts to 12.5%. Among the 960 cases studied, 64.7% were males (n=621) and the age group between 19yrs to 30yrs constituted the major contributors (48.5%) for poisoning cases (Table 1). Majority of the poisoning cases belonged to Hindu religion (96.3%) followed by muslims (3.2%) & 75.7% (n=824) of the cases were reported from rural region (Table 2). Among the monthly distribution of cases (Table 3), highest number of cases were reported during the month of May (10.2%), closely followed by the month of June (10%). 33.9% (n=326) of cases occurred during the time gap between 12:01hrs to 18:00hrs (Table 4) closely followed by 06:01hrs to 12:00hrs (30.8%). Out of the 960 cases studied, 531 cases (55.3%) were reported to the hospital within 2hrs of the incident & 337 cases (35.1%) were reported between 2-6hrs (Table 5).

Table No. 1: Age and Sex wise distribution of cases

S. No.	Age group and Sex		Number of cases		Percentage	
1.	0-5yrs	Male (M)	8	16	0.8%	1.6%
		Female (F)	8		0.8%	
2.	6-18yrs	M	47	96	4.9%	10%
		F	49		5.1%	
3.	19-30yrs	M	304	465	31.7%	48.5%
		F	161		16.8%	
4.	31-50yrs	M	203	302	21.1%	31.5%
		F	99		10.3%	
5.	> 51yrs	M	52	71	5.4%	7.4%
		F	19		2.0%	
6.	Don't know	M	7	10	0.7%	1%
		F	3		0.3%	
Grand total 339			621	960	64.7%	100%
			35.3%			

Table No. 2: Region and Religion wise distribution of cases

S. No.	Religion		Number		Percentage	
1.	Hindu	Urban (U)	924	124	96.3%	12.9%
		Rural (R)		800		83.3%
2.	Muslim	U	31	10	3.2%	1.0%
		R		21		2.1%
3.	Christian	U	4	1	0.4%	0.1%
		R		3		0.3%
4.	Others	U	1	1	0.1%	0.1%
		R		0		0%
Grand total 824			960	136	100%	24.3%
				75.7%		

Table No. 3: Month wise distribution of cases

Month	Number	Percentage
Jan	73	7.6%
Feb	77	8%
Mar	83	8.6%
Apr	83	8.6%
May	98	10.2%
Jun	96	10%
Jul	67	6.9%
Aug	93	9.7%
Sep	77	8%
Oct	71	7.4%
Nov	73	7.6%
Dec	69	7.2%

Table No. 4: Time of incident of poisoning cases

S. No.	Time of incident	Total Number of cases	Percentage
1.	00:01 to 06:00hrs	73	7.6%
2.	06:00 to 12:00hrs	296	30.8%
3.	12:01 to 18:00hrs	326	33.9%
4.	18:01 to 00:00hrs	235	24.5%
5.	Don't know	30	3.1%

Table No. 5: Time interval between incident and hospitalization

S. No.	Time interval	Total number of cases	Percentage
1.	< 2hrs	531	55.3%
2.	2-6hrs	337	35.1%
3.	6-24hrs	48	5.0%
4.	> 24hrs	10	1.0%
5.	Don't know	34	3.5%

Among the route of entry of poison into the human body, oral route constituted the highest number accounting to 69.9% (n = 671) among the cases studied. Irritant poisons (70.3%) were the most common type of poisons encountered in our study, with Organo-phosphorus compounds (23.3%) being the commonest sub-type among irritant poisons (Table 6). The intention of poisoning (Table 7) was suicidal in 65.1% (n = 625) of cases followed by accidental poisoning seen in 32.7% (n = 89) of cases studied. Among the cases who attempted suicidal poisoning, 92.1% (n = 164) dint reveal the exact reason but only 5.1% (n = 9) of cases revealed that family problem was the reason they took poison. Among the persons accompanying the patient to the hospital, siblings (14.2%) formed the majority closely followed by parents (13.6%). Regarding the mode of transportation, 67.8% (n = 651) of cases chose to ride/drive their own vehicle to come to Hospital, 15.7% (151) & 15.5% (n = 149) chose Auto/Taxi & ambulance respectively. Coming to the immediate outcome of the patient (Table 8), 82.2% (n = 789) of the cases survived and were admitted to the hospital, 16.8% (n = 161) cases survived and had been referred to the higher centers & only 0.7% (n = 10) cases died and were subjected to Medico-legal Autopsy.

Table No. 6: Type and sub-types of the poisons studied

S. No.	Type of poison	Poison Sub-type	Cases		Percentage	
1.	Corrosives	Acids	8	5	0.83%	0.53%
		Alkali		2		0.2%
		Metallic salts		1		0.1%
2.	Irritants	OP poison	675	224	70.3%	23.3%
		Phosphides (rat poison)		125		13%
		Snake bite		145		15.1%
		Scorpion bite (sting)		13		1.4%
		Honey bee (sting)		117		12.2%
		Paint		3		0.3%
		Bangle		9		0.9%
		Others		39		4.1%
3.	Systemic poison	Alcohol	198	41	20.6%	4.3%
		Anti-depressants		15		1.6%
		Anti-psychotics		10		1%
		Analgesics		19		2%
		Paracetamol		21		2.2%
		Others		48		5%
4.	Miscellaneous	Food poisoning	20		2.1%	
5.	Unknown	-	59		6.1%	

Table No. 7: Alleged manner of poisoning among the cases studied

S. No.	Manner of poisoning	Total no. of cases	Percentage
1.	Accidental	328	34.2%
2.	Suicidal	625	65.1%
3.	Homicidal	2	0.2%
4.	Don't know	5	0.5%

Table No. 8: Immediate outcome of poisoning

S. No.	Outcome	Total no. of cases	Percentage
1.	Survived & Referred	161	16.8%
2.	Survived & Admitted	789	82.2%
3.	Dead & subjected to Autopsy	10	0.7%

DISCUSSION

The extent of poisoning morbidity and mortality in a society reflects the socio-economic as well as the mental state of the society. In India and other developing nations, especially among rural regions, Pesticide poisoning from occupational, accidental and intentional exposure is a major problem. In our study, there was a higher incidence of poisoning in males (64.7%) as compared to females (35.3%) and most of the poisonings were in the age group of 19-30 yrs (48.5%), followed by 31.5% in 31-50 year age group. These results are similar to studies done by Rao S et al¹⁰ [57% & 43%, 2/3rd patients <30yrs], Purnanand N et al¹¹ [79.5% & 43%, 41.02% in the age group of 41-50yrs], Sharma BR et al¹² [63% & 27%, majority cases in 21-25yrs age group] & Ramesha KN et al¹³ [75.4% & 24.6%, majority in 20 – 29 years age group (31.2%), followed by 12- 19 year age group]. This high incidence in this age group among males are attributed to point that males are more exposed to stress and have the responsibility to take care of the family and other financial matters.

Since Chamarajanagar District Hospital is the only major hospital located in the surrounding areas, much of the rural population comes here for treatment. Hence, 75.7% of cases studied are from rural background. Maximum numbers of cases were reported during the month of May closely followed by June and during 12:01hrs to 18:00hrs. More than 2/3rd of the cases were reported within the Golden Hour of treatment i.e., within 6hrs of the incident. Similar findings were noted in studies done by Jesslinet al¹⁴ which states that more number of cases was noted during summer season and major number of cases was reported during day times.

However, Pokhreyet al¹⁵ states that more cases were reported during rainy season and during night times. Water & Electricity scarcity among rural areas during summer leads to crop failure and financial losses which indirectly increases the incidence of suicide. And also grains are preserved during summer season for which pesticides are procured, that increases the availability of poison and indirectly it leads to rise in the incidence during summer.

Irritant poisons accounts to the highest incidence (70.3%) among poisoning in our study. Pesticides, Organophosphorus compound in particular form the major type of poisons among Irritants followed by Snake bite, rat poison and honey bee bite (sting). Similar results were noted in South Indian studies done by Rameshaetal¹³, Jesslin et al¹⁴, Jaiprakash et al¹⁶, Vinay et al¹⁷ & Srinivas K et al¹⁸. However, in contrast, studies done in North India by Bajaj et al¹⁹ & Singh et al²⁰ shows that the incidence of aluminium phosphide was found to be high. As Agriculture is the main occupation of the people in and around Chamarajanagar District and organophosphorus compounds were commonly used pesticide in these localities, the most commonly used agent for poisoning was organophosphorus compound. Though majority of the patients have not revealed the exact reason for committing suicide by poison, it appears that Family problems, unemployment, crop failure, financial crisis were the prime reasons for committing such an act. Similar theories have also been put up by other studies (Singh et al²⁰) which state that factors like dowry, cruelty by the in-laws, family quarrels, maladjustment in married life and dependence of women on husband are responsible for the higher incidence of poisoning among house wives & failure in the exams or inability to cope up the high expectation from parents and teachers has increased the incidence of poisoning among students.

CONCLUSION

This study highlights the profile of poisoning cases in 3 years admitted to the Chamarajanagar District Hospital which clearly indicates the high

risk population involved and the common poisons encountered in these region. Proper steps with multi-centric approach have to be taken by appropriate authorities in future to reduce the incidence of poisoning and effective strategic preventive measures should be taken to prevent such acts.

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Ten Year Multifactorial Analysis of Suicidal Hanging Deaths

Vaibhav Sonar¹, Rajesh Bardale², Nitin Ninal³

¹Associate Professor, ²Professor and Head, ³Assistant Professor, Dept. of Forensic Medicine,
Govt. Medical College, Miraj, Dist. Sangli. M.S.

ABSTRACT

The present study was conducted with the objective to gain, more knowledge and awareness in to epidemiological trends and pathological aspects of suicidal hanging deaths in western part of Maharashtra. The study included retrospective analysis of suicidal hanging deaths from Jan 2001 to Dec. 2010. Total number of hanging deaths were 343 out of 4828 autopsies. Incidence of hanging was 7.41 per 1 lakh population, male female ratio being 3.7:1. 31-40 year age group was mostly affected (30.90%). 244 (90.37%) male and 49 (67.13%) female were married, 297 (86.59%) cases were of complete hanging, apparel were used as ligature material in maximum number of cases, ligature mark was obliquely placed, above the level of thyroid cartilage in maximum number of cases. Act was completed at home in 242 (70.55%) cases, predisposing factor being family quarrel in 21.29% of cases. Hemorrhage in neck muscles found in 16 (4.66%), fracture hyoid bone in 7 (2.04%) and fracture of thyroid cartilage in 23 (6.7%) of cases.

Key words: Hanging, suicide, predisposing factors, fracture hyoid bone.

INTRODUCTION

Suicide is one of the most important public health problems worldwide. Over 800,000 people die due to suicide every year and there are many more who attempt suicide. Suicide occurs throughout the lifespan and was the second leading cause of death among 15-29 year olds globally in 2012. From 1987 to 2007, the suicide rate increased from 7.9 to 10.3 per 100,000 with higher suicide rates in southern and eastern states of India. In 2012, Tamil Nadu (12.5% of all suicides), Maharashtra (11.9%) and West Bengal (11.0%) had the highest proportion of suicides¹. Pattern of suicidal deaths deciphers the present social and psychological state of mind of people of a region. Suicidal pattern, behavior

and rates differ in various populations and cultures². The choice of method used to commit suicide depends on the availability of means, knowledge about mortal effectiveness and object's drive. Preference of method of suicide in men and women is complexly determined³. In India, hanging is the commonest method of committing suicide in cities and towns as it is considered as a painless form committing self-destruction⁴. The number of hanging deaths is increasing day-by-day. Even though hanging is suicidal, postmortem suspension is not uncommon. In situation like the allegation of postmortem suspension, the internal findings of the neck structures play an important role to assess the manner of death of the individual. Most of the cases of hanging encountered at autopsy are atypical hanging⁵.

Correspondence Author:

Dr. Vaibhav Sonar

Associate Professor

Dept. of Forensic Medicine

Govt. Medical College, Miraj, Dist. Sangli. M.S. 416410

E-mail: sonufm76@gmail.com

Miraj is a part of Sangli Miraj Kupwad Municipal Corporation, West Maharashtra (Pune Division) having population of 462705 with 8572 sq.km area. In this study an attempt has been made in the view to gain, more knowledge and awareness in to epidemiological trends and pathological aspects of suicidal hanging deaths in this area and to identify areas of intervention.

MATERIAL AND METHOD

This ten years (Jan 2001 to Dec 2010) retrospective study was carried out in Department of Forensic Medicine, Govt. Medical College, Miraj. The total number of cases were 343 (7.10%) deceased persons due to suicidal hanging out of 4828 total autopsies. The data was collected from post-mortem reports, inquest and other documents available of all the cases where cause of death was due to suicidal hanging. A total of 343 cases were analysed in relation to demographic status, ligature material, place of hanging, type of hanging and post-mortem findings.

RESULTS

Since Jan 2001 to Dec 2010 total 343 cases of suicidal hanging was autopsied, incidence of hanging 7.41 per 1 lakh population (Table 1). Out of 343 cases male cases were 270 (78.71%) and female are 73 (21.29%), male female ratio being 3.7:1. Maximum number of cases were in the age group of 31-40 years (106, 30.9%), followed by 21-30 years (94, 27.40%) (Table 2). Out of 343 cases 193 (56.27%) cases were from urban area while 150 (43.73%) cases were from rural area, 244 (90.37%) male and 49 (67.13%) female were married, 23 (8.52%) male and 21 (28.77%) female were unmarried, while each of 3 cases were widow or widower (Table 3). 297 (86.59%) cases were of complete hanging, while 46 (13.41%) cases were incomplete hanging. 242 (70.55%) cases completed their act at home, followed by outskirts in 81 (23.62%) cases, in lodge 10 (2.92%) cases, at their work place 2 (0.58%) cases, prison or police lockup 5 (1.46%) cases and 3 (0.87%) cases in hospital ward (Table 4). Causative factors are shown in Table no 5. In maximum number of cases apparel were used as ligature material (Table 6). In 304 (88.63%) cases ligature mark was found above the level of thyroid cartilage and in 39 (11.37%) cases it

was at the level of thyroid cartilage. While it is obliquely placed in 301 cases and horizontally placed in 42 cases, completely encircling neck in 29 cases and incomplete in 313 cases. Associated self-inflicted injuries like cut throat, incised wounds over wrist found in three cases, one case was of dyadic death, in one case hanging was with tied hands. In 97 cases suicidal note was found. Fracture of thyroid cartilage was found in 23 cases, fracture hyoid bone in 7 cases, and hemorrhage in neck muscles found in 16 cases.

Table No. 1: Incidence of hanging in study period (2001-2010)

Year	Hanging	Total cases
2001	29 (5.6%)	517
2002	20 (4.33%)	462
2003	32 (6.43%)	498
2004	40 (8.8%)	453
2005	32 (7.64%)	419
2006	20 (4.72%)	423
2007	53 (10.92%)	485
2008	29 (5.8%)	500
2009	36 (7.21)	499
2010	52 (9.09%)	572
Total	343 (7.1%)	4828

Table No. 2: Age wise distribution

Age group (years)	No	Percentage
Below 10	00	00
11-20	31	9.03
21-30	94	27.40
31-40	106	30.90
41-50	50	14.57
51-60	33	9.62
61-70	21	6.12
71-80	5	1.45
More than 80	3	0.87
Total	343	100

Table No. 3: Marital Status

Marital Status	Male	Percentage	Female	Percentage	Total	Percentage
Married	244	90.37	49	67.13	293	85.42
Unmarried	23	8.52	21	28.77	44	12.83
Widow	3	1.11	3	4.10	6	1.75
Total	270	100	73	100	343	100

Table No. 4: Place of Hanging

Place of hanging	No	Percentage
Home	242	70.55
Lodge	10	2.92
Work place	02	0.58
Outskirt	81	23.62
Prison/ Police custody	05	1.46
Hospital ward	03	0.87
Total	343	100

Table No. 5: Causative factors

Causative factors	No	Percentage
Disease	54	15.74
Psychiatric illness	36	10.50
Finance	29	8.45
Family quarrel	73	21.29
Dowry	12	3.49
Frustration	23	6.71
Not known	116	33.82
Total	343	100

Table No. 6: Ligature material:

Ligature material	No	Percentage
Cotton rope	61	17.78
Jute rope	30	8.75
Nylon rope	31	9.04
Odhani/ Dupatta	83	24.20
Saree/ Lungi/ Dhoti	115	33.53
Wire/ belt	12	3.50
Chadar/ Bedsheet	11	3.20
Total	343	100

DISCUSSION

The present retrospective study was conducted between 2001 and 2010. A total of 4828 cases were autopsied of which deaths due to suicidal hanging comprised 7.1% (n – 343) of autopsies. Studies conducted by Chaurasia et al.⁶ in four year study of Varanasi region reported 283(3.63 %) cases. In another study conducted by Mohammed ZGS et al.⁷ from Ahmedabad studied 74 (3.29%) cases for the period of 3 years, Kumar and Verma⁸ in Lucknow a total of 4405 cases were autopsied in a five year period of which only 10% of cases were due to hanging. Hassan et al.⁹ in a

two year period in Kuwait reported a total of 118 cases. R. Clement et al.¹⁰ had studied on 206 cases over a period of 8.5 years. Hence regional socioeconomic and cultural factors play an important role in suicidal hanging.

Sex and Age: Out of 343 cases male cases were 270 (78.71%) and female are 73 (21.29%), male female ratio being 3.7:1, thus forming majority of males, these findings are consistent with Mohammed ZGS et al.⁷, Sharma et al.¹¹, Waghmare PB et al.¹², Dixit et al.¹³ and contrary to Singh KP et al.¹⁴ which reported 48.58% males and 51.42% females. This wider variation in the sex group is possibly due to the cultural, religious, economic and lifestyle factors driving the individual to suicidal hanging. The majority of cases belonged to 31–40 years 30.9%(136) followed by 21–30 years 27.40% (94) least affected age group was from those below the first decade and above 6th decade, these results are contrary to the claims made by Chaurasia et al.⁶, Mohammed ZGS et al.⁷, and Sharma et al.¹¹ which quote maximum incidence in 21 to 30 years.

Marital status: 70.45% of the victims were married, similar were the observations made by Saisudheerand Nagaraja¹⁶ wherein 82% of his victims were married.

Ligature material: In the present study the commonest choice of ligature material used was apparel (soft) material (odhani/dupatta (n – 83) and sari/lungi/ dhoti (n – 115) constituting to 57.72% (n – 198) cases thereafter cotton rope (n-61), nylon rope (n-31), jute rope (n-30), wire/ waist belt (n-12) and the least preferred choice was the chadar/ bedsheet (n-11) reported in only 2 cases (0.76%), similar were the observations made by Waghmare PB et al.¹², Sharma et al.¹¹. In the present study hard ligature materials like cotton rope, nylon rope, jute rope comprised 39.06%. This wide nature of deviations in the choice of ligature material depends on the dressing method of the population and occupation. Whereas in the UK, Bennet¹⁵ the commonest choice was hard materials like rope, belt, cord and cable, soft materials like sari or stole were least found in that region.

Type of hanging: The present study also revealed the fact that 86.59% of the hangings were complete (n – 297), these results are close to the observations made

by Sharma et al.¹¹ and Saisudheer and Nagaraja¹⁶, in their study, 68% and 64% of the cases respectively were due to complete hanging, however these observations are contrary to those made by Dean et al.¹⁷ and Pradhan et al.¹⁸. They observed that 83.4% (n= 229) and 47.37% of their cases were due to partial hanging, all these observations highlight the regional influence, lifestyle and to a certain extent the type of residence.

Ligature mark: In the present study, 80.58% (n = 213) of the victims ligature mark showed discontinuity (incomplete), similar were the observations made by Saisudheer & Nagaraja (82%)¹⁶ and Jayprakash & Sreekumar (78%)¹⁹. Obliquity of the ligature mark was noticed in 87.88% (n = 232) of cases and horizontal ligature mark was noted in 6.82% (n = 18) of cases, similar were the observations made by Jayprakash and Sreekumar¹⁹. The type of knot, continuity of mark and completeness of hanging are important in determining the ligature mark over the neck.

Motivational factor: The major motivating factors observed in the study were family related issues comprising 73 cases (21.29%), similar were the observations made by Saisudheer and Nagaraja¹⁶, who concluded that 18% of cases were due to family related issues, contrary to N. Vijayakumari²⁰ who reported 34% family related issues. The other major factors were the disease conditions contributing to self-suspension, comprising 15.74% (n = 54) of cases. These observations were contrary to the claims made by Saisudheer and Nagaraja¹⁶ they had claimed 6% of their victims had died due to diseased conditions. Other factors like psychiatric illness (n = 36), financial worries (n = 29), dowry (n = 12) and frustration (n = 18) also contributed to the cause. Thus the psychological state, economic state of the individual and his health issues are the major driving force behind suicidal hanging. Since these issues are closely associated in married individuals, suicidal hanging is common among them.

Place of hanging: The most preferred places to commit the act in 70.55% (n = 242) of cases were the places of residence, similar were the views of Bhosale SH²¹ (69.88%), Cook et al²² (71%), Uzun et al²³ (83.33%). The reason is privacy and easy manipulations

to commit the act apart from non-interference in the process of suicide. The second most preferred place for committing suicide is outskirts then lodge, prison/ police custody, hospital ward and work place.

Level of ligature mark: The majority of the ligature marks over the neck were situated above the thyroid cartilage in 88.63% (n = 304) of cases, over thyroid cartilage in 11.37% (n=39) whereas in one of cases the ligature mark was situated below the thyroid cartilage, similar were the views of Saisudheer and Nagaraja (88%)¹⁶ and Sharma et al. (85%)¹¹. The presence of ligature mark above the thyroid cartilage is due to the yielding soft tissue between upper bony margin of the jaw and the lower protruding thyroid cartilage besides the concentration of a larger force on small area of the neck.

Neck findings: The study of neck structures indicated that the sternocleidomastoid muscle was involved in 4.66% (n = 16) of cases, however these observations were contrary to the claims made by Jayprakash and Sreekumar¹⁹, who had concluded that only 19.6% of their cases showed damage to the sternocleidomastoid fibers. In cases of hanging and more preferably in complete hanging there is always the sternocleidomastoid muscle is subjected to shear movement from external large indenting pressure on its belly causing a tear of its attachments from the sternal end. This may not be the case in all partial hanging wherein part of the body force acts on muscles and vessels. Fracture of hyoid bone was found in 7 (2.04%) cases. The fracture of thyroid cartilage were noted in 23 (6.7%) cases correlating with Feigin G⁵ (6.4%) but it does not correlate with Morlid I²⁴ (12.5%), Luke et al²⁵ (13.11%) and Dixit et al¹³ (15.60%). This is because of the fact that majority of his victims were in 4th and 5th decade of life wherein the bones are ossified leading to the fracture unlike the present study wherein the majority of the victims were between 21 and 40 years. The other factors like height of suspension and type of hanging also play an important role.

The study highlights the influence of regional, religious, cultural, socioeconomic factors and

demographic factors responsible for suicidal hanging. It also encourages further research into these factors so as to prevent the incidences of suicidal hanging.

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Conflict of Interest: Nil

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Pattern of Poisoning in Autopsy Cases at a Tertiary Care Center in Bengaluru—A Five Year Retrospective Study

Akshith Raj S Shetty¹, Girish Chandra YP², Anitha Shivaji⁴, S Praveen³

¹Assistant Professor, ²Professor, ³Professor and Head, Department of Forensic Medicine, MS Ramaiah Medical College, Bengaluru, ⁴Assistant Professor, Department of Forensic Medicine, Kasturba Medical College, Manipal University

ABSTRACT

Introduction: Poisoning whether accidental or intentional is a significant contributor to mortality and morbidity throughout the world. Pattern of poisoning in a region depends on variety of factors, such as socioeconomic status of population, religious and cultural influence and availability of poisons. Thus, a study of pattern of poisoning would not only help in management of poisoning cases but also in planning appropriate preventive measures.

Aim: The aim of present study is to study the pattern of deaths due to poisoning in autopsy cases and to analyse the socio etiological factors involved.

Materials and Methods: The study is a 5-year retrospective study conducted at Department of Forensic Medicine, M S Ramaiah Medical College during the period from 1st January 2011 to 31st December 2015. All cases of deaths due to poisoning brought for medico legal autopsy were studied. The data obtained was computed and descriptive analysis of baseline characteristics were analysed and summarized.

Results: In our study, 6.77% of the total cases autopsied in the study period belonged to death due to poisoning of which maximum numbers of 198 (66%) cases were seen in male and 100 (34%) cases were female and male to female ratio being 2:1. Most of the poisoning cases were reported in the 21-30 years age group. Majority of cases (73%) were suicidal in manner. Majority of cases were due to OP poisoning.

Conclusions: Thus, the study concluded that males are higher in number, and poisoning is seen most commonly among people from the age group of 21-30 years. During the span of the study, poisoning due to insecticide were predominant, constituting about 49% of all poisoning cases, suicidal manner was predominant.

Key Words: *Pattern of poisoning, manner of death, Retrospective study, Organophosphorus.*

Corresponding Author:

Dr Anitha Shivaji

Assistant Professor

Department of Forensic Medicine, Kasturba Medical College, Manipal University, Manipal, Karnataka - 576104

Email: anita.shivajirao@gmail.com

INTRODUCTION

Poisoning whether accidental or intentional is a significant contributor to mortality and morbidity throughout the world. World Health Organization (WHO) conservatively estimates that about 3 million cases of poisoning occur every year in the world and about 2,20,000 (2.2 Lac) deaths occur due to poisoning.

Of these 99% of fatal poisoning occurs in developing countries particularly among agriculture workers.¹

Poisoning is prevalent in all parts of the India but trend of poisoning varies from place to place. In advanced countries, it has been observed that poisoning deaths are mainly due to the cleansing agents, detergents and other cosmetics. Paracetamol, Carbon monoxide etc are frequently used as agents of poisoning. In India agrochemicals dominate the death due to poisoning. Pattern of poisoning in a region depends on variety of factors, such as socioeconomic status of population, religious and cultural influence and availability of poisons.

Poisoning can be occupational accidental or intentional exposure. It is a major public health problem in the developing world. Hazardous occupational practices & unsafe storage expose millions of people to toxic effects of pesticides. However, deliberate self-poisoning account for majority of fatal episodes and put tremendous stress on hospital services, particularly in Asia.^{2,3} Many studies have shown that deliberate self-poisoning has a far higher mortality than accidental poisoning.^{4,5} The act of self-harm has been done to express anger, rebellion or revenge by causing distress to another person in some cultures. Many studies emphasize that not all people who die following acts of self-harm, actually wished to die.⁶ Determinants for a fatal event include poison's toxicity, time taken in receiving clinical attention and the efficacy of medical treatment. WHO class I hazardous pesticides are easily available in developing countries and the virtually non-existent medical services in the developing world ensure that the mortality rate for deliberate self-poisoning is at least 20 times higher in these countries.⁷

Thus, a study of pattern of poisoning would not only help in management of poisoning cases but also in planning appropriate preventive measures. In this context, the present study was carried out with the objective to study the pattern of poisoning cases in the last five years in a tertiary care hospital in Bengaluru.

MATERIAL AND METHODS

The study is a 5-year retrospective study conducted at Department of Forensic Medicine, M S Ramaiah Medical College during the period from 1st January 2011 to 31st December 2015. All cases of deaths due to poisoning brought for medico legal autopsy were studied. A standard pro forma specially designed was used to collect information regarding age, socio-economic background, manner, type of poison and regarding hospitalization and survival period. Standard autopsy protocol was followed and relevant samples / viscera subjected to chemical analysis to arrive at a conclusion were noted.

Inclusion criteria: All cases which were subjected for autopsy as due to poisoning and where in the blood and viscera was sent for chemical analysis.

Exclusion criteria: Unidentified bodies where chemical analysis was negative.

Bodies in advanced state of decomposition.

Statistical analysis: Based on the above parameters the cases were selected and 298 cases were studied. Descriptive analysis of baseline characteristics was analysed and summarized.

RESULTS

Of the total 4398 autopsy cases during the period from January 1st, 2011 to December 31st 2015, 298 were attributed to poisoning accounting for 6.77%.

Table No. 1: Sex distribution of poisoning cases

	Suicide	Accidental	Homicidal	Dyadic	Total
Male	143	52	3	0	198
Female	75	20	1	4	100
	218	72	4	4	298

AGE DISTRIBUTION OF POISONING CASES

Table No. 2: Showing the age of the victims and the type of poison consumed

	OP compound	Phosphide	OP + Alcohol	Alcohol	Pyrethroids	corrosives	Drugs of abuse	Prescription drugs	Snake bite	carbamate	CO	iron	others	Total
0-10 years	2	1	0	0	0	1	0	0	2	0	0	1	3	10
11-20 years	18	15	0	2	3	1	0	2	1	1	1	0	1	45
21-30 years	43	26	4	7	3	3	2	4	2	0	0	2	3	99
31-40 years	31	8	5	12	1	2	2	2	3	0	1	0	1	68
>40 years	40	10	6	6	3	2	1	3	2	0	1	0	2	76
	134	60	15	27	10	9	5	11	10	1	3	3	10	298

Figure No. 1: Showing the age of the victims and the motive for poisoning

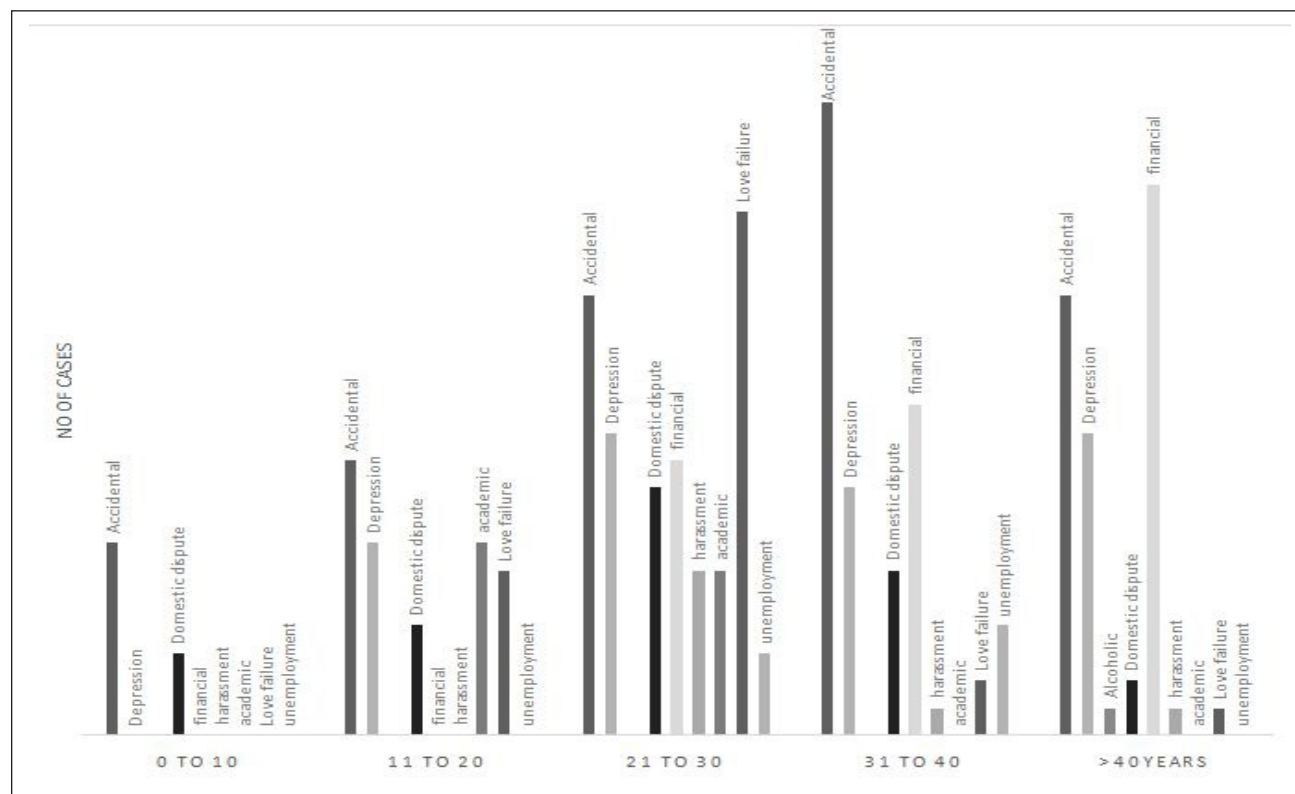
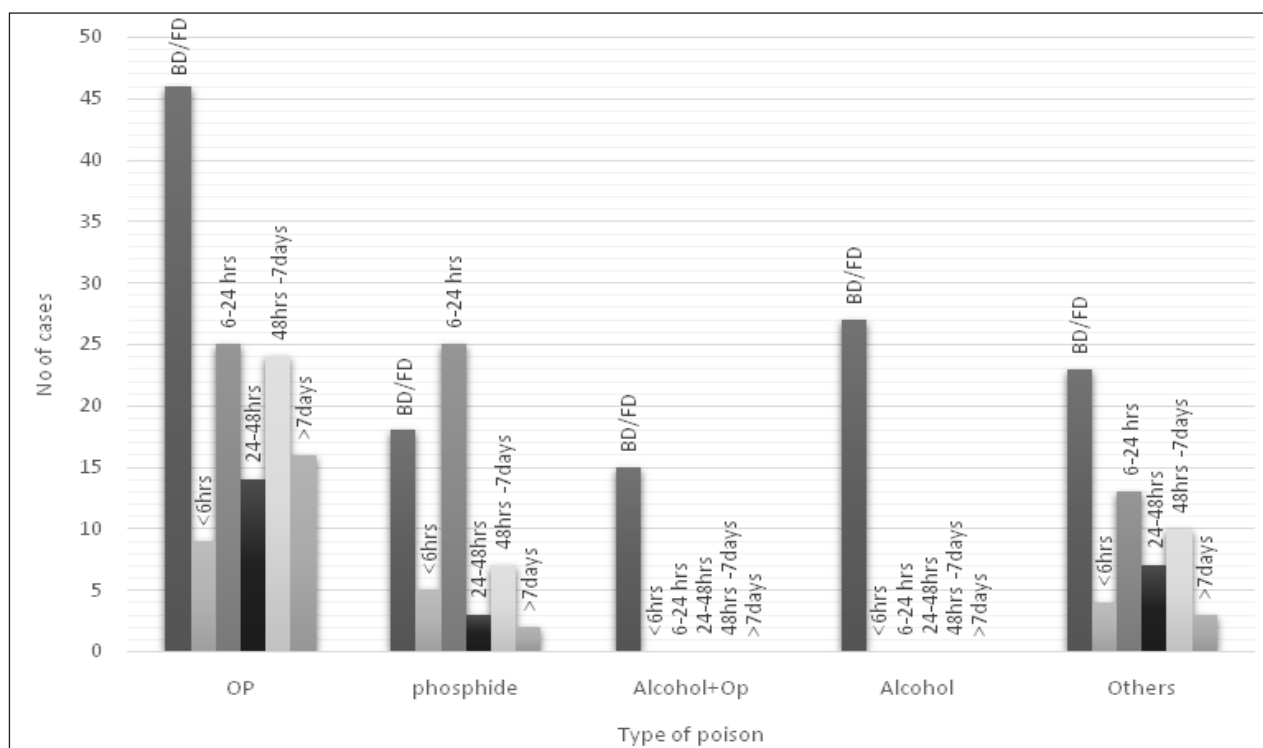


Table No. 3: Showing the manner of poisoning and the type of poison.

	OP Compound	Phosphide	OP + Alcohol	Alcohol	Pyrethroids	corrosives	Drugs of abuse	Prescription drugs	Snake bite	carbamate	CO	iron	others	Total
Suicide	124	54	14	0	7	5	1	7	0	1	0	1	4	218
Accidental	5	4	0	27	3	4	4	4	10	0	3	2	6	72
Homicidal	3	0	1	0	0	0	0	0	0	0	0	0	0	4
Dyadic	2	2	0	0	0	0	0	0	0	0	0	0	0	4
	133	60	15	27	10	9	5	11	10	1	3	3	10	298

Figure 2: Showing the survival period in different type of poisons.

DISCUSSION

The study showed a predominance of death due to poisoning among males accounting to 66% of the total cases with a ratio of 2:1 (**Table 1**) These findings are similar to findings of other studies conducted by Gannar OG at Gulbarga which shows that 65.65% of cases were male.⁸ According to study of Vinay Shetty 51.5% of cases were males.⁹ This high incidence is attributed to point that males are more exposed to stress and strain and have the energetic life. However, another study showed that it was more among females (52.3%) than males (47.7%).¹⁰

Pokhrel et al found that females were more susceptible to the intentional poisoning than male.¹¹ While in our study it was the males who outnumbered the females in intentional poisoning though all the cases of dyadic death involved females. (**Table 1**)

The present study showed a higher incidence in 21-30 years age group, (**Table 2, Figure 1**) this age group is a period in which a person is most active in all respects be it family life, professional life, or social life, which increases the stress and often leads to

devastating outcomes. This was followed by the older age group which could be due to loneliness, depression and financial reasons as shown in the chart. (**Table 3**) Poisoning is most common among people from the age group of 21-30 years and then shows a progressive fall as the age progresses according to a study by Celine et al.¹² Ali et al also found that majority of the cases was young people from the age group 16-40 years (about 80%).¹³ Another study has come up with very similar findings i.e. maximum victims were from the age group of 15-30 years.¹⁴

Majority of cases (73%) were suicidal in manner followed by (24%) accidental in manner. (**Table 3**) Suicide was the commonest manner of poisoning and many authors made this observation based on history provided by the investigating officers or relatives. Majority of the suicidal poisoning involved OP compounds (57%) and Phosphide (25%). Ali et al. in a study on clinical pattern and outcome of OP poisoning showed that suicide is the most common modes of poisoning and reported in 65% cases, followed by accidental (27%) and homicidal (8%).¹³ Therefore, suicide is still the leading cause of poisoning followed

by accidental and homicidal. Moreover, most of the suicides were attributed to financial reasons, family problems and depression.

Roberts et al mentioned that use of a poison for a purpose is determined by many factors including its easy availability in the market, price and popularity among the masses and appropriate laws concerning the poisonous agent.¹⁵ OP pesticides were responsible for the majority of deaths in most series of self-poisoning cases.¹⁶ It appears that OP poisoning constitutes majority of cases because of easy availability, low cost, unregulated sale and presence in majority of households in this region. Pesticide poisoning is a major public health problem in developing world.¹⁷ Intentional self-poisoning was the major cause of death due to poisoning.^{2,3}

Many studies have shown that deliberate self-poisoning has a far higher mortality than accidental poisoning.⁵ The act of self-harm has been done to express anger, rebellion or revenge by causing distress to another person in some cultures. The role of intent in an attempted suicide is controversial. Determinants for a fatal event include poison's toxicity, time taken in receiving clinical attention and the efficacy of medical treatment. WHO class I hazardous pesticides are easily available in developing countries and the virtually non-existent medical services in the developing world ensure that the mortality rate for deliberate self-poisoning is at least 20 times higher in these countries.⁷ As seen in our study, almost 41% of the cases of OP poisoning did not survive beyond 6 hrs and Phosphide poisoning 38% did not survive beyond 6hrs. Overall survival rate beyond seven days of taking poison was a mere 6%. (**Figure 2**)

CONCLUSION

The present study was done to study the pattern of poisoning in Bengaluru, The Male: Female ratio for poisoning in this region was 2:1 with majority of cases in the 21-30 years age group. OP poisoning (57%) is still the leading cause of poisoning in this region followed by phosphide poisoning (25%). Suicidal poisoning was responsible for 73% of poisoning cases. By addressing the issues related to these victims, by implementing

strict guidelines for the availability of insecticides and by educating the public regarding house hold poisons deaths due to poisoning can be decreased and thereby benefitting the society.

The authors declare that there is no conflict of interest regarding the publication of this article.

This research received no funding from any agency.

Ethical clearance was taken from the Ethical Committee of the institution before starting the research.

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Prognostic Parameters of Hospital Mortality in Paraquat Poisoning

Mehdi Torabi¹, Maryam Jafari², Moghaddameh Mirzaee³

¹Assistant Professor of Emergency Medicine, ²Department of Emergency Medicine, Kerman University of Medical Sciences, Kerman, IRAN, ³Department of Biostatistics and Epidemiology, School of Public Health, University of Medical Sciences, Kerman, Iran

ABSTRACT

Background: In the case of paraquat poisoning, determining patients' outcome is very important. Considering the role of inflammatory and cellular injuries in the mechanism of this poisoning and finding the role of the parameters involved in these injuries can help to determine the outcome of the patients.

Methods: This historical cohort study was performed during a period of five years on patients over 16 years old, who had been poisoned with paraquat and referred to the emergency department within the first 24 hours of poisoning. Laboratory test related to the inflammation including Complete Blood Count (CBC) [White Blood Cell (WBC), the Mean Platelet Volume (MPV), and the Red cell distribution width (RDW)] and organ dysfunction scores such as Sequential Organ Failure Assessment score (SOFA score) were observed and the hospital mortality was considered as the outcome of the patients.

Results: From 108 patients poisoned with paraquat, 61 (56.48%) were male. The mean age of the patients was 23.25±8.27 years and the hospital mortality rate was observed in 28.70% of the patients. According to the forward conditional method in multivariable analysis, the hospital mortality had a significant relationship with the leukocyte count, bicarbonate ion, and the SOFA score.

Conclusions: Considering inflammatory and cellular injuries, involved in paraquat poisoning, leukocytosis as a prognostic factor for inflammation, and SOFA score and acidosis as the factors related to cell injury could independently predict hospital mortality.

Keywords: Paraquat, Organ dysfunction score, Leukocyte count, Bicarbonate ion

Corresponding Author:

Mehdi Torabi

Assistant Professor of Emergency Medicine, Department of Emergency Medicine, Kerman University of Medical Sciences, Kerman, IRAN

Tel : +98 9131992016

Fax: +98 3432474638

Email: mtorabi1390@yahoo.com

me_torabi@kmu.ac.ir

INTRODUCTION

Paraquat is a toxic herbicide with a high rate of fatality among humans. Consequently, its prognosis in paraquat-poisoned patients is of great importance^{1,2}.

Due to the role of inflammatory responses in the process of paraquat poisoning, the tests that confirm the inflammation can predict the prognosis of these patients^{2,3}. WBC has a relationship with the severity of inflammation. The higher amount of WBC results in more severe inflammation and mortality^{4,5}. The

size of platelets in blood circulation and MPV are different, based on the severity of inflammation. In severe inflammatory conditions, MPV decreases and in cases where there is less inflammation, MPV increases. Therefore, the changes in MPV can indicate pre-inflammatory activity⁶. RDW indicates the difference in the size of red blood cells or anisocytosis. In cases of inflammation, RDW increases due to inhibition of erythropoiesis^{6,7}. RDW elevation is strongly correlated with the inflammatory markers^{8,9}.

There are some organ dysfunction scores to determine disease severity and predict outcomes in critically ill patients. These systems such as Sequential Organ Failure Assessment score (*SOFA score*) can determine the level of acuity in critically ill patients. However, the prognostic significance of *SOFA score* after acute paraquat (PQ) poisoning remains unclear^{10,11}.

This study aims to find the relationship of inflammatory and cellular injury parameters in paraquat-poisoned patients at the first 24 hours of admission with their hospital mortality.

MATERIALS & METHOD

Study design: In this historical cohort study, a number of patients with paraquat poisoning referred to the Afzalipour Hospital, which is the toxicology referral center in Southeast Iran, were investigated. All the patients were over 16 years old, had consumed the poison orally, and were referred to the hospital within the first 24 hours of poisoning. They were included in the study by two methods. First, 138 patients were enrolled retrospectively (from 20 April 2011 to 20 April 2014) based on their medical documents. From these, 60 patients were excluded because they did not meet the inclusion criteria or their medical documents were not complete. Finally, a total of 78 patients were included in this study. In the second method, 30 patients (from 20 April 2014 to 20 April 2016) were included prospectively and participated in the study until the last follow-up. Patients below 16 years of age and with a history of liver, kidneys, pulmonary, and cardiac diseases, or cancer, along with those who were referred

after the first 24 hours of poisoning, were excluded from the study. All the patients were treated by the same toxicologist based on the designed therapeutic protocol. The data were collected by an emergency medicine resident and recorded in a previously designed checklist. The study process was supervised by an emergency medicine specialist.

The present study was based on the Helsinki Accords (1975) and was approved by the Ethics Committee of Kerman University of Medical Sciences. Informed consents were obtained from all the patients.

Variables & outcomes: The study variables included demographic information (age, sex, and the amount of ingested toxin), laboratory tests related to the inflammatory conditions (WBC, MPV, RDW), *SOFA score* and ABG. The association of these variables with hospital mortality was investigated quantitatively.

Statistical analysis: In order to describe the quantitative variables, mean and standard deviations (SD) were used, respectively. For the qualitative variables, a percentage of frequency was used. The odds ratio (OR) and 95% confidence interval (CI) were used for expressing the severity of this association. Univariate and multivariable analysis using the logistic regression model were done.

FINDINGS

Basic characteristics: A total of 108 paraquat-poisoned patients (78 retrospectively and 30 prospectively) were investigated during five years. **Table 1 presents the descriptive information of major variables.**

Variables	Number (%)
Age(y), Mean \pm SD	23.25 \pm 8.27
Gender	
Male	61(56.48)
Female	47(43.52)
Amount of ingested paraquat > 50 mL	32(29.62)
Buccal Ulcer	104(96.29)
Hospital Mortality	31(28.70)

Univariate analysis: The hospital mortality rate had a significant relationship with the amount of ingested toxin, duration of hospital admission, WBC, RDW, bicarbonate ion (HCO_3), and the SOFA score (Table 2).

Table No. 2: Univariate analysis of variables according to their association with hospital mortality

Variables	Mortality (Mean \pm SD)		OR (95%CI)	P Value
	No	Yes		
Age	22.21 \pm 5.19	26.25 \pm 13.85	1.05 (0.99 -1.11)	0.098
Amount of ingested paraquat (mL)	45.90 \pm 7.55	93.88 \pm 7.01	0.18 (0.07-0.47)	< 0.0001
Hospital Admission(Days)	10.95 \pm 5.46	6.00 \pm 7.46	0.85 (0.78-0.94)	0.001
Laboratory				
WBC	10.96 \pm 3.77	21.100 \pm 9.27	1.31 (1.17-1.48)	< 0.0001
MPV	10.05 \pm 1.08	10.14 \pm 1.28	1.11 (0.76-1.63)	0.56
RDW	13.76 \pm 2.33	16.12 \pm 3.66	1.31 (1.12-1.53)	0.001
Bicarbonate ion (HCO_3)	23.44 \pm 5.20	17.79 \pm 5.51	0.84 (0.76-0.92)	< 0.0001
Organ Dysfunction Score				
SOFA	2.71 \pm 1.47	6.62 \pm 3.70	1.90(1.45-2.49)	<0.0001

Abbreviations: WBC; White Blood Cell, MPV; Mean Platelet Volume, RDW; Red cell Distribution Width, SOFA; Sequential Organ Failure Assessment

Multivariate analysis: In the forward conditional method, SOFA score, WBC and HCO_3 remained in the final step of the model and were also independently associated with hospital mortality (Table 3).

Table No. 3: Multivariate regression analysis of variables according to their association with hospital mortality

Variables	Odds Ratio(OR)	95% CI	P-Value
SOFA	1.90	1.15-3.13	0.012
WBC	1.43	1.19-1.72	< 0.0001
Bicarbonate ion (HCO_3)	0.85	0.74-0.97	0.019
Hospital Admission	0.86	0.74-0.99	0.041

ROC curve : Using the variables remaining in the final model, we drew the ROC curves for mortality. The curve, created for the prediction of mortality using SOFA score, showed an AUC and best cut-off point of 0.82 and 3.5, respectively (Fig. 1). The ROC curve by the WBC was 0.86 and 12750 (Fig. 2), and by bicarbonate ion (HCO_3); was 0.78 and 20.20, respectively (Table 4).

Table No. 4: AUC, sensitivity, and specificity of the final model

Variables	Sensitivity(%)	Specificity(%)	AUC	Best Cut-off
SOFA	77.40	75.3	0.82	3.5
WBC	80.00	76.60	0.86	12750
Bicarbonate ion (HCO_3)	89.50	70.00	0.78	20.20

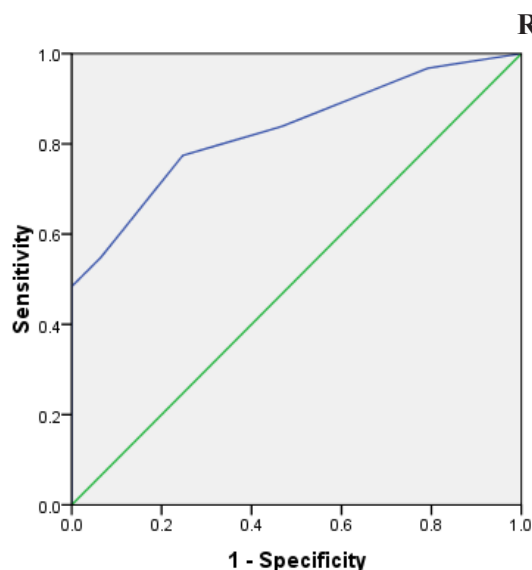


Figure No. 1: Receiver operating characteristic curve for SOFA predicting mortality.

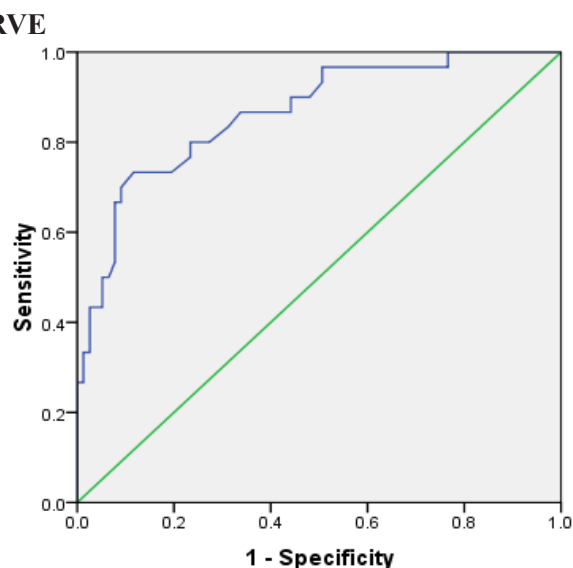


Figure No. 2: Receiver operating characteristic curve for WBC predicting mortality.

Limitations of the study: There were some limitations in this study: It was done in a single center, the number of poisoning cases decreased after giving necessary training to people in affected areas, an exact estimation of the consumed dose was difficult and some medical documents were incomplete.

DISCUSSION

This historical cohort study showed that in the case of paraquat poisoning, there is a significant relationship between the hospital mortality and leukocytosis, SOFA score, bicarbonate ion at the first 24 hours of admission.

In paraquat poisoning, tissue injury occurs through two major mechanisms. First, the toxin causes cell injury by creating an oxidative stress through free radicals and reactive oxygen, lipid peroxidation, and apoptosis^{12, 13}. Secondly, an inflammatory response is also considered as one of the major mechanisms of tissue injury^{2, 3}. Based on these two injury mechanisms, most vital organs are affected. Consequently, an early death during the first 1-4 days due to multiple organ failures or a late death after 3 weeks, owing to respiratory failure resulted from pulmonary fibrosis, can occur¹³. The inflammatory response after paraquat consumption is the main and primary response to tissue injury. Therefore, it is expected

that the tests related to inflammatory reactions is affected and these tests might help to predict the prognosis and hospital mortality³. Leukocytosis is a marker of the acute phase used to determine the severity of inflammation in various diseases and conditions. A greater number of the WBC is associated with more severe inflammation. It has been observed in many studies that leukocytosis is independently related to morbidity and mortality^{14, 15}. This is in line with our findings. Mortality was significantly higher among patients with leukocytosis that can be explained through physiopathology of this poisoning. This finding shows that with an increase in inflammation presented in the form of leukocytosis increase, mortality increases and the affected group of patients are reported to have a worse prognosis^{16, 17}. One of the other tests related to inflammatory conditions is RDW. RDW increase happens under the influence of oxidative stresses and inflammatory responses¹⁸. It has been observed in some studies that RDW increase in critically ill patients can play a role in predicting their mortality¹⁹⁻²¹. In our study, this relationship was also present in the univariate model. But, in the multivariate models, this relationship was observed only for WBC. This relationship, even in the univariate model, was not observed with MPV.

The cell injuries cause multiple organ failures by forming free radicals. Mortality is higher among patients with organ dysfunction, especially in lungs, liver, and kidneys. Organ dysfunction results in bad prognosis. Therefore, the organ dysfunction scores can play an important role in determining the outcome of these patients²²⁻²⁶. Furthermore, since the serum paraquat level cannot be measured in all centers¹⁴, using these prognostic systems can help to determine the prognosis of critically ill patients. One of these predictive scores is SOFA that has been designed based on predicting failure and functions of organs. Therefore, it can help to predict mortality in case of paraquat poisoning. This score is a convenient, inexpensive score that is suitable to use in hospitals. This score includes parameters of major target organs such as lungs, brain, heart, liver, kidneys and hematologic system. Therefore, SOFA score with a predictive value equal to the serum paraquat level can be used to predict the outcome of the poisoned patients. In our study, there was also a significant relationship between SOFA score and hospital mortality with the best cutoff point of 3.5. The advantage of this score is its versatility through monitoring several organs, along with its accuracy, especially when the cause of death is multiple organ failure²⁵⁻²⁸.

Bicarbonate ion (HCO_3) helps to determine acid-alkaline imbalance in patients. Its decrease shows acidosis and higher acidosis is associated with higher mortality²⁹. Therefore, bicarbonate can be useful in predicting hospital mortality in case of paraquat poisoning³⁰. In this study, we observed that lower levels of bicarbonate and acidosis can increase the chances of hospital mortality in the paraquat-poisoned patients.

CONCLUSIONS

SOFA score is one of the organ dysfunction scores that shows the failure of organs such as kidneys, liver, and lungs. Also, WBC can help to determine the inflammatory injuries in case of paraquat poisoning. Both of them are useful in detecting hospital mortality at the first 24 hours of admission. Besides, acidosis and the decrease in bicarbonate can also be used in predicting mortality.

Conflict of Interest: None declared

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Forensic Examination Findings among Child Victims in Pekanbaru, Indonesia (2010-2016)

Dedi Afandi¹, Mohammad Tegar Indrayana¹, Syarifah Hidayah Fatriah¹,
Iriandanu Nugraha², Muhammad Ridho Fiardhy Pangestu²

¹Forensic and Legal Medicine Department, Faculty of Medicine, Universitas Riau

²Faculty of Medicine, Universitas Riau

ABSTRACT

The role of forensic examination is very important to collect evidence on violence against children (VAC). To know the incidence of child victim, describe victim and forensic examination findings, we conducted retrospective study in Emergency Department Bhayangkara Hospital Pekanbaru. The medicolegal report of the child victims from January 2010 to December 2016 was reviewed. Out of 2071 child victims, two-third were physical assault. Average incidence number was 295.8 per year. Physical assault was more prevalent among boy (75.4 %) with ratio 3.1. Sexual assault was predominant among girl (92.7 %). Adolescent is main victims of child physical and sexual assault, diminishing with decrease age. Bruise and abrasion were more frequent found with head as common site. Almost boy has no abnormal finding on genital examination. Perianal examination showed no abnormal finding. Both of boy and girl have the same risk of becoming victims.

Key words: *violence against children, physical assault, sexual assault, adolescent, forensic examination finding*

INTRODUCTION

Violence against children (VAC) happens in all parts of the world. In the WHO 2006 report, estimated that violence against children to result in death have higher incidence rates twice in low-income countries (2.58 / 100.000) than in countries with high income (1.21 / 100.000). From the statistical data in US, in 2013 found as many as 679000 children are victims of abuse and neglect, about 1520 children died, and as much as

9% experienced violence sexual.¹⁻³ In Japan, number of reported child abuse cases increased from 1101 in 1990 to 66807 in 2012, an increasing number of cases have also occurred in Korea (2001-2008), and in Philippines (1997-2012).³

In Indonesia, number cases of VAC continued to increase. Data from the National Commission for Child Protection of the Republic of Indonesia noted an increase in cases between 2011 to 2014; 2178 cases in 2011, 3512 cases in 2012, 4311 cases in 2013, and 5066 cases in 2014. The survey on violence against children made in 2013 found that in children between the ages 13 – 17 years it was indicated that 1 out of 3 boys and 1 out of 5 girls had experienced one form of emotional/ physical/sexual violence in the past 12 months.²

The role of forensic examination is very important through forensic evidence collection. The forensic doctor will obtain a history of violence, perform physical examination, documenting exam findings,

Corresponding Authors:

Dedi Afandi,

M.D., D.F.M., Forensic Medicine Specialist, Ph.D
Associate Professor, Forensic and Legal Medicine
Department, Faculty of Medicine, University Riau

Jl. Diponegoro 1, Pekanbaru, Riau, Indonesia

Telp/Fax : +62-761-572725

Mobile : +62 811751976

E-mail : dediafandi4n6@gmail.com

collect evidence, interpret and analyze of findings.⁴ In Indonesia legal system, the forensic doctor will examine child victims by order from the police's official inquiry letter. The medicolegal report established by forensic doctor after all protocol forensic examination has performed.⁵

The principal aim of this study is to know the incidence number of child victim attending the Emergency Department of Bhayangkara Hospital Pekanbaru (BHP), describe victim and forensic examination findings. This hospital is a teaching hospital of the Faculty of Medicine, University of Riau and the hospital center for Forensic Medical Services (FMS) in Pekanbaru. All VAC cases reported to the police will be referred to BHP. Pekanbaru is urban area and the capital city of the Riau Province, one of 34 provinces in Indonesia. Population in Pekanbaru is approximately 1.2 million people. This study may add to our overall understanding of magnitude of problem and may help to identify patterns of injury or trends of incidence in child victims, especially among urban areas and may assist in implementing effective preventative measures.

MATERIAL AND METHODS

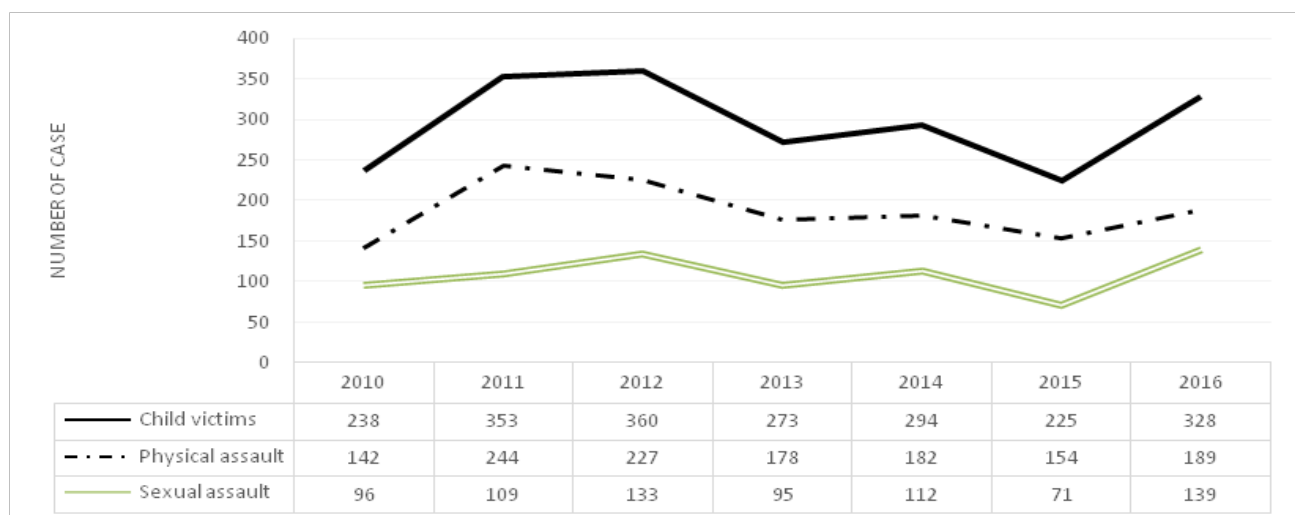
This retrospective study was carried out in Emergency Department Bhayangkara Hospital Pekanbaru from January 2010 to December 2016. The medicolegal report of the child victims who had been brought for examination into the Emergency Department was reviewed. The

source of data was medicolegal report and the police's official inquiry letter. All medicolegal reports of child victim were studied for the incidence of VAC, sex, age, forensic examination findings (presence of wound, site of wound, and perianal-genital injury). The types of VAC were obtained from the police's official inquiry letter is divided into physical and sexual assault. The study was approved by the Research and Ethics Committee of the Faculty of Medicine University of Riau.

FINDINGS AND DISCUSSION

Violence against children became one of the cases that give a large proportion of the violence and is a serious problem nowadays. It also illustrated number of VAC cases in Pekanbaru. Out of 2071 VAC victim, 1316 (63.5%) were child physical assault and 755 (36.5%) were child sexual assault. Number of VAC victims period 2010 - 2016 tend to be remain each year. Average incidence number per year was 295.8 for VAC cases, 188 for child physical assault cases, and 107.8 for child sexual assault cases. The number of cases of VAC could be higher in population because many victims do not report because they are ashamed or fear of being blamed. By number of cases, our study result was higher compare to study in Bahrain⁶, Netherland⁷, and Saudi Arabia⁸. This may reflect an improvement in recognition and referral of cases by professionals, and or may also be due public consciousness because of increasing media reporting and awareness campaigns.⁶

Figure No. 1: The number of child victims and type of violence against children.



Physical assault remains the dominant form of VAC, which is similar to study in Saudi Arabia (70%)⁹, Kuwait (81.5%)⁹, Singapore (60%)¹⁰, Al-Kharj (57.5%)¹¹ and Viet Nam (47.5%)¹². Other study showed incidence of physical assault lower than our study, in transitional countries, incidence of physical assault less than 20% compare to other type of child violence.¹³ This difference occurred because both parental attitudes towards corporal punishment and individual factors like child's age and sex, and socio-economic factors are associated with different forms of child abuse.^{10,13}

Our study showed that the prevalence among boys and girl are relatively equal, which is similar from study in Saudi Arabia¹⁴ and the UK¹⁵. In other words, all sexes have the same risk of becoming victims of VAC.

Child physical assault stated boys experience slightly higher rates of physical assault than girls.¹⁶ This similar with our study, 922 (75.4%) of the physical assault victims were boy. This agrees with study in Bahrain⁶, Egypt¹⁷. In our study, majority of sexual assault victims were girls (92.7%), which is similar to study in Cairo¹⁷, Arif et al¹⁸, Hagra et al¹⁹, and by Aboul-Hag et al²⁰.

Other while, study by Küçüker²¹ and Al-Mahroos²² showed boy slightly higher than girl. This difference could be due to sociocultural characteristics of the area of study, different method of study and different number of victim.

Regarding age of VAC, physical assault and sexual assault victim, the highest incidence was found in age group 15-18 years old, diminishing with decrease age. This study compatible with studies in Lahore¹⁸, Egypt¹⁹ and UK²³ but other study in Bahrain⁶ reported the highest incidence under 3 years old. This difference can be explained because of different methods to diagnose of type of VAC, different age groups used to differentiate of childhood and adolescence, different number of victim and varying study population. Regarding phase human growth and development, this study is line with another study that the most victim were adolescent. This phase is the transition period, related to the search for identity, which later teenage boys will tend to be the target of physical violence, while girl would be more vulnerable to sexual violence. The older child was riskier to experienced VAC.^{1,3}

Table No. 1: Distribution of incidence and age by type of violence and sex among child victims in the period 2010 - 2016

Variable	Type of Child Violence						Total (N = 2071) n (%)
	Physical assault (N=1316) ^a			Sexual assault (N=755) ^a			
	Boy n (%)	Girl n (%)	Total n (%)	Boy n (%)	Girl n (%)	Total n (%)	
<i>Number, years, total</i>	992 (75.4)	324 (24.6)	1316 (100)	55 (7.3)	700 (92.7)	755 (100)	2071 (100)
2010	109 (8.3)	33 (2.5)	142 (10.8)	6 (0.8)	90 (11.9)	96 (12.7)	238 (11.5)
2011	178 (13.5)	66 (5.0)	244 (18.0)	3 (0.4)	106 (14.0)	109 (14.4)	353 (17.0)
2012	185 (14.1)	42 (3.2)	227 (17.3)	5 (0.7)	128 (16.9)	133 (17.6)	360 (17.4)
2013	129 (9.8)	49 (3.7)	178 (13.5)	4 (0.5)	91 (12.1)	95 (12.6)	273 (13.2)
2014	138 (10.5)	44 (3.3)	182 (13.8)	15 (2.0)	97 (12.8)	112 (14.8)	294 (14.2)
2015	115 (8.7)	39 (3.0)	154 (11.7)	12 (1.6)	59 (7.8)	71 (9.4)	225 (10.9)
2016	138 (10.5)	51 (3.9)	189 (14.4)	10 (1.3)	129 (17.1)	139 (18.4)	328 (15.8)
<i>Age, mean (SD), year</i>	15.28 (3.05)	14.97 (3.64)	15.20 (3.21)	9.91 (3.98)	12.90 (4.39)	12.08 (4.43)	14.29 (3.89)
0 – 5	19 (1.4)	13 (1.0)	32 (2.4)	6 (0.8)	72 (9.5)	78 (10.3)	110 (5.3)
6 – 10	60 (4.6)	28 (2.1)	88 (6.7)	28 (3.7)	120 (15.9)	148 (19.6)	236 (11.4)
11 – 14	191 (14.5)	50 (3.8)	241 (18.3)	13 (1.7)	147 (19.5)	160 (21.2)	401 (19.4)
15 – 18	722 (54.9)	233 (17.7)	955 (72.6)	8 (1.1)	361 (47.8)	369 (48.9)	1324 (63.9)

Table No. 2: Distribution of presence and site of wound by type of violence and sex among child abuse victims period 2010 - 2016

Variable	Type of Child violence						Total (N = 2071) n (%)
	Physical assault			Sexual assault			
	Boy (n=992) n (%)	Girl (n=324) n (%)	Total (n=1316) n (%)	Boy (n=55) n(%)	Girl (n=700) n (%)	Total (n=755) n (%)	
<i>Presence of wound</i>							
Bruise	605 (61.0)	179 (55.2)	784 (59.6)	7 (12.7)	67 (9.6)	74 (9.8)	857 (41.4)
Abrasion	507 (51.1)	167 (51.5)	674 (51.2)	4 (7.3)	86 (12.3)	90 (11.9)	764 (36.9)
Laceration	80 (8.1)	19 (5.9)	99 (7.5)	0 (0.0)	4 (0.6)	4 (0.5)	103 (5.0)
Burn	2 (0.2)	3 (0.9)	5 (0.4)	0 (0.0)	1 (0.1)	1 (0.1)	6 (0.3)
No wound finding	166 (16.7)	41 (12.6)	207 (15.7)	52 (94.5)	531 (75.9)	583 (77.2)	790 (38.1)
<i>Site of wound</i>							
Head	673 (67.8)	163 (50.3)	836 (63.5)	1 (1.8)	15 (2.1)	16 (2.1)	852 (41.1)
Neck	117 (11.8)	24 (7.4)	141 (10.7)	0 (0.0)	25 (3.6)	25 (3.3)	166 (8.0)
Chest	87 (8.8)	22 (6.8)	109 (8.3)	0 (0.0)	23 (3.3)	23 (3.0)	132 (6.4)
Abdomen	34 (3.4)	8 (2.5)	42 (3.2)	0 (0.0)	5 (0.7)	5 (0.6)	47 (2.3)
Back	97 (9.8)	23 (7.1)	120 (9.1)	0 (0.0)	13 (1.9)	13 (1.7)	133 (6.4)
Upper extremity	242 (24.4)	128 (39.5)	370 (28.1)	4 (7.3)	25 (3.6)	29 (3.8)	399 (19.3)
Lower extremity	98 (9.9)	53 (16.4)	151 (11.5)	4 (7.3)	12 (1.7)	16 (2.1)	167 (8.1)

Bruise was the most frequent found followed by abrasion. Presence of wound was more frequent found in physical assault. This study is in line with study by Kemp et al²⁴, in Bahrain⁶ and around the world that skin manifestations were the most frequent presentation and bruising is the commonest injury.^{6,24}

Regarding site of wound, head was the most common site (41.1%) and more frequent in physical assault (63.3%). These findings are in line with literature that state “In infants and young children, bruises to the head (except for the forehead), neck, ears, and torso including chest, abdomen, genitourinary region, back, and buttocks rarely result from accidental injury mechanism”.²⁵

Table No. 3: Distribution of perianal-genital forensic examination findings among suspect child sexual assault victims period 2010 - 2016

Variable	Boy (N = 55) n(%)	Girl (N = 700) n(%)
<i>Female Genital</i>		
Hymen tears		
- Acute (partial/complete)		345 (49.3)
- Old (partial/complete)		280 (40.0)
Erythema		77 (11.0)
No abnormal finding		122 (17.4)
<i>Male Genital</i>		
Presence of lesion	4 (7.3)	
No abnormal finding	51 (92.7)	
<i>Perianal</i>		
Perianal erythema	2 (3.6)	5 (0.7)
Bruise and or abrasion	17 (30.9)	24 (3.4)
Reduce tone of anal sphincter	7 (12.7)	11 (1.6)
Anal laceration	1 (1.8)	1 (0.1)
Scar	2 (3.6)	0 (0.0)
Fold change	3 (5.5)	0 (0.0)
No abnormal finding	26 (47.3)	665(95.0)

Acute and old hymenal tears were seen in 49.3% and 40%, respectively. This study suggested in one victim could be found both acute and old hymenal tear. Beyer et al²⁶ and study in Lahore¹⁸ reported hymenal cleft in 20-22% of cases. This difference with our study could be due to different number of victim and different time of victim attending.

In boy, we reported most of victim with no abnormal finding in perianal examination (95%) and male genital examination (92.7%), bruise and abrasion were seen at perianal in 3.4 % cases. Boys are known to be reluctant to disclose sexual abuse and often the injury remained completely unexplained.²⁷ In our experience, genital injury in boy could be no abnormal finding in examination, especially due to by sucking or contacting.

Our study has some limitation. It was based on medicolegal report of child victims. It only showed physical and sexual assault, and another type of abuses such as emotional abuse, neglect, and exploitation cannot be known from the data source. The medical history of perpetrators was also not available in the medical report.

CONCLUSION

The average incidence number per year is 295.8 for child victim cases. Physical assault is more frequent found compare to sexual assault. Both of boy and girl have the same risk of becoming victims. The main victims are adolescent diminishing with decrease age. Bruise and abrasion were more frequent found with the head as common site. The absence of genital injuries and perianal sign does not rule out sexual assault. We recommend that all case of child victim should be recorded, documented, detailed and careful examination.

Conflicts of Interest: None

Source of Funding: None

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Burn Deaths: An Autopsy Based Study in a Tertiary Care Hospital in Western Odisha

Choudhury Jyotish Chandra¹, Nayak Amarendra², Singh Purnima³,
Mohanty Punyanshu⁴, Sahu Manas Ranjan⁵

¹Associate Professor, Department of FMT, SCB Medical College, Cuttack, Odisha,

²Associate Professor, Department of FMT, VIMSAR, Burla, Odisha, ³Assistant Surgeon, District Head Quarter Hospital, Sambalpur, ⁴Professor, Department of FMT, PRM Medical College, Baripada, Odisha,

⁵Associate Professor, Department of FMT, AIIMS, Bhubaneswar, Odisha.

ABSTRACT

Burn is a major public health problem in developing countries. The dowry and related bride burning incidences makes it a bigger challenge in Indian context. Profile of burn victims vary between communities, cultures and regions. To know the socio-demographic profile of burn victims, identify the most vulnerable and to determine underlying cause, this study was taken up in the only tertiary care hospital in western Odisha. This prospective autopsy based study between Jan 2014 to Sept 2015 done in VIMSAR, Burla, included 55 such cases of burn deaths. A majority of 72.8% were females with peak incidence in 21-30 yrs age group. Eighty percentage females were married and 73.33 % male victims were unmarried. Most (47.27%) cases were reported to take place in kitchens. All the female burns were within the premises of home. Fall of open flame lamps were the commonest source of fire followed by kerosene stoves. More than 70% of surface burns were detected in two third of fatal burns. The young married females in kitchen using kerosene stoves and flame lamps in rural area are identified as most vulnerable to fatal burn incidences. Specific strategies need to be developed to safe guard them.

Key words: Fatal burns, Autopsy, Dowry, Married female, Kitchen, Kerosene stove

INTRODUCTION

Burn deaths contribute for a significant proportion of all medico-legal autopsies in hospitals across India. Since long, fatal burns continue to be a major public health problem affecting all communities both rural and urban.^[1] It affects all ages from babies to elderly and is

a problem in both developed and developing world.^[2] Among the deaths due to burning, alleged dowry deaths are of great concern especially in Hindu communities of India.^[3] The practice of dowry and related bride burnings differ between regions, communities, cultures and economies. In most of the studies on burn deaths from India, females out number male burn victims by a large margin.^[1,3,4,5,6] Accidental burns in women occurring most commonly in kitchens where they spend more time in cooking using open fires.^[4,7] Married female burn victims far outnumber the unmarried females.^[8]

The etiological factors of burn injuries vary considerably in different communities and regions and hence the need for detailed epidemiological studies to

Corresponding Author:

Nayak Amarendra

Associate Professor,

Department of FMT, VIMSAR, Burla, Odisha, India

Mobile: 9437226031

E-mail: dramarnayak@rediffmail.com

understand the problem status in different regions.^[9] This autopsy based study is focused on the western part of the state of Odisha with an aim to determine the socio demographic characteristics of burn victims and compare the data with studies from other parts. By identifying the vulnerable victims and causative behaviour and events, precautionary measures can be suggested.

MATERIALS AND METHOD

A prospective study was conducted from January 2014 to September 2015 in the Department of Forensic Medicine and Toxicology, VIMSAR, Burla, a tertiary care Hospital in western part of Odisha. The fatal dry flame burn cases received for medico-legal autopsy during the period were the subjects in the study. The scalds, electrocution, lightening, radiation and chemical burns were consciously excluded from it. During the period, out of 2085 autopsies, 55 were such fatal dry heat burns. The information regarding age, marital status, time and place of occurrence, causative agent involved were collected from hospital records, documents submitted by police and from interview of accompanying family members conducted in a structured format. Detailed post mortem examination was done. All these data are compiled, analysed and compared.

RESULTS

Out of total 2085 autopsies held during the present study period, 55 (2.63 %) were of dry burn deaths. There were 40(72.8%) females and 15(27.2%) males among the fatal burn deaths with female to the male ratio are 2.6:1. The peak incidence was in the age group of 21-30 years. The age range of 11-40 years accounted for 85.36% of all female burn victims. (Table no- 1)

In our study group (table-2), 73.33 % of male burn victims were unmarried while 80 % of females were married. Majority 43 (78.18%) of burn victims were belonging to rural area. As evident from Table-3, higher incidences of burn deaths were observed in the months of January (23.63%) and December (18.18%) in comparison to rest of the year.

Table No. 1: Age and Sex Distribution of Burn Victims

Age (Years)	Male (%)	Female (%)	Total (%)
0-10	1 (1.1%)	0 (0%)	1 (1.8%)
11-20	4 (7.2%)	6 (10.9%)	10 (18.1%)
21-30	4 (7.2%)	21 (38.18%)	25 (45.45%)
31-40	4 (7.2%)	8 (14.54%)	12 (21.81%)
41-50	0 (0%)	2 (3.63%)	2 (3.63%)
51-60	1 (1.81%)	1 (1.81%)	2 (3.63%)
61-70	0 (0%)	1 (1.81%)	1 (1.81%)
71-80	1 (1.81%)	1 (1.81%)	2 (3.63%)
Total	15(27.2%)	40(72.8%)	55 (100%)

Table No. 2: Marital status of burn victims- gender wise

Age (Years)	Male (%)	Female (%)	Total (%)
Married	4 (26.6%)	32 (80%)	36 (65.45%)
Unmarried	11 (73.3%)	8 (20%)	19 (34.54%)
Total Cases	15 (100%)	40 (100%)	55 (100%)

Table No. 3: Months of occurrence of burn events

Month	No. of cases	Percentage
January	13	23.63%
February	0	0%
March	7	12.72%
April	2	3.63%
May	1	1.81%
June	1	1.81%
July	4	7.27%
August	3	5.45%
September	5	9.09%
October	2	3.63%
November	7	12.72%
December	10	18.18%
Total	55	100%

Maximum number of 26(47.27%) burn cases originated from kitchens and all such victims were females. Sixty five percent of fatal female burns were from kitchens and 17.5% had occurred in bed rooms. Two third of the male burn victims sustained the injury outside their homes and workplace but all the female burn victims suffered the burns within their homes. (Table-4)

Table No. 4: Place of occurrence of burn incidences

Place of occurrence	Male (%) (15 = 100%)	Female (%) (40 = 100%)	Total (%) (55 = 100%)
Kitchen	0 (0%)	26 (65%)	26 (47.27%)
Bedroom	2 (13.3%)	7 (17.5%)	9 (16.36%)
Living room	0 (0%)	2 (5%)	2 (3.63%)
Home (not specified)	3 (20%)	5 (12.5%)	8 (14.54%)
Courtyard	8 (53.3%)	0 (0%)	8 (14.54%)
Work place	2 (13.3%)	0 (0%)	2 (3.63%)

Fall of a lamp was reported to be the commonest source of fire followed by burn from kerosene stove or Chullah. Fire incidences originating from LPG stoves were reported in least number of cases. In about 15% of cases, there was a stated event of pouring of kerosene either by self or by others prior to setting fire intentionally. (Table-5)

Table No. 5: Cause and Source of Fatal Burns

Cause of fire	Total (%)
Kerosene stove	15 (27.27%)
Fall of Lamp	18 (32.72%)
Pouring of kerosene	8 (14.54%)
Chullah	12 (21.81%)
LPG	2 (3.63%)
Total = 55	55 (100%)

About two fifth burn fatalities in the present study groups had a body surface area involvement of more than 90% and two third of fatal burn victims had a body surface area involvement of more than 70%.(Table-6)

Table No. 6: Body Surface Area Involvement

Body surface are involved	Total (%)
0-30%	0 (0%)
30-49%	7 (12.72%)
50-69%	11(20%)
70-89%	14 (25.45%)
> 90%	23 (41.81%)
Total	55 (100%)

DISCUSSION

Burn deaths are very frequently encountered in post mortem centres across the country. Studies from urban centre like Mumbai^[4] reported 6.14% autopsies as burns, Aurangabad^[5] 13.75%, Chandigarh^[8, 9] and Varanasi^[2] as 19%. But the present study of ours, taken up in a tertiary care hospital in the western part of Odisha, show only 2.63% dry flame burns among all autopsies. This centre caters to the health need of a predominantly rural, thinly populated catchment with poor communication to here. The possible reason for this low burn load may be because, patients moving to other adjoining referral centres with better burn care units and better road and rail connectivity.

About a three fourth of burn victims of our study were females with a female to male ratio of 2.6:1. Similar female preponderance has been observed in almost all Indian studies.^[1,4-10] All these studies including ours show a peak incidence in the age group of 21-30 years, majority cases within 11-40 yrs and minimal towards extremes of ages. It is customary in the local society that, the newly married bride prepares food for in-laws in the kitchen irrespective of whether she is working or housewife. This sudden change in life style after marriage, lack of familiarity of kitchen chores coupled with factors like dowry related harassment,

torture and maladjustment with in laws, among many others could be the probable reasons behind females in twenties accounting for so many burn fatalities.

We found 80% of female burn victims as married and 73.33 % males were unmarried. Shinde A B et al^[3] reported 81.9% female burn victims being married. He also found 14 out of 16 males were married contrary to our figures. Zopate P R et al^[6] found 72% females as married and Harish D et al^[9] have observed it to be 78%. Our observation of majority males as unmarried is in contrast to all said studies. This could be due to delayed marriage, problem of unemployment along with its related stress and hazards affecting the men in the region, which needs further studies to understand.

Our study region is predominantly rural and we found 78.18% of burn victims belonging to rural setting. Similar reports were also received from other rural and semi urban study centres like Zanjad N P et al^[1] (76.3%), Zopate PR et al^[6] (83%) and Patel Tejas C et al^[7] (67.08%). However an urban based study from Mumbai by Vidhate S, Pathak H^[4] observed 74.31% cases came from urban area. The profile of cases in an institution depends upon the population it serves.

Table three of this article reflects that 41.81% of fatal burn events took place in the month of January and December, the peak winter in the region and next were March and November. Harish D et al^[8] found peak incidences in summer months of March and April in Chandigarh and Vidhate S^[4] in Mumbai showed a peak of 47.71% in summer months of Feb to May. In the harsh winter here, People use extra, thick and woollen clothes and use fire places, which could be the probable underlying reason of high winter incidences of fatal burns in our study.

Kitchen is identified to be the commonest place of occurrence of burn events. Among females 65 % such incidences originate from kitchens and in 66.6 % male cases, fire was outside home or work place. All the female burn victims of our study sustained burns within the home. Shinde A B et al^[3], Vidhate et al^[4], Zopate et al^[6], Patel Tejas C et al^[7] and Harish D et al^[9] in their studies also found kitchen the most common. Females in

the region mostly stay at home, cook food in kitchen and take care of family while men go out for work and stay largely out door. This could be the reason behind such observed trend as regards place of occurrence.

Rural population in the region have lesser access to safer cooking and electric lighting appliances and use open Chullah, kerosene stoves for cooking and kerosene lamps for lighting homes. This might be the reason; we got most fire incidences originated from fall of lamps (32.72%) and kerosene stoves (27.27). Gadge Sachin J et al^[10] has similar finding in this regard (fall of lamps- 48.2%, Kerosene stove- 29.6 %). Harish D et al^[9] in an urban study reported kerosene stove as commonest (64%) and Chhullah only in 6% cases. But our rural based study reflects Chullah contributing to 21.81% cases.

As depicted in table-6, all the fatal burns had total body surface area (TBSA) involvement of 30 % or more and in 41.81 % instances more than 90% burn was detected. Kumar Awdhesh^[2] found more than 90% burns in 40.67% cases of fatal burns and Zanjad N P et al^[1] reported more than 60% burns in 72 % cases. Fatality of burns increases with increasing TBSA involvement. Ghaffar Usama B et al^[11] found just 22% cases with more than 90% burns. Use of inflammable substances, multi tasking by women in kitchens ignoring safety rules, wearing loose synthetic ethnic dresses, self immolation or homicidal bride burning at home using kerosene etc helps in rapid spread of fire and could be responsible for high TBSA burns in the study.

CONCLUSION

The major observations of this study in western part of Odisha are largely matching with the studies from other parts of India. The most vulnerable groups identified are married females in their twenties and thirties from rural areas contracting flame and fire burns in kitchens while using kerosene stoves, open Chullah or from use of open fire lamps. Fatal female burns happened indoors and most such male cases were outdoors or in work places. Unmarried males found more prone in comparison to their married counterpart.

Hence, to safeguard the identified vulnerable groups from a devastating injury of burns, specific targeted strategies like creating social awareness, spreading the know how on safe kitchen practices, encouraging and providing safe cooking and lighting appliances needs to be made. In the long run, stressing upon overall socioeconomic development of the region and spreading public awareness against the social menace of dowry as well as gender inequality will be effective.

Conflict of interest: Nil

Source of support: Nil

Ethical clearance: It has been obtained from Institutional Ethics Committee, VIREC, VIMSAR Burla prior to commencement of study in 2014.

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Maternal outcomes of Intimate Partner Violence (IPV) During Pregnancy in India

Sonia R.B D'Souza¹, Ranjani P², Sweetey Fernandes³, Anitha S⁴

¹Associate Professor, ²Assistant Professor-Senior Scale, ³Assistant Professor, Dept. of Obstetrics and Gynecological Nursing, Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, ⁴Associate Professor, Dept. of Forensic Medicine, Kasturba Medical College, Manipal Academy of Higher Education, Manipal

ABSTRACT

Background: Pregnancy is a very challenging period, especially so if the pregnant woman is exposed to Intimate Partner Violence (IPV) during her pregnancy. The health of the mother during pregnancy is very important because the health of the fetus depends largely on that. IPV during pregnancy can cause several maternal health problems and issues that could be deleterious to health of the fetus. IPV during pregnancy is present but not reported as frequently and seems to receive less attention in the perinatal care when compared to other health conditions that occur during pregnancy.

Objective: To analyze objectively the maternal outcomes of pregnant women who had experienced Intimate Partner Violence (IPV) during their pregnancy

Methods: A comprehensive literature search was made in the following databases like PubMed, CINAHL, Google Scholar, Proquest and Science Direct for retrieving the related studies. Data were analyzed according to the objective. Narrative analysis was adopted to write this review.

Results: The study found that IPV experienced during pregnancy affects the physical, reproductive health, mental health as well the health seeking behavior of the pregnant woman.

Conclusion: It is pertinent to have proper screening mechanisms for IPV, which are functioning in the antenatal clinics. Availability of health care providers who are sensitive to the issues these women face and are able to screen IPV effectively is the need of the hour.

Keywords: Intimate Partner Violence, maternal outcomes, pregnant women

INTRODUCTION

Intimate partner violence (IPV) is considered as a societal evil having not only societal consequences but also clinical implications. The definition of IPV

is “behaviour within a current or former intimate relationship that causes physical, sexual or psychological harm, including acts of physical aggression, sexual or psychological abuse and controlling behaviors.”^[1] The synonyms for IPV are also “domestic violence, domestic abuse, battering, violence against women or gender based violence”. It is a type of violence, which occurs among heterosexual or same-sex couples. ^[2] Literature suggests that 85% of IPV is directed mostly towards women although IPV can occur against men also. ^[3]

Pregnancy causes a drastic transition in the lives of couples and is considered to be a major milestone. It is

Corresponding author:

Mrs. Ranjani P

Assistant Professor- Senior Scale

Manipal College of Nursing, Manipal Academy of Higher Education, Manipal

Email: ranjani.p@manipal.edu

Mobile: 0820-2922462

also a very challenging period. This period could also contribute to IPV, due to the vulnerability of the period in terms of physical, emotional, social and economic demands that pregnancy necessitates. This vulnerability extends to the perinatal period as well. The health of the mother during pregnancy is essentially important because the health of the fetus depends largely on that. IPV during pregnancy is present but not reported and seems to receive less attention in the perinatal care when compared to other health conditions that occur during pregnancy.^[4]

In fact, it must be noted that pregnancy does not protect women from IPV; in fact, it increases the vulnerability of women to it.^[5,6] The prevalence of IPV during pregnancy is as high as 20%.^[7] In Asian countries, it is as high as 4-48%^[8] and the prevalence in India is found to be about 21-28%.^[9] Literature suggests that women experience many morbidities if they are exposed to IPV. Depression and mental ill-health are the most likely disorders experienced by women exposed to IPV during pregnancy.^[10] Adding to the woes of these women who are exposed to IPV during pregnancy, they also experience adverse perinatal outcomes like premature labor and have a risk of having low birth weight infants.^[11, 12, 13]

SIGNIFICANCE OF THE REVIEW

Based on this background, the researchers have taken up a review to analyze the maternal outcomes of IPV during pregnancy in the Indian population from the available literature. There are few studies done in this particular area with varied objectives and outcomes. This review tries to combine the different aspects of maternal outcomes of IPV during pregnancy from the available literature.

METHOD

Studies reporting on maternal outcomes of pregnant women (from confirmation of pregnancy to term gestation) exposed to IPV were selected for the review. A comprehensive literature search was made in the following databases namely the Google Scholar,

PubMed, Proquest, CINAHL, and Science Direct. The “MeSH and text word terms for <maternal outcome(s)> combined with MeSH and text word terms for <Intimate Partner Violence>. Synonyms were also used in place of IPV like “domestic violence, domestic abuse, battering, violence against women or gender based violence”. These were then combined with text word terms for <maternal outcomes of women during pregnancy to IPV>”. The researchers excluded conference proceedings for which there were no full text papers, narrative reviews, dissertations, case-reports, letters to the editor and records for which there were no abstracts. Since the study was a review study, ethical clearance was not sought.

All databases were searched between 2013 - 2017. From the related studies, only those relevant for the objectives were analyzed to do a narrative review. The selection criteria employed included publications in peer-reviewed journals, studies published in the last five years, studies with full-text available, written in English only and studies done on human beings. A total of 3110 records were identified through database searching. After the initial screening 3102 records were avoided since, they did not focus on maternal outcomes of IPV during pregnancy. For the present review, eight studies, which included original research like Randomized Controlled Trials (RCTs), cohort studies, case-control studies and cross-sectional surveys were included.

RESULTS AND DISCUSSIONS

The evidence regarding the maternal outcomes of IPV during pregnancy are summarized from the eight scientific articles and are described under the following.

PRENATAL HEALTH SEEKING BEHAVIOR

It is a known fact that prenatal care is very essential to prevent adverse birth outcomes. In fact, pregnancy is time that usually women have regular health visits. Experiencing IPV during pregnancy could make women seek prenatal care later than the recommendations. In addition, they may also miss or postpone their routine

prenatal visits to their health care providers. This may also increase their vulnerability to gestational diseases.

PHYSICAL HEALTH

Adequate weight gain and maintenance of good physical health during pregnancy is a predictor for good perinatal outcomes. However, women who experience IPV during pregnancy often have poor weight gain and other gestational diseases associated with it. Poor weight gain is also associated with inadequate nutritional intake including micronutrients and supplements, which may also be a consequence of experiencing IPV. In worst-case scenario, physical trauma may also cause maternal mortality.

MENTAL HEALTH

Women who experience IPV during pregnancy are also likely to suffer from co-morbid mental disorders like depression, Post Traumatic Stress Disorder (PTSD), other psychosocial difficulties and behavioral problems as well. If the woman exposed to IPV suffers from depression, then this may lead her to engage in substance abuse, alcohol consumption or smoking. IPV during pregnancy may also lead to committing self-harm or suicide.

REPRODUCTIVE HEALTH

Women who experience IPV are also exposed to the risk of contracting sexually transmitted diseases due to the high-risk behavior of their partners. These women are also prone to get urinary tract infections. Unplanned or unintended pregnancies and abortions are also very frequently reported by these women.

CONCLUSION

It is very important that proper screening mechanisms for IPV are at place especially in the antenatal/prenatal clinics and the antenatal Out Patient Departments (OPDs). It is not only important that proper screening mechanisms are available, it is also essential that proper training is provided to the health care providers to screen women at risk appropriately and be sensitive in their dealing with them.

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Study of Alleged Dowry Death Cases at a Morgue in West Bengal

Vikas Gurbani¹, Shagun Thakur¹

¹Asst. Prof., Dept. of F.M.T., Kalinga Institute of Medical Sciences (KIMS) & PBMH, Bhubaneswar.

ABSTRACT

Sec. 304-B of Indian Penal Code states “Where the death of a woman is caused by any burns or bodily injury or occurs otherwise than under normal circumstances within seven years of her marriage and it is shown that soon before her death she was subjected to cruelty or harassment by her husband or any relative of her husband for, or in connection with, any demand for dowry, such death shall be called “dowry death”, and such husband or relative shall be deemed to have caused her death^[1]. The predominant types of dowry crimes relate to cruelty (which includes torture and harassment), domestic violence (including physical, emotional and sexual assault), abetment to suicide and dowry death (including, issues of bride burning and murder). Maximum no. of cases 31(42.6%) were in the age group of ‘19-22 yrs’(Table – II); followed by 27(37.0%) in the age group of ‘23-26 yrs’. The other age groups in decreasing order of frequency are ‘27-30 yrs’ – 8 (10.9%) cases; ‘15-18 yrs’ – 5 (6.8%) cases and ‘31-34 yrs’ – 2 (2.7%) cases. The cause of death in majority of the cases – 46(63%) was burn injuries (Table – VII). The second major cause of death was hanging as seen in 12(16.4%) cases, followed by poisoning in 11(15.1%) cases. There were 2(2.7%) cases each of strangulation and head injury.

Keywords: alleged dowry deaths, unnatural deaths in married females,

INTRODUCTION

“Dowry” in the sense of the expression contemplated by Dowry Prohibition Act is a demand for property of valuable security having an inextricable nexus with the marriage, i.e., it is a consideration from the side of the bride’s parents or relatives to the groom or his parents and/or guardian for the agreement to wed the bride-to-be ^[1]. The dowry system is thought to put great financial burden on the bride’s family^[2]. In some cases, the dowry

system leads to crime against women, ranging from emotional abuse, injury to even deaths^[3]. The payment of dowry has long been prohibited under specific Indian laws including, the Dowry Prohibition Act, 1961 and subsequently by Sections 304B and 498A of the Indian Penal Code.

Although Indian laws against dowries have been in effect for decades, they have been largely criticised as being ineffective^[4]. The practice of dowry deaths and murders continues to take place unchecked in many parts of India and this has further added to the concerns of enforcement^[5].

Dowry is considered a major contributor towards observed violence against women in India. Some of these offences include physical violence, emotional abuses, and even murder of brides and young girls prior to marriage^{[6][7][8]}. The predominant types of dowry

Corresponding author:

Dr. Shagun Thakur

Asst. Prof., Dept. of F.M.T., Kalinga Institute of Medical Sciences (KIMS), Kusubhadra Campus, KIIT Road, Patia, Bhubaneswar -751024. Odisha

Mobile: +91 8895553861

Email: shagun.thakur@ymail.com

crimes relate to cruelty (which includes torture and harassment), domestic violence (including physical, emotional and sexual assault), abetment to suicide and dowry death (including, issues of bride burning and murder). Sec.304-B of Indian Penal Code states “Where the death of a woman is caused by any burns or bodily injury or occurs otherwise than under normal circumstances within seven years of her marriage and it is shown that soon before her death she was subjected to

cruelty or harassment by her husband or any relative of her husband for, or in connection with, any demand for dowry, such death shall be called “dowry death”, and such husband or relative shall be deemed to have caused her death^[1].

According to National Crime Research Bureau (India)^[9], the following is the year-wise statistics of dowry death cases registered across India :

Crime Head	2008	2009	2010	2011	2012	Percentage variation in 2012 over 2011
Dowry Death (S.302/304 IPC)	8172	8383	8391	8618	8233	-4.5
Cruelty by husband and relatives (S.498-A IPC)	81, 344	89, 546	94, 041	99, 135	106, 57	7.5

Since, dowry death is an unnatural death of a female, these cases often undergo post-mortem examination to ascertain the actual cause of death. The role of a forensic expert is important not only in determining the cause of the death but also to find out the nature of death – whether accidental, suicidal or homicidal.

MATERIALS AND METHODS

This study was conducted at Kolkata Police Morgue under Department of Forensic & State Medicine, Medical College, Kolkata. The period of this study was from 1st June’11 to 31st May’12. During this period, a total of 1298 autopsies were conducted at Kolkata Police Morgue of which 73 cases were of alleged dowry deaths. All these 73 cases are part of this study. The data is collected from inquest reports, investigating officer (I.O.), post-mortem reports and direct interviewing of relatives and in-laws of victim/deceased. The data collected during this study is analyzed in tabular form along with its representation in form of diagrams & charts like bar-diagram, pie-chart etc.

OBSERVATIONS AND RESULTS

Out of these 1298 cases, 73 were alleged dowry death cases which are included in this study.

Maximum no. of cases 31(42.6%) were in the age group of ‘19-22 yrs’(Table – I); followed by 27(37.0%) in the age group of ‘23-26 yrs’. The other age groups

in decreasing order of frequency are ‘27-30 yrs’ – 8 (10.9%) cases; ‘15-18 yrs’ – 5 (6.8%) cases and ‘31-34 yrs’ – 2 (2.7%) cases.

Table No. 1: Age-group of cases

Age (in years)	Frequency of Cases	Percentage
15-18	5	6.8%
19-22	31	42.6%
23-26	27	37.0%
27-30	8	10.9%
31-34	2	2.7%
Total	73	100.0%

According to the age at the time of marriage (Table – II), half of the alleged victims were in the age group of ‘19-22 yrs’ – 37 (50.7%) cases, at the time of their marriage. The other age-groups in decreasing order of frequency are ‘15-18 yrs’ – 20 (27.4%) cases, ‘23-26 yrs’ – 13 (17.8%) cases and ‘11-14 yrs’ – 3 (4.1%) cases.

Table No. II: Age-group of cases at the time of marriage

Age at the time of Marriage (in years)	Frequency of Cases	Percentage
11-14	3	4.1%
15-18	20	27.4%
19-22	37	50.7%
23-26	13	17.8%
Total	73	100%

As per the duration of marriage (Table – III), maximum no. of cases had completed two years of marriage – 15 (20.5%) cases, closely followed by 14 (19.2%) cases who had completed three years. The other groups in decreasing order of frequency are ‘4 years’ – 10 (13.7%) cases; ‘<1 year’ – 9(12.3%) cases, ‘5 years’ – 9(12.3%) cases, ‘6 years’ – 9(12.3%) cases and ‘1 year’ – 7(9.6%) cases

Table No. 3: Duration of Marriage

Duration of Marriage (in years)	Frequency	Percentage
Less than 1 year	9	12.3%
1 year	7	9.6%
2 years	15	20.5%
3 years	14	19.2%
4 years	10	13.7%
5 years	9	12.3%
6 years	9	12.3%
Total	73	100.0%

According the place of residence, around half of the alleged victims were from urban population – 36(49.3%) cases, followed by 29(39.7%) cases from semi-urban population and lastly 8(11.0%) cases were from rural population.

In majority of the cases – 66(90.4%), the uterus of the alleged victim at the time of autopsy was found to be non-gravid, but in 7(9.6%) cases gravid uterus was found, which shows they were pregnant at the time of incident.

The cause of death in majority of the cases – 46(63%) was burn injuries (Table – IV). The second major cause of death was hanging as seen in 12(16.4%) cases, followed by poisoning in 11(15.1%) cases. There were 2(2.7%) cases each of strangulation and head injury

Table No. 4: Cause of Death

Cause of Death	Frequency of Cases	Percentage
Burns	46	63.0%
Hanging	12	16.4%
Poisoning	11	15.1%
Strangulation	2	2.7%
Head Injury	2	2.7%
Total	73	100.0%

The manner of death in majority of the cases – 35(47.9%), was suicidal (Table – V), followed by accidental in 23(31.5%) cases. In 7(9.6%) cases, the nature of death was homicidal and in 8(11.0%) cases the nature of death was undetermined or investigation was pending.

Table No. 5: Manner of Death

Nature of Death	Frequency of Cases	Percentage
Accidental	23	31.5%
Suicidal	35	47.9%
Homicidal	7	9.6%
Undetermined/ Pending Investigation	8	11.0%
Total	73	100.0%

DISCUSSION

Table – I shows that maximum number of the alleged victims were in the age group of ‘19-22 years’ (42.6%) and 27(37.0%) victims were in the age group of ‘23-26 years’. So, almost 80% of the alleged victims were in the age group from ‘19-26 years’. Agrawal & Agrawal (1967) ^[10] have reported in their study of 84 female burns the 60(70.43%) subjects were in the age group of 15-30 years. Kumar et al (1989)^[11] in their study on 152 burnt married females reported that 103(67.75%) cases were in the age group of 16-25 years. Das Gupta and Tripathi (1984) ^[12] reported in their study of burnt wife syndrome that 85% cases of burnt wives were between the age of 16-30 years and the rest 15% were beyond the age of 30 yrs. Sakhare (1985) ^[13] had analyzed 1200 suspicious deaths of married females and reported their age group wise distribution as follows :-15-20 years - 582 cases; 21-25 years - 348 cases; 26-30 years - 209 cases; >31 years - 61 cases. Saxena (1986) ^[14] observed in his study that there were 60% of the bride burning in the age of 18-20 years and 30% in the age of 20-25 years. Only 10% of the victims were above the age of 25 years. Radhika, R.H. & Anand, K. (2011)^[15] in a similar study reported that majority of the victims were in the age group of 18-25 years.

It is evident from the table-II that in 23(31.5%) cases the age of the alleged victim at the time of marriage was between 11-18 years, i.e., they got married before attaining the age of majority. This shows that the system of early marriage of the girl child is still prevalent despite the legal norms in the country.

As far as the duration of marriage is concerned, Radhika R.H. & Anand K (2011)^[15] in a similar study reported that the victims died within three years of their marriage. This shows that women were subjected to abuse and torture by their husband and in-laws in the early years of marriage so that more dowry can be obtained from the victim's family. They ultimately gave up their life or were killed and the groom can marry once again for another handsome dowry.

As per the living conditions, Das Gupta and Tripathi (1984)^[12] reported that nearly equal number of victims were from rural and urban areas. In their study 54% cases were from rural areas and 46% cases were from urban areas. According to Sakhare (1985)^[13], most of the deaths were from villages (54%) and urban areas (25%) that the city areas (21%). Kumar et al (1989)^[11], reported in his study that 73% of the victims were from rural population, 21% from urban population and 6% from semi-urban population. The results of my study reflect the current scenario in the country as many people migrate to bigger and smaller cities in search of occupation. Also, my study area mainly involves urban population.

In 7 cases, where the alleged victim was found to be pregnant at the time of incident could be due to the fact that during pregnancy, the women become irritable, listless and thus they either commit suicide or succumb to accidental burn injuries, when overburdened with their household duties.

According to the cause of death, Agnihotri, A. (1998)^[16] in a similar study reported that majority (67.55%) of deaths are due burns followed by deaths due to poisoning (14.75%), whereas asphyxia accounts for lowest incidence of deaths. Radhika, R.H. & Anand, K. (2011)^[15] in a similar study reported that hanging constituted the maximum number of dowry deaths i.e. 47 (78.33%) cases out of 60 cases, followed by poisoning 7 (11.66%) cases, burns 5 (8.33%) cases, strangulation 1 (1.66%) case.

As per the manner of death, Radhika, R.H. & Anand, K. (2011)^[15] in a similar study reported that 93.33% cases were suicidal and 5% cases were accidental and remaining 1.66% cases were homicidal in nature. Thus, majority of the victims succumbed to the pressure of the abuse caused by their husbands or in-laws and gave up their lives. In a few cases, the victims were allegedly killed by their husband or in-laws as seen in 9.6% cases.

CONCLUSION

Dowry is a problem which is deeply rooted in our Indian system. In order to change the situation, measures have to be taken at many levels to change the face of the society.

Legal Measures: Although laws are in place to prevent this unfortunate incident from happening but they are not enforced properly. Due to the delay in delivery of justice, many criminals escape punishment. There should be special courts to handle these cases. This will help in the quick disposal of cases and reinstate the people faith in the judiciary.

The law-enforcing agencies should investigate the incidents of dowry deaths more thoroughly, particularly the crime-scene and collect as much evidence as possible. All the cases of torture of wives by their husband or in-laws or dowry deaths should be reported without fear. Now-a-days, even after the reporting of cases has increased, still the conviction rate in these cases is as low as 18%. This can be due to the fact that police fail to investigate the cases properly or fail to collect the necessary evidence required.

The voluntary non-government organisations and law-enforcing agencies should work hand-in-hand to prevent and control crime against women.

The role of forensic expert is also important. After a forensic expert receives a case of alleged dowry death as evident from the inquest report, he should perform a meticulous post-mortem examination of the victim and try to gather as much information as possible, so as to the cause and nature of death. He should make it a point to visit the scene of crime in cases of alleged dowry deaths.

Social Measures: Taking or giving dowry should be seen as derogatory and should be discouraged in all forms.

The role of media is important as it can reach many people across the country. A country-wide campaign on many platforms like – television, print, internet with famous personalities should be made to make people aware of this heinous crime.

Social boycott of families which have harassed bride for dowry is a string weapon to effect social change.

The parents of the bride should not let their daughters marry in a family where the groom's families are asking for dowry.

If a woman in order to come out of a failed marriage due to abuse/torture and takes a divorce, she should not be seen as an outcast and should be supported socially and financially to lead an independent life or to remarry again.

ETHICAL CLEARANCE

Ethical clearance taken from Institutional Ethics Committee of Medical College & Hospital, Kolkata.

Conflict of Interest : None

We certify that the manuscript has been read and approved by both of us and we agree with the ranking of the authorship. We also state that this study is our original and honest work.

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