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Identification of Sex from Maxillary Sinus in Northern Maharashtra

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ABSTRACT

Background: Maxillary Sinus are delicate spaces between maxillary bones and floor of orbital cavities, helps to lightened the skull and resonance of voice after puberty. Variations in size and shape were observed, owing to their delicacy they get break hence CT scan study was carried out both sexes.

Methods: 25 male 25 female aged between 25-55 year healthy adults were studied, with CT images, medio-lateral, supero-inferior and antero-posterior dimensions and volumes of MXS were measured in both sexes and results were analysed statistically.

Results: ML Right SIR right, AP right ML (left) APC (left) volumes of MXS were compared and there was highly significant p value.

Conclusion: This radiological study (CT scan) of sexual dimorphism of MXS will be useful to medico-legal expert, anthropologist and anatomist

Keywords: Maxillary Sinus, CT Scan, Morphometric Volumes, Adults.

INTRODUCTION

Many criteria are available for sexual dimorphism of crania but least data is available regarding maxillary sinus because maxillary bones are delicate hence they are called pneumatic bones and more prone to get destructed after burial in the soil, as they are delicate, hence their morphometric study was done radiologically.

Maxillary sinus lightens the skull and help in resonance of voice.1 Maxillary sinus (MXS) is first paranasal sinus (PNS) to develop and is located in the right and left maxillary bones and consists of two pyramidal shaped air filled cavities lined by mucosa. The MXS tend to appear at the second month of embryonic life and complete its development by the age between 18 to 20 years of life (3)(4) but the size and shape of MXS varies amongst individuals between genders and different ethnic groups. However the size and shape of MXS will be stabilized after second decade of life thus reliable measurements can be achieved after 20th year of age; will be an ideal study (4). The variations of MXS in both genders are also contributed by nutritional, genetic, hormonal, environmental factors. Hence present study also represents northern Maharashtra population.
Material and Method

25 Male and 25 Female aged between 25-55 years visiting to ACPM Medical college hospital Dhule-424002 (Maharashtra) were studied.

Inclusive Criteria: Volunteers did not have any pathology of para-nasal sinuses were selected for study.

Exclusion Criteria: The persons who had undergone surgery of PNS or Norma frontalis History of fracture of Norma frontalis. The person who had any pathology in PNS, and immune compromised patients were excluded from study.

Methods: Non-contrast CT scan was performed to study the morphometry of Maxillary sinuses in both sexes using GECT/e dual slice CT scanner (GE health care technologies, Waukesha, WI, USA). Prior to the scan every patient was instructed to remove the metallic objects, jewellery, hairpins etc, from the head, to neck region and positioned on CT scan table in prone position. The patient’s neck was hyper-extended with the chin resting on pad for stabilization. Pads were inserted on both sides of the head. The gantry was angulated to make it par perpendicular to the hard palate 3mm thickness were used on preliminary. Scout view extending form anterior margin frontal sinus to the posterior margin of spheroid sinus with a reconstruction matrix zone of 512X512 at 120 KV, 100MA coronal CT was performed after instructing the volunteers to remain steady during the entire procedure.

The measurements like ML and SI was studied, maxillary sinus was in the widest position with the help of on screen (figure-1). To measure the AP dimensions of the maxillary sinus, the first and last appearance of the sinus was noted in the sequential coronal CT sections and number of sections between them were selected finally selected section were multiplied by 3 (thickness of single section to find out the AP of the sinus. Maxillary sinus volume (MSV) was calculated by using the paint on slice tool on the work station. To define a volume of the sinus was traced manually on each slice of the image stack using on the screen mouse pointer in the coronal plane (figure-2). Once the tracing was complete, the work station automatically segmented the entire volume of the sinus form the surrounding structure and the segmented portion could be visualized and manipulated in 3D.

At this point switching to the histogram view on the work station (fig-C) automatically reflected the volume of the sinus in the cubic centimetres (CC) of both right and left maxillary sinus. The duration of study was 2017 to 2019.

Duration of study was from April-2021 to March-2022

Fig. 1: Linear measurement of medio-sinus and super inferior dimension of maxillary sinus
Table-1: Comparison of various dimensions of maxillary sinus measured on CT scan studies in both sexes.

- ML Right 28.32 (SD±3.15) in males, 26.92 (SD±4.15) in female, t test value was 1.34 and p value significant (p<0.001).
- SIR (Right) 39.05 (SD± 3.60) in males, 34.21 (SD±4.30) in females, t test value 4.25 and p value p<0.001. (p value was highly significant)
- AP (Right side) 43.42 (SD±3.30) in males, 37.06 (SD±2.28) in females, t test 7.90 and p<0.001(p value was highly significant).
- ML (left side) 28.09(SD±2.38) in male, 24.08 (SD±4.30) in females, t test 4.08 and p<0.004 (p value was highly significant).
- SIL (left side) 37.20 (SD±4.18) in males, 34.09 (SD±3.58), t test value 2.82 and p<0.005 (p value was highly significant).
- APL (left side) 41.38 (SD±2.62) in males, 38.08 (SD±2.50) in females, t test was 4.44 p<0.001 (p value was highly significant).
**Statistical analysis:** Comparisons of various dimensions of MVS measured in CT scan studies were studied with t test analysis. The statistical study was carried out SPSS software.

**OBSERVATION AND RESULTS**

Table-2: Comparison maxillary sinus volume measured in both sexes in CT scan study

- VR - 18.22 (SD±2.50) in males, 13.28 (SD±3.12) in females, t test value was 6.17 and p<0.01 (p value was highly significant).
- VL - 17.07 (SD±2.70) in males, 12.42 (SD±3.40) in females, t test 5.35 and p<0.001 (p value was highly significant).

**DISCUSSION**

Present study of Identification of sex from MXS in northern Maharashtra population. ML (right)26.92 (SD±3.2) in males, 26.92 (SD±4.15) in females, t test was 1.84 p<0.001. SIR (right)39.63 (SD±3.60) in males, 34.21 (SD±4.30) in females, t test was 4.29 and p<0.001. AP (Right side) 43.42 (SD±3.30) in males, 37.06 (SD±2.28) in females, t test was 7.90 and p<0.001. ML (left side) 28.09 (SD±2.38) in males, 24.08 (SD±4.30) in females, t test value was 4.08 and p<0.004. SIL (left side) 37.28 (SD±4.18) in males, 34.09 (SD±3.55) in females, t test was 2.82 and p<0.005. APL (left side) 41.38 (SD±2.62) in males, 38.08 (SD±2.50) in females, t test was 4.55 and p<0.001 (Table-1). Compassion of MXS volume measured in both sexes in CT scan study. VR 18.22 (SD±2.50) in males, 13.28 (SD±3.10) in females, t test was 6.17 and p<0.001. VL study had 17.07 (SD±2.70) in males, 12.42 (SD±3.40) in females, t test value was 5.35 and p<0.001 (Table-2). These findings were more or less in agreement with previous studies (5)(6)(7).

It was interesting to note that left MXS width was more discriminate than right MXS for sexual dimorphism in various studies of north and south Indian studies (8)(9). Because it is well established fact that, foramina or sinus/ space in the bone tends to starts at surface irregularities because strain energy tends to concentrate such points. It was also noted that right MXS was larger and wider in abroad studies (10)(11). This anatomical variability between genders could be environment or nutritional adaptations because skeleton of a particular individual is able to adapt to its owner’s way of life.

It was also mentioned that till puberty sexual dimorphism is insignificant in crania but after puberty hormonal, nutritional environmental factors play vital role in the gender determination in India and abroad crania.

It can’t be denied that, male’s needs to have correspondingly bigger lungs to support their relatively more massive muscles and body organs. Secondly males need a large air way, which begins with nose and nasopharynx. In other words, physiological changes in nasal cavity size and shape occur as direct result of respiration related needs, such as warming and humidifying inhaled air. As the MXS occupies the remaining space within the naso-maxillary complex, it also increase in size hence morpho-metric values is higher in males than females.

**SUMMARY AND CONCLUSION**

The present study of gender determination of MXS by CT scan study is an important step in identification in Medico-legal practice. It has to be borne in mind that MXS tend to stabilize morpho-metrically after second decade of life. Hence radiographic images will prove ideal in sexual dimorphism after second decade of life but this study further demands genetic, nutritional hormonal embryological study because the factors which determine the time of ossification are still obscure.

**Limitation of Study** – Due to tertiary location of research centre, small number of patients, lack of latest techniques, we have limited findings and results.

- This research paper was approved by Ethical committee of ACPM Medical College hospital Dhule-424002 (Maharashtra)
- No Conflict of Interest
- No Funding
Table 1: Comparison of various dimensions of Maxillary Sinuses measured on CT scan studies in both sexes

<table>
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<tr>
<th>Sl. No</th>
<th>Particulars</th>
<th>Male (25) Mean value SD±</th>
<th>Female (25) Mean value SD±</th>
<th>T test value</th>
<th>P value</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>ML Right</td>
<td>28.32 (±3.15)</td>
<td>26.92 (±4.15)</td>
<td>1.34</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>2</td>
<td>SIR (Right)</td>
<td>39.03 (±3.60)</td>
<td>34.21 (±4.30)</td>
<td>4.29</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>3</td>
<td>AP (Right side)</td>
<td>43.42 (±3.30)</td>
<td>37.06 (±2.28)</td>
<td>7.90</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>4</td>
<td>ML (Left side)</td>
<td>28.09 (±2.38)</td>
<td>24.08 (±4.30)</td>
<td>4.08</td>
<td>P&lt;0.004</td>
</tr>
<tr>
<td>5</td>
<td>SIL (Left side)</td>
<td>37.20 (±4.18)</td>
<td>34.09 (±3.58)</td>
<td>2.82</td>
<td>P&lt;0.005</td>
</tr>
<tr>
<td>6</td>
<td>APL (Left side)</td>
<td>41.38 (±2.62)</td>
<td>38.08 (±2.50)</td>
<td>4.55</td>
<td>P&lt;0.001</td>
</tr>
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MLR = Right Medio-lateral dimension of right side.
SIR (Right) = Supero-Inferior Dimension of right side.
AP (Right side) = Antero posterior dimension of side right.
ML (Left side) = Medio- lateral dimension of left sinus Maxillary sinus.
SIL = superior-Inferior dimension of left maxillary.
APL (left side)= left Antero-posterior dimension of left Maxillary sinus.

Table 2: Comparison of Maxillary sinus volume measured an in both sexes

<table>
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<tr>
<th>Sl. No</th>
<th>Particular</th>
<th>Male (25) Mean value SD±</th>
<th>Female (25) Mean value SD±</th>
<th>t test</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VR</td>
<td>18.22 (±2.50)</td>
<td>13.28 (±3.12)</td>
<td>6.17</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>2</td>
<td>VL</td>
<td>17.07 (±2.70)</td>
<td>12.42 (±3.40)</td>
<td>5.35</td>
<td>P&lt;0.001</td>
</tr>
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</table>

VR = Volumes of Right Maxillary sinus
VL = Volumes of Left Maxillary sinus

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CASE REPORT

Blunt Force Trauma in a Suspected Case of Drug Overdose Death: a Dilemma for Forensic Pathologists

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ABSTRACT

Deaths resulting from blunt force injury are some of the most common cases encountered by a practising forensic pathologist. At the same time, deaths due to drug abuse, especially synthetic opioids, are also a common phenomenon all over the world. In this paper, an interesting case is reported wherein a dead body brought as a case of drug overdose had tell-tale signs of blunt trauma on the body. The injuries were present on the non-accessible parts of the deceased’s body pointing towards homicide. This case has been reported considering the interesting nature of the case as well as to emphasize the importance of meticulous postmortem examination so that the opinion may not be influenced by the history given by the investigating agencies.

Keywords: History, drug overdose, blunt force trauma, death

INTRODUCTION

Opioid abuse has been a global menace for centuries. The state of Manipur is a border state with neighbouring Myanmar, which is a part of the ‘Golden Triangle’, and considered a major transit point for drug trafficking and has many drug-dependent people, especially between the ages of 16 and 45.1

It is known that synthetic opioids are refractive to reversal by antagonists and have often proven lethal.2 On the other hand, one million people die annually worldwide due to homicides.3 However, homicidal blunt force trauma in a case of suspected accidental drug overdose death is a challenge to investigate and requires a thorough examination of all aspects of the case.

CASE REPORT

A 24-year-old male was brought to a peripheral hospital in Imphal, Manipur (India), late at night for treatment as a suspected case of drug overdose; however, he was declared brought dead by the doctor. The history given by the police was that he was a drug addict, and he attended a party along with his friends the previous evening. He had injected himself with some drug after which he fell asleep. At midnight, when his friends tried to wake him up, he was not responding, and white froth was seen coming out of his mouth and nostrils.

AUTOPSY FINDINGS

Rigor mortis was fully developed and postmortem staining was present at the back and
fixed. The face was congested; lips, fingertips and toes were cyanosed. White froth was seen around the mouth and nose (Fig 1). An injection mark was seen over the right cubital fossa, red in colour (Fig 2). Multiple abraded contusions were seen over the back, across the midline, over an area (20cm x 16cm), with sizes ranging from (2cm x 1cm) to (9cm x 1.3cm), 108cm above the heel, red in colour (Fig 3). Multiple abraded contusions were seen over the anterior aspect of the right leg, over an area (18cm x 10cm), with sizes ranging from (1cm x 0.8cm) to (4cm x 1cm), 25cm above the heel, red in colour (Fig 4). Scalp haematoma, (5cm x 6cm), was present over the right occipital region, 1cm from the midline; and (6cm x 3cm), over the left occipital region, 3cm from the midline; red in colour (Fig 5). Subdural haemorrhage with corresponding subarachnoid haemorrhage was seen over bilateral occipital lobes and the cerebellum (Fig 6). The stomach contained brownish-coloured fluid with semi-digested rice particles @ 100 ml with no peculiar
smell (Fig 7). Brain & lungs were congested and oedematous. All the other organs were also congested. Histopathology Examination showed features of interstitial oedema & congestion in the lungs, heart tissues showed congestion and the kidneys showed acute tubular necrosis. High-Performance Liquid Chromatography (HPLC) detected morphine in the blood. The final opinion as to the cause of death was given as “Asphyxia with intracranial haemorrhage resulting from blunt head trauma”.

DISCUSSION

A death is labelled as suspicious if it is unexpected, and its circumstances or cause are unexplained in the early investigation. The body was brought by the police as a case of a suspected drug overdose. It is common for substance-abusing individuals to accidentally injure themselves because of inebriation or intoxication, which impairs judgment or motor control or coordination. At the same time, inflicting injury to the head is one of the most efficient methods of homicide as assailants often select a part of the body, where the maximum damage can be done with minimum effort. Further, an overdose of opioids can suppress the respiratory system, resulting in hypoxia which can result in variable levels of brain damage, ranging from transient cognitive impairment to death. However, the presence of multiple blunt trauma on the body with associated head injury baffled the autopsy surgeons regarding the cause and nature of death in the present case. It appeared that the drug overdose led to considerable harm to respiratory control in presence of blunt head trauma. Hence, asphyxia and homicidal blunt head trauma could have contributed to the sudden death of the person. Interestingly, the autopsy findings in the present case helped in turning the investigation towards homicide.

CONCLUSION

The present case was a challenge for the autopsy surgeon since there were many factors which contributed to the cause of death. Both head injury and drug overdose can individually cause death in ordinary circumstances. In the present case, autopsy helped in establishing the cause and manner of death, and helped in the investigation of the crime in the right direction.

Ethical clearance: Taken from Research Ethics Board Committee, RIMS, Imphal.

Source of funding: Nil

Conflict of Interest: Nil

REFERENCES:

Pattern of Medico-Legal Cases in the Casualty Department of a Tertiary Care Hospital in the Moradabad District

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1Assistant Professor, 2Associate Professor, 3Professor and Head, 1-3Department of Forensic Medicine, TMMC & RC, Moradabad, 4Assistant Professor, SRTRGMCH, Ambajogai.

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ABSTRACT

Introduction: Casualty or now labeled as “Emergency department” by National Medical Commission of India, the name of the department itself explains that every emergency case should enter into any hospital through that department, including Medico-legal cases. Casualty medical officer is the first treating doctor and it is his/her responsibility to determine either the case should be labeled as medico-legal or not and then accordingly intimation to police, documentation and report submission is done in regards to evidence collection and appear in the court as expert witness.

Objective: In present study, an attempt is made to know the pattern and magnitude of medico-legal cases.

Materials and methods: This is a retrospective, cross-sectional study which was conducted in Teerthanker Mahaveer Medical College & research Hospital, Moradabad to study pattern of medicolegal cases for one year (from 1st August 2021 to 31st July 2022).

Observation and Result: This study revealed that, road traffic accidents (RTA) constituted majority (58.31%) of medico-legal cases followed by poisoning (13.24%) and fall from height (10.14%). Majority of cases were male (73.24%). The most of the cases were in the age group 21-30 years i.e. 34.65%. The most of cases were reported in casualty between 06.00 p.m. to 11.59 p.m. (38.31%) followed by 12.00 p.m. to 06.00 p.m. (32.11%). The maximum case were reported in October (16.06%) followed by November (12.96%). The most of cases reported in Rainy season (July-October) (36.06%) followed by winter (33.24%).

Conclusion: In our study, road traffic accidents constituted most common type of medicolegal case and males outrun female cases. Most common age group was 21-30 years. Most cases occurred in the month of October while rainy season was common in regards to seasonal variation. Most of the cases encountered between 06.00 pm to 11.59 pm. Most of the cases were, from outside of Moradabad region constituting.

Keywords: Medico-legal cases, Pattern, Road Traffic Accident (RTA), Season, Casualty department.

INTRODUCTION

Casualty or now labeled as “Emergency department” by National Medical Commission of India, the name of the department itself explains that every emergency case should enter into any hospital through the department, including Medico-legal cases. On duty, casualty medical officer is the first treating doctor and it is his/her responsibility to determine either the case should be labeled as medico-legal or not and then accordingly intimation to police, documentation and report submission is done in regards to evidence collection and to appear in the court in future, as expert witness. MLC (Medico-legal Register) register
and documents should be preserved properly, considering their importance in court.

List of medicolegal cases is exhaustive. Cases that are to be treated as medicolegal are: (a) All cases of injuries and burns - the circumstances of which suggest commission of an offense by somebody (irrespective of suspicion of foul play); (b) all vehicular, factory, or other unnatural accident cases specially when there is a likelihood of patient’s death or grievous hurt; (c) cases of suspected or evident sexual assault; (d) cases of suspected or evident criminal abortion; (e) cases of unconsciousness where its cause is not natural or not clear; (f) all cases of suspected or evident poisoning or intoxication; (g) cases referred from court or otherwise for age estimation; (h) cases brought dead with improper history creating suspicion of an offense; (i) cases of suspected self-infliction of injuries or attempted suicide; (j) any other case not falling under the above categories but has legal implications.¹

The first treating doctor can label a case as medico-legal at his/her discretion, if he/she suspects any foul play. All medico-legal cases should be informed to concerned police station. That will help to provide evidence related to case from examination and initiate legal proceedings early also that will prevent doctor from unnecessary allegations from relatives or inquiries by law authority, in future, if any.

OBJECTIVES

In present study, an attempt is made to know the pattern and magnitude of medico-legal cases in aspect of types of cases, age and sex of cases, time of arrival in casualty department, months and seasons of arrival of cases and to analyze the data and find out suggestion for improvement of medico-legal work, if any.

MATERIALS AND METHODS

This study was a one year, record based, retrospective cross sectional study of all medico-legal cases registered in medicolegal register in casualty of TMMC & RC, Moradabad, between time periods, from 1st August 2021 to 31st July 2022. The data was collected on basis of age group, sex, month-wise distribution, seasonal variation, pattern distribution and on time of arrival of various medico legal cases etc. The data thus obtained was analyzed and observations were presented in tables and compared with other studies.

Research Instrument: It is a retrospective hospital medical record based observational study.

Data Collection: Data was collected in a predesigned proforma to collect the information like the age, gender and type of medico-legal cases etc. mentioned in the medical records. The profile of these cases were studied by grouping the total number of such cases during period w.e.f. 1st August 2021 to 31st July 2022 under following categories: Road traffic accidents, Injuries, Assault, Burns, Falls, Poisoning etc.

Inclusion Criteria: All cases which were registered under medico-legal cases were included in this study.

Exclusion Criteria: Non-medicolegal cases were excluded.

Observation and Result

In this one year, from 1st August 2021 to 31st July 2022, a total 355 cases were reported and studied.

In regards to types of medicolegal cases i.e. labeling a case as medico-legal, the most common cases registered were road traffic accidents i.e. 207 cases (58.31%), followed by poisoning 47 cases (13.24%), fall from height 36 cases (10.14%), assault 27 cases (7.61%), burn cases were 10 in number (2.82%), followed by asphyxial deaths cases were 08 (2.25%), minimum number belonged only 01 case of firearm (0.28%) and sexual assault 01 (0.28%), as shown in table 1.

In this study, most of the cases were males being 260 cases (73.24%) and females were 95 (26.76%). (Table 2)
In our study, maximum number i.e. 123 cases (34.65%) were in the age group of 21-30 years followed by 31-40 age group constituting 76 cases i.e. 21.41% (Table 3).

In this study, in regards to month wise distribution, most of the cases occurred during October constituting 57 cases (16.06%) followed by November with 46 cases (12.96%). Minimum number of cases was in April 07 (1.97%) (Table 4).

In regards to seasonal variation, most of the cases were in rainy season constituting 128 cases (36.06%) and least number of cases i.e. 109 (30.70%) were in summer (Table 5).

In regards to time of arrival, most of the cases came to casualty in between 06.00 pm to 11.59 pm i.e.136 cases (38.31%) followed by 12.00 pm to 5.59 pm i.e.114 cases (32.11%). Least cases were from time period between 06.00 am to 11.59 am i.e. 49 cases (13.80%).

Table 3: Age group wise distribution of medicolegal cases

<table>
<thead>
<tr>
<th>Age</th>
<th>Medicolegal cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 years</td>
<td>13</td>
<td>3.66</td>
</tr>
<tr>
<td>11-20 years</td>
<td>61</td>
<td>17.19</td>
</tr>
<tr>
<td>21-30 years</td>
<td>123</td>
<td>34.65</td>
</tr>
<tr>
<td>31-40 years</td>
<td>76</td>
<td>21.41</td>
</tr>
<tr>
<td>41-50 years</td>
<td>44</td>
<td>12.39</td>
</tr>
<tr>
<td>51-60 years</td>
<td>26</td>
<td>7.32</td>
</tr>
<tr>
<td>61 and above</td>
<td>12</td>
<td>3.38</td>
</tr>
<tr>
<td>Total</td>
<td>355</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: Month wise distribution of medicolegal cases

<table>
<thead>
<tr>
<th>Month</th>
<th>Medicolegal case</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 2021</td>
<td>24</td>
<td>6.76</td>
</tr>
<tr>
<td>Sep 2021</td>
<td>26</td>
<td>7.32</td>
</tr>
<tr>
<td>Oct 2021</td>
<td>57</td>
<td>16.06</td>
</tr>
<tr>
<td>Nov 2021</td>
<td>46</td>
<td>12.96</td>
</tr>
<tr>
<td>Dec 2021</td>
<td>41</td>
<td>11.55</td>
</tr>
<tr>
<td>Jan 2022</td>
<td>11</td>
<td>3.10</td>
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<tr>
<td>Feb 2022</td>
<td>20</td>
<td>5.63</td>
</tr>
<tr>
<td>March 2022</td>
<td>42</td>
<td>11.83</td>
</tr>
<tr>
<td>April 2022</td>
<td>07</td>
<td>1.97</td>
</tr>
<tr>
<td>May 2022</td>
<td>29</td>
<td>8.17</td>
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<tr>
<td>June 2022</td>
<td>31</td>
<td>8.73</td>
</tr>
<tr>
<td>July 2022</td>
<td>21</td>
<td>5.92</td>
</tr>
<tr>
<td>Total</td>
<td>355</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5: Season wise distribution of medicolegal cases

<table>
<thead>
<tr>
<th>Season</th>
<th>Medicolegal cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer (March-June)</td>
<td>109</td>
<td>30.70</td>
</tr>
<tr>
<td>Rainy (July-October)</td>
<td>128</td>
<td>36.06</td>
</tr>
<tr>
<td>Winter (November-February)</td>
<td>118</td>
<td>33.24</td>
</tr>
<tr>
<td>Total</td>
<td>355</td>
<td>100</td>
</tr>
</tbody>
</table>

In addition, when we studied in regards to region wise distribution of cases, residence of most of the cases was from outside of Moradabad region constituting 213 cases (60%).
DISCUSSION

In present study, in regards to the type of medicolegal cases, most of the cases belong to road traffic accidents constituting to 207 cases (58.31%). Findings of our study are consistent with the studies conducted by Yogesh C, Amirthvarshen et al; Kulkarni P & Pandey R K; Siddappa S C & Datta A; Yatoo GH, Jalali et al, and Manju L & Beevi P N where road traffic accidents constituted majority of medicolegal cases. The reason for road traffic accidents being the most commonly encountered medicolegal cases was that the hospital is located on national highway and other reason being non-following of traffic rules or rash driving.

Some studies like by Malik Y, Chawla R et al and study by Yadav A and Singh NK differ from our study which showed maximum cases were from poisoning, the reason may be these hospitals being in rural area.

In our study, poisoning cases were second in number constituting 47 cases (13.24%).

In our study most of the cases were males 260 out of 355 i.e. (73.24%), which is a similar finding in most of the studies like Kulkarni P, Pandey R K; Siddappa S C, Datta A; Yatoo GH, Jalali et al; Manju L, Beevi P N and by Malik Y et al, the reason being males are usually involved in driving and outdoor activities.

In our study, maximum cases i.e. 123 cases were in the age group of 21-30 years i.e. 34.65%. This is similar to most of the studies done like study done by Gupta Ashok and Bhola Kumar Singh; Saxena A, Vinod Kumar et al, and also by Siddappa S C, Datta A, supporting the fact that young adults are of driving age group and more involved in outdoor activities. The risk taking behavior is more commonly seen among this age group. They are usually reluctant to follow the established safety measures compared to old experienced drivers.

In this study, in regards to month wise distribution, most of the cases occurred during October constituting 57 cases (16.06%) followed by November with 46 cases (12.96%). Study by Saxena A, Vinod Kumar et al showed maximum cases in month of November (17.05%) followed by July (12.5%), likely reason may be winter though usually from November.

In our study region, winter starts from late October leading to fall in temperature and appearance of dense fog on roads, causing decrease in visibility and making driving dangerous.

In regards to seasonal variation, most of the cases were in rainy season constituting 128 cases (36.06%) similar finding were seen in study by Saxena A, Vinod Kumar et al also in study by Garg V, Verma Sk and study by Hussaini SN, Kulkarni CS et al, as in rainy season roads are very slippery and visibility is also decreased thus increasing the chances of accidents.

In our study, most of the cases were in between 06.00 pm to 11.59 pm i.e.136 cases (38.31%). This is contrast to findings in the study by Siddappa S C, Datta A and study by Saxena A, Vinod Kumar et al where most of the cases were between 12.00 pm to 06.00 pm followed by cases between 06.00 pm to 11.59 pm, supporting the accepted fact that night time driving is more prone to accidents.

In our study, in regards to region wise distribution of cases, most of the cases were residing outside of Moradabad region constituting 213 cases (60%) and 142 (i.e. 40%) cases from Moradabad region. The cases were reason being most cases were of RTA and hospital is situated on highway, so travelers from outside Moradabad, encountered in road traffic accident constituted majority of the cases.

CONCLUSION

In our study, in regards to indication for medicolegal, the most common cases registered were road traffic accidents i.e. 207 cases (58.31%).

Most of the cases were males being 260 cases (73.24%).
Maximum cases i.e. 123 cases were in the age group of 21-30 years.

In regards to month wise distribution, most of the cases occurred during October constituting 57 cases (16.06%).

In regards to seasonal variation, most of the cases were in rainy season constituting 128 cases (36.06%).

In regards to time of arrival, most of the cases came to casualty in between 06.00 pm to 11.59 pm i.e.136 cases (38.31%).

In regards to region wise distribution of cases, residence of most of the cases was, from outside of Moradabad region constituting 213 cases (60%).

RECOMMENDATIONS
Considering the change of the name of Casualty to Emergency department by NMC, adequate qualified manpower/staff should be provided round the clock to department to handle medical as well as legal cases.

Indiscriminate labeling of a case as medicolegal should be avoided so that unnecessary burden of doctor as well as police authority should be reduced.

All treatment records and allied documents should be stored in emergency department itself.

Preserved samples should be handed over to concerned police personnel immediately and reports should be preserved in the department, itself.

Uniform comprehensive guidelines should be given by NMC in regards to handling of medicolegal cases.

NMC may consider introduction of targeted course (online/offline) in regards to handling of medicolegal cases which will be compulsory for all doctors.

Road safety awareness programs should be conducted by traffic police on frequent basis, especially for young adults.

Conflict of interest: None.

Source of funding: Nil.

REFERENCES
10. Saxena Atul, Vinod Kumar et al. Pattern of Medico-legal Cases in the Casualty Department of A Teaching Hospital, Bareilly, Uttar-Pradesh, J Indian Acad Forensic Med. October-December 2015, Vol. 37, No. 4
INTRODUCTION

The responsibilities of emergency physicians toward patients are determined by law. Emergency physicians do not have the right to refuse a patient admission to the emergency department, even if all beds are full.¹² They provide health care services in a stressful environment while interacting with patients with different severity levels and risks.³ On the contrary, encountering malpractice claims has become a threat to the professional careers of emergency physicians similar to other groups of physicians.⁴ According to a study conducted by the American Medical Association, the risk of emergency physicians encountering a malpractice claim increases by
5% each year in their career compared with the previous year. Malpractice allegations and avoidance behaviors are affected by many factors other than age, gender, and duration of professional experience. This study aimed to examine the basic characteristics of emergency physicians, such as age, gender, and duration of professional experience, which affect their risk of encountering malpractice claims.

MATERIALS AND METHODS

STUDY DESIGN

This study consisted of a survey, and the survey questions were prepared by academicians from an academic emergency medicine clinic, based on articles related to the subject. After obtaining the approval of the Hospital local ethics committee, the survey was administered to the emergency physicians who volunteered to participate in the study in an electronic environment. The results were collected in the electronic environment. The survey was conducted between May 2019 and July 2019 for a period of 3 months.

MEASUREMENTS

In Section[A] of the survey, the participants were asked regarding their sociodemographic characteristics, such as their age, gender, and duration of professional experience in the emergency department (in years), and regarding the service level of the hospital they worked in (i.e., Medical College Hospital, Sub-divisional Hospital, Superspeciality Hospital, and Rural hospital). In Section[B] the following questions were asked regarding their experience of encountering malpractice claims:

- Have you ever encountered a medical malpractice claim?
- Have you been subjected to an institutional investigation for medical malpractice?
- Have you ever received a penalty in an institutional investigation conducted against you for medical malpractice?
- Have you been subjected to a judicial investigation for medical malpractice?
- Have you ever received a penalty in a judicial investigation conducted against you for medical malpractice?

While responding to these questions, the participants were asked to respond only according to the legal procedures that had been concluded and were asked to exclude ongoing investigation procedures, if any.

STATISTICAL ANALYSIS

All analyses were performed using the Statistical Package for Social Sciences for Windows v.21 (IBM) software. The Shapiro–Wilk test was used to measure the normality of distribution. The Mann–Whitney U test was used to compare continuous variables described as median due to their nonhomogeneous distributions, whereas the chi-square test was used to analyze categorical variables described as frequency and percentage distributions. P values < 0.05 were considered as statistically significant.

RESULTS

The survey was sent via the electronic environment to emergency physicians who volunteered to participate in the study. These emergency physicians served in our tertiary-level health care institutions (Deben Mahata Govt. Medical College Hospital), another Medical College in neighbouring districts, 2 Sub-divisional Hospitals, 10 rural hospitals and 4 secondary-level health care institutions. The survey was sent to 401 emergency physicians, of which 212 replied. Thus, the survey response rate was 52.8%.

A total of 212 emergency physicians volunteered to participate in this study. Of these, 61.8% were male. The average age of the participants was 32.8 years (range, 24–51 years). Of the participants, 50% (n = 106) were employed in a training and research hospital, 30.1% (n = 64) in a university hospital, and 19.8% (n = 42) in a secondary-level state hospital. The duration of professional experience in an emergency department was
≤5 years for 46.2% (n = 98) participants, 6–10 years for 38.2% (n = 81), and >10 years for 15.6% (n = 33).

Among the participants, 49.1% (n = 104) had encountered a malpractice claim, whereas 40.1% (n = 85) had been subjected to an institutional investigation. Further, 5.8% (n = 5) of the emergency physicians who were subjected to an institutional investigation eventually received a penalty, and 14.2% (n = 30) had been subjected to a judicial investigation. In addition, 3.3% (n = 1) of the physicians who had been subjected to a judicial investigation eventually received a penalty. Since the number of participants who received a penalty was less, the status of receiving a penalty was not included in the subgroup comparisons.

The relationship of the status of being subjected to an institutional or judicial investigation with the subcategories of age, gender, duration of professional experience at the emergency department, and hospital service levels was examined. The difference between the status of being subjected to an institutional investigation and average age (those above and below the average age) was statistically significant (P < 0.03).

An increase in the rate of being subjected to an institutional investigation was noted among emergency physicians with ≥6 years of experience (6–10 years; 41/40, >10 years; 19/14). On the contrary, no statistically significant difference was found between the groups with 6–10 years and >10 years of professional experience when they were compared in terms of the rates of institutional investigations (P = 0.5). In the case of emergency physicians with ≤5 years of professional experience, the rate of being subjected to an institutional investigation was significantly less (25/73, P < 0.001). No statistically significant relationship was observed between the status of being subjected to an institutional investigation and gender or the service level of the hospital in question (P = 0.778; P = 0.990, respectively).

A statistically significant difference was identified when the ratios of being subjected to a judicial investigation were compared between emergency physicians who had ≤5 years of experience and those who had >10 years of experience. The rate of being subjected to a judicial investigation was lower among emergency physicians with ≤5 years of experience (8/90 vs 9/24, P = 0.005). No statistically significant relationship was found between the status of being subjected to a judicial investigation and age, gender, and service level of the hospital (age, P = 0.111; gender, P = 0.674; service level of the hospital, P = 0.908, respectively).

**DISCUSSION**

When the different characteristics of the emergency physicians were compared, the three most important results obtained in this study were as follows:

1. An increased rate of institutional investigation with increasing age of the emergency Physician.
2. An increased rate of institutional investigation in those with >10 years of professional experience in the emergency department.
3. A low rate of judicial investigation rate in the first 5 years of professional experience in the emergency department.

Previous studies have examined the relationship between the risk of encountering a malpractice claim and age and reported that emergency physicians aged <35 years encounter a malpractice claim almost one-third less compared with other physicians (5,7). Jena et al. explored the relationship between age and judicial investigation and reported that the risk of encountering a malpractice allegation in low-risk specialty areas was 36% for physicians aged up to 45 years and 75% for those aged up to 65 years. In the same study, the risk of encountering a malpractice claim in high-risk specialty areas was 88% for physicians aged up to 45 years and 99% for those aged up to 65 years (5).
The rate of being subjected to an institutional investigation was lower for younger emergency physicians in the present study presumably because the study group had a low average age and 46% of the participants had professional experience of ≤5 years. Although the results were similar to those of the studies by Jena et al. and Studdert et al., the present study differed from the two studies because they did not specify a specific area of expertise. Another difference was that in the present study group, the maximum age was 51 years and the rate of being subjected to an investigation was lower than the rate of encountering a malpractice allegation up to the age of 45 years in high-risk specialties, as also reported by Studdert et al. [5,7].

In the forensic investigation system of India, a preliminary examination is conducted primarily for government officials as required by law. Only based on the results of this examination, a lawsuit is allowed to be filed against physicians [8]. Consequently, the rate of judicial investigations in the present study was found to be lower than that of institutional investigations as the former is a continuation of the latter.

Both Studdert et al. [9] and Carlson et al. [10] reported >10 years as the average duration of professional experience in their studies. The times indicated in these two studies differed from those in the present study, which found that 84% of the emergency physicians had <10 years of professional experience. Studdert et al. reported that 96% of the physicians had >10 years of professional experience and the malpractice-related investigation rate was 88% [9]. Carlson et al. reported that the average duration of professional experience of physicians was 15.7 years and malpractice rates increased by 4% each year [10].

The average duration of professional experience in the present study was lower than the rates reported in the studies conducted by Carlson et al. and Studdert et al. The institutional investigations of emergency physicians with >10 years were proceeded as criminal investigations more. In the present study, the rate of institutional investigations of emergency physicians who had >10 years of professional experience in the emergency department was 60%, whereas the rate of judicial investigations was 27%. These rates were 26% versus 8% for emergency physicians with 5 years of professional experience and 51% versus 16% for those with 6–10 years of professional experience. The rate of institutional investigations that were proceeded as judicial investigations was 14% for emergency physicians with ≤5 years of professional experience, 35% for those with 6–10 years of professional experience and 33% for those with >10 years of professional experience.

The present study found that the number of judicial investigations decreased with the increase in the duration of professional experience. However, the rate of judicial investigation significantly increased after 10 years of professional experience in the emergency department, and it was found to be less in the first 5 years of professional experience in the emergency department.

The present study found that the status of being or not being subjected to an institutional or judicial investigation was not related to the gender of the emergency physician. However, a meta-analysis reported that the risk of encountering malpractice claims for male physicians was 2.5 times more than that for female physicians [11]. In another study, 82% of the physicians against whom a lawsuit was filed were male, and the difference between the genders was statistically significant [7]. However, these studies were not specific to emergency physicians. Further studies are required to determine the risk of encountering malpractice claims for male and female physicians with emergency department expertise.

Other factors affecting the risk of encountering a malpractice claim for physicians include crowdedness [12], characteristics of physicians’ individual practices [13], and physicians’ personality traits and mental health [14, 15]. These were also investigated earlier. Previous studies examined the outcomes of encountering a malpractice
claim, such as economic\(^{(15)}\), depression and medical malpractice syndrome \(^{(15,17)}\), time spent in litigation \(^{(18)}\), and defensive medicine approach \(^{(6,9,19)}\). However, the characteristics of the specialty of emergency medicine differ from the characteristics of others \(^{(20)}\). Therefore, new studies specific to the field of emergency medicine are needed.

**LIMITATIONS OF THE STUDY**

The present study included only a group of emergency physicians; therefore, it could not be generalized to all emergency medical physicians. The results were obtained based on participants’ responses to the survey, and the responses were trusted and accepted to be correct. This study focused on the natural characteristics of participants, such as their age, gender, and duration of professional experience in the emergency department. The number of patients evaluated, working hours, and other factors were not in the scope of the present study.

In conclusion, the risk of encountering a malpractice claim was found to be related to the physician’s age and duration of professional experience in the emergency department. Malpractice claims can be affected by the physician’s individual characteristics, such as age, gender, and duration of professional experience. They represent a wide and multifaceted subject comprising the health status of doctors, health institutions, and health expenditure of states \(^{(6,17,21)}\). More extensive studies are required to determine the physicians’ risk of encountering a malpractice claim.

Ethical Clearance: Taken-From Deben Mahata Govt. Medical College and Hospital

**Ethical Committee.**

**Source of funding- Self**

**Conflict of Interest- Nil**

**REFERENCES**


INTRODUCTION

The incidence of chronic liver disease is increasing worldwide.\(^1\) Common causes of chronic liver disease include alcohol, chronic hepatitis B and C and non-alcoholic fatty liver disease (NAFLD). Liver has a major impact on the production and maintenance of blood starting early in life in the foetus. It functions as a haemopoietic organ before birth and plays an active and vital role in proper erythropoiesis and the manufacture of clotting factors and inhibitors after birth, as well as maintaining hemostasis balance.

The liver also stores iron, Vitamin B12, and folic acid, all of which are required for normal hematopoiesis.\(^2\)

Abnormalities in hematological parameters are common in patients with cirrhosis. Due to its unique portal circulation and synthetic properties (clotting factors, thrombopoietin) and immune functions, the liver is involved in or responsible for a variety of haematological abnormalities.

The pathogenesis of abnormal haematological indices in cirrhosis is multifactorial and includes portal hypertension-induced
sequestration, alterations in bone marrow stimulating factors, viral and toxin-induced bone marrow suppression. The factors affecting are dietary deficiencies, bleeding, alcoholism, and abnormalities in hepatic protein synthesis for blood formation or coagulation. Abnormalities in these hematological indices are associated with an increased risk of complications including bleeding and infection.²

There is a paucity of data from Indian subcontinent regarding the blood picture in patients of CLD. Keeping this in mind the present study was undertaken which to help clinicians and epidemiologists in decision making.

MATERIAL AND METHODS

After obtaining the due approval of the Institutional Ethics Committee patents were enrolled after taking a written informed consent from them.

Study design: Hospital Based Cross Sectional study

Study period: Duration of 2 years ie, from August 2019 to July 2021

Study Population: All patients more than 60 years admitted in hospital for evaluation of chronic liver disease.

Sample Size: 100

The prevalence of haematological abnormalities in cases of CLD is approx. 80% (1). Sample size was calculated using formula:

\[ n = \frac{Z^2(5\%) \times p \times (1-p)}{E^2} \]

\[ n=\text{sample size} \]

\[ Z = \text{Level of significance (at 95\% confidence level, its value is 1.96)} \]

\[ P = \text{probability (0.80)} \]

\[ Q = 1-P (1-0.80=0.20) \]

\[ E=\text{Error (10\% of prevalence)}^2 \]

\[ n = (1.96)^2 * (0.80)* (0.20) / (0.08)^2 \]

\[ n = 97=100 \text{ (approx.)} \]

Inclusion Criteria

1. All patients more than 60 years with chronic liver disease-Alcoholic cirrhosis, viral cirrhosis, autoimmune hepatitis, metabolic causes of liver diseases.

2. Ultrasonography finding of small nodular liver with splenomegaly and intra-abdominal collaterals or presence of ascites

Exclusion Criteria

1. Patients with underlying malignancy or known primary hepatocellular carcinoma.

2. Patients with primary coagulation disorder or primary abnormalities of haemostatic function.

3. Acute hepatic failure.

4. Patients with pre-existing anaemia due to other causes.

5. Patients suffering from end stage medical diseases like COPD, Coronary artery disease, cardiac failure and CKD.

STUDY METHODOLOGY

A pre-structured performa was prepared to collect the demographic data that included Age, Gender, Occupation, Area of Residence, History of present illness (duration of illness, bleeding tendencies, abdominal distension, jaundice, oliguria). Past history was taken regarding previous treatment of diabetes, hypertension, tuberculosis, coronary heart disease, trauma, blood transfusion, surgery needle pricks, contact with blood products. Personal history was recorded regarding alcoholism (years, types and grams of alcohol consumption was asked in detail), smoking along with family history of chronic liver diseases, HTN, DM.

Blood samples were obtained and analysed for Complete Blood Count (CBC) and routine clinical biochemistry. Peripheral blood smears were assessed for Anisopoikilocytosis, nucleated RBCs and morphological type of anaemia; Hypersegmented neutrophils, toxic granulation, relative lymphocytes and immature cells/ blasts and platelet number and morphology.
STATISTICAL ANALYSIS

The collected data was analysed using SPSS (Statistical Package for social sciences) version 25.0 software. For Qualitative data various rates, ratios and percentages (%) were estimated where as for quantitative data Mean/Median, SD etc. were calculated. Categorical and nominal data was analysed and expressed in percentage. The T-test was used for analysing quantitative data, or else non parametric data was analysed by Mann Whitney test and categorical data. P-value < 0.05 considered as significant.

RESULTS

Table 1

<table>
<thead>
<tr>
<th>SYMPTOMS</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generalized weakness</td>
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</tr>
<tr>
<td>Dyspnea</td>
<td>40</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>88</td>
</tr>
<tr>
<td>Hematemesis/melaena</td>
<td>26</td>
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<tr>
<td>Abdominal pain</td>
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<tr>
<td>Encephalopathy</td>
<td>12</td>
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<td>Pallor</td>
<td>53</td>
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<tr>
<td>Icterus</td>
<td>51</td>
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<tr>
<td>Loss of body hair</td>
<td>06</td>
</tr>
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<td>Koilonychia</td>
<td>04</td>
</tr>
</tbody>
</table>

Distribution of cases as per clinical presentation

Table 2

<table>
<thead>
<tr>
<th>Past history</th>
<th>No. of cases</th>
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<tbody>
<tr>
<td>Alcoholic Liver Disease</td>
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</tr>
<tr>
<td>Hepatitis C Virus</td>
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</tr>
<tr>
<td>Hepatitis B Virus</td>
<td>13</td>
</tr>
<tr>
<td>Autoimmune hepatitis</td>
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<tr>
<td>Primary Biliary Cholangitis</td>
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<tr>
<td>Wilsons disease</td>
<td>01</td>
</tr>
<tr>
<td>Budd chari syndrome</td>
<td>01</td>
</tr>
<tr>
<td>Glycogen storage disease</td>
<td>01</td>
</tr>
<tr>
<td>Cryptogenic causes</td>
<td>04</td>
</tr>
</tbody>
</table>

Distribution of cases based on etiology of liver disease

Table 3

<table>
<thead>
<tr>
<th>Grade</th>
<th>Platelet count</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe thrombocytopenia</td>
<td>&lt; 20000</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>Moderate thrombocytopenia</td>
<td>20000-70000</td>
<td>9</td>
<td>9%</td>
</tr>
<tr>
<td>Mild thrombocytopenia</td>
<td>70000-150000</td>
<td>34</td>
<td>34%</td>
</tr>
<tr>
<td>Normal</td>
<td>&gt;150000</td>
<td>49</td>
<td>49%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Distribution of study subjects based on platelet count

DISCUSSION

In the present study 70% of males and 95% of females had anaemia. Majority of males(48.5%) and females(47.5%) had moderate anaemia, 31.5% of male an 42% of female had severe anaemia, 20% of male and 10.5% of female had mild anaemia.

In the study done by Bibhu Prasad Behera, among 69 patients, showed a mean Hb of 7.99±2.18 g/dl, of which 53.62% of patients had severe anaemia, 36.23% patients had moderate anaemia, 5.8% of them had mild anaemia and 4.35% of them had a haemoglobin in normal range. In study done by Sudhir Chandra Jha among 50 patients 88% of patients were anaemic out of which 45.5% of male and 50% of female patients had moderate anaemia, and 22.7% of male and 33.3% of female patients were severely anaemic. In Selvamani et al among 100 patients 88% patients had anaemia and only twelve patients had normal hemoglobin. About 32% patients had severe anaemia less than 8gm% of hemoglobin. In study done by Viney Sambyal et al among 546 patients 43.2% patients had haemoglobin less than 9gm%.

RBC Morphology

In present study 11 patients with normal haemoglobin level had normochromic and normocytic blood picture. Majority of the males(54%) and females(42%) with anaemia had a normocytic and normochromic blood
picture. 27% of male and 26% of female patients with anaemia had a microcytic hypochromic blood picture. 15% of male and 21% of female patients with anaemia had macrocytic normochromic blood picture. 4% of male and 1% of female patient with anaemia had a dimorphic blood picture.

In Selvamani et al study among the 100 patients 52% patients had normochromic and normocytic anaemia, 30% patients had microcytic anaemia and 16% patients had macrocytosis, 02% patients had dimorphic anaemia. In study done by Gaurav Bhutada et al among 30 patients of chronic liver disease 26.66% patient had a normal blood picture, 36.66% had microcytic blood picture and 36.6% had macrocytic blood picture. In Bibhu Prasad Behera et al study among 69 patients, majority of 60.87% had microcytic hypochromic blood picture, 36.26% had a normocytic normochromic blood picture.

**WBC Abnormalities**

In the present study, WBC count of less than 4000 was seen in 32% cases and WBC of 60% patients were in normal range (4000-11000), and 8% of patients had a raised WBC count.

In study done by Selvamani et al among the 100 patients leucopenia was present in 6% of patients and leucocytosis in 22% of patients. In study done by Viney Sambyal et al among 546 patients 7.7% had leucopenia, and 3.3% had leucocytosis.

**Platelet Abnormalities**

In the present study 49% cases had a normal platelet value of >1.5 lakh /cummm and 51% had thrombocytopenia. Majority of cases that is 34% had mild thrombocytopenia (70000-1.5 Lakh/cummm). 9% cases had moderate Thrombocytopenia (20000-70000/cummm) and 8% cases had severe thrombocytopenia (<20000 /cummm).

In study done by Selvamani et al Thrombocytopenia was found in 46 patients among 100 cases in the study. In study done by Viney Sambyal et al among 546 patients 48.7% patients had thrombocytopenia. In study done by Bibhu Prasad Behera et al 68.12% patients had thrombocytopenia.

**CONCLUSION**

The study categorically showed male preponderance in patients with Chronic Liver disease. Anaemia was prevalent in 89% of study population with major blood picture being normocytic normochromic anaemia. Mild to moderate thrombocytopenia was seen in 17% and leucopenia was seen in 32% of the patients. Similar studies at other centres will help to create a data base of haematological profile in CLD patients in geriatric population of India.

**CONFLICT OF INTEREST:** None

**SOURCE OF FUNDING:** Self

**REFERENCES**

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Problem Identification of Islamic Law Implementation in COVID-19 Mortuary Practice in Indonesia from the Perspective of Forensic Pathologists

Destri Budi Nugraheni, Idha Arfianti Wiraagni, Ahnav Bil Auvaq, Dika Putri Vindi Santika Anie, Ninik Setiyowati

ABSTRACT

Indonesia consists of many different ethnic groups and religions. Islam is the major religion in Indonesia, thus also rendering Islamic tradition as being significant in Indonesia. This is also the case with Islamic law. In March 11, 2020, COVID-19 was declared as pandemic by WHO. Since then, there were reported cases of forceful seizure of deceased bodies by the deceased’s family in Indonesia. The aim of this research is to understand the problems related with Islamic law implementation in COVID-19 mortuary practice in Indonesia from the perspective of forensic pathologists. This study also aims to analyze whether the solutions given are in accordance with Islamic law.

The sampling method used was convenience sampling. The respondents were forensic pathologists from different areas in Indonesia. 19 out of 20 respondents reported problems and solutions. The solutions were in accordance to Islamic law.

Problem that is present in mortuary practice in the context of muslim COVID-19 patients are related to the bathing and shrouding process. There is distrust on whether proper care had been carried out. The situation happened due to the community’s lack of comprehensive understanding of proper Islamic mortuary practice in COVID-19 pandemic context.

Keywords: COVID-19, forensic pathologists, Islamic law, mortuary practice
“kepercayaan” (adherents of local religions). Per June 2021, according to the data from Population and Civil Registration Agency (Dukcapil) of Ministry of Home Affairs Indonesia, there are 272.23 million people within the population of Indonesia, 86.88% (236.53 million people) of those are Muslims.\(^1\) Islam as the major religion in Indonesia thus results in Islamic tradition as generally being regarded significant on all sectors in Indonesian lives.

Islamic law tradition is a normative tradition that came with the spread of Islam to Indonesia. Islamic law\(^2\) is sourced from Islamic teaching that is regarded as sacred as it is directly commanded by God, it is complied by muslims as it is regarded as the core of Islamic teaching.\(^3\) In Al-Baqarah verse 208, God commanded each men that believes in Islam to apply Islamic teaching fully, not only believing and only practising partly.\(^4\) This emphasize is sufficient as basis to apply Islamic law in all aspects of human life, including in the field of medicine and especially in the handling of deceased bodies.

As stated in the constitution, Indonesia commits to ensure the right to belief each person their respective religions and to practice freely in accordance to their religion and belief.\(^5\) This includes in the case of mortuary practice. Proper funeral care is the right of the deceased and is the obligation of the heirs. The obligation is as obliged in Islamic inheritance law, that is the heirs should finish burial before dealing with the inheritance. This includes from bathing the body until the burial.\(^5\)

In March 11, 2020, COVID-19 was first declared as pandemic by WHO.\(^7\) In Indonesia, first reported COVID-19 case was confirmed in March 2, 2020.\(^8\) Ever since, there have been numerous problems that arise in the context of COVID-19 deceased bodies in Indonesia. Clashes between the community and healthcare personnels, especially in the case of forceful seizure of deceased body, happened in several areas in Indonesia, namely in Bondowoso\(^9\), Buol\(^10\), Jember\(^11\), Kolaka\(^12\), and Situbondo\(^13\).

The accident in Situbondo even went viral on social media. Mostly, the reasoning behind the seizure was because the body needs to be bathed at home, or rather the family wants to directly bathe the body. This is problematic in the medical sense as bathing at home without precautions could lead to COVID-19 infection.

These sparks of controversy led relevant institutions to address the problem. Institutions in Indonesia had released several regulations on how to handle the deceased body in accordance to Islam while also insuring safety of the morticians. Director General for Guidance of the Islamic Community of Ministry of Religion Indonesia released Circular Letter Number P-003/DJ.III/Hk.00.7/04/2020 to revise prior Circular Letter Number P-002/DJ.III/Hk.00.7/03/2020 about COVID-19 handling in public areas, meanwhile Kementerian Kesehatan (health ministry of Indonesia) released Guideline on COVID-19 Deceased Body Handling and Burial. Both legislations were used as basis of Majelis Ulama Indonesia’s fatwa Nomor 18 Tahun 2020 tentang Pedoman pengurusan Jenazah (Tajhiz al Janaiz) Muslim yang Terinfeksi Covid as one of the main guidelines for handling of the COVID-19 infected deceased body.\(^14\)

There are several matters on Islamic law that should be enforced:

1. Male deceased body should be bathed by male handler and female deceased body should be bathed by female handler, except in the case of spouse. The fatwa from MUI also enforces the same even in the context of COVID-19. If there are no available same gender mortician, the deceased body could also be bathed without undressing the body or just by *tayamum*. *Tayamum* is done by wiping the face and both arms with dust, all the while the mortician wearing appropriate PPE to protect themselves from COVID-19 infection.\(^15\)

2. The mortician should bathe the deceased body while wearing gloves to protect from *najis* from the body.\(^16\)
3. The body should be shrouded by 3 layers of clothes for male and 5 layers of clothes for female. The body can then be put into water tight container.  

4. The body in the coffin is then arranged to be facing the qibla. 

Identification of problems on Islamic law implementation in the matter of mortuary practice in COVID-19 pandemic in Indonesia is important as it is shown that there are many reported problems in Indonesia. The example of forceful seizure of deceased body is only one of the many problems that arise within the community. This research is qualitative research that includes forensic pathologists from all around Indonesia that is directly involved with Islamic law implementation in COVID-19 mortuary practice. The aim of this research is to understand the problems related with Islamic law implementation in COVID-19 mortuary practice in Indonesia from the perspective of forensic pathologists. This also includes the solutions that were given by the forensic pathologists. The aim is then also to analyze whether Islamic law had been implemented accordingly in COVID-19 specific mortuary practice in Indonesia.

MATERIAL AND METHODS

The sample of this study was chosen using convenience sampling method. Forensic pathologists that were involved in this study were 20 respondents from different islands in Indonesia. 11 of the respondents were male (55%) and the 9 others were female (45%). Religion wise, 16 of the respondents were muslims (80%) and 4 others were non-muslims (20%). The forensic pathologists studied forensic from different universities in Indonesia, namely UI, UGM, UNAIR, UNPAD, UNDIP, and USU. The forensic pathologists were placed in hospitals all around Indonesia, with at least 6 years of experience. Thus, the 20 respondents that were involved in this study were amongst the best forensic pathologists in Indonesia.

The respondents filled a questionnaire that contains questions related to the problems surrounding the topic of mortuary practice in Indonesia on the context of COVID-19. The questions included all problems that arose around the topic. Afterwards, the solution that the forensic pathologists did to overcome the problem were also asked. Each respondents received phone credit as appreciation from the researcher after the result is confirmed and clear. The study is done after acquiring ethical clearance from MHREC FKKMK UGM no. KE/FK/0931/EC/2021.

FINDING AND DISCUSSION

Funeral care is one of the obligations in the muslim community that belongs to the category of wajib kifayah, that is when part of the community fulfilled the obligation, the other part of the community is no longer obliged to do so. Funeral care in Islamic law starts from bathing the deceased body, shrouding the body, funeral prayer, and lastly burial. In almost all of the process, the immediate family will mostly be involved in the process if the family knows the procedure or else the family would watch. It is not uncommon for a son to bathe his father’s deceased body, shroud the body, do the funeral prayer, carry the coffin to the cemetery, and finally bury his own father. Daughters are also commonly bathe their own mothers’ deceased bodies. This common habit, due to COVID-19, needs readjustment especially when the patient died of COVID-19 infection.

19 out of 20 forensic pathologist respondents reported problems and the solution they provided surrounding the handling of muslim COVID-19 deceased body. The other 1 respondent that didn’t report were from Papua. The problems that were reported were related to the family distrust on whether Islamic law has been implemented properly and the others were related to facility and infrastructure relevant to the funeral care. Problems that were related to distrust were:

a. The family did not believe that the deceased body were already properly shrouded and funeral prayer were already
conducted when the deceased body is ready to be buried;

b. The family demanded the body to directly in contact with the ground (in cases of COVID-19, the body is buried inside a coffin thus it is worried that the body is not in contact with the ground);

c. The family feels that the body has not been bathed properly and demanded the body to be bathed by the family;

d. The family demanded the shroud to be untied;

e. The family refused the body to be shrouded in plastic;

f. The family wanted to open the coffin to see the deceased’s face, to pray and to pay respect;

g. The family demanded the body to be immediately buried;

Related to the problems above, the respondents overcame the situation by explaining to the family about the fatwa from MUI about funeral care guidelines of muslim COVID-19 deceased body.19 The majority of the respondents explained that according to the fatwa, funeral care should be held according to health protocol and by authorized personnel. In the case of the family demanded the body to not be covered in plastic and for the shroud to be untied, it was also explained that the process had been held in accordance to the fatwa. One of the respondent improvised by asking the family to prepare 3 gulu-gulu (one gulu-gulu equals to about a fist) of dirt to be included inside the coffin, so that the body while buried inside a coffin still in contact directly with the ground. The dirt prepared were used to support the body to lean the body towards qibla. Other respondents recorded the funeral prayer in video to then be send to the family (in the case of the family not able to join the funeral prayer), to prove that proper funeral prayer had been done. On other cases in which the family is available, the family was asked to join the funeral prayer.

It seems that there are many in the muslim community that is still not clear on how

funeral care should be done in the context of COVID-19, this leads to refusal and distrust on whether proper care had been done. On the other hand, forensic pathologists should understand how proper funeral care in the context of COVID-19 should be held in accordance to Islamic law. This needs to be so because forensic pathologists are the ones to lead the process. By understanding the relevant law, problems and misunderstanding in practice can be minimized. In Indonesia, there are several fatwas released by MUI that can be referred to, such as:


b. Fatwa MUI Nomor 14 Tahun 2020 tentang Penyelenggaraan Ibadah dalam Hal Terjadi Wabah COVID 19 about proper prayer service in the context of COVID-19 pandemic; and

c. Fatwa MUI Nomor 18 Tahun 2020 tentang Pedoman Pengurusan Jenazah (Tajhiz al Janaiz) Muslim yang Terinfeksi COVID 19 about the implementation of funeral care for muslim COVID-19 deceased body.

The guideline on proper Islamic mortuary practice in the context of COVID-19 is as below:

1. Funeral care (tahjiz al-janaiz) for infected COVID-19 patient, especially on bathing and shrouding should be done in accordance with health protocol and by authorized personnel while also in accordance with Islamic law. Funeral prayer and burial should be done as usual while still maintaining proper conduct to minimize COVID-19 infection.

2. The guideline on bathing COVID-19 deceased body is as below:

   a. The body is bathed without undressing the body;

   b. The mortician should be the same gender as the body;
c. If the present mortician is from the opposite gender, the bathing can also still be done without undressing the body. The other alternative is to substitute bathing with tayamum;

d. The mortician should clean najis before bathing the body;

e. The mortician bathes the body by pouring the water to all part of the body;

f. If an expert considers bathing not an option, bathing can be substituted with tayamum that is by: 1) wiping the face and both hands of the body (up to the wrists or beyond) with dust. 2) To protect the mortician, PPE should be worn while conducting tayamum.

g. If expert consider bathing and tayamum not an option, according to darurat syar’iyyah, the funeral care can be continued without bathing or tayamum.

3. The guideline on shrouding COVID-19 deceased body is as below:

a. After the body is bathed, done tayamum, or maybe due to darurat syar’iyyah the body is not bathed or done tayamum, the body then is shrouded using shroud covering the whole body. Then, the body is put inside waterproof body bag to prevent viral transmission and to protect the personnel handling the body.

b. After shrouding, the body is then put into a water tight coffin leaning right so that when buried the body faces the qibla.

c. If after shrouding there still is najis on the body, the najis can be ignored.

4. The guideline on funeral prayer is as below:

- The funeral prayer is recommended to be done as soon as the shrouding process is finished.
- Funeral prayer must be held in safe area to prevent COVID-19 infection.

f. It should be done directly (in the same area) by at least one person. If it is not possible, the funeral prayer can be conducted in the cemetery before or after burial. If it is still not possible, the funeral prayer can be conducted from afar.

g. People doing the funeral prayer must protect themselves from COVID-19 infection.

5. The guideline on COVID-19 deceased body burial is as below:

- It must be done in accordance to Islamic law and health protocol.
- It is done by sending the body with the coffin into the grave without reopening the coffin, plastic wrapping, or the shroud.

The guideline above on proper mortuary practice, should the community understand, can prevent distrust and refusal from the family. Proper Islamic mortuary practice is commonly understood within the community, though there seems to be misunderstanding when it is related to COVID-19 pandemic, that proper measures should also be done to prevent COVID-19 infection from the deceased body. These measures, that is changes of rules within the context of emergency, is accommodated in Islamic law. In emergency situations, rules can be overruled.

Morally, forensic pathologists in mortuary practice represents the family’s obligation to fulfil the deceased body rights to be properly taken care of until burial. This is why it is important for forensic pathologists to understand the Islamic law surrounding the topic of mortuary practice. This should be done in order to maintain proper Islamic law implementation and health protocol on the practice. In Islam, the principle of maqasid shariah dictates that the goal of Islamic law is to achieve maslahah, Islamic term for utilitarian benefit. It is also the case for proper mortuary practice, that is to achieve the maslahah of the deceased body. Before achieving the maslahah of the deceased body, though, maqasid shariah dictates that the essential interests are amongst...
the first to be protected, that is faith, life, lineage, intellect, and property, in this case arguably the safety of the community from COVID-19 infection. The fatwa from MUI can serve as introduction to the family in order to achieve better understanding about the matter. While, for example, recruiting more female mortician to help handle the process so that female deceased bodies can be bathed accordingly is a good step to take, it is not obliged by the fatwa as there is an alternative to bathe the body without undressing.

Other than distrust and refusal due to the misunderstanding of the family on proper mortuary practice on the context of COVID-19, respondents also reported problems due to lack of facilities and infrastructure. For example, the lack of ambulances and near cemeteries resulted in the delay of burial. Another example is the tight small rooms and uncomfortable PPE resulted in slow process of funeral care.

These issues related to the facilities and infrastructure does not relate directly with the implementation of Islamic law. Though, it is still relevant as in Islam burial is to be conducted as soon as possible, as stated in the hadith, “Be fast in handling a deceased body. For if the body lived a virtuous life, you are helping them to be closer to virtue. And if the body lived a sinful life, you’re letting them go from your shoulder.” (HR. Bukhari). Late burial due to specific conditions such as a pandemic is allowed, it is better to do the burial faster.

**CONCLUSIONS**

Problem that is present in mortuary practice in the context of muslim COVID-19 patients are related to the bathing and shrouding process. The family demanded the process to be done in accordance with Islamic law as known commonly. There is distrust from the family on whether the forensic pathologists had done it properly in accordance with Islamic law. The situation happened due to the community’s lack of comprehensive understanding of proper Islamic mortuary practice in COVID-19 pandemic context. While the proper care, within the bounds of COVID-19 pandemic, had been carried out, the family still demanded proper care due to lack of understanding. This lack of understanding is due to failure of relating the commonly known procedure with the COVID-19 situation specific procedure. The forensic pathologists, as the ones that deals with the deceased bodies directly, had done accordingly to the deceased bodies directly, had done accordingly to Islamic law and provided appropriate solutions to the problems.

**Ethical clearance** - Taken from MHREC FKKMK UGM no. KE/FK/0931/EC/2021.

**Source of funding** - from Faculty of Law, Universitas Gadjah Mada.

**Conflict of Interest** – NIL.

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Unnatural Death Among Covid-19 Tested Positive Individuals: A Retrospective Study

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ABSTRACT

Introduction: Covid 19 started out as a fast-spreading viral disease, in Wuhan in 2019. Soon, it spread across the globe and WHO declared it a Pandemic. Various countries took various measures to control its spread and transmission. By the time, countries recovered from it, a new wave would come along with different expressions and pathophysiology.

When Covid 19 began, various health agencies in India started making protocols and standard operating procedures including conducting autopsies in COVID-19 infected bodies.

Aims and Objectives: Aim of our study is to analyze cause of death among all covid 19 positive cases brought for medicolegal autopsies from the time of lockdown for a period of one year. Our aim is to see if there were any factors which could have prevented these deaths.

Materials and methods: A retrospective study of 1 year conducted from 25th March 2020 to 24th March 2021, (1st wave of Covid 19) was done in a tertiary care hospital in Bangalore. (Bowring and Lady Curzon hospital)

Results: 39 Covid-19-positive unnatural deaths were handled with the youngest being 18 years old and the oldest beings 83. The majority turned out to be suicides (51.28%), then RTAs, falls, and natural death. The commonest method of suicide was hanging (35.89%), followed by poison consumption, and falling from a height.

Conclusion: COVID-19 is a viral infection with variable clinical signs and variable fatality rates. There is much to learn about it. However, suicides in COVID-19 cases might not have ended death if some care, timely diagnosis, and treatment were provided.

Keywords: Covid 19, unnatural deaths, suicide.

INTRODUCTION

In the last passing days of 2019, Wuhan started facing a new problem. A viral infection, similar to influenza, but more widespread and deadly, not responding to routine treatment. Before it could be curtailed and isolated, it had spread to various countries and the death toll increased. WHO named the new disease COVID-19 and later declared it as a Pandemic.
when it became evident that it had spread too far too many countries.

Covid 19 is caused by novel Coronavirus, SARS-CoV-2, severe acute respiratory syndrome - Coronavirus 2. It is a negatively stranded RNA virus with a capacity for rapid mutation and recombination.1

1st reported case of Covid 19 in India was on 30th Jan 2020, 1st death due to the disease on 4th February 2020. In view of the spreading disease, on 24 March 2020, the Government of India ordered a nationwide lockdown for 21 days, extended later on, limiting the movement of the entire 1.3 billion population of India as a preventive measure against the COVID-19 pandemic in India. 2

In order to reduce transmission of Covid-19 infection, many hard steps were taken by the Government of India including nationwide closing of businesses, travel restrictions, and controlled movement of individuals. The main concern was to prevent the transmission of the virus and aftereffects of infection i.e. to decrease the mortality rate. The lockdown was justified by the government and other agencies for being defensive to prevent covid19 spread and bye some time for preparation of medical tools for the battle against the said pandemic. The lockdown and restrictions were extended again and again before they were partially uplifted to allow the movement of people in limited numbers. The restrictions on isolation and quarantine were also reduced slowly.

Aim of our study is to analyze the cause of death among all covid 19 positive cases brought for medicolegal autopsies from the time of lockdown for a period of one year. Our aim is to see if there were any factors that could have prevented these deaths.

MATERIALS AND METHODS

A retrospective study of 1 year was conducted from 25th March 2020 to 24th March 2021, which coincided with the first wave of Covid 19 and was done in a tertiary care hospital in Bangalore - Bowring and Lady Curzon hospital. All the medicolegal autopsies conducted during the time period on Covid 19 positive cases were included. Clinical autopsies, Covid 19 positive cases autopsied before or after the duration were excluded. The details were collected from the postmortem reports, police requisition forms, hospital records, etc. The results were tabulated based on age, sex, cause of death

RESULTS

A total of 39 Covid 19 positive tested bodies were brought for medicolegal autopsies in the study duration. Out of which, five cases were of unknown persons (12.82%) and all five were males. Out of 39 cases, only 5 were female (12.82%).

Age wise, youngest was 18-year-old and oldest, 83-year-old. The mean age was 45.33 years. More deaths were noted in 30-39 years and 40-49 years range, 8 in each group (20.51% each). Followed by 50-59 years, 7 in number, 17.94%. The least deaths occurred in 80-89-year range (1 death).

Majority of cases were due to hanging (35.89%), followed by road traffic accidents (23.07%), natural death (17.94%), poisoning and fall from height (7.69% each). 2 cases were due to gunshot wounds and in 1 case, death was undetermined.

Suicidal deaths contributed to 51.28%. Females showed no preference among hanging or poisoning. Accidental deaths occurred in 23.07% cases. No correlation was found in road traffic accidents. Out of 7 natural death cases, 5 belonged to unknown. In the remaining two, one suffered from hypertensive cardiovascular bleed and other was suffering from tuberculosis

DISCUSSION

Covid 19 is not just a viral disease, not just a Pandemic. It is a lesson for us to learn from. The importance of isolation, quarantine, lockdowns in regard to transmission of the disease can be seen in this case. This also showed us the gaps in our health service sector and the need for protocols for any emergency.
Table 1. Age and Sex distribution in covid 19 positive autopsied cases

<table>
<thead>
<tr>
<th>Age group</th>
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<th>Female</th>
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<td>7</td>
<td>17.94</td>
</tr>
<tr>
<td>60-69</td>
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<td>1</td>
<td>5</td>
<td>12.82</td>
</tr>
<tr>
<td>70-79</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>05.12</td>
</tr>
<tr>
<td>80-89</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>02.56</td>
</tr>
<tr>
<td>90-99</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>5</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Sex wise manner of death distribution

<table>
<thead>
<tr>
<th>Manner</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentage %</th>
</tr>
</thead>
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<tr>
<td>Suicidal</td>
<td>17</td>
<td>3</td>
<td>20</td>
<td>51.28</td>
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<td>Homicidal</td>
<td>2</td>
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<tr>
<td>Accidental</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>23.07</td>
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<tr>
<td>Natural</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>17.94</td>
</tr>
<tr>
<td>Undetermined</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>02.56</td>
</tr>
<tr>
<td>TOTAL</td>
<td>34</td>
<td>5</td>
<td>39</td>
<td>100</td>
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</tbody>
</table>

Table 3. Sex wise cause of death distribution

<table>
<thead>
<tr>
<th>COD</th>
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<th>%</th>
<th>Female</th>
<th>%</th>
<th>Total</th>
<th>%</th>
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<tr>
<td>Hanging</td>
<td>13</td>
<td>33.33</td>
<td>1</td>
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<td>14</td>
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<td>Poison</td>
<td>2</td>
<td>05.12</td>
<td>1</td>
<td>02.56</td>
<td>3</td>
<td>07.69</td>
</tr>
<tr>
<td>Fall from height</td>
<td>2</td>
<td>05.12</td>
<td>1</td>
<td>02.56</td>
<td>3</td>
<td>07.69</td>
</tr>
<tr>
<td>RTAs</td>
<td>9</td>
<td>23.07</td>
<td>0</td>
<td>-</td>
<td>9</td>
<td>23.07</td>
</tr>
<tr>
<td>Gunshot injuries</td>
<td>2</td>
<td>05.12</td>
<td>0</td>
<td>-</td>
<td>2</td>
<td>05.12</td>
</tr>
<tr>
<td>Natural</td>
<td>5</td>
<td>12.82</td>
<td>2</td>
<td>05.12</td>
<td>7</td>
<td>17.94</td>
</tr>
<tr>
<td>Undetermined</td>
<td>1</td>
<td>02.56</td>
<td>0</td>
<td>-</td>
<td>1</td>
<td>02.56</td>
</tr>
</tbody>
</table>

Covid 19 occurred in waves, each time with different mutation and different pathophysiology and the treatment protocol was different each time. The medication that worked last time may not work this time. The clinical signs and symptoms also varied. From a case of cough and cold needing home quarantine and isolation to prevent spread of disease to sudden respiratory distress needing ventilatory support, from minor body aches to disseminated coagulopathy to multi organ dysfunction, the range varied.

The lockdowns, isolation, travel restrictions also brought lots of complications including losing job, loss of pay, unemployment, financial breakdowns and more.

As per reports by National Crime Records Bureau (NCRB), India lost 1.53 lakh people to suicide as compared to coronavirus which killed close to 1.49 lakh people in 2020.²

Anecdotally, mental disorders have been linked to infection with common respiratory viruses. However, some publications now
expressed concern regarding clusters of COVID-19 breakouts among those with mental illness. Social isolation, financial woes, fake and misinformation about the disease - all such factors influence the suicidal behavior and become trigger points in a person suffering from effects on mental health due to Covid 19 infection.

There has been studies showing increased suicide trends during Covid 19 period. However, there are no studies done on unnatural deaths among Covid 19 positive cases.

According to McDowell et al, the COVID-19 outbreak in Boston was associated with significant differential increases in ED presentations with suicidal ideation and SUD. This is similar to our study which shows more than half of the cases had committed suicide.

According to studies by Sripada et al, majority of suicide victims were male (75.3%), 53.8% cases of suicides were by hanging. This is like what we found in our study.

CONCLUSION

This study highlights the need for special care to be taken for the mental health in cases of Pandemic, especially of Covid 19 positive cases. These deaths could have been prevented if proper diagnosis and treatment. More studies are needed to learn about the correlation in detail.

ACKNOWLEDGEMENT

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SOURCE OF SUPPORT: - Nil

CONFLICT OF INTEREST: None declared

ETHICAL CLEARANCE: Taken from the Institutional ethics committee.

REFERENCES

Cross Sectional Study on Socio Demographic and Clinical Profile on Acute Abdomen in a Tertiary Care Hospital Hyderabad, Telangana

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ABSTRACT

A cross sectional study on socio demographic and clinical profile of acute abdomen was conducted in a tertiary care teaching hospital in Suraram, Hyderabad, Telangana. It was retrospective and record based study, 170 in-patient case sheets from the department of General surgery admitted in emergency with acute abdomen from 1st July 2021 to 30th June 2022 were collected from Medical record department of Hospital. Socio demographic and clinical details were collected from the case sheets in to a pre structured data sheet and the data was analyzed by SPSS (version 21.0) software.

Four most common causes of acute abdomen found in our study are acute appendicitis accounting 30% of total number of admissions, followed by acute cholecystitis with 21.2%, acid peptic diseases with 18.23% and renal calculi contributed fourth common cause of acute abdomen accounting 12.4%. Acute appendicitis was the leading cause in males whereas acute cholecystitis was the leading cause in females. Majority of cases 74.75% were treated conservatively and 25.35% cases were treated with surgery. 85.9% of cases were treated without any complications. Mortality was very negligible due to referral to higher centers. Similar results were observed in studies conducted in India and abroad.

Keywords: Socio demographic profile, clinical profile, acute abdomen.

INTRODUCTION

A cross sectional study on socio demographic and clinical profile of acute abdomen was conducted in a tertiary care teaching hospital in Suraram, Hyderabad, Telangana. It was retrospective and record based study, 170 in-patient case sheets from the department of General surgery admitted in emergency with acute abdomen from 1st July 2021 to 30th June 2022 were collected from Medical record department of Hospital. Socio demographic and clinical details were collected from the case sheets in to a pre structured data sheet and the data was analyzed by SPSS (version 21.0) software.

The majority of patients presenting with acute abdominal pain have associated
symptoms (e.g., nausea, vomiting, diarrhea and constipation) that are often helpful in making a diagnosis. Additionally, constipation may point towards an intestinal obstruction. The causative pathologies of the acute abdomen range from intra-abdominal to extra-abdominal and metabolic diseases. Common causes of acute abdominal pain include acute appendicitis, acute cholecystitis, acute bowel obstruction, urinary colic, perforated peptic ulcer, acute pancreatitis, acute diverticulitis, and nonspecific, nonsurgical abdominal pain. Therefore a multidisciplinary approach is imperative and early consultation is the key in order not to unnecessarily delay treatment. Two thirds of patients do not require operative management.

The general rule is that any pain which is persistent for a period of more than 6 days is usually caused by a disease of surgical significance. This led to the common misconception that the acute abdomen is synonymous with the surgical abdomen. However, not all cases of acute abdomen are best treated with surgery.

Most cases of acute abdomen can be diagnosed clinically by the presence of abdominal pain, abdominal tenderness, guarding and rigidity. There should be a certain diagnostic modality which confirms the diagnosis and the surgeon should feel safe and accurate in deciding which patients require immediate surgical intervention. Although imaging modalities like X-rays, Ultra sonography (USG), CT scan and MRI, are available and can diagnose accurately.

The aim of the study is to explain socio-demographic and clinical profile of surgical cases of acute abdomen reported to the tertiary care teaching hospital with following objectives.

➢ To explain the most common causes of acute abdomen.
➢ To explain the socio-demographic details in relation to the cause of acute abdomen.
➢ To explain the clinical presentation and management in relation to the disease.
➢ To know about post-operative complications and mortality.

Clinching an early diagnosis of cause for acute abdomen is imperative for the emergency management of acute abdomen patients. Misdiagnosis and delay in the treatment can lead to complications and death. This study is useful for accurate diagnosis for establishing better infra structure, good treatment protocol and will help to invariably a superior management.

MATERIALS AND METHODS
A cross-sectional retrospective study on socio-demographic and clinical profile of acute abdomen was conducted in a tertiary care teaching hospital at Suraram, Hyderabad, Telangana. 170 in patient case sheets of General surgery were collected from the department of medical records. Study was conducted from 1st July 2021 to 30th June 2022, for a period of one year after obtaining permission from institutional ethics committee. Names of the patients were kept anonymous and absolute professional secrecy was maintained during the study.

Patients admitted in the emergency department of hospital with surgical causes of acute abdomen were considered for this study and those with medical causes and gynecological origin of acute abdomen was excluded.

The following data was collected from the in-patient case sheets.

• IP Number.
• Age.
• Sex.
• Marital status.
• Locality.
• Religion.
• Nutritional habits.
• Seasonal distribution, Educational qualification.
• Smoking, alcohol and other addictions.
• Any genetic predisposition of the disease.
• Any associated co-morbid condition present.
• Clinical presentation of the case.
• Diagnostic methods used to evaluate the case.
• What is the cause of acute abdomen
• Number of cases treated conservatively
• Number of cases requiring emergency surgery
• Any postoperative complications developed
• Any specific treatment protocol followed
• Any cases referred to higher centers and reasons
• Duration of stay in hospital.
• Whether discharged with full recovery
• Death due to complications if any during first 24 hrs of surgery.
• Death due to complications if any during postoperative period.

Data was collected in to a pre structured data sheet and entered in Microsoft Excel spread sheet; data was analyzed by SPSS (version 21.0) software.

RESULTS
A Cross sectional, retrospective and record based study was conducted in a tertiary care teaching hospital Hyderabad, 170 case sheets of surgical causes of acute abdomen in which 86 of male sex and 84 of female sex were collected from MRD of hospital and the following results were observed (Table 1 and Figure 1 to 4).

DISCUSSION
A cross sectional, retrospective study on socio-demographic and clinical profile of acute abdomen was conducted in a tertiary care teaching hospital at Suraram, Hyderabad, Telangana. A total of 170 case sheets among which 86 belong to males and 84 belong to females were collected from Medical Records Department of the hospital. Socio demographic and clinical details were collected from the case sheet and analyzed statistically by using SPSS software. We noticed 6 most common clinical diagnoses in our study area. We found statistical significance of age in association with clinical presentation (p=0.000) and sex in association with clinical diagnosis (p=0.018),

<table>
<thead>
<tr>
<th>Socio-demographic details</th>
<th>Findings</th>
<th>Socio-demographic details</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total study population</td>
<td>Males 86, Females 84</td>
<td>Locality</td>
<td>85 Urban, 85 Rural</td>
</tr>
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<td>Religion</td>
<td>Hindu 145, Muslim 24 and Christian 1</td>
<td>Nutrition</td>
<td>Vegetarian 7, Mixed diet 163</td>
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<tr>
<td>Season</td>
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<td>Cases recurrences</td>
<td>7 recurrent and 163 new cases</td>
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<td>Co morbidity</td>
<td>Hypertension 6, Diabetes mellitus 5 both hypertension and diabetes 8, Asthma 2, Hypo Thyroid 8, Epilepsy 4. No co-morbidity 137.</td>
<td>Investigations</td>
<td>USG 92, endoscopy 12, CT scan 3, Liver function test 2, X ray KUB 2, ERCP 1, Widal test 1, Clinical diagnosis 56.</td>
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<tr>
<td>Management</td>
<td>Conservative 127, Surgery 43.</td>
<td>Postoperative complication</td>
<td>Nil 42, Complication 1.</td>
</tr>
<tr>
<td>Referral</td>
<td>Referred to higher centre 9</td>
<td>Discharge</td>
<td>Full recovery 137, Left against medical advise 17, Abscond 4</td>
</tr>
<tr>
<td>Death</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 1: Clinical diagnosis in study population.

- Acute appendicitis: 51 cases
- Cholecystitis: 37 cases
- Gastritis: 33 cases
- Renal calculi: 21 cases
- Intestinal obstruction: 12 cases
- TB Appendicitis: 11 cases
- Cystitis: 9 cases
- Inflamed bowel: 2 cases
- Intestinal perforation: 1 case
- Hydrocele: 1 case
- Appendicitis: 1 case

Fig. 1: Age wise distribution of study population.

Fig. 2: Clinical presentation in study population.

Fig. 3: Duration of stay in hospital.

Age wise distribution shows 2.4% of cases from 0 to 10 years, 7.6% from 10 to 20 years, 30.6% from 20 to 30 years, 40% from 30 to 50 years, 16.5% from 50 to 70 years and 2.9% cases are above 70 years. Highest number of cases of acute abdomen were reported in 30 to 50 years age group, and second highest were reported in above 50 years of age group in our study population.

In locality wise distribution we observed an equal numbers of cases from both urban and rural areas. Majority of patients in our study group i.e. 85.3% belong to Hindu community, 14.1% were Muslims and very less number of patients 0.6% were from Christian community, the percentage distribution almost representing their population percentage.

Regarding Dietary habits, 95.9% of study group consumed mixed diet and remaining 4.1% are vegetarians. Most of the cases of acute abdomen i.e. 69.4% presented to the emergency department during the rainy season, 30% reported in winter and only 0.6% cases reported during summer. Highest number of acute abdomen cases was reported in rainy season. Regarding personal habits, 80% of the patients are neither smokers nor alcoholics, whereas the remaining 20% are smokers and alcoholics. In our study we noticed very least percentage of cases (0.6%) having genetic predisposition.

Acute abdomen in relation to co-morbidities, we observed that 80.6% have no co-morbidities. 19.4% of cases are associated with co-morbidities among that 11.1% have hypertension with diabetes and 4.7% have hypothyroidism. Epilepsy was found in 2.4% and 1.2% were asthmatics.

Other clinical presentations associated with acute abdomen in our study population was 41.8% of cases presented with pain abdomen in right iliac region, 30% were diffuse abdominal pain with vomiting, 6.5% of cases were abdominal pain with fever and 6.5% with hypogastric pain. The remaining presentations i.e. 5.3% were pain abdomen with burning micturition, 4.1% were abdominal pain with diarrhea, 2.4% with lumbar pain, 1.2% were abdominal pain with constipation, 1.2% with Melena and 1.2% were abdominal pain with headache.
Regarding investigations, 54.1% of cases underwent ultrasonography, 31.2% of cases were investigated with X ray erect abdomen, endoscopy was performed in 7.1%, CT scan in 1.8%, Liver function test in 1.2%, kidney ureter and bladder radiography in 1.2%, ERCP in 1.25% and widal tests were done in 0.6% of cases. Majority of cases were diagnosed by ultrasonography and erect abdominal x ray.

In regard to the clinical diagnosis in our study, 30% of total number of cases was diagnosed as acute appendicitis, out of the total male population it contributed to 31.3% and in female subjects it contributed to 28.57%. Second highest number of cases was diagnosed as acute cholecystitis which is 21.2%, in total male it contributed to 12.79% and females 29.76%. Third common cause of acute abdomen in our study was acid peptic disease, which is 18.25%, among total male population it accounts to 22.09% and in female population it accounts to 14.28%. Fourth common diagnosis was renal calculi which is 12.4% in which majority are males, with 5.84% from total male population and 1.19% from female population. Other clinical diagnosis was intestinal obstruction in 4.7%, pancreatitis 3.5%, TB abdomen 1.8%, liver abscess and cystitis contribute 1.25% each, 1.2% were acute inflammatory bowel disease and remaining other clinical conditions contributed 0.6% each were intestinal perforation, dengue fever, hydro-nephrosis, urinary tract infections, appendicular mass, enteric fever and hemorrhoids.

In total study population, surgery was the treatment of choice in 25.3% only whereas 74.7% cases were treated conservatively. Postoperative complications were negligible around 0.6%, 4.1% cases were referred to higher centers.

Regarding In-patient duration of stay in the hospital, only 6.5% stayed less than 24hrs, 34.7% stayed for 2 to 3 days, 28.8% stayed 3 to 5 day and 30% stayed more than 5 days. Regarding discharges 85.9% of cases were discharged with full recovery, 10% of cases left against medical advice, and 3.5% of cases were absconded and mortality was only 0.6%.

A study conducted by Ahmadullah Danish titled “Retrospective case series study for acute abdomen” at Aliabad Teaching hospital revealed the most common cause of acute abdomen was acute Appendicitis, second being intestinal obstruction and the third was acute cholecystitis. A study conducted in Japan by Hidero Yoshimoto on “seasonal variations and severity of acute abdomen” revealed acute appendicitis was the most common cause of acute abdomen. In another study conducted at Nigerian Teaching Hospital by John Owoade Agboola et.al. also found similar results. We also observed similar results in our study.

CONCLUSION
Four major causes of acute abdomen reported in our study are acute appendicitis, cholecystitis, acid peptic diseases and renal calculi. Appendicitis was the leading cause of acute abdomen in males whereas cholecystitis was the leading cause in females. Second highest cases reported in males are acid peptic diseases but in females it was acute appendicitis. Third highest number of cases was cholecystitis in males where as in females it was acid peptic disease. Renal calculus was the fourth commonest cause of acute abdomen in both males and females. Majority of the cases around two thirds were treated conservatively, only 25.3% underwent emergency surgery. Several studies conducted in India and abroad also found similar results.

Acknowledgement: We thank Mr. Ramesh statistician, MRIMS for helping in statistics.

Conflict of interest: Nil

Ethical clearance: Institutional ethics committee permission was taken

Source of funds: Self

REFERENCES


**INTRODUCTION**

Poisoning is a major public health problem globally, with thousands of deaths occurring every year, & those who survived the same, live with a life long suffering. In the last few decades, with the improvement in knowledge of science & technology a revolution has been created, whereby man has found new ways to lead a healthy life as well as to early end his life. In the scenario of developed world, it is the household chemical agents and prescribed drugs commonly used as poisoning agents, whereas in the developing countries, agricultural - chemicals, in spite...
of their invaluable contribution increasing the food production and pest control, are the most common offenders. There are more than 9 million natural and synthetic chemicals worldwide and the list keeps on growing inexorably. Pesticides are the commonest cause of poisoning and according to WHO estimates approximately 3 million pesticides poisoning so occur annually worldwide causing more than 220000 deaths(1). India accounts for one third of pesticide poisoning cases in the third world and the worst affected are the farm workers who contribute nearly three quarters of the labour force. In general accidental poisoning is more common in children whereas suicidal poisoning is more common young adults. Most of the fatality rate is of intentional poisoning by OP (Organo-phosphorous) compounds, which has been reported in southern and central India. As per National Crime Records Bureau (ncrb ) studies, the rate of suicides is 12% in 2021 which was 9.9% in 2017. Among the states with higher percentage of share of suicide during 2019-2021 was Maharashtra (13.6%) , followed by Tamil Nadu ( 9.7%). The most common method adopted by victims was hanging (57%) followed by poison (25.1%) as per 2020-2021 studies(). Hence It is very important to know the nature and severity of poisoning in order to take appropriate preventive measures. The aim of present study is to determine the socio-demographic profile and assessing the pattern of commonly used poisons in the cases being brought for medico legal examination.

MATERIALS AND METHODS

The present cross- sectional study was conducted for a period of one year from January 2021- December 2021, in the cases of death due to poisoning, subjected to autopsy at Government Thoothukudi medical college. Cases of Snake bite, food poisoning and alcohol intoxication were excluded in the study. Data regarding age, gender, residence, time elapsed after intake, type of poison, manner of poisoning, duration of hospitalization and outcome was collected in a pre-structured proforma based on inquest report, post mortem examination & report of chemical analysis of viscera from forensic science laboratory . The data was analyzed using standard statistical methods.

RESULTS

Out of total -895 cases brought for medicolegal autopsy in 1 year study period,140 (15.64%) poisoning cases werepresent. In this, males(n=108, 77%) , contributed the majority of cases compared to females ( n=32, 23%). The incidence of poisoning death was noted to be higher in age group of 31-40 years (n=32, 22.9%) & lowest was recorded in 71-80 years age group( n=4, 0.03%)- (table 1 )

The incidence of poisoning was found to be more among married ( n=102, 72.86%) , while among singles (n= 38, 27.14%).in our case, majority of the deceased belong to lower socioeconomic status (n=124, 88.57%), while minimal no. in upper class(n=1,0.07%). The majority of case was found to have occurred in time period from July- september

Table 1: Age Distribution

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male(N)</th>
<th>%</th>
<th>Female(N)</th>
<th>%</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>10-20 YRS</td>
<td>6</td>
<td>50%</td>
<td>6</td>
<td>50%</td>
<td>12</td>
</tr>
<tr>
<td>21-30 YRS</td>
<td>14</td>
<td>73.68</td>
<td>5</td>
<td>26.31</td>
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</tr>
<tr>
<td>31-40 YRS</td>
<td>28</td>
<td>87.5</td>
<td>4</td>
<td>1.25</td>
<td>32</td>
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<tr>
<td>41-50 YRS</td>
<td>20</td>
<td>83.33</td>
<td>4</td>
<td>1.66</td>
<td>24</td>
</tr>
<tr>
<td>51-60 YRS</td>
<td>20</td>
<td>80</td>
<td>5</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>61-70 YRS</td>
<td>16</td>
<td>66.66</td>
<td>8</td>
<td>33.33</td>
<td>24</td>
</tr>
<tr>
<td>71-80 YRS</td>
<td>4</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>108</td>
<td>77.14</td>
<td>32</td>
<td>22.857</td>
<td>140</td>
</tr>
</tbody>
</table>
(n=52, 37.14%), while least in january - march time period (n=25, 17.87%). The most common manner of death was found to be suicidal (n=125, 89%), while the least common was homicidal (n=1, 0.007%).

Most commonly used poison was organophosphorous (n= 84, 60%), while least common was hair dye (n=5, 3.57%), which contributed n=25,17.857% (TABLE 1.2). Of all the samples from poisoning cases sent to viscera analysis - positive report was less (n=47,33%), while negative report was obtained more (n=93,67%).

Majority of cases occurred at home (n=96, 68.57%) while those occur outside home was comparatively less (n=44, 31.4%). The time duration of survival after poisoning till death, maximum deaths occurred in 1-7 days (n=72,51.4%), while those who survived more than 7 days was only (n=12)8.57%.

DISCUSSION

There has been an ongoing trend in increase in no. of deaths due to poisoning. The sociodemographic profile plays major role in it. The regional variations & accessibility to different sorts of poison can vary from place to place at times. In our present study of the total- 865 cases, 140 cases account for poisoning which is 15.62%. Almost similar pattern was observed in incidence of poisoning case study conducted in various parts ranging between 10-20%, as in studies by Kumar TN et al -11.7%, Kanchan T etal – 17.9%, Raut PK et al -14.54, Rangu Sridhara chary etal-15.7%, while exceptions were noted in studies of Harish D, Shetty AK etal, Singh SP etal., Haloi M etal with incidences of - 24%, 25%, 5.25%, 3.7% respectively(3,4,5,6,11). Rural background as the common background correlates with almost every study. The most common manner being suicide was noted in our study (89.28%), similar to findings by Siddhapur KR etal (93.1%), Haloi M. etal(92.7%), Kumar D R etal(91.53%) 

This implies that poisoning is most commonly used method for suicide, as it is easily available in any house, & mere enragement or stress factor or even under effect of addiction, compel the person to take it as soon as possible. Majority deaths was seen in males (77.14%) similar to other studies. This shows though women are said to be mentally weak, when it comes to handling social, economic stress, many a times men fall prey to thought of losing their lives.

As per our study , majority of deceased belong to age group-31-40 yrs (22.85), which is a bit different from other studies, where more predominant age group was 21-30 years, as per studies of Raut P K etal (45.71%), Shetty AK etal (43%), Singh S P etal (41.82%). This variation might be possibly due to variation in living conditions of people over here compared to other regions. The working class bear more stress , are more addicted to substance abuse which often leads to family problems, emotional breakdown ultimately ending up in deaths. As similar to other studies , in our study also the incidence of poisoning among married people was more (72.857%), other studies also supporting the same as per Haloi. M etal (66.6%), Singh SP et al(60%), Raut Pk et al(60%).

The unsatisfactory married life, unemployment , substance abuse, extra marital affairs all contribute to the increasing incidence among married groups. The most common poison used is organophosphorous (n=84,60%), which is almost same in every region of India with exceptions seen in studies of singh SP et al ( aluminium phosphide = 50.9%), Harish D etal (aluminum phosphide = 50.2%),
CONCLUSION

Organophosphorous contribute the major cause of poisons contributing to death. In a developing country like India where majority of its earnings come from agriculture activities, the use of insecticides/pesticides cannot be fully avoided. The same is with the industries involved in producing theses chemicals. Rather than banning these items, putting a control over their accessibility is what can be done at the maximum. The increased health awareness among common public including the mental health care programmes to tackle the serious life situations can very much reduce the sudden provocative thought of committing suicides. The various government schemes & financial supports to support the rural class can help in their upbringing socially & economically thereby reducing the burden. The increased setting up of poison information & control centres with sophisticated technologies can help in effective diagnosis & management of cases thereby reducing the mortality.

SOURCE OF FUNDING: SELF

CONFLICT OF INTEREST: NIL

REFERENCES


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Violence Against Women: A Study In Mukta Centre

Dileep Kumar K.B, Praveen, Shruhti M. K, Georgina George, Raghavendra R

INTRODUCTION

Women and children are a vulnerable subset of the population who are more prone to violence. The Mukta project, a pilot project, initiated by the Centre for Enquiry into Health and Allied Themes (CEHAT) and National Health Mission (NHM) aimed to identify female victims of violence at an early stage and to provide them with support and referral services.

Methodology: A retrospective study was conducted among the people coming to the Mukta Centre in the Emergency Medicine Department at Bowring and Lady Curzon Hospital from January 2022 to June 2022.

Results: A total of 102 cases were studied in the 6-month duration. The violence suffered was not limited to just physical but also sexual violence, emotional damage, psychological violence and financial violence too. Often, the victim would be suffering from multiple types of violence.

Conclusion: Support from the MUKTA Centre gives battered women a choice whether to remain in a relationship with someone who has perpetrated domestic violence, and access to aid in the form of health care, childcare and shelter if not anything else.

Keywords: Violence, women, domestic, sexual.

INTRODUCTION

Women and children are a vulnerable subset of the population who are more prone to violence. The support they can get in society is very less – more often due to common misbelieves, poor knowledge and little to no access to the outside world. In 1993, the UN Declaration on the Elimination of Violence Against Women defined domestic violence as: Physical, sexual and psychological violence occurring in the family, including battering, sexual abuse of female children in the household, dowry-related violence, marital rape, female genital mutilation and other traditional practices harmful to women, non-spousal violence and violence related to exploitation. According to a National Family and Health Survey (NFHS) 2005, the total lifetime prevalence of domestic violence was 33.5% and sexual violence was 8.5% in women aged 15-49. According to National Crime Records Bureau, 4,28,278 crimes against women were registered in the
country. Crimes against women include cases of rape, molestation, acid attack, cruelty by husband/his relatives and domestic violence, among others. A total of 31,677 rape cases were registered in India during 2021—around 87 rape cases every day on average. As per NFHS-5, 77% of women did not report violence to anyone including family and friends. Many acts and Bills have been enacted to correct this issue all over the world, including in India, the earliest law being—the Dowry Prohibition Act of 1961. Recent legislation in this regard is the Protection of Women from Domestic Violence Act of 2005. Even in a hospital setup, where these victims of suffering may come when situations turn too serious—Governments and NGOs are taking steps to provide much-needed medical aid and other aids simultaneously. This study was conducted to find patterns of violence against women so that more measures could be taken to help them.

MUKTA CENTRE

The Mukta project, a pilot project, initiated by the Centre for Enquiry into Health and Allied Themes (CEHAT) and National Health Mission (NHM) aimed to identify female victims of violence at an early stage and to provide them with support and referral services. Mukta centres are run with the collaboration of several departments in a hospital, the police and the Department of Women Welfare, with some NGOs. SOPs were made. A nodal officer is appointed for a specific region who helps in seamless management and easy referral services. Mukta Centre became operational in Bowring and Lady Curzon Hospital on 10th December 2021.

AIMS AND OBJECTIVES

To determine the pattern of violence against women in the Mukta Centre in the Emergency Medicine Department at Bowring and Lady Curzon Hospital.

MATERIALS AND METHODS

Study type: Retrospective

Duration of study: 6 months—From 1st January to 30th June 2022

Inclusion criteria: All the cases seen in the Mukta Centre in the Emergency Medicine Department at Bowring and Lady Curzon Hospital

Exclusion criteria: None

Details were collected from Critical Care Response Unit registers (CCRU). The help of the staff in Mukta Centre was sought in cases of queries.

RESULTS

A total of 102 cases were studied in the 6-month duration.

Victims were of varying ages. The most common age group was between 21-30 years (39), and the least number of victims were between 61-70 years (1) and 71-80 years (1) (Table 1).

Hindus (63.72%) were predominant among the victims who sought help, followed by Muslims (29.41%).

The highest number of victims were married (79.41%). However, widowed women (2.94%), divorced women (2.94%), and unmarried women (10.78%) were victims too.

In all cases, MLC was made in the hospital and police were intimated. However, only few victims filed an FIR against the assailant/abuser (Table 2).

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>No. of victims</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td>11-20</td>
<td>13</td>
<td>12.74</td>
</tr>
<tr>
<td>21-30</td>
<td>39</td>
<td>38.23</td>
</tr>
<tr>
<td>31-40</td>
<td>30</td>
<td>29.41</td>
</tr>
<tr>
<td>41-50</td>
<td>11</td>
<td>10.78</td>
</tr>
<tr>
<td>51-60</td>
<td>5</td>
<td>4.9</td>
</tr>
<tr>
<td>61-70</td>
<td>1</td>
<td>0.98</td>
</tr>
<tr>
<td>71-80</td>
<td>1</td>
<td>0.98</td>
</tr>
</tbody>
</table>
Table 2. LEGAL PROCEDURE

<table>
<thead>
<tr>
<th></th>
<th>No. of cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLC made</td>
<td>102</td>
<td>100</td>
</tr>
<tr>
<td>FIR filed</td>
<td>42</td>
<td>41.17</td>
</tr>
</tbody>
</table>

Only 18 victims gave a previous history of violence (Table 3).

Table 3: PREVIOUS HISTORY OF VIOLENCE

<table>
<thead>
<tr>
<th>Previous H/o violence</th>
<th>No. of cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>18</td>
<td>17.64</td>
</tr>
<tr>
<td>No</td>
<td>84</td>
<td>82.35</td>
</tr>
</tbody>
</table>

The identity of the abuser was known in 99 cases and unknown in 3 cases. The most common perpetrator was the husband (50) (Table 4).

Table 4. RELATIONSHIP WITH ABUSER

<table>
<thead>
<tr>
<th>Relationship with abuser</th>
<th>No. of cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husband</td>
<td>50</td>
<td>49.01</td>
</tr>
<tr>
<td>Ex-husband</td>
<td>3</td>
<td>2.94</td>
</tr>
<tr>
<td>Boyfriend/Intimate Partner</td>
<td>7</td>
<td>6.86</td>
</tr>
<tr>
<td>Parents</td>
<td>8</td>
<td>7.8</td>
</tr>
<tr>
<td>Brother</td>
<td>3</td>
<td>2.94</td>
</tr>
<tr>
<td>Son</td>
<td>4</td>
<td>3.92</td>
</tr>
<tr>
<td>Daughter-in-law</td>
<td>4</td>
<td>3.92</td>
</tr>
<tr>
<td>Male Relatives</td>
<td>14</td>
<td>13.72</td>
</tr>
<tr>
<td>Female Relatives</td>
<td>10</td>
<td>9.8</td>
</tr>
<tr>
<td>Grandparents</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>Other Known People</td>
<td>11</td>
<td>10.78</td>
</tr>
</tbody>
</table>

Violence suffered was not limited to just physical but also sexual violence, emotional damage, psychological violence and financial violence too. Often, the victim would be suffering from multiple types of violence (Table 5).

Table 5. TYPE OF VIOLENCE

<table>
<thead>
<tr>
<th>Type of violence</th>
<th>No. of victims</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Violence</td>
<td>69</td>
<td>67.64</td>
</tr>
<tr>
<td>Emotional Damage</td>
<td>56</td>
<td>54.9</td>
</tr>
<tr>
<td>Psychological damage</td>
<td>37</td>
<td>36.27</td>
</tr>
<tr>
<td>Financial violence</td>
<td>33</td>
<td>32.35</td>
</tr>
<tr>
<td>Sexual Violence</td>
<td>7</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Medical aid was given in all cases. 3 were referred to other centres (KIDWAI, Victoria Hospital). A temporary shelter was provided to 1, by contacting NGOs. Follow-up by at least 2 members of the Mukta team was done in all cases.

DISCUSSION

Domestic violence is considered a violation of Human Rights. United Nations Declaration on the elimination of Violence against Women (VAW), in 1993, defined VAW as “any act of gender-based violence that results in or is likely to result in physical, sexual, or psychological harm or suffering to women, including threats of such acts, coercion, or arbitrary deprivation of liberty, whether occurring in public or private life. Domestic violence generally has been understood as a “private” matter in which governments should not interfere and for which they are not accountable 1.

Traditionally the home has been idealized as a place of safety and security, a sanctuary from duty, responsibility, and work. The relationships between members of the family were also idealized as respectful and supportive. Violence against vulnerable groups is always under-reported. There might be various reasons for that, including the belief that they deserve the punishment, and, in many cases, victims refuse to believe that they have been abused, it has become part of their normal lives. According to National Crime Records Bureau, in 2021, crime against women increased by 13.2% compared to last year and rapes increased by 19.34% 3.

As per the latest reports from National Family and Health Survey, 29.3% of married Indian women between the ages of 18-49 years have faced domestic violence/or sexual violence. The factors related to domestic violence are present throughout the country, regardless of setting, whether it is in Karnataka (highest cases-44%) or in Lakshadweep (least cases-1.3%) 4. Lack of sensitization, misogyny, patriarchal society, feudal norms, lack of awareness, lack of healthy relationships, all contribute to the scenario. Various international
stages have recognized this problem, and so has our government.

In a study conducted by Mahapatro et al in 2012, only 39% of women mentioned the incidence of one or the other forms of domestic violence. Overall, 37% of them indicated the prevalence of psychological violence, and about 14% of physical and sexual violence in their homes, respectively. However, in our study, physical violence was more common and 6.8% of cases gave a history of sexual violence. Women aged 21 to 35 years suffered more compared to those who were older which is comparable to our study which shows maximum victims came from the 21–30-year group.

In a study done by Yasmin S et al in a slum in West Bengal in 2019, psychological violence was the most common form of domestic violence (91.23%) followed by physical (82.46%) and sexual violence (64.91%). However, in our study, physical violence (67.6%) was more predominant. And only 9.65% had reported to the police which is less compared to our study where only 41.1% filed FIR. Probably, the reason is these women had come to the hospital only after suffering a lot or had serious injuries needing medical attention.

The major problem is many still believe domestic violence means married women suffering at hands of their husbands. So many studies are done focusing on married women, not considering the plight of unmarried, divorced or widows.

The Protection of Women from Domestic Violence Bill, 2005 having been passed by the Lok Sabha on 24th August 2005 and by the Rajya Sabha on 29th August 2005 received the assent of the President of India on 13th September 2005 and came on the statute book as the Protection of Women from Domestic Violence Act, 2005.

PROTECTION OF WOMEN FROM DOMESTIC VIOLENCE ACT

SCOPE: Primarily meant to provide protection to wife or female live-in partner, but now extends to women living in a household such as sisters, widows, or mothers. They can approach the Centres for legal aid without filing FIR. Legal aid, shelters and monetary benefits shall be provided to victims without delay. An important criticism of the Act is with respect to section 14, which may prescribe counselling of either party and delay proceedings up to two months. Redressal of domestic violence has always tended to focus on reconciliation between the perpetrator and the victim, even within the criminal justice system. This is due to the perceptions regarding the importance of preserving family unity.

CONCLUSION

India needs to develop a comprehensive domestic violence policy. The response to recognizing that there are many forms of domestic violence - not restricted to life-threatening situations, but also including emotional, physical, sexual, psychological, and financial abuse - and it consequently should be flexible enough to be able to deal with the whole spectrum of violence. Support from the MUKTA Centre gives battered women a choice whether to remain in a relationship with someone who has perpetrated domestic violence, and access to aid in the form of health care, childcare and shelter if not anything else.

ACKNOWLEDGEMENT: - We acknowledge the cooperation of the faculties of the department of forensic medicine and toxicology, Atal Bihari medical college and research institute, Bengaluru.

SOURCE OF SUPPORT: Nil

CONFLICT OF INTEREST: None declared.

ETHICAL CLEARANCE: Taken from the Institutional ethics committee.

REFERENCES:


Retrospective Study of Pattern of Skull Fractures in Different Medicolegal Autopsies

G. Hema Latha, M. Ramesh Babu, B. Sugnan, K. Lakshmi, N. Dinesh Varma

INTRODUCTION
Skull fractures occurred due to RTAs, Assaults and other cases are the most common cause for hospitalization, disability, financial loss and death of the individual. Skull fractures are of various types i.e., linear, comminuted, depressed, hinge etc. Some of the skull fractures may cause rupture of dura mater and injury to brain matter thereby, causing permanent neurological damage and death. In this present study, we focused on the pattern of skull bone fractures involved in various manners like Accidental, Homicidal, Suicidal, also pattern of distribution among male and female, age wise distribution, time of death in a day, and also discussed about any other associated injuries that contributes to cause of death. 165(92%) skull fractures are observed in accidents, 141(78%) cases involve linear fracture. region wise distribution most commonly involved is base of skull region alone in 63(35%) cases commonly seen in fall from height cases, parieto-temporal and base of skull together 36(20%) cases seen in road traffic accidents, temporal and base of skull region 14(7.8%). In other associated injuries commonly involved intracranial haemorrhages and scalp contusions.

MATERIALS AND METHODS
In this study total 180 cases post-mortem conducted in mortuary of GGH Mortuary, Guntur Medical, Guntur. These cases are presented with skull fractures for post-mortem examination in which manner such as accidental,
homicidal, suicidal to be assessed during the period of April 2022 to September 2022. All the necessary information is collected from the inquest papers, investigating officer and relatives of the deceased. All the findings are described in detail in the prescribed proforma and the collected data analysed with suitable statistical tools to find out the significance of the results. Autopsy dissection techniques are used with references from Otto Saphir\(^2\).

**RESULTS AND DISCUSSION**

Head injury is a morbid state, which is produced by mechanical force which indicates the severity of force applied to the skull region to cause fractures and effect on brain such as transient concussions up to some extent. mostly due to blunt force impact and causing gross and subtle structural changes in the scalp, skull, and contents of the skull. There are two types of forces that leads to causing head injury 1. Direct Force like compression of skull under the heavy objects like vehicle wheels commonly seen in road accidents. 2. Indirect force from heavy objects like bricks and metal sticks hitting the head in motion which is seen in assault cases, in other way head is in motion and it is hitting the stable objects observed in fell on hard surfaces.

Outer table of skull bone is comparatively thicker than inner table, approximately two times\(^1\). The thickness of skull bone varies from region to region such as thicker in temporal, sphenoid greater wing, sagittal ridges and protuberance of occipital and thinner, vulnerable at parietotemporal lateral parts of frontal bone and lateral parts of occipital bone. It is rare that the skull fracture itself is dangerous to life, but the concomitant effect of transmitted force upon the cranial contents.

In present study total 180 cases of deaths with skull fractures were included of which 153 cases are male, 27 are female. Among the selected population, male predominance is seen (85%) when compared to Female (15%) it indicates that male persons are mostly accompanied with outdoor chores and it is similar to study conducted by Dr. R. Ravi Kumar\(^7\) mentioned in his study, male victims are 87.75%.

All the cases are divided according to the age group as shown in Table 1. In age group wise distribution more in age groups 41-50 years i.e., 30%, 20% in 21-30 years, and it is almost equal to age group 31-40 years (18%), 51-60 years (17%) indicate that skull fractures are more common in younger and middle age groups. Inference from above, highest number of cases belongs to the age group between 41-50 years and least number in the age group between 0-10 years (Table 1).

Distribution of cases among manner of death 165(92%) cases are due to accidental,9 (5%) cases are due to homicidal,6(3%) cases are due to suicidal in manner of death (Table 2). Manner of death in skull fractures seen are mostly accidental (92%), followed by homicidal (5%), suicidal (3%) which indicates that reason for skull fractures commonly are road traffic and other accidents, least common in assault, and suicidal falls.

In present study total 180 cases of deaths with skull fractures were included of which 66(37%) died at 6AM to 11.59PM, 48(27%) died at 12AM to 5.59AM, and 48(27%) died at 6PM to 11.59PM.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Number cases of deaths with skull fractures</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>3</td>
<td>2%</td>
</tr>
<tr>
<td>11-20</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>21-30</td>
<td>36</td>
<td>20%</td>
</tr>
<tr>
<td>31-40</td>
<td>33</td>
<td>18%</td>
</tr>
<tr>
<td>41-50</td>
<td>54</td>
<td>30%</td>
</tr>
<tr>
<td>51-60</td>
<td>30</td>
<td>17%</td>
</tr>
<tr>
<td>61-70</td>
<td>12</td>
<td>7%</td>
</tr>
<tr>
<td>71-80</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manner of Death</th>
<th>Number of Autopsies</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homicidal</td>
<td>9</td>
<td>5%</td>
</tr>
<tr>
<td>Suicidal</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>Accidental</td>
<td>165</td>
<td>92%</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100%</td>
</tr>
</tbody>
</table>
died at 12NOON to 5.59PM, 33(18%) cases died at 6PM to 11.59PM, 33(18%) died at 12AM to 5.59AM. Time of death in a 24 hours framework as shown in table 3, commonly occurs in road traffic accidents morning hours 6 AM - 11.59 AM i.e. (37%), followed by 12PM - 5.59 PM (27%), indicate that most of the incidents causing head injuries occurs in between 6 AM - 11.59 AM, it is almost equal to total cases happened during night hours 6 PM - 5.59 AM (Table 3).

In present study total 180 cases of deaths with skull fractures were included of which the following region wise distribution 63(35%) is present in base of skull region, 36(20%) is present in parieto-temporal and base of skull, 14(7.8%) is present in temporal and base of skull region fracture and remaining all regions wise distribution in below (Table 4). Skull fractures region wise distribution most commonly involved is base of skull region alone in 63(35%) cases commonly seen in fall from height cases ring fractures are commonly seen\(^3\), parieto-temporal and base of skull together 36(20%) cases seen in road traffic accidents, temporal and base of skull region 14(7.8%) cases, when compared to study done by Anh, Nguyen Tuan\(^4\) et.al where the temporal bone and base of skull are most common and when compared to study done by Sunil Kumar Soni\(^5\) et.al, where most common site of fracture is frontal (40.35%) followed by temporal (28.94%) (Table 4).

In present study, deaths with skull fractures (table 5) were included of which 141(78%) are Linear type of fractures, 24(13%) is comminuted type of fractures, 6(3%) are Hinge type of fracture and depressed, depressed+ hinge, comminuted + hinge each share 3(2%) of distribution. Type of fractures distribution in our study most common type is linear or fissure (78%) followed by comminuted fracture (13%). It is similar to the study conducted by the Sunil Kumar Soni\(^5\) et.al where the 56.14% are linear fractures and comminuted fracture are 10.52% and also in the study conducted by Anh, Nguyen Tuan\(^4\) et.al, the most common type is linear (46%) and as per Author David Dolinak\(^8\) most encountered skull fractures in post-mortem examination are linear and curvilinear fractures (Table 5).

In present study total 180 cases of deaths with skull fractures were included of which 75(42%) cases are associated with intracranial haemorrhages, 35(20%) cases are associated with contusion of scalp, 19(10%) each are associated with black eye and blunt injury to neck, 16(9%) each are associated with laceration of scalp and blunt injury to chest (fracture of rib). Other injuries associated with skull fractures are

### Table 3: Distribution among time of death in a day

<table>
<thead>
<tr>
<th>Time of death</th>
<th>Number of Autopsies</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AM to 5.59AM</td>
<td>33</td>
<td>18%</td>
</tr>
<tr>
<td>6AM to 11.59AM</td>
<td>66</td>
<td>37%</td>
</tr>
<tr>
<td>12NOON to 5.59PM</td>
<td>48</td>
<td>27%</td>
</tr>
<tr>
<td>6PM to 11.59PM</td>
<td>33</td>
<td>18%</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Table 4: Distribution among skull region wise injury

<table>
<thead>
<tr>
<th>Area of fracture</th>
<th>Number of persons affected</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Temporal</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Parietal</td>
<td>8</td>
<td>4.4</td>
</tr>
<tr>
<td>Occipital</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>F+P+T</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>P+T</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>F-P-MCF</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Orbital+F-P</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>O+BOS</td>
<td>11</td>
<td>6.1</td>
</tr>
<tr>
<td>P-T+Base of skull</td>
<td>36</td>
<td>20</td>
</tr>
<tr>
<td>P+O</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>T+O+F+B+BOS</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>F+BOS</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>F-P+BOS</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>T+BOS</td>
<td>14</td>
<td>7.8</td>
</tr>
<tr>
<td>BOS</td>
<td>63</td>
<td>35</td>
</tr>
<tr>
<td>F-T+BOS</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>P-O+BOS</td>
<td>6</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100</td>
</tr>
</tbody>
</table>
as shown in Table 6, intracranial haemorrhages (42%) are more common and least with blunt injury to the neck causing spinal cord fracture (10%) (Table 6).

CONCLUSION

Skull fractures are more common in accidents and causing more deaths in male population belongs to middle age which are mostly preventable in nature by providing early medical assistance to the victims can decrease the death rate and effective implementation of preventive measures and strengthen the medical policies. Most common region of skull involved in road traffic accidents are parietotemporal and base of skull, region involved in fall from height is base of skull and in assault cases parietal region.

Conflict of interest statement: None.

Source of funding: Nil

Ethical consideration: This study is approved by Institutional Ethics Committee of Guntur Medical College, Guntur, vide reference no. GMC/IEC/015/2022, Dated 29-09-2022.

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Table 5: Distribution among type of fracture

<table>
<thead>
<tr>
<th>Types of fracture</th>
<th>Number cases of deaths with skull fractures</th>
<th>Percentage *%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>141</td>
<td>78</td>
</tr>
<tr>
<td>Comminuted</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>Depressed</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Hinge</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Depressed +Hinge</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Comminuted fracture+ Hinge</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6: Distribution of other associated injuries along with skull fractures

<table>
<thead>
<tr>
<th>Associated injuries</th>
<th>Number of affected</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracranial haemorrhage</td>
<td>75</td>
<td>42%</td>
</tr>
<tr>
<td>Black eye</td>
<td>19</td>
<td>10%</td>
</tr>
<tr>
<td>Laceration of scalp</td>
<td>16</td>
<td>9%</td>
</tr>
<tr>
<td>Contusion of scalp</td>
<td>35</td>
<td>20%</td>
</tr>
<tr>
<td>Blunt injury to neck</td>
<td>19</td>
<td>10%</td>
</tr>
<tr>
<td>Blunt injury to chest (rib fracture)</td>
<td>16</td>
<td>9%</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100%</td>
</tr>
</tbody>
</table>

7. Dr. R. Ravikumar, M.D An autopsy Study of Patterns of Skull fractures in Road Traffic Accidents Involving Two Wheelers. JKAMLS Jan - Jun 2014; vol 23(1) : Pages 9-14.

Forensic Epidemiological Study of Drowning Deaths in a Cosmopolitan City of Karnataka

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ABSTRACT
Drowning is one of the leading causes of unintentional injury death worldwide, amounting to about 7% of all injury-related deaths. The estimated world-wide annual deaths due to drowning is said to be around 2,36,000. Children, males and individuals with increased access to water are most at risk of drowning. In India there exists proximity of people with the water bodies like rivers, canals, wells or ponds. All these water bodies are easily accessible and there are hardly any preventive or safety measures. This major public health problem related to drowning can be prevented by frequently studying data from the medicolegal registers, which is primarily the aim of this study.

Keywords: Drowning, Asphyxia, Autopsy, submersion, epidemiology, prevention.

INTRODUCTION
Drowning is a form of asphyxia caused by aspiration of fluid into air-passages, caused by complete or partial submersion in water or other fluid medium. In the year 2002 the World Congress on Drowning (WCOD) which was held in Amsterdam gave new definition of drowning as “the process of experiencing respiratory impairment from submersion or immersion in a liquid.”

Magnitude of the Problem
In many countries, a major contributor to premature mortality and an important cause of deaths due to unintentional injury is drowning. According to the current estimates of World Health Organization, every year almost 0.26 million people die due to drowning out of which more than 90% of the victims are from low- and middle-income nations. As per NCRBI data in the year 2021, drowning was the third major contributor which accounted for 7.5% of all unnatural causes of accidental deaths. In India, major sources of water supply are wells, rivers, canals and dams. Due to ease of access and lack of safety measures drowning is a common cause of unnatural deaths. Also due to easy and unsecured access to water bodies in India it becomes an easy way for disposing on bodies after homicide. And determining
the manner of death especially in drowning deaths has always posed a great challenge to the forensic pathologist. The encounters are even more plausible in coastal areas. Mangalore is a cosmopolitan coastal city located in the Southwest part of India with more than nine lakh inhabitants surrounded by the Arabian Sea and Nethravathi river. Mangalore is a tropical region with peak summers and well known for its heavy rainfall during the rainy seasons with overflowing of Nethravathi river and in-turn occurs flooding of the low-lying areas in the sub-urban areas. Data and knowledge about factors affecting drowning can help in better understanding of this menace and in turn lead to more effective measures to prevent the problem, albeit challenging. This paper aims to study the epidemiology of drowning deaths in Mangalore, over the last six years roughly (5.5 years) so that preventive measures can be undertaken.

MATERIALS & METHODS

The study material consisted of 306 medicolegal autopsies conducted in the department of forensic medicine and toxicology, Kanachur Institute of Medical Sciences, Mangalore, Karnataka between January 2016 to June 2022 making it a period of five and half years. Of these, 19 cases (6.2%) were deaths due to Drowning. These Drowning deaths were studied retrospectively (retrospective observational study design) after obtaining clearance from the institutional ethical clearance committee.

Forensic epidemiological study parameters to be studied such as age, sex, season, water source, manner of death, and occupation were recorded on a structured proforma. Cases which are still pending toxicological chemical analysis were excluded. Hospital case records, police inquest reports, detailed interview with relatives, post mortem examination reports and chemical analysis reports were the source for material.

The information thus collected, was tabulated using Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 21.0 and results were thereby drawn.

RESULTS

During this study period, a total of 306 cases were brought for postmortem examination out of which 19 (6.2%) deaths were due to Drowning. The highest number of victims 11 (57.9%) belonged to age group of 41-50 years [Table 1]. Males dominated females in number of deaths. 14 victims were males (73.68%) and 5 victims were females (26.31%) [Table 2]. Majority of deaths happened during rainy season amounting to 12 deaths (63.15%) [Table 3]. The most common manner of death was accidental drowning amounting to 16 deaths, (84.21%) [Table 4]. Maximum number of persons fell victim by falling into overflowing canals (gutters) amounting to 13 deaths (68.42%) [Table 5]. Majority of the victims 16 (84.21%) were self-employed street urchins [Table 6].

<p>| Table 1: Age Distribution of Decedents |</p>
<table>
<thead>
<tr>
<th>Age group (Years)</th>
<th>Number of Deaths</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11-20</td>
<td>1</td>
<td>5.26</td>
</tr>
<tr>
<td>21-30</td>
<td>1</td>
<td>5.26</td>
</tr>
<tr>
<td>31-40</td>
<td>4</td>
<td>21.05</td>
</tr>
<tr>
<td>41-50</td>
<td>11</td>
<td>57.9</td>
</tr>
<tr>
<td>51-60</td>
<td>2</td>
<td>10.52</td>
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<tr>
<td>TOTAL</td>
<td>19</td>
<td>100</td>
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</table>

<p>| Table 2: Sex Distribution |</p>
<table>
<thead>
<tr>
<th>Sex</th>
<th>Number of Deaths</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>14</td>
<td>73.68</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>26.32</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>100</td>
</tr>
</tbody>
</table>

<p>| Table 3: Season of Death |</p>
<table>
<thead>
<tr>
<th>Season</th>
<th>Number of Deaths</th>
<th>Percentage (%)</th>
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</thead>
<tbody>
<tr>
<td>Summer</td>
<td>6</td>
<td>31.57</td>
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<tr>
<td>Rainy</td>
<td>12</td>
<td>63.15</td>
</tr>
<tr>
<td>Winter</td>
<td>1</td>
<td>5.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>100</td>
</tr>
</tbody>
</table>
DISCUSSION

In this section the authors attempt to compare our study findings with observations made by other researchers on forensic epidemiology of drowning hitherto falling during the same observational study period as ours or such coastal regions to. It would be pertinent to the readers at this stage firstly to know that there are 6 tertiary care medical college and hospitals within a 16-kilometre radius in the city of Mangalore. The data collected from KIMS hospital Mangalore is but a small fraction of cases falling under the same jurisdiction of police stations which prefer the government hospital in majority of cases. Thus, when our study values do not correlate with other researchers, this factor has to be kept in mind. And when they do, they cannot be equated with cities bigger than Mangalore. However, the study gets its advantage over other regions because of the city being located in a coastal region.

Majority of the decedents in our study belonged to 41-50 years age group which correlated with findings made by Lin YC et al.,7 and closely to Niraj Kumar et al.,8 but it did not correlate with Shetty & Shetty 6, Radhakrishna et al.,9. Males predominated females in our study which correlated with findings made by all authors credited above.6-9 Further, majority of the decedents fell victim during rainy season. This observation correlated with study made by Radhakrishna et al., but it did not correlate with observation made by other researchers credited above. 6,7,8 This could be due to regional/locality/topographical differences between the suburbs versus downtown. The most common manner of death was accidental in our study which correlated with all other authors credited above. 6,7,8 While considering the water source to which the decedents fell victim to- most of our studied cases submerged into overflowing canals (gutters) which correlated with all authors credited above 6,8,9 except by Lin YC et al. This small difference in non-correlation could be explained by the fact that their study primarily focussed on drowning in the elderly in bathtubs. Lastly, we observed that majority of the decedents in our study were self-employed street urchins who being more prone to drowning which may be well put as an occupational risk. This observation correlated closely correlated with Niraj Kumar et al but it did not correlate with other authors credited above. This could be once again due to the difference in the locality as stated earlier the scenario of the suburbs of Mangalore versus downtown.

CONCLUSION

The authors conclude that drowning is undoubtedly a high-priority public health problem. The Municipal corporation and such bodies have taken adequate measures in every area such as barricading entry of people into the beaches during the nights, appointing night watchmen around the beaches, prompt closure of open drains etc. However, the topography of the suburbs is such that the mud easily gets leached leading to overflowing of gutters and canals which we feel must be looked upon to so that these accidental deaths being predominant will reduce. While the municipal bodies have no role in curbing suicidal and homicidal
drowning deaths, it purely rests in the mentality of every individual to live and let live in accordance with the law as legally abiding citizens of India.

**Conflict of Interest:** None

**Ethical Committee Clearance:** Obtained

**Source of Funding:** Self

**REFERENCES**


A Study of Postmortem Findings of Asphyxial Deaths Due to Hanging in a Semi Urban Region of Karnataka

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ABSTRACT

Hanging, a method of deliberate & intentional self-harm amounts for a major proportion of autopsies which medicolegal experts encounter in their clinical tenure at various hospitals pan India. A retrospective study was conducted in the Department of Forensic Medicine and Toxicology, Kanachur Institute of Medical Sciences, Mangalore from Jan 2016 to June 2022, with an objective to study the post mortem findings in autopsy cases of hanging. Out of 306 autopsies, 14.38 % cases were that of hanging with a female to male ratio being 3:1. Most cases were atypical (81.81%,36) and partial hanging (72.72%, 32) with the ligature mark situated above the thyroid cartilage. 86.36 % of cases (38) had dried salivary stain at the angle of mouth and one case showed involuntary discharge. The incidence of fracture of hyoid bone and thyroid cartilage not observed in any cases.

Keywords: Violent asphyxia, Hanging, Autopsy, salivary stains, thyroid cartilage, hyoid bone.

INTRODUCTION

Hanging is a type of violent asphyxial death in which the neck is constricted with a ligature and the body is suspended wherein the weight of the body acts as the constricting force. According to the literature, there are two types of hanging that are documented i.e., hanging with complete suspension of the body without the feet touching the ground (complete hanging); and hanging with incomplete suspension, with parts of the body or feet touching the ground (incomplete or partial hanging). Based on the position of the knot, hanging is described under 2 headings – Typical hanging where the knot is present at the occiput and atypical hanging where the knot is at any other position.

At autopsy, the classical signs of asphyxia observed are cyanosis, congestion, petechial haemorrhage, pulmonary edema and postmortem fluidity of the blood.1,8

A detailed assessment of various postmortem findings is always deemed mandatory especially in a few cases where the ligature mark produced due to the variable amount of pressure on the neck may create ambiguity.

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Email Id: drbkgopal2020@gmail.com
In the current study it is attempted to get an insight into the post mortem features of deaths due to hanging in Mangalore region.

**MATERIALS AND METHODS**

The study consisted of 44 hanging victims out of 306 medico-legal autopsies performed in the Department of Forensic Medicine, Kanachur Institute of Medical Sciences, Mangalore, Karnataka during the period of 5.5 years (from January 2016 to June 2022).

Necessary information for the study was gathered from inquest report by the Police and treatment records of hospital. Discussion with relatives, friends, and neighbours of the victims were also obtained separately for additional data. In certain cases, crime scene visits and review of the photographs were utilized for supplementary information.

A detailed proforma was used to record the details of observation made in the cases of hanging in the present study. The information thus collected, was tabulated using Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 21.0 and results were thereby drawn.

**RESULTS**

During this study period, 306 cases were brought for post-mortem examination out of which 44 (14.38 %) deaths were due to hanging. 3/4 of the victims were females. Out of 306 cases, typical hanging was found only in 8 cases (18.19 %) whereas most of the cases 36 (81.81%) were atypical hanging. Knot was on the left side of neck in 23 cases (52.27%) (Table 1).

In the present study partial hanging was seen in almost 3/4th of the deaths. Complete hanging was accounted for 12(27.28%) deaths (Table2).

In our study, the level of ligature mark was above the thyroid cartilage in 38 cases, overriding the thyroid cartilage in 4 cases and below the thyroid cartilage in 2 cases (Table 3).

86.36 % of cases (38) had dried salivary stain at the angle of mouth and 2.27 % of total case showed involuntary discharge.

No incidence of hyoid bone and thyroid cartilage fracture were observed in any of the cases.

Postmortem lividity was seen over the back of the body in 41 (93.18%) cases.

In present study, Peri ligature injuries like rope burns (93.18% of cases) followed by Cyanosis of fingertips and nail beds of both hands (88.63 % cases) were one of the commonest findings. Petechial haemorrhage on face were observed in all partial hanging case. Pale, white, hard and glistening subcutaneous tissue underneath the ligature marks were noticed at autopsy in all cases. Pulmonary edema was observed in 42 cases.

<table>
<thead>
<tr>
<th>Typical / Atypical</th>
<th>Position of knot</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical</td>
<td>Back</td>
<td>Left</td>
</tr>
<tr>
<td>Typical</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Atypical</td>
<td>-</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>8(18.19%)</td>
<td>23(52.27%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Hanging</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>12</td>
<td>27.28</td>
</tr>
<tr>
<td>Partial</td>
<td>32</td>
<td>72.72</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of ligature mark</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above the thyroid cartilage</td>
<td>38</td>
<td>86.36</td>
</tr>
<tr>
<td>Below the thyroid cartilage</td>
<td>2</td>
<td>4.55</td>
</tr>
<tr>
<td>Overriding the thyroid cartilage</td>
<td>4</td>
<td>9.09</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1: Typical and Atypical hanging

Table 2: Type of Hanging (Complete / Partial)

Table 3: According to the Level of the Ligature Mark
and congestion of lungs were noticed in all the cases. Other classic signs of asphyxia were absent in majority of complete suspension of victims’ bodies.

**DISCUSSION**

During this study period, 306 cases were brought for post-mortem examination out of which 44 (14.38 %) deaths were due to hanging. 75% of the victims were females. Domestic and work-related issues, bereavement, failure in love along with easy accessibility of ligature material in a private setting may be the cause for the female predominance.

In our study, atypical hanging (81.81%) was commonly noticed over typical hanging (18.19 %). In over half of the victims’ cases, Knot was on the left side of neck. Similar findings were observed in the studies conducted by other authors. This form of knot and completeness of hanging are important in determining the ligature mark over the neck.

In the present study, partial hanging was more commonly observed in comparison to complete hanging which was reported in approximately 1/4th of the deaths. This is in concurrence with studies by some authors but not in agreement with a few others. This could be due to regional influence, multiple medical colleges being under the same jurisdiction of the police stations, dynamics of hanging with regards to the residence.

In our study, the level of ligature mark was above the thyroid cartilage in majority of the cases followed by those overriding the thyroid cartilage and the least below the thyroid cartilage. This was also observed in few other studies. This observation is suggestive of a greater force acting of in the elastic soft tissue over a small area of the neck between bony margin of the jaw and the thyroid cartilage.

Majority of cases (38) had dried salivary stain at the angle of mouth and a single case presented with involuntary discharge at autopsy. The findings are consistent with a few north Indian studies who observed 32.31% cases with dribbling of saliva. Absence of hyoid bone and thyroid cartilage fracture in any of the cases was inconsistent with a few studies

Postmortem lividity was seen over the back of the body in majority of the victims’ points to the fact that the body was removed from suspension within a few hours and placed in a prone position.

These internal findings at autopsy with regards to signs of asphyxia was found to be consistent with a few literature studies.

**CONCLUSION**

Precise understanding and interpreting of autopsy findings in hanging cases is of utmost importance in making an assertive diagnosis of death owing to hanging. Our current study showed that the findings in different types of hanging could differ, from time to time with exceptions to the largely accepted. Awareness of these combinations of findings are of vital importance in coming to an inference in a suspected case of hanging to avoid any inaccurate opinion.

**Conflict of Interest:** Nil

**Ethical Clearance:** Obtained

**Source of Funding:** Self

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8. B. Knight, P. Saukko. Fatal Pressure on the Neck in: Knight’s Forensic Pathology,


Socio - Demographic & Medico – Legal Profile
Among the Victims of Acute Fatal Asphyxia Cases at S.M.S Medical College, Jaipur

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ABSTRACT

Background: Asphyxia is typically relevant in a forensic setting when it involves mechanical asphyxia. There are various means in which mechanical asphyxia is carried out like pressure over the neck in form of hanging, ligature/ manual strangulation, mugging, garrotting, and, some other forms as smothering, suffocation, choking etc.

Aims & objective: Assessment of socio – demographic profile& medico – legal profile among the victims of acute fatal asphyxia cases at S.M.S hospital, Jaipur.

Material & methodology: a cross-sectional descriptive observational prospective study that used inclusion and exclusion criteria was conducted. 160 (4.90%) autopsies were of these acute asphyxia fatalities (n=3261) were taken in the study. The present study had been conducted in the Mortuary, Department of Forensic Medicine & Toxicology, S.M.S Hospital, Jaipur during the period from June 2018 to October 2019.

Result & observation: The majority of 63 cases (39.37%) were found to be between the ages of 21 and 30. 109 cases (68.13%) were predominantly male. 142 cases (88.75%) were literate & 18 cases (11.25%) were illiterate. Students made up the majority of fatalities with 44 cases (27.5%), followed by homemakers with 41 cases (25.6%). Hanging was responsible in majority of cases (85%). Suicidal manner was present in majority of cases (86.87%).

Conclusion: Majority of victims was of productive age group of society and most of them were students and house makers. The main causes are high expectations, an unhealthy and stressful lifestyle, and less tolerant behaviour in families and social groups. Justice, compassion, educational initiatives, and individual, communal, and societal approaches are required to reduce these cases.

Keywords: mechanical asphyxia, hanging, suicide, socio – demographic and medico – legal profile.

INTRODUCTION

The term Asphyxia is equated in use to the lack of oxygen although; etymologically the term means absence of pulsation². The four physiological causes of asphyxia are reduced oxygen in the environment, reduced blood oxygenation, reduced cardiovascular oxygen transfer, and interference with cellular oxygen absorption³. Autopsy diagnosis of asphyxia rests upon the identification of classical signs
of asphyxia viz. cyanosis, congestion and petechial haemorrhages. Acute fatal asphyxia is one of the indicators of level of social & mental health. Acute fatal asphyxia has a serious psychological & social impact on the family and community as most of the cases were of suicidal manner. Out of all means Hanging is one of the most common methods of suicide because the material easily available in market and success rate is also high by this mean. The medicolegal specialist plays a particularly important role in preventing these cases of death by reconstructing the circumstances of death, analysing the injury patterns, and identifying potential sources of danger. Data on acute fatal asphyxia cases in a particular area can also give the reflection of mental health of the population & its law and order situation. A low value can be described in favour of peace, harmony and prosperity in the particular area as there would be less suicides & murders.

AIM & OBJECTIVES
Study was conducted to evaluate the victims of acute fatal asphyxia in terms of socio-demographics and medical-legal profiles and to paint a picture of the causes therefor.

MATERIALS & METHOD
All medico-legal autopsies of acute fatal asphyxia deaths were included in the cross-sectional descriptive observational study. Inclusion criteria were deaths resulting from mechanical asphyxia as per post mortem findings and history of incident narrated by legal heir. Exclusion criteria were medico-legal autopsies suspected hypoxic episodes not characteristically acute fatal asphyxia and cases of death due to terminal asphyxia event but not mechanical asphyxia in preview of Forensic context. Sample size was calculated at 95% confidence level assuming a relative error of 30% for which sample of 159 cases of medico-legal autopsied were to be required which are further rounded of to minimum 160 cases for the present study.

OBSERVATIONS & RESULTS
3261 medico-legal autopsies were conducted at the study centre during the study period, amongst which 465 were of Asphyxial fatalities, out of these 160 cases were included in the present study. All details were recorded and analysed.

Out of the total 160 cases included in the study, majority were of young adults i.e. 21-40 years age including 94 cases (58.75%); with another high proportion of such deaths reported in middle aged adults i.e. 41-60 years age with 30 cases (18.75%) and adolescents being 26 cases (16.25%). Least number of cases was reported in extreme age groups with seven cases (04.36%) of senior citizens and only three cases (01.88%) of children less than ten years of age. This distribution is quite obvious as majority of unnatural deaths are reported in young adults owing to their active participation in day to day activities and stressful episodes making them vulnerable to all types of unnatural episodes resulting in fatalities (Table 1).

68.13% were males and rest 31.87% were females. Male: Female ratio was 2.14. Males were about more than twice the number of females succumbing to Asphyxial episodes which is an obvious fact, them being active members of our society (Table 2).

Table 1: Age wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 10</td>
<td>03</td>
<td>01.88</td>
</tr>
<tr>
<td>11 - 20</td>
<td>26</td>
<td>16.25</td>
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<tr>
<td>21 - 30</td>
<td>63</td>
<td>39.37</td>
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<tr>
<td>31 - 40</td>
<td>31</td>
<td>19.37</td>
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<tr>
<td>41 - 50</td>
<td>22</td>
<td>13.75</td>
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<td>51 - 60</td>
<td>08</td>
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<tr>
<td>61 - 70</td>
<td>05</td>
<td>03.13</td>
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<tr>
<td>&gt;= 70</td>
<td>02</td>
<td>01.25</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 2: Gender wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>109</td>
<td>68.13</td>
</tr>
<tr>
<td>Female</td>
<td>51</td>
<td>31.87</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.00</td>
</tr>
</tbody>
</table>
68.75% cases were married and rest 30.62% cases were unmarried with a single case of a divorced female. Considering the gender wise distribution of cases 43.75% people succumbing to acute fatal asphyxia were married men and 24.4% were unmarried males. Among females, there were 78.43% married females and 19.61% unmarried females and one divorcee female (0.96%) (Table 3).

Majority of the deaths resulting from acute fatal asphyxia were seen in literate people (88.75%) and rest (11.25 %) were illiterate. This shows that with increase in the knowledge about the ways of committing suicide by hanging; most of the victims were literate (Table 4).

Majority of the deaths resulting from acute fatal asphyxia were seen in students (27.5%) followed by house makers (25.6%). All married women including the divorcee succumbing to Asphyxial death in the present study were house makers. 23.7% sufferers were employed in the private sector and 18.1% were self-employed. Highlighting the plight of agricultural economy, there were four farmers among fatal Asphyxial deaths and two cases each were from Labour class and unemployed sections of society (Table 5).

Majority of cases were of hanging (85%) followed by cases of drowning (6.25%) and suffocation (03.1%). Remaining nine cases in the present study had suffered fatal asphyxia due to Strangulation or throttling (1.9%) and two cases each suffered traumatic asphyxia, aspiration and lung pathology (1.25% each) (Table 6).

87.5% cases were suicidal and 3.1% were homicidal in nature. Rest 9.4% cases of acute fatality due to asphyxia were accidental in nature. Most common occurrence in the present study resulting in fatal asphyxia was hanging due to which the proportion of suicidal cases has outnumbered the magnitude of Accidental (09.4%) and homicidal cases (03.1%).

Table 3: Gender wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>70 Male, 40 Female</td>
<td>68.75</td>
</tr>
<tr>
<td>Unmarried</td>
<td>39 Male, 10 Female</td>
<td>30.62</td>
</tr>
<tr>
<td>Divorce</td>
<td>00 Male, 01 Female</td>
<td>00.63</td>
</tr>
<tr>
<td>Total</td>
<td>160 Male, 101 Female</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 4: Gender wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Education</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literate</td>
<td>142</td>
<td>88.75</td>
</tr>
<tr>
<td>Illiterate</td>
<td>18</td>
<td>11.25</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 5: Occupation wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>44</td>
<td>27.50</td>
</tr>
<tr>
<td>House makers</td>
<td>41</td>
<td>25.60</td>
</tr>
<tr>
<td>Private Job</td>
<td>38</td>
<td>23.70</td>
</tr>
<tr>
<td>Self Employed</td>
<td>29</td>
<td>18.10</td>
</tr>
<tr>
<td>Farmer</td>
<td>04</td>
<td>02.50</td>
</tr>
<tr>
<td>Labourer</td>
<td>02</td>
<td>01.30</td>
</tr>
<tr>
<td>Unemployed</td>
<td>02</td>
<td>01.30</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 6: Incidence wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Incidence</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanging</td>
<td>136</td>
<td>85.00</td>
</tr>
<tr>
<td>Drowning</td>
<td>10</td>
<td>06.25</td>
</tr>
<tr>
<td>Suffocation</td>
<td>05</td>
<td>03.10</td>
</tr>
<tr>
<td>Strangulation &amp; Throttling</td>
<td>03</td>
<td>01.90</td>
</tr>
<tr>
<td>Traumatic Asphyxia</td>
<td>02</td>
<td>01.25</td>
</tr>
<tr>
<td>Aspiration</td>
<td>02</td>
<td>01.25</td>
</tr>
<tr>
<td>Asphyxia due to lung pathology</td>
<td>02</td>
<td>01.25</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 7: Manner of Incidence wise distribution of cases of acute fatal asphyxia

<table>
<thead>
<tr>
<th>Manner of Incidence</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suicidal</td>
<td>139</td>
<td>86.87</td>
</tr>
<tr>
<td>Accidental</td>
<td>15</td>
<td>09.38</td>
</tr>
<tr>
<td>Homicidal</td>
<td>04</td>
<td>02.50</td>
</tr>
<tr>
<td>Natural</td>
<td>02</td>
<td>01.25</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.00</td>
</tr>
</tbody>
</table>
DISCUSSION

Majority of unnatural deaths are reported in young adults owing to their active participation in day to day activities and stressful episodes making them vulnerable to all types of unnatural episodes resulting in fatalities. The age distribution in the present study was similar to that of Delmonte C, et al (2001) who also reported Asphyxial deaths most commonly in the young adult age groups.

The male population is more exposed to stress in our society as they are the active members of the societal chores and also responsible for the financial management of the household which are matters of challenge in today’s world. Moreover, the younger generation nowadays is more ambitious especially males which also leads to more of stress and challenges. Similar male preponderance is reported by most post-mortem studies on unnatural deaths. Males outnumber the females in other studies on Asphyxial episodes as also reported by Delmonte C, et al (2001) and by Chaudhari KM, et al (2016).

Stress and emotional challenges are an integral part of marital life. With the advent of married status in life, come an array of responsibilities so that the preponderance of married persons in a study on Asphyxial deaths is quite explanatory more over as most cases of acute fatal asphyxia in the present study were of hanging, a commonly employed method for suicide followed by drowning.

Observations of incidence wise distribution of cases of acute fatal asphyxia are similar to those of Chaudhari KM, et al (2016) although the proportion of cases of drowning was much lower in comparison to those of hanging in the present study. Majority of cases occurred in residential premises (95.62%), which is quite obvious owing to the highest proportion of hanging deaths in the study sample.

Observations of manners of death are dissimilar to those reported by Delmonte C, et al (2001) who reported a preponderance of accidental cases in their study; although the proportion of homicidal cases are similar in both the studies. These variations are attributable the variation in the study sample in the two studies. The study being compared to had incorporated samples from four groups including Aspiration, Drowning, Suffocation and Strangulation but such an organised sample could not be obtained in the present study where hanging deaths were the predominant proportion amongst cases of acute fatal asphyxia, thus resulting in preponderance of suicidal deaths in the present study. The study sample of the present study included ten cases of drowning, five cases of suffocation and only two cases of aspiration. There were two cases of asphyxia related to chronic lung disease which served as control as also taken up in an organised manner in the study of comparison. The maximum proportion of cases reported by Delmonte C, et al (2001) were of suffocation followed by aspiration, drowning and strangulation. Thus the variations in results of the two studies is attributable to the variation in study samples of the two studies.

CONCLUSION

Majority of cases were of deaths due to hanging seen in young adults and the distribution of incidences of acute fatal asphyxia were highly significant across various age groups. Most cases of Asphyxial deaths were due to hanging and so was the gender wise distribution showing preponderance of hanging in both males and females. All cases of suffocation were of males and two thirds of cases of strangulation and throttling were of females raising concern towards crime against women rampant in our society. The male population is more exposed to stress in our society as they are the active members of the societal chores and also responsible for the financial management of the household which are matters of challenge in today’s world. Justice, compassion, educational initiatives, and individual, communal, and societal approaches are required to reduce these cases.
**Source of funding:** Self-Generated.

**Ethical approval:** From the institutional ethical committee.

**Conflict of interest:** Nil

**REFERENCES**


INTRODUCTION

The major difficulty for a Forensic expert is that asphyxia cannot always be reliably equated to hypoxia and there may not be truly distinctive signs to establish the post mortem diagnosis to reach to definite opinion of cause of death in such controversial cases. Asphyxia is a name given to different kinds of lesions that can produce similar Histopathologic findings4, 7, and 9,11,12,13. It is important to document the pathologic changes in such cases to exclude other forms of trauma or other modes of death that may denote murder made to appear as suicide or natural death.
and many more. Several circumstances can cause sudden death secondary to respiratory failure; mechanical asphyxia is a potential concern in all suspected deaths. However, additional histological studies and molecular studies can help identify death secondary to asphyxia and drowning. Lungs are the most important organs where an array of pathologic changes take place and help in the diagnosis of fatal asphyxia. This was thus initiated to study the histopathologic findings of lungs in cases of acute fatal asphyxia along with the correlation with the post-mortem findings in these medicolegal autopsies.

**OBJECTIVE**

The study was conducted to determine manner of death specific histopathologic changes seen in various asphyxia death.

**MATERIAL AND METHODS**

All medical-legal autopsies of acute asphyxia deaths were included in this cross-sectional descriptive observational study. Inclusion criteria was deaths resulting from acute fatal asphyxia as per post mortem findings and informed written consent from legal heir for participation in study. Exclusion criteria were medicolegal autopsies of cases of suspected hypoxic episodes not characteristically acute fatal asphyxia and Cases of deaths due to terminal asphyxial event but not mechanical asphyxia in preview of Forensic context. Sample size was calculated at 95% confidence level assuming prevalence of histopathologic findings of Ductal over-insufflation in lungs in 21.8% cases as found in reference article at the relative error of 30% for which sample of 159 cases of medicolegal autopsies of acute asphyxia autopsied were to be required, which are further rounded off to minimum 160 cases for the present study. After gross examination samples were preserved from appropriate parts of lungs tissues bilaterally for further histopathological examination and microscopic evaluation of pulmonary pathology, if any.

**RESULT AND DISCUSSION**

3261 medicolegal autopsies were conducted at the study centre during the study period, amongst which 465 were of asphyxial fatalities, out of these 160 cases were recorded and analyzed in the present study. Majority were of young adults i.e. 21-40 years age including 94 (58.75%) cases; with another high proportion of such deaths reported in middle aged adults i.e. 41-60 years age with 30 (18.75%) cases and adolescents being 26 (16.25%) cases. These findings were consistent with Delmonte C et al 2001.

The male: female ratio was 2.14, with 68.13% of cases being male and the remaining 31.87% being female. Similar results were found by Delmonte C et al 2001 (73.65% male, 26.35% female), and Chaudhari KM et al 2016 (73.33% male, 26.67% female). Amongst 160 cases of acute fatal asphyxia, majority of cases were of hanging (85%) (62.66% Chaudhari KM, et al 2016) (51.88% Grellner W et al 1994) followed by cases of drowning (6.25%) (37.34% Chaudhari KM et al 2016) and suffocation (03.1%). Remaining nine cases in the present study had suffered fatal asphyxia due to strangulation or throttling (1.9%) and two cases each suffered traumatic asphyxia, aspiration and lung pathology (1.25% each).

The known macroscopic and histologic signs of general damage through hypoxia, e.g., edema, hemorrhage, pulmonary emphysema, passive congestion, and degenerative cellular changes, are usually diverse and are not conclusive as individual findings. Similar findings can also arise through injuries leading to impairment of the circulation, or ischemia, thereby reducing or interrupting the tissue oxygen supplies. The extent of terminal hypoxia is also relevant to the postmortem detectable changes. In our study strangulation was associated with greater rates of alveolar bleeding, congestion, alveolar collapse, alveolar over-insufflation, bronchiolar constriction, and bronchiolar dilatation, whereas aspiration was associated with higher rates of septal haemorrhage and foreign body. Drowning and suffocation were
each characterised by intra-alveolar edema and ductal over-insufflation with interstitial edema, respectively.

In drowning cases, distinct morphologic alterations might also be anticipated in the parenchyma of the lungs. The pathophysiologic mechanism involves general hyperhydration of submicroscopic cell organelles such as mitochondria and endoplasmic reticulum, which causes swelling and intracytoplasmic vesicular formation in pneumocytes and capillary endothelia. The degree of alveolar tissue collapse, over-insufflation, bronchiolar constriction, and dilatation was diverse in all instances after histological analysis of the pulmonary architecture. The four Histopathologic lesions—edema, intra-alveolar deposition of proteic and amorphous material, passive congestion, and hemorrhage—were equally prevalent in all four groups. The usual morphologic response identified in the lungs of suffocation victims was defined by acute significant emphysema (ductal over-insufflation). Similar findings were observed in study of Delmonte C et al 20013 and Chaudhari KM et al 20162.

In cases of deaths due to strangulation, alternating areas of bronchiolar constriction and dilatation leading to alveolar collapse and over-insufflation, associated with a picture of alveolar hemorrhage, were the morphologic characteristics of lung involvement. These disturbed morphologic disarrangements of the bronchiolar and alveolar architecture determine changes in the circulation relationship leading to a particular reaction pattern—the alveolar hemorrhage—which enabled them to be distinguished from other forms of death.

Alveolar tissue over insufflation was characteristically found with histopathological scores of 3 & 4 in 100% cases of strangulation whereas was detected at score 2 in almost all cases of hanging and was at score 1 in all cases of throttling (100%). it was graded at score 3 in all cases of Drowning (100%). These scores were highly significantly related to the Type of incidence that resulted in asphyxia. In the present study, the type of incidence was revealed to be highly significantly correlated with the quantitative analysis of scores for all histological characteristics. But, yet specificities cannot be concluded for different asphyxias because of the small sample size for most variants of asphyxia included in the two studies. Still, it can be said that in comparison to drowning, the histopathology findings of alveolar tissue collapse, alveolar over-insufflation, bronchiolar constriction and bronchiolar dilatations, congestion, interstitial edema and alveolar hemorrhage were more commonly observed in lungs of hanging. The only histopathology finding that was more commonly noticed in lungs of drowning was intra-alveolar edema. These findings are similar to those of Chaudhari KM, et al2, an Indian study where the study sample is quite similar to that of the present study (Table 1).

<table>
<thead>
<tr>
<th>Histopathological Score (No. of cases)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alveolar Tissue Collapse</td>
<td>1</td>
<td>19</td>
<td>139</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Alveolar Tissue Over-insufflation</td>
<td>1</td>
<td>9</td>
<td>149</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bronchiolar Constriction</td>
<td>6</td>
<td>22</td>
<td>132</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bronchiolar dilatation</td>
<td>2</td>
<td>24</td>
<td>133</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Interstitial Edema</td>
<td>6</td>
<td>8</td>
<td>143</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Intra-Alveolar Edema</td>
<td>5</td>
<td>145</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Intra-alveolar Deposition of Proteic &amp; Amorphous Material</td>
<td>150</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 1 Contd.

<table>
<thead>
<tr>
<th>Histopathological Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-Alveolar Hemorrhage</td>
<td>5</td>
<td>26</td>
<td>129</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Passive congestion</td>
<td>1</td>
<td>150</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interstitial Hemorrhage</td>
<td>1</td>
<td>159</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Septal Hemorrhage</td>
<td>31</td>
<td>121</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alveolar Hemorrhage</td>
<td>6</td>
<td>14</td>
<td>139</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Ductal Over-insufflation</td>
<td>52</td>
<td>97</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Dilatation of the Alveolar Spaces</td>
<td>1</td>
<td>156</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Congestion</td>
<td>0</td>
<td>5</td>
<td>155</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Foreign material/body</td>
<td>155</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Fig. 1:** showing histopathological findings of lung in the case of hanging

**Fig. 2:** showing histopathological findings of lung in the case of strangulation

**Fig. 3:** showing histopathological findings of lung in the case of suffocation

**Fig. 4:** showing histopathological findings of lung in the case of drowning

**Fig. 5:** showing histopathological findings of lung in the case of aspiration

**CONCLUSION**

As an additional histologic criterion to support the asphyxia diagnosis, the histopathologic examination of the lungs at autopsy may be helpful. In 85.03% of cases, the discriminant parameters produced the correct permitted classification. Thus, documenting histopathology findings of lungs as supplementary autopsy evidence based on the theory that asphyxia comprises
various types of lesions that can produce varying histopathology findings can be a worthwhile exercise. Also, additional studies, including macroscopic characteristics, clinical data, and electron microscopy techniques, are probably required for better identification of asphyxia. However, the use of morphometric instruments in normal procedures should be encouraged in the analysis of death by asphyxia for confirmation due to its ease of use, effectiveness, and low cost.

Moreover, this type of histopathological diagnosis of lung morphological findings of lungs can act as a supplemental tool for confirmation of diagnosis especially in cases where the characteristic findings necessary to conclude the cause of death may be subtle thus, resulting in dilemmas for the forensic experts.

Ethical clearance: Taken from institutional ethics committee of SMS Medical College Jaipur

Source of funding: Self

Conflict of Interest: The main causes of conflicts in day-to-day work in mortuary settings are typically asphyxial deaths. We are attempting to investigate additional angles for examining asphyxial deaths through this effort.

REFERENCES


Prospective Study of Differential Diagnosis and Management of Patients With Pain in Right Iliac Fossa – Study of 50 Cases

Kirit D Parmar, Pratik H Vyas, Varun B Bajaj, Darshil Shah, Mohmadadil Punasiya, Parin Patel

ABSTRACT

AIMS:
• To evaluate various etiologies presenting as pain in right iliac fossa pain and their diagnosis using clinical examination and various radiological investigations.
• To evaluate various modes of management available to treat those conditions.

OBJECTIVES:
1. To study different etiologies which can present as pain in the right iliac fossa.
2. To study number of patients requiring different modalities of treatment including conservative or operative management
3. To study number of patients requiring planned or emergency surgical management.

CONCLUSION: In Study Of 50 Cases. Majority of the patients presenting with pain in RIF are from 3rd and 4th decade. Females (54%) were more affected than males (46%). Majority of patients presents (72%) within 5 days of onset of pain. 44% of patients had diagnosed as appendicitis based on clinical evaluation, and 30% of patients had confirmed by ultrasonography. 26 patients were managed conservatively, and 24 patients were managed operatively. The most common complication was wound infection which was more common in emergency operations followed by postoperative ileus.

Keywords: Acute Appendicitis, Right Iliac Fossa Pain

INTRODUCTION

Pain in right iliac fossa is one of the most common presentation of the patients reporting at the emergency department. Nearly 75% of the cases presenting with acute abdominal pain can be attributed to the right lower quadrant of the abdomen. The differential diagnosis of the patients presenting with acute pain R.I.F is not always straight forward and a number of conditions may be responsible for pain at this site. In most of the cases, first diagnosis to be considered is acute appendicitis, which is undoubtedly the most common surgical
emergency.[3] Although appendectomy is the most common emergency general surgical procedure performed in any hospital, its diagnosis still remains difficult and a negative appendectomy rate of 15-30% rising up to 50% in women of reproductive age has been reported.[4]

Several authors considered higher negative appendectomy rates acceptable in order to minimize the incidence of perforation. There is a long list of surgical and medical problems, including right ureteric colic, nonspecific mesenteric lymphadenitis, ruptured ectopic gestation, pelvic inflammatory disease, ruptured functional ovarian cysts, amoebiasis, viral gastroenteritis, acute cholecystitis, perforated duodenal ulcer, Crohn’s colitis, right basal pneumonia etc. which can present as an acute pain in R.I.F and can create a diagnostic problem. So the familiarity with the conditions other than appendicitis presenting as acute pain in R.I.F as well as their management is very important. The purpose of the present study is to recognise certain well defined clinicopathological entities, presenting as pain in the right iliac fossa, the relative incidence of various pathologies, their management and outcome. Relevant literature has been reviewed.

RESULTS

Many surgical and gynaecological conditions like appendicitis, ureteric calculi, ileocolitis, pelvic inflammatory disease, ectopic pregnancies are more prevalent in younger age groups (Table 1).

### Table 1: Age Distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>Patient (N)</th>
<th>Patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td>23</td>
<td>46</td>
</tr>
<tr>
<td>31-40</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>41-50</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>51-60</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>61-70</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>71-80</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>81-90</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Grand Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

In present study females (n-27 54%) outnumbered the males (n-23 46%).

Pain in right iliac fossa was more common symptom in female than male due to prevalence of gynaecologic problems.

In present study 48.14% of females had gastrointestinal conditions, 37.04% had gynaecological conditions, 7.40% had urological conditions and 7.40% had other conditions like rectus sheath hematoma and psoas abscess.

In present study 78.26% of males presented with gastrointestinal conditions, 17.39% presented with urological conditions and 4.34% had other conditions like rectus sheath hematoma (Table 2).

Patients with appendicitis, ureteric calculi, torsion of ovary, ectopic pregnancy presented with pain within 5 days, whereas patients with pelvic inflammatory disease and ileocolitis presented with pain within 6-10 days and patients with ileocecal tuberculosis, caecal cancer presented with pain within 11-15 days (Table 2).

The most common associated complain with pain was nausea which was present in 90% of case followed by vomiting which was present in 64% of cases. Fever was present only in two cases i.e., 4% of cases. One case was of ileocecal tuberculosis with appendicitis and second case was of caecal perforation. Whitish discharge per vaginum was present in 2/3 cases of pelvic inflammatory disease. Abdominal distension was present in all the case of small bowel obstruction (Table 4).

USG has sensitivity of 67% and specificity of 88% in diagnosing bowel and mesenteric conditions. In present study all 50 patients got done sonography of abdomen. 30% of

### Table 2: Number of Days of Pain

<table>
<thead>
<tr>
<th>Pain (N = Days)</th>
<th>Patient (N)</th>
<th>Patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 5</td>
<td>36</td>
<td>72</td>
</tr>
<tr>
<td>6 – 10</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>11 – 15</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Grand Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
In present study Out of 15 patients of appendicitis diagnosed on ultrasonography 2 patients underwent CECT abdomen to rule out other pathologies and were diagnosed with appendicitis with peri-appendicular abscess. Out of 50 patients 1 patient (2%) was diagnosed with intussusception on clinical evaluation out of which 1 patient (2%) had changes of intussusception on ultrasonography which was confirmed by CECT abdomen. From these observation radiological investigations has more specificity in diagnosing various aetiologies presenting as pain in right iliac fossa than clinical evaluation.

Patients presenting with right iliac fossa pain were expected to have leucocytosis. In present study 30% of patients had wbc count more than 11,000 and 70% of patients had wbc within normal limits.

In present study out of 50 patients 31 patients (62%) had gastrointestinal conditions, 10 female patients (20%) had gynaecological conditions, 6 patients (12%) had urological problems and other conditions were present in rest 3 patients (6%) which included rectus sheath hematoma (4%) and psoas abscess (2%). Out of 62% of gastrointestinal problems 30% had appendicitis in acute or chronic form, 8% had ileocolitis, 6% had small bowel obstruction, 6% has mesenteric lymphadenitis, 4% had peptic perforation, 2% had ileoceleal tuberculosis, 2% had

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Complaints</th>
<th>Patient (N)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nausea</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Vomiting</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>3</td>
<td>Abdominal Distention</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Constipation</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Diarrhoea</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Burning Micturition</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Painful Menstruation</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>Whitish discharge per Vagina</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Bleeding per Vagina</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Fever</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>None</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 3: Associated Complaints With Pain

Table 4: Diagnosis According To Ultrasonography Findings Of Abdomen

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Usg Findings</th>
<th>Patient (N)</th>
<th>Patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Appendicitis</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Ileocolitis</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Hemorrhagic cyst</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Ectopic pregnancy</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Ovarian torsion</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Rectus hematoma</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Psoas abscess</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Mesenteric lymphadenitis</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>Intussusception</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Small Bowel Obstruction</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>Bowel perforation</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Ureteric calculi</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>13</td>
<td>Undescended testes</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Ileoceleal tuberculosis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>Right Colon carcinoma</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>NAD</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

patients were diagnosed with appendicitis. 10% of patient had ureteric calculi, 8% had ileocolitis, 6% had mesenteric lymphadenitis, 6% had small bowel obstruction and in 14% of patients ultrasonography was normal.
started with laparoscopic approach but was eventually converted to open method due to peri-appendicular collection.

Out of 24 operated patients 9 patients (37.5%) had postoperative complications in terms of post operative ileus, wound infection and sepsis and 15 (62.5%) patients had no complications. In present study out of 24 operated case 9 developed complications. Out of 9 patients, 7 patients were operated in emergency and 2 patients were operated electively. Out of 9 patients, 5 patients (55.55%) developed wound infection, 3 patients (33.33%) developed postoperative ileus and one patient (11.11%) developed sepsis. Out of 5 patients developing wound infection, 3 patients (60%)

**DISCUSSION**

Present study was descriptive study conducted in tertiary care hospital at Ahmedabad on patients admitted for pain in the right iliac fossa pain between December 2021 and November 2022. All the patients above 18 years of age were included.

Total 50 patients having complain of right iliac fossa pain were participated.

The relevant history and clinical findings of each case were noted. The final diagnosis was established based on histopathological examination of the operated specimen. For the cases managed conservatively, the clinical

---

### Table 5: Specificity of Radiological Investigation in Diagnosing Various Etiologies Presenting as Pain in Right Iliac Fossa

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Condition</th>
<th>Diagnosis Based On Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Clinical</td>
</tr>
<tr>
<td>1</td>
<td>Appendicitis</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Ileo-colicitis</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Ureteric calculi</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Small bowel obstruction</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Peptic perforation</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Ectopic pregnancy</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Intussusception</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Others</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>50</td>
</tr>
</tbody>
</table>

caecal perforation, 2% had right colon carcinoma and 2% had intussusception. Out of 12% of urological conditions, 10% had ureteric calculi and 2% had undescended testis and no cases of pyelonephritis were found. Out of 20% cases of gynaeological conditions 6% had Mittelschmerz syndrome, 6% had pelvic inflammatory disease, 4% had ectopic pregnancy, 2% had right sided haemorrhagic cyst and 2% had torsion of right ovary. Out of 50 patients 26 patients (52%) were managed conservatively and 24 patients (48%) were managed operatively. The operations conducted were for appendicitis, peptic perforation, caecal perforations, ectopic pregnancy, right side colon carcinoma, psoas abscess, ovarian torsion and undescended testis.

Out of 50 patients (30%) had appendicitis. All the 30% of patient were managed operatively either by laparoscopic method or open method acute or chronic appendicitis were differentiated by clinical examination and ultrasonography. Out of 15 cases, 10 cases (66.66%) had acute appendicitis and 5 (33.33%) had chronic appendicitis. Out of 9 laparoscopic surgeries 7 surgeries (77.77%) were done electively and 2 surgeries (22.22%) were done in emergency. Out of 5 open surgeries 3 surgeries (60%) were done in emergency and 2 surgeries (40%) were done electively. And one patient was taken in emergency and was
diagnoses supported by radiological findings were considered final. Due to covid pandemic some of the patients were unable to come for follow up on time.

More than half patients having complain of right iliac fossa pain were present in age group of 21-30 years (46%) and 31-40 years (18%) followed by 51-60 years of age group. Least number of patients were fell in 61-90 years of age (total 9%) (Table-1) Many surgical and gynaecological conditions like appendicitis, ureteric calculi, ileocolitis, pelvic inflammatory disease, ectopic pregnancy are more prevalent in younger age groups. in study of Omar Farooq et al [5], patients having complain of right iliac fossa pain was present in age group of 5-15 years (25.33%) and 15-25 years (41.33%), 25-35 (29.33%) years, 35-45 (2.6%) years followed by more than 45 (1.3%) years of age group. Overall, in study, more than half (54%) of patient having complain of right iliac fossa pain were female. Around (46%) patients were male (Table 2). Pain in right iliac fossa was more common symptom in female than male due to high prevalence of gynecological problems. In study of Shetty Sushruth et al[6], a total of 250 patients with RIF pain were included, of which 135 (54%) were males and 115 (46%) were females. In study of Dr. Saurabh Kothari et al[7], a total of 250 patients with RIF pain were included, of which 61% were males and 39% were females. In study of Y Abdelaim et al[8], a total of 117 patients with RIF pain were included, of which 38% were males and 62% were females.

CONCLUSION

In the present study of Prospective Study Of Differential Diagnosis and Management Of Patients With Pain In Right Iliac Fossa – Study Of 50 Cases, 50 patients of pain in right iliac fossa who fulfil the inclusion criteria were taken, evaluated and treated. The main purpose of the study was to evaluate the different etiologies presenting as pain in right iliac fossa, their timely diagnosis using clinical evaluation further confirmed by radiological investigations, various modes of management and outcome of the treatment. Due to covid pandemic some of the patients were unable to come for follow up on time.

Majority of the patients presenting with pain in right iliac fossa are from 3rd and 4th decade. Many surgical and gynaecological conditions like appendicitis, ureteric calculi, ileocolitis, pelvic inflammatory disease, ectopic pregnancy are more prevalent in younger age groups. Females (54%) were more affected than males (46%).

In present study majority of the cases were involving gastrointestinal system (62%) both in males and females, followed by urology system (12%) in males and gynecology system in females (20%).

Majority of the presents (72%) within 5 days of onset of pain due to acute conditions presenting as pain in right iliac fossa.

Nausea (90%) and vomiting (64%) were the most common associated complaints of pain with which patients presented.

In present study, 44% of patients had diagnosed as appendicitis based on clinical evaluation, and 30 % of patients had confirmed by ultrasonography. So it concludes that USG helps in diagnosing acute appendicitis accurately and timely.

Leucocytes are raised only in 30% patients presenting as pain in right iliac Fossa. Out of 50 patients 26 patients (52%) were managed conservatively and 24 patients (48%) were managed operatively. Out of 24 operated patients, 12(50%) patients were operated electively and 12 (50%) patients had to be operated in emergency.

Out of total 15 appendicitis patients, majority of patients were managed by operation either by laparoscopic (60.00%) or open surgery (33.33%). Remaining patients (6.67%) were managed by converted from laparoscopic to open surgery. 9(60%) patients out of 15 patients of appendicitis were operated electively. 6(40%) patients had to be operated in emergency.

In present study, more than one third patients (37%) developed post-operative
complication out of total 24 operated patients. Majority of patients (63%) had no postoperative complication. The most common complication was wound infection which was more common in emergency operations followed by postoperative ileus which was more common in patients who were approached by exploratory laparotomy.

**Ethical clearance:** Taken from IEC

**Source of funding:** Self

**Conflict of Interest:** NIL

**REFERENCES**


Comparison of the Poisoning Severity Score, Sequential Organ Failure Assessment Score, and Acute Physiology and Chronic Health Evaluation II Score with Lactate to assess the outcome in Acute Organophosphorus Poisoning

Krishna Moorthy DGSR, Manju Priya S, Rajesh K, Devendra Prasad K

ABSTRACT

Introduction: Organophosphorus pesticide self-poisoning is estimated to kill around 200000 people yearly. Early recognition is life-saving as the mortality rates are high following OP Poisoning. Acute Physiology and Chronic Health Evaluation II Score (APACHE II), Sequential Organ Failure Assessment Score (SOFA), and Poisoning Severity Score (PSS) with Lactate, are used to evaluate the prognosis.

Materials and Methods: This prospective observational study included 236 individuals with acute OP poisoning who presented to the emergency department and were hospitalized in the critical care unit and step-down ICU. PSS, SOFA, and APACHE II scores were calculated at Emergency Department and followed up with the patient until discharge or death.

Results and Discussion: Patients had a mean age of 32.8 ± 13.4 years and were 49.2% female and 50.8% male. Out of 236 patients, 22 patients died and 214 were discharged. The best cut-off values for predicting mortality with PSS, SOFA, and APACHE II scores were 2, 3, and 15, with AUROC of 0.929, 0.970, and 0.984. In addition to Lactate to the above scores, the AUROC increased to 0.981, 0.993, and 0.992, respectively. The study found that SOFA and APACHE II scores with Lactate are significantly associated with mortality and have strong discriminative power in predicting mortality.

Keywords: Acute Physiology and Chronic Health Evaluation II, clinical outcome, lactate, Organophosphorus poisoning, Poisoning Severity Score, Sequential Organ Failure Assessment score.

INTRODUCTION

Organo-phosphorus (OP) pesticide self-poisoning is estimated to kill around 200000 people annually, mainly in Asia, and it predominantly occurs in rural communities. as the mortality rates are high following OP Poisoning, early recognition is life-saving in severe cases.\textsuperscript{[1]}

The principal pharmacological action of all Organophosphorus compounds is the inhibition of acetyl-cholinesterase; most patients die from cardiorespiratory failure.
However, there is much variation in the timing of onset and clinical features depending on the particular OP. [2]

Many scoring systems are being implemented to appropriately measure the severity and prognosis of OP Poisoning patients. [1] Three scores are extensively used to assess the prognosis of severe patients. Several studies have demonstrated that they can be utilized to measure the severity of AOPP patients. However, the diagnostic efficacy varies. [3-5]

The Poison Severity Score (PSS) was developed by the International Program on Chemical Safety (IPCS), the European Community, and the European Association of Poisons Centers and Clinical Toxicologists to create a scoring system that produces a qualitative evaluation of the morbidity caused by different types of poisoning. [6]

The Acute Physiology and Chronic Health Evaluation II (APACHE II) score, a regularly used clinical scoring approach created by Knaus et al., may be used to evaluate the severity and prognosis of acute critical disorders. [7] Additionally, the Europe intensive care unit’s sequential organ failure assessment (SOFA) score is used for assessing organ damage and predicting death in critical patients and has the advantages of being objective, reliable, straightforward, and easy to obtain. [8]

Arterial lactate (Lac) level has been identified as a valuable biomarker for assessing tissue microcirculation status. [9] AOPP increases acetylcholine accumulation, which results in a range of muscarinic, nicotinic, and central nervous system symptoms, as well as a change in microcirculation state. [10]

OBJECTIVE

To assess the prognosis in Acute Organophosphate Poisoning patients using the Poison Severity Score (PSS), Acute Physiology and Chronic Health Evaluation II (APACHE II) score, Sequential Organ Failure Assessment (SOFA) score, and Lactate.

MATERIALS AND METHODS

This prospective observational study included 236 patients who presented to the Emergency Department with Acute Organophorous Poisoning and were admitted to a tertiary care hospital (Sri Devraj Urs Medical College Hospital, Karnataka, India) between January 2020 and December 2021, after excluding the 12 patients who were lost to follow-up during the study. The sample size for a cross-sectional study was estimated based on the high diagnostic accuracy of the PSS score 81.1% (AUC) in a cross-sectional study (The evaluation of acute physiology and chronic health evaluation II score, poisoning severity score, sequential organ failure assessment score combine with lactate to assess the prognosis of the patients with acute organophosphate pesticide poisoning) by with precision of 5% estimated sample size will be 236.

Inclusion Criteria

1. Patients of age group more than 18 years
2. Patient with a history of Organo-Phosphorus compound consumption

Exclusion Criteria

1. Patients discharged against medical advice
2. Pregnant women with poisoning

We obtained the following information from the patient at the emergency room after the inclusion and exclusion criteria were met. OP Compound Type, Intake quantity, Time interval between consumption and presentation, Vital Signs, Glasgow Coma Scale (GCS), Routine Blood Investigations, Arterial Blood Gas, Serum Pseudo Cholinesterase levels, ICU, ward, and ventilator days. We calculated the PSS, SOFA score, and APACHE II scores at the emergency department and followed up with patients until discharge or death from the hospital.

Statistical analysis

The data were entered into a Microsoft Excel data sheet and analyzed with SPSS 22 (IBM
SPSS Statistics, Somers, NY, USA) software. Frequencies and proportions were used to represent categorical data. The chi-square test or Fischer’s exact test (for 2x2 tables only) was employed as a significance test for qualitative data. The mean and standard deviation were used to describe continuous data. To determine the mean difference between two quantitative variables, an Independent t-test was utilized as a significance test. The receiver operating characteristic (ROC) and appropriate cut-off points were utilized to calculate sensitivity, specificity, and positive and negative predictive values. A test that predicts an outcome no better than chance has an area under the ROC curve of 0.5. An area under the ROC curve above 0.8 indicated a reasonably good prediction. P-value of <0.05 was considered statistically significant after assuming all the rules of statistical tests.

RESULTS
In our study, 236 individuals with Organo Phosphorus poisoning above 18 were included, with a mean age of 32.8 ±13.4 years. Men accounted for 50.8% of the total (n=120), while women accounted for 49.2% (n=116). 42 were admitted to the intensive care unit, and 194 were admitted to the step-down intensive care unit. There were 22 deaths among the 236 patients, and 214 were discharged. The average period between intake and presentation was three hours (range 1–5 h). Out of 236 individuals, chlorpyrifos (62) is the most common type of OP compound ingested, followed by Dichlorovas (38) and Profenophos (36) (Table 1).

Patients were divided into two groups based on their outcomes: survivors (N=214) and non-survivors (N=22). The baseline characteristics of the two groups are shown in Table 1. Lactate, APACHE II score, PSS, and SOFA score were substantially higher (P<0.05) in the Non-survival group, whereas GCS and pseudo cholinesterase levels were significantly lower (P<0.05).

The mean PSS, SOFA score, APACHE II scores, and Lactate among those discharged were 1, 1, 5, and 3, respectively. The mean PSS, SOFA score, APACHE II score, and Lactate among those who died were 3, 7, 28, and 9, respectively (Table 1). In our study, the mean PSS, SOFA, APACHE II, and Lactate scores were considerably higher in the deceased than in the living (Table 2).

For mortality prediction, the predictive accuracies of the PSS, SOFA score, and APACHE II score were assessed using receiver operator characteristic (ROC) curves. The best cut-off points for predicting mortality in Acute Organophosphate Poisoning patients were 2, 3, and 15, with a sensitivity of 95.45%, 95.45%, 95.45%, and specificity of 91.12%, 91.59%, and 95.79%, respectively. (Table 2) In the PSS, SOFA, and APACHE II scores, the area under the AUROC curve was 0.929, 0.970, and 0.984, respectively. (Figure 1)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Survivors</th>
<th>Non-Survivors</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>33 ±13</td>
<td>37 ±18</td>
<td>0.186</td>
</tr>
<tr>
<td>Amount (ml)</td>
<td>72 ±34</td>
<td>134 ±51</td>
<td>0.001*</td>
</tr>
<tr>
<td>MAP (mm of Hg)</td>
<td>88 ±12</td>
<td>75 ±21</td>
<td>0.012*</td>
</tr>
<tr>
<td>GCS</td>
<td>14 ±1</td>
<td>7 ±3</td>
<td>0.001*</td>
</tr>
<tr>
<td>Serum Pseudo Cholinesterase</td>
<td>837 ±397</td>
<td>384 ±235</td>
<td>0.001*</td>
</tr>
<tr>
<td>PSS SCORE</td>
<td>1 ±1</td>
<td>3 ±1</td>
<td>0.001*</td>
</tr>
<tr>
<td>SOFA SCORE</td>
<td>1 ±2</td>
<td>7 ±3</td>
<td>0.001*</td>
</tr>
<tr>
<td>APACHE II SCORE</td>
<td>5 ±5</td>
<td>28 ±9</td>
<td>0.001*</td>
</tr>
<tr>
<td>LACTATE</td>
<td>3 ±2</td>
<td>9 ±3</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

Table 1: Characteristics of survivors and non-survivors.
The best cut-off values for predicting death in patients with Acute Organophosphate Poisoning were 8, 11, and 19, with sensitivity of 95.45%, 95.45%, and 100%, and specificity of 96.26%, 98.13%, and 95.79%, respectively, for PSS, SOFA, and APACHE II scores in addition to Lactate. (Table 3) The areas under the ROC curves for the PSS, SOFA, and APACHE II scores with Lactate were 0.981, 0.993, and 0.992, respectively. (See Fig. 2)

Adding Lactate to the PSS, SOFA, and APACHE II scores for mortality prediction in Acute Organophosphate Poisoning patients increases the AUROC curve from 0.929, 0.970, and 0.984 to 0.981, 0.993, and 0.992, respectively. PSS-Lac, SOFA-Lac, and APACHE II-Lac had better AUROC, Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value in predicting mortality than PSS, SOFA score, and APACHE II.

Table 2: Comparison of the PSS, SOFA, and APACHE II scores in predicting the outcome

<table>
<thead>
<tr>
<th>Scores</th>
<th>Cutoff</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>+PV (%)</th>
<th>-PV (%)</th>
<th>AUROC</th>
<th>95% CI b</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS SCORE</td>
<td>2</td>
<td>95.45</td>
<td>91.12</td>
<td>52.5</td>
<td>99.5</td>
<td>0.929</td>
<td>0.889 to 0.958</td>
<td>0.001*</td>
</tr>
<tr>
<td>SOFA score</td>
<td>3</td>
<td>95.45</td>
<td>91.59</td>
<td>53.8</td>
<td>99.5</td>
<td>0.970</td>
<td>0.940 to 0.988</td>
<td>0.001*</td>
</tr>
<tr>
<td>APACHE II</td>
<td>15</td>
<td>95.45</td>
<td>95.79</td>
<td>70.0</td>
<td>99.5</td>
<td>0.984</td>
<td>0.958 to 0.996</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

Fig. 1: Comparison of ROC curve for PSS, SOFA, and APACHE II scores in predicting mortality.

Table 3: Comparison of the PSS, SOFA, and APACHE II scores with Lactate in predicting the outcome

<table>
<thead>
<tr>
<th>Scores</th>
<th>Cutoff</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>+PV (%)</th>
<th>-PV (%)</th>
<th>AUROC</th>
<th>95% CI b</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS Lac</td>
<td>8</td>
<td>95.45</td>
<td>96.26</td>
<td>72.4</td>
<td>99.5</td>
<td>0.981</td>
<td>0.954 to 0.994</td>
<td>0.001*</td>
</tr>
<tr>
<td>SOFA Lac</td>
<td>11</td>
<td>95.45</td>
<td>98.13</td>
<td>84</td>
<td>99.5</td>
<td>0.993</td>
<td>0.971 to 0.999</td>
<td>0.001*</td>
</tr>
<tr>
<td>APACHE II Lac</td>
<td>19</td>
<td>100</td>
<td>95.79</td>
<td>71.0</td>
<td>100</td>
<td>0.992</td>
<td>0.970 to 0.999</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

Fig. 2: Comparison of ROC curve for PSS, SOFA, and APACHE II scores in predicting mortality after combining with Lactate.
DISCUSSION

According to the findings, all three scores did well in predicting clinical outcomes due to acute OP poisoning. However, when Lactate was added to the scores, all three showed improvement. Out of 236 acute OP-poisoned patients, 50.8% were men (n=120), and 49.2% were women (n=116), with a mean age of 32.8 years. Yuan S et al.’s study comprised 59 individuals with a mean age of 56, with 54% of the samples being men and 46% women. [10]

In our study, the mean PSS, SOFA, and APACHE II score among individuals discharged were 1, 1, and 5, respectively, and Among expired patients, 3, 7, and 28. According to Yuan S et al.’s study, Discharged patients had PSS, SOFA, and APACHE II scores of 2, 2, and 10, respectively; among expired patients, it was 4, 8, and 24. [10] According to Kim Y H et al. study, discharged patients had mean SOFA and APACHE II scores of 3 and 9.2, respectively. There were 6.7 and 13.3, respectively, among the deceased. [3]

The AUROC for predicting mortality in patients with Acute Organophosphate Poisoning with PSS, SOFA, and APACHE II scores was 0.929, 0.970, and 0.984, respectively, in our research. The AUROCs of the PSS, SOFA, and APACHE II scores, according to Yuan S et al., were 0.811, 0.837, and 0.876, respectively. [10] In the Kim Y H et al. study, the AUROC of SOFA and APACHE II scores were 0.70 and 0.76, respectively. [3]

The AUROC for predicting mortality in Acute Organophosphate Poisoning patients with PSS, SOFA score, and APACHE II scores in addition to Lactate was 0.981, 0.993, and 0.992, respectively, in our study. The AUROCs of the PSS, SOFA score, and APACHE II score with Lactate were 0.878, 0.956, and 0.922, respectively, according to Yuan S et al. [10]

PSS, SOFA, and APACHE II scores performed well in our study compared to other studies; however, SOFA and APACHE II scores with Lactate had high prediction rates compared to others.

CONCLUSION

Eventually, the SOFA and APACHE II scores with Lactate are significantly associated with mortality and exhibit great discriminative power in predicting death in acute organophosphorus poisoning patients.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: This research has received ethical approval from Sri Devraj Urs Medical College Institutional Ethical Committee with Number SDUMC/KLR/IEC/241/2019-2020

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9. Chen YX, Li CS: Lactate on emergency department arrival as a predictor of mortality. 2015:404-10. 10.1136/thoraxjnl-2014-206461
Analytical Study of Suicidal Deaths in Female Reproductive Age Groups, Based on Autopsies Conducted in GGH, Mortuary

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ABSTRACT

Suicidal death is nothing but ending one’s own life, which is the most daunting human tragedies and a serious public health problem. As for NCRB the suicide rate has increased from 6.2% (2020) to 7.2% (2021). This study takes 100 cases retrospectively for the duration of 6 months. All suicidal deaths postmortem examinations are done in the reproductive age group females from April 2022 to September 2022. Those deaths occurred on the spot, or in the GGH Guntur, while undergoing treatment. The distribution of cases based on age, geographical area, marital status, educational status, place of occurrence, history of previous attempt of suicide, hormonal status in female, case of death and motive behind the suicide. Majority of cases belong to age group 19-29 years and 58% of urban population committed suicide with common motive behind the suicide is failure in exam. Preferred method for death is ingestion of poison which is seen in 46% of cases. Victims with changes in hormonal status like in menstruation are considerable in number. Family history of committing suicides or history of suicides in the neighbors have provoked some people. Counselling of such identified group of people at various levels will help the needy victims and decrease the suicide incidence.

Keywords: female, reproductive age, suicide, urban, poison, motive.

INTRODUCTION

Death is inevitable event in human being; however, everyone dies naturally after certain age, but unfortunately life may end unnaturally at any time due to accident, homicide or by committing suicide. Suicidal death is nothing but ending one’s own life, which is the most daunting human tragedies and a serious public health problem. As for NCRB the suicide rate has increased from 6.2% (2020) to 7.2% (2021) which involves various methods like ingestion of poison, hanging (self suspension¹), drowning and fall from height. Hanging is Every year number of suicidal deaths brought for post-mortem examination to GGH, Mortuary Guntur. A comprehensive review of the roots of problems can help us to draw various strategies to prevent suicides. Thus, it can be seen that primary prevention of suicide cannot be realistically planned given the present state of our knowledge.
MATERIAL AND METHODS

All suicidal deaths postmortem examinations are done in the reproductive age group females from April 2022 to September 2022. Those deaths occurred on the spot, or in the GGH Guntur, while undergoing treatment. All the Postmortem examinations are attended, reports are collected from the department, Hospital records are collected for the admitted cases. Suicidal notes, history from the relatives of the deceased inquest report, report of Scene of Offence is also considered. Information regarding the present problem is gathered from several sources and all the collected information is analyzed and compared with available sources and the following conclusions were drawn.

RESULTS AND DISCUSSION

1. AGE:

The study population was divided into 3 age groups as shown in Table 1 i.e., 12-18, 19-29, 30-45. The most number of cases belongs age group 19-29 i.e., 62 cases (62%), Followed by 30-45 age group which recorded 30 cases and 8 cases (8%) belongs to age group 12-18 years. In this study, age group of 19-29 years were occupied the major part of deaths i.e., 62% which is followed by 30-45 years age group i.e., 30% deaths and least number of deaths are seen in 12-18 (8%) years age group. Which is corelate with the study conducted by Girish Gutte et al i.e. (53%). According to National Crime Records Bureau report of 2021 in total age group 18 to below 30 years are 34.5 % (Table 1).

Table 1: Distribution according to age group

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of Autopsy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 yrs-18 yrs</td>
<td>30</td>
<td>30%</td>
</tr>
<tr>
<td>19 yrs-29 yrs</td>
<td>62</td>
<td>62%</td>
</tr>
<tr>
<td>30 yrs to 45 yrs</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

2. GEOGRAPHICAL AREA:

Major portion of the Study Group belong to urban with 58 cases (58%), Followed by semiurban i.e., 22 cases (22%), with nearly equal from rural i.e., 20 cases (20%). It is observed predominantly population belongs to urban areas 58 %, semi urban 22 %, whereas rural areas 20 % . Our study population mostly belongs to urban and semi urban area.

3. MARITAL STATUS:

Based on marital status, more Suicides are seen in Married i.e. 74 deaths (74%) when compared with Unmarried i.e.20 deaths (20%), followed by Divorced i.e. 12 deaths (12%). suicide rates are high in married (74 %) compared to unmarried (20 % ), divorced (12%). As per National Crime Records Bureau, 2021 statistics the suicide rate are in the following order, married (66.9%), followed by unmarried (24 % ), divorced (1.5%).

4. EDUCATIONAL STATUS

In present study Graduates have high rates of Suicides i.e. 72 deaths (72%),followed by persons finished secondary Education i.e. 14 deaths (14%) followed by Illiterate i.e. 8 death (8%) , and least at primary School level i.e. 6 death (6%). In this study, suicides are observed highly in graduates (72 % ), intermediate level (14 %),illiterates (8 %) and least number of cases observed in primary school level (6 %). According to the NCRB, 2021 statistics the suicide rate are in the following order, high rate in secondary education (24 %) , middle level (19.1%), primary education (15,8 %), illiterates (11 %).

5. PLACE OF OCCURRENCE:

Observations from this maximum number of suicides occurred in their house 86 deaths (86 %) remaining committed suicides in open fields i.e., 14deaths (14%). In our observation ,majority people i.e., 86 % committed suicide in their houses and only 14 % in open fields.
6. HISTORY OF PREVIOUS ATTEMPTS OF SUICIDE

In this study population, most of the people did not have any history of previous suicide attempts i.e. 76 deaths (76%). Those with previous attempts on self-account for i.e., 22 deaths (22%), least among previous history in family i.e. 2 deaths (2%). (Table 2)

In this study, we have observed least percentage of the people have the history of the previous attempts in self (22%) in family (2%), highest percentage (76%) of with no previous history. Occurrence of suicidal deaths among the family members or the neighbours has provoked some of the people. (Table 2)

7. HORMONAL STATUS IN FEMALE:

Reference from above data suicidal deaths occurred in non-pregnant group i.e., 60 deaths (60%) followed by who were menstruating i.e. 36 deaths (36%) and least among pregnant women i.e., 4 deaths (4%). During this study from Table 3, it is observed that 36% of the females are in menstruation phase and 4% pregnant while committing suicide. It is closely related to study done by Leenaar AA et. al in which they observed of women who died by suicide were menstruating at that time. Pal PB, Karmarkar R et. al also mentioned in their study that the endometrium of most female subjects of child bearing age were seen to be in secretory phase while committing suicide (Table 3).

8. CAUSE OF DEATH

In the present study the leading cause of death is poisoning i.e. 46 cases (46%) followed by Hanging i.e. 38 deaths (38%), Burns and Drowning each 6 deaths (6%), railway injuries and fall from height each 2 deaths (2%).

Regarding cause of death, female died due to poisoning (46%), hanging (38%), suicidal burns and drowning (6%), suicides at railwaytrack and self fall from height (2%). Among the cases of poisoning pesticides (86.9%) and corrosive (8.7%) poisoning not detected (4.4%). Poisoning not detected due to more time gap between consumption and death (Table 4). According to NCRB 2021 statistics hanging (57%), poisoning (25.1%), drowning (5.1%). As per study conducted by Singh Rajendra et al., means adopted for suicide as follows poisoning (43.83%), burns (28.77%), hanging (19.18%), drowning (4.10%), railway injuries (4.10%) (Table 4)

9. MOTIVE BEHIND THE SUICIDE:

In the present study the leading motive behind Suicides are Failure in studies and family problems each i.e. 24 deaths (24%). The other motives with decreasing order of frequency are Love failure, financial problems each 12 deaths (12%), dowry problems and illness each 6 deaths (6%), agricultural crop failure and others contribute with each 4 deaths (4%). From Table 5, the common motive observed

Table 2: Distribution based on history of previous suicide attempts

<table>
<thead>
<tr>
<th>Previous attempts history</th>
<th>No. of Autopsy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No history</td>
<td>76</td>
<td>76%</td>
</tr>
<tr>
<td>Self</td>
<td>22</td>
<td>22%</td>
</tr>
<tr>
<td>Family</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Neighbours</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 3: Distribution based on history of hormonal status in females

<table>
<thead>
<tr>
<th>Hormonal status</th>
<th>No. of Autopsy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Non pregnant</td>
<td>60</td>
<td>60%</td>
</tr>
<tr>
<td>Menstruating</td>
<td>36</td>
<td>36%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4: Distribution according to cause of death

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>No. of Autopsy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poisoning</td>
<td>46</td>
<td>46%</td>
</tr>
<tr>
<td>Burns</td>
<td>6</td>
<td>6%</td>
</tr>
<tr>
<td>Hanging</td>
<td>38</td>
<td>38%</td>
</tr>
<tr>
<td>Drowning</td>
<td>6</td>
<td>6%</td>
</tr>
<tr>
<td>Railway injuries</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Fall from height</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>
behind the suicide is the failure in the exam (24%) and family problems (24%), failure in love and financial burdens (12%), punishment from parents (8%), illness (6%), dowry problems (6%), agriculture failure (4%) and others (4%). According to NCRB 2021 statistics, family problems (33.2%), illness (18.6%) are the leading causes of death. Alcohol addiction (6.4%), marriage related problems (4.8%), love failures (4.4%).

CONCLUSIONS

After analyzing 100 cases of suicidal deaths brought GGH mortuary, Guntur highest number female deaths observed in 19-29 age group. Victim females belong to urban and semi urban region with education graduate and above are more in victims. More incidents occur in their houses. Failure of exams and family problems are more common motives behind the suicide. Victims with changes in hormonal status like in menstruation are considerable in number. Family history of committing suicides or history of suicides in the neighbors have provoked some people. Poisoning followed by hanging are the most common methods adopted by victims. The lives of this age group are very precious for the future development and prosperity of the country.

The suicide is a momentary decision which is taken for some insult happening to the body, mind and reputation. In most cases the suicide is not a wish to die but a cry for help identification of high-risk age groups for suicides, by close observation made by the parents, teachers, neighbors, social workers and doctors. Counselling of such identified group of people at various levels will help the needy victims and decrease the suicide incidence.

Conflict of interest statement: None.

Source of funding: Nil

Ethical consideration: This study is approved by Institutional Ethics Committee of Guntur Medical College, Guntur, vide reference no. GMC/IEC/014/2022, Dated 29-09-2022.

REFERENCES


<table>
<thead>
<tr>
<th>Motive</th>
<th>No. of Autopsy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dowry problems</td>
<td>6</td>
<td>6%</td>
</tr>
<tr>
<td>Love failure</td>
<td>12</td>
<td>12%</td>
</tr>
<tr>
<td>Punishment from parents</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>Failure in studies</td>
<td>24</td>
<td>24%</td>
</tr>
<tr>
<td>Family problems</td>
<td>24</td>
<td>24%</td>
</tr>
<tr>
<td>Financial burdens</td>
<td>12</td>
<td>12%</td>
</tr>
<tr>
<td>Agricultural crop failure</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Illness</td>
<td>6</td>
<td>6%</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>
Autopsy Study of Sudden Death Cases With Special Reference to Histopathological Changes in Heart

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ABSTRACT

Background: Sudden cardiac death and arrhythmia accounts for 15 – 20% of all deaths. Though Coronary artery disease is the major cause of sudden deaths, diagnosis of other underlying causes is necessary. Hence we intended to analyze the various cardiac causes related to sudden deaths and the associated histopathological findings of heart.

Methods: Present study was an autopsy based cross sectional observational study conducted at Madurai Medical College mortuary for a period of one year. 100 cases of sudden deaths were subjected to autopsy and histopathological changes of heart were studied.

Results: In the present study, majority of cases belonged to the age group of 40 - 60 years with male preponderance. In histopathological examination, atherosclerosis was the most common finding with involvement of left anterior descending artery. Other findings include myocardial infarction, myocarditis, pericarditis and dysarrythmogenic ventricular hypoplasia. Multiple cardiac lesions were noted in few cases.

Conclusion: An accurate diagnosis of the underlying morbidity at risk of sudden death either at postmortem or in living patients and life threatening arrhythmias is the pre – requisite to adopt therapeutic and preventive strategies.

Keywords: Sudden Cardiac Death, Histopathology of heart.

INTRODUCTION

Sudden death can be defined as deaths occurring within 24 hours from the onset of symptoms. Sudden cardiac death as a consequence of cardiovascular event with or without an existence of cardiovascular pathology accounts for about 45 to 50% of total incidence of sudden deaths. Sudden death of young and healthy adult has a profound impact on the psyche of the society. It is estimated that 60% of coronary artery disease patients are South Asians1.

The underlying cardiovascular pathology in sudden deaths in most patients in the Indian subcontinent is atherosclerosis, whose progression and acceleration is proportional to the traditional risk factors, altered lifestyles and inherent risk factors. The atherosclerotic process culminates in ischemic heart disease and current trends point to increasing incidence of ischemic heart disease in young population2. Furthermore the initial manifestation of ischemic disease is sudden cardiac death.
Garg S et al\textsuperscript{3} study revealed that most of the cardiovascular deaths occurred within age range of 41 to 60 years and coronary atherosclerosis was found to be the most common finding. Histological evidence was present in 14% of cases in the study. Sonowane S.Y. et al\textsuperscript{4} carried out a study at a tertiary institution in India regarding pathology of heart coronaries, and aorta in autopsy cases. Atherosclerotic coronary artery disease was found to be the common lesion followed by hypertensive heart disease. Old healed myocardial infarction was found to be the predominant type of myocardial infarction and most of the infarction was of transmural type.

In the study conducted by Sreelakshmi at el\textsuperscript{5}, most cases of hypertrophic cardiomyopathy were observed in young men and accounted for about 14.7% of this study. Shubangi et al\textsuperscript{6} study revealed a wide spectrum of changes, the most common being atherosclerosis found in 35 to 95% cases, myocarditis with pericarditis in 9% cases, chronic ischaemic heart disease in 4% of cases. Also in histological grading of atherosclerosis, they observed maximum number of cases in grade 3 followed by grade 4. Double and triple vessel involvement was seen in most cases and the most common coronary involvement is Left anterior descending artery followed by left circumflex artery in their study.

Uma N. Srivatsava et al\textsuperscript{7} study revealed that sudden cardiac death occurred in 39.7 deaths/100,000 population of Tirunelveli. Frequency of sudden cardiac death in males was found to be 4 to 5 times greater than in females. Shanthi et al study shows that most common age group involved was 50 - 60 years. Histo-morphological changes observed were atheromatous change in aorta in most cases\textsuperscript{8}. Autopsy of 50 sudden death cases revealed atherosclerosis in 35% cases followed by myocardial infarction with early changes in 18% cases and thrombus in coronary in 18% cases.

Mawrahnisha et al\textsuperscript{9} revealed that ischemic heart disease was responsible for 30% of sudden death, acute myocardial infarction in 7% cases. In their study, calcification was seen in cases with complicated atherosclerosis by vonkossa stain and elastin fibres by von gijemsa stain.

The present study was undertaken to establish the nature of cardiac diseases associated with sudden death and to analyze the various histopathological changes of heart in sudden deaths.

**MATERIALS AND METHODS**

The present study was an autopsy based cross sectional study conducted at the mortuary of Madurai Medical College from the period of September 2018 to September 2019. All cases due to sudden deaths autopsied at the mortuary of Madurai medical college and Govt Rajaji Hospital Madurai were included for the study except the cases with pre-existing congenital heart disease and sudden deaths with obscure histories. Total number of autopsies done during the above period was 3405 out of which 100 sudden deaths which fulfill the criteria were taken for the study.

Autopsies were performed by lettule’s method of en masse removal of viscera with the aim to observe histopathological changes that could guide to cause of death especially when there is history of no specific disease or co-morbidities. The thickness of walls of heart, the weight of the heart, regions of myocardial infarct (old and recent), coronaries of heart were examined using regular sections every 4-5 mm. Microscopic studies of heart was also done for intimal changes, lumen narrowing and atherosclerotic changes. All data were analysed descriptively.

**RESULTS**

Autopsy and histopathological data of 100 cases of sudden death were collected. Maximum number of cases in the study belonged to the age group 40 to 60 years with significant male preponderance was noted. 90% of the deaths occurred outside the hospital. With regard to the duration between onset of symptoms and death, 26 cases out of
100 cases died in short period i.e. within 30 minutes, 43 cases within few hours of onset of symptoms i.e. 6 to 24 hrs and 30 cases after 24 hours and in 10 cases, duration of onset of symptoms could not be evaluated due to non availability of specific history.

51% of cases had weight of the heart in the range 301 – 400 gms, 33% with range 201 – 300 gms and in 115 of cases, the weight of the heart was below 200 gms. Only 5% of the cases had weight of the heart above 400gms. The involvement of heart wall was also noted and heart wall changes were observed in 20 cases in the study. The findings are as shown in Table 1.

In histopathological examination of 100 cases, the most common finding was atherosclerosis followed by myocardial hypertrophy and myocardial infarction. Dysarrthmogenic ventricular hypoplasia, Myocarditis and pericarditis were seen in less number of cases. No specific findings were observed in 10 cases during microscopic examination (Table 2).

<table>
<thead>
<tr>
<th>Heart wall involved</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biventricular Hypertrophy</td>
<td>5</td>
<td>25%</td>
</tr>
<tr>
<td>Left ventricular Hypertrophy</td>
<td>10</td>
<td>50%</td>
</tr>
<tr>
<td>Right ventricular Hypertrophy</td>
<td>5</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Histopathological Findings</th>
<th>No. of Cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atherosclerosis</td>
<td>46</td>
<td>46%</td>
</tr>
<tr>
<td>Myocardial hypertrophy</td>
<td>15</td>
<td>15%</td>
</tr>
<tr>
<td>Dysarrthmogenic ventricular hypoplasia</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>No significant pathology</td>
<td>10</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

In cases of atherosclerosis (46 cases), major blockage was noted in left anterior descending artery in 31 cases (67.3%), left circumflex artery in 10 cases (21.7%), right coronary artery in 5 cases (10.8%). Also, single vessel involvement due to atherosclerosis was seen in 41 cases (89.13%), double vessel involvement in 4 cases (8.7%) and triple vessel involvement was observed in 1 case (2.17%). Grading of atherosclerosis was done based on percentage of block (Chart 1). 50% of the cases had grade 2 block in the present study. (Chart 1)

Out of the 15 cases of myocardial infarction in the study, 12 cases showed old infarct, while 3 cases showed features of recent infarction. Multiple cardiac lesions were seen in 5 cases which consist of combination of two or more cardiac lesions like pericarditis, myocarditis, atherosclerosis and pericardial or myocardial haemorrhage (Table 3). Certain nonspecific findings like increased epicardial fatty tissue, left ventricle with few congested vascular spaces, right ventricle congestion etc in the heart were observed (Table 4).

**DISCUSSION**

In the present study maximum number of cases was observed in age group 41 to 60 years. In adults SCD is a complication and often the first clinical manifestation of ischemic heart disease (Table 3 & 4).
With decreasing age of the victim, the non-atherosclerotic cashes of sudden death like congenital coronary arterial abnormalities, premature coronary artery disease, cardiomyopathies, mitral valve prolapse and myocarditis become increasing.

Data from across the world shows male preponderance with respect to sudden cardiac deaths which was the case in the present study also where males were 78 % and 22 % were females.

Coronary atherosclerosis in the present study is 46% cases. Atherosclerosis of coronary arteries and its downstream sequelae are responsible for most of the cardiac morbidity and mortality. Atherosclerosis with calcification was present in 26 cases whereas with thrombosis was present in 4% cases. Joshi C reported calcification in 17% cases and thrombosis in 5% cases. Patients with increased coronary atherosclerotic calcification appear to be at more risk for coronary events. Thrombus is most dreadful complication of atherosclerosis and may partially or completely occlude the lumen. Plaque calcification is found more frequently in advanced lesions, it may also occur in small amounts in earlier lesions, which appear in 2nd and third decade of life. Histopathological investigations had shown that plaques with microscopic evidence of mineralization are larger.

In the present study major blockage was noted in left anterior descending artery followed by left circumflex artery 10 cases, Right coronary 5 cases. As per our study the coronary atherosclerosis was common and single vessel involvement was 89%, double vessel involvement was 8.6%, triple vessel involvement was 2.17%.

The next common lesion in present study was myocardial hypertrophy seen in 20 cases.

Myocardial infarction was present in 15% cases. In the present study recent myocardial infarction constituted 20% and old myocardial infarction 80% as compared to Joshi C study in which 45% were recent and 55% old myocardial infarction. Rao DS reported 24% recent and 27% old infarct. In the present study myocarditis was found in 3% cases, in contrast to 9% in a study by Joshi C et al. Primary pericarditis is uncommon and is mostly secondary to infection.

**CONCLUSION**

In the present study, it was concluded that the most frequent lesion in the study of histopathological lesions of heart was atherosclerosis. Atherosclerosis was the main cause of MI and sudden deaths. In sudden deaths, cause of death cannot be found by routine autopsy where histopathological examination of organs becomes most important. When sudden death occurs in adults, coronary atherosclerosis is the main cause while myocarditis is the main cause in children. Our study findings shows the need for emphasis on strategies like stress reduction, life style modification, healthy diet, regular

<table>
<thead>
<tr>
<th>Multiple lesions</th>
<th>No. of Cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atherosclerosis &amp; Myocarditis</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>Atherosclerosis, Myocarditis &amp; Pericarditis</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>Myocarditis and myocardial and pericardial haemorrhage</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>IHD and Pericarditis</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>IHD and Myocarditis</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Table 4: Non – specific findings**

<table>
<thead>
<tr>
<th>Non – specific findings</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased epicardial fatty tissue</td>
<td>14</td>
<td>60.8%</td>
</tr>
<tr>
<td>congested vascular spaces in left ventricle</td>
<td>4</td>
<td>17.3%</td>
</tr>
<tr>
<td>Right ventricle congestion</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>Cardiac muscle fibre congestion</td>
<td>1</td>
<td>4.3%</td>
</tr>
<tr>
<td>Arrhythmogenic dysplasia of right ventricle</td>
<td>1</td>
<td>4.3%</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>100%</td>
</tr>
</tbody>
</table>
exercise especially in the young people. Better screening tests for early diagnosis should be employed, drug therapy in selected individuals can reduce the risk of cardiac events, but at present Framingham risk assessment is suboptimal.

Histopathological studies provide the most accurate clues to a good understanding of cardiovascular diseases. With good insight into disease pathophysiology, novel interventions could be introduced to improve care and better outcomes for patients undergoing cardiovascular diseases. It is advisable to begin a sequence of investigations from a detailed family history to referral of parents, siblings and offspring to a cardiologist for screening.

LIMITATIONS

Methods of diagnosing myocardial infarction in postmortem examination like three Tesla Magnetic Resonance imaging, Immunohistochemical detection of S100 calcium binding protein A1 and quantitative myoglobin assay were not carried out in the present study to find the cause of death since they are sophisticated and are not available in our study setting.

Declaration of Conflicting Interest: Nil

Funding: No outside funding was obtained

Ethical Clearance: This research has received approval from the Institutional Ethics Committee of Madurai Medical College

REFERENCES


A Case of Poisoning Due to Glutaraldehyde and Alprazolam Ingestion with Multiple Tentative Cuts Over Wrist and Neck

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ABSTRACT

Alprazolam is most commonly used benzodiazepine in overdose for deliberate self-poisoning. Glutaraldehyde is used for cold sterilization of medical, surgical and dental equipment. Poisoning due to accidental exposure as well as self-poisoning is common with glutaraldehyde. Self-inflicted or hesitational cuts are associated with suicide or attempted suicide or suicidal gestures and their examination is an important task for forensic expert.

Keywords: Alprazolam, Glutaraldehyde, Hesitational cuts, Incised wound.

INTRODUCTION

Alprazolam is triazolo analogue of the 1,4 benzodiazepines. It is mainly indicated as antidepressant and anxiolytic. It is also very effective in the treatment of panic attack, panic disorder and agoraphobia. Alprazolam is one of the most commonly prescribed benzodiazepines1. Benzodiazepines are frequently used for deliberate self-poisoning and responsible for roughly one third of all cases of deliberate self poisoning2. Alprazolam is also most commonly used benzodiazepine in overdose3.

Glutaraldehyde (GA) is best disinfectant for cold sterilization of heat-sensitive medical, surgical and dental equipment. It is found in products such as Endomax, Cidex, Omnicide Sporocidin, Matricide, Aldesen, Wavicide, Hospex and others. Glutaraldehyde is also used as a tissue fixative in pathology and histology labs. It is also used as a hardening agent in the development of x-rays4. Accidental acute exposure to GA is common in humans5.

Self-inflicted or hesitational cuts or tentative cuts are common among young generation. Injuries that are deliberately self-inflicted are common and their examination is an important task for forensic expert. These circumstances are associated with suicide or attempted suicide or suicidal gestures6.
CASE REPORT

A 30 years old unmarried male, with history of previous suicidal attempt, came to our Medical emergency trauma centre (METC), King George’s Medical University at 14 February, 2019 with conscious state, with alleged history of ingestion of 25 tablets of 0.25 mg alprazolam (Alprax) and 100 ml endomax (glutaraldehyde with activating substance) 3 hours before admission, with intention to commit suicide. Both the alprax and endomax are taken with in difference of 5 minutes.

Further, his family members gave history that patient had been suffering from psychiatric illness for which he had been on medication as advised by a psychiatrist. His medication includes alprazolam. Patient was dental technician and often used glutaraldehyde to disinfects dental equipment. As stated by patient, last night he was very emotional and under stress due to breakup of his long relationship with his love partner. His relationship was disturbed since last six months.

Local Injuries

1. A muscle deep incised wound of length 4 cm present at ventral aspect of wrist. Wound was 3 cm proximal to wrist joint. Direction of wound is lateral to medial

2. A muscles deep incised wound of length 4 cm was present 5 cm proximal and parallel to injury no.1

3. A muscles deep incised wound of length 4 cm was present 5 cm proximal and parallel to injury no.1. direction of wound wss lateral to medial. (Fig 1.)

4. An old incised wound, covered by scab was present 2 cm proximal to injury no. 3.

5. An incised wound of length 8 cm present at left front of neck. Its medial end was 4 cm below to chin and lateral was 7 cm below from left ear lobule. Direction of wound is lateral to medial.

6. An incised wound of 3 cm length was present 4 cm below thyroid cartilage

7. Below injury no.6 multiple old healed incised wounds. (Fig 2.)

General examination

Pallor, icterus and pedal oedema absent. Vitals of patient at time of admission were: blood pressure 114/70, pulse rate 90/min. Neurological examination-pupils were bilaterally contracted with sluggish reaction to light, diminished tendon reflexes and retention of urine. His Glasgow coma scale (GCS) was 15 (E4V5M6). Respiratory system examination shows bilateral clear chest. Cardiovascular system (CVS) examination shows normal S1S2, tachycardia was noted, and ECG showed sinus tachycardia.

Routine haematological test shows raised TLC counts (30200), differential leucocyte count shows neutrophilia (92%) and lymphocytopenia (8%), mean corpuscular haemoglobin (34 pg) is slightly raised. Routine Biochemical tests were almost normal except slightly raised direct bilirubin.

Arterial blood gas analysis showed blood pH 7.341, pCO2 46.2, pO2 22.3, HCO3- 21.4,
anion gap 21.4, Na+ 138.3 mmol/L, K+ 3.48 mmol/L and Cl− 96 mmol/L.

As suggested by the above finding, history from patient and family members probability diagnosis of alprazolam over dosage and glutaraldehyde intoxication was made. A nasogastric tube was placed and bladder catheterization was done. Gastric lavage did not reveal any pill or pill fragments. Administration of parenteral fluids was done. Flumazenil, which is the antidote of alprazolam poisoning, was given. Rest of the treatment given to patient was symptomatic. Patient showed improvement within 12 hours. 0.25 mg tablets of alprazolam, as a part of prescription from a psychiatrist for treatment of his anxiety disorder, was already available to him. Since he was dental technician, glutaraldehyde as disinfectant (for dental equipment and X ray film) was easily available for him. Thereby, he attempted suicide with alprazolam tablets and glutaraldehyde solution and along with multiple tentative cuts over wrist and neck, out of frustration caused by his breakup from his love one. Since there was no neurological deficit, he was discharged after 48 hours. We advised the patient for psychiatric evaluation as well as counselling of his personal problems. We advised his family members to spend time with the patient and give moral support to patient to enable the patient to deal with life’s challenges. We also advised family members to give prescribed medications to him under their personal vigilance.

DISCUSSION

Alprazolam, a triazolobenzodiazepine derivative has anxiolytic and antidepressant properties. It is very effective in the treatment of panic disorders, panic attack and agoraphobia. Alprazolam is one of the intermediate-acting benzodiazepines, which is rapidly absorbed after ingestion and achieve its peak plasma concentration within 1-2 hours of ingestion. Its elimination half-life is 6-26 hours. Alprazolam is metabolized primarily by cytochrome P450 3A4 (CYP3A4), to two major metabolites in the plasma: 4-hydroxyalprazolam and α hydroxylalprazolam. Alprazolam and its metabolites are excreted primarily in the urine.

Higher toxicity of alprazolam overdose raises many questions about its increasing use and the population in which it is mainly prescribed. In 1991 alprazolam was approved for treatment of panic disorder. Now days over-prescription of alprazolam for panic attack, panic disorder and anxiety have been rising. About 85% of alprazolam indications were for panic disorder, mixed anxiety, depression, anxiety. People suffering from panic disorder are more prone to develop suicidal thought and suicidal attempt than in the general population therefore use of alprazolam in panic patient should be used in controlled way. In our case, the patient was psychiatric and on alprazolam medication. He had taken overdose of alprazolam during his disturbed personal relation.

Reports of human exposure to glutaraldehyde is limited to a few individual cases and there are no reports of glutaraldehyde ingestion. This is unique case of glutaraldehyde ingestion.

Glutaraldehyde (GA) is one of the best disinfectants for cold sterilization of medical and dental equipment. It is also used as a developer and fixer in X-ray film processing, as a fixative in histochemistry and electron microscopy. The accepted glutaraldehyde air-concentration is 0.2 ppm. Medical radiation technologists and endoscopy nurses, dental technician are more prone to develops sensitization of skin and respiratory organ. Chronic inhalation affects the nose and respiratory tract, and lesions become severe with prolonged duration of exposure. Most frequent symptoms of glutaraldehyde vapour exposure include headache red eyes, cough and running nose. The incidence of contact dermatitis and bronchial asthma has also been reported. Many adverse neurobehavioral effects, including anxiety, headache, dizziness, drowsiness, loss of attention, alteration of homeostatic reflexes, were observed at very high concentration of
glutaraldehyde in the operating theatre\textsuperscript{16}. In our case patient was dental technician often uses glutaraldehyde for disinfection.

Tentative cuts are mainly seen on accessible parts of the body such as wrist, elbow and sometime over the neck. These injuries are usually superficial in nature. If a person is right-handed, tentative cuts is seen over the left side of the body, moving from left to right, with greater depth on the left and tailing off to the right side\textsuperscript{17}.

CONCLUSION

Persons suffering from psychiatric illness like anxiety disorder, panic disorder, depression etc are more vulnerable to commit suicide. Very few mortalities are reported due alprazolam intoxication. Alprazolam, as a part of prescription from a psychiatrist for treatment psychotic illness, is easily available to such persons and this play major role for their suicidal attempts. Alprazolam intoxicated patient can be easily managed even non availability of its antidote. Literature available at internet play important role for its misuse. Easy availability of alprazolam at medical store is also a major contributor of its misuse. Misuse of alprazolam is prevented by control over distributor’s end like medical stores and raising awareness of the people about the negative depiction of alprazolam being used for suicidal intent.

Glutaraldehyde is a skin, eye and respiratory tract irritant and skin and respiratory tract sensitizer. 2% solution of Glutaraldehyde is used as disinfectant. Even this concentration of glutaraldehyde produces moderate to severe irritation of the skin, wearing gloves (butyl rubber or nitrile rubber gloves) is essential to prevent hazards to the skin. Life-threatening laryngeal oedema may occur due to oropharyngeal injuries. Patients should carefully monitor for several hours after glutaraldehyde ingestion. Airways should keep patent and endotracheal intubation may requires.

**Conflict of interest** is - Nil.

**Ethical Clearance**: Not Required because my manuscript is a case report. and the case report doesn't require any ethical approval.

**Source Of funding**: Not required

**REFERENCES**


Finding Out Cause of the Maternal Death Following Vaginal Delivery- A Case of Complete Placenta Previa: An Autopsy Report

Mohammad A. Khan, Sangeeta Kumari, Manisha Verma, Mousami Singh, Anoop K. Verma

ABSTRACT

Placenta previa occur when the placenta is situated completely or its part into the lower uterine segment. Placenta previa can give rise to bleeding either during pregnancy, during labour or following delivery. Transvaginal sonography is most accurate method to diagnose placenta previa. Due to the fact that since one part of the placenta is partially detached, while the other part of placenta has grown into the uterus, postpartum haemorrhage with lethal outcome may occur, unless the mother is hospitalized. Such complications can be prevented by legal abortions. Placenta previa prevents a safe vaginal delivery and requires the delivery of the neonate to be via caesarean delivery.

Keywords: Placenta previa, Delivery, Vaginal bleeding, Pregnancy

INTRODUCTION

Placenta previa occurs when the placenta is situated completely or its part into the lower uterine segment and is located close to the internal os of cervix. Clinically this is important as it can give rise to bleeding either during pregnancy, during labour or following delivery. The prevalence of placenta praevia is around 5 per 1000 pregnancies. The underlying cause of placenta previa is unknown. There is however, an association between endometrial damage and uterine scarring. The expression of placental Cripto-1 (Epidermal growth factor) in the placenta previa groups was higher than that of control. Placenta previa is more common in women who had a caesarean birth, more than one child, twins or triplet, surgery on the uterus, increased maternal age, uterine abnormalities, smoking, cocaine use, assisted reproductive techniques. The nicotine and carbon monoxide, found in cigarettes, act as potent

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vasoconstrictors of placental vessels; this compromises the placental blood flow thus leading to abnormal placentation. It became more evident secondary to the increasing rates of caesarean sections. Traditionally placenta previa is divided into four types –

1. **Low lying placenta**: In this type placenta is extended into the lower uterine segment but does not reach the internal orifice of cervix. In most of cases it often moves upward in the uterus as the due date approaches.

2. **Marginal placenta**: When placenta just reaches the internal orifice of cervix, but does not cover it then the condition is known as marginal placenta.

3. **Partial placenta**: In this type placenta partially covers the internal orifice of cervix.

4. **Complete placenta previa**: In this the internal orifice of cervix is completely covered by placenta.

Transvaginal sonography is most accurate method to diagnose placenta previa. Transabdominal sonography can also be performed however, it incorrectly identifies placenta previa as compared to transvaginal sonography. The risk of perinatal mortality in women with placental previa is estimated to be 4% to 8%.

**CASE REPORT**

Sealed dead body of 32 years old female (gravida 3 and Para 1) brought by police to mortuary, King George’s Medical University for autopsy to find cause of death. Family members put an allegation on the doctor of a private hospital where she delivered a baby by vaginal route. As stated by family members, the gynaecologist was not present at that moment, but still normal delivery was performed by junior doctor which resulted in profuse vaginal bleeding. Bleeding was not controlled by junior doctor and patient died due to postpartum haemorrhage at 07/04/2019.

**Autopsy Finding:** Autopsy was performed at 08/04/19 at 4.00 pm at Mortuary, King George’s Medical University Lucknow with post-mortem number 1407/2019. The body was that of an average build female, of age 32 years. Rigor mortis was present all over the body. Post-mortem lividity was present on the back and dependant parts of the body in supine position. The abdomen was distended. There was no external injury present over the body. There was no history of blunt trauma on abdomen.

**On examination breast**: Breast enlarged and superficial veins of breast was prominent. Areola dark in colour and Montgomery tubercle present over areola. Nipple enlarged.

**On examination of abdomen wall**: abdominal wall wrinkled and pendulous. Linea nigra and striae gravidarum was present.

**On examination perineum**: slightly lacerated on opening the abdominal cavity there was no blood or blood clot in abdominal cavity (Figure 1).

**On examination of uterus**: flabby, cavity almost obliterated by apposition of anterior and posterior walls.

![Fig. 1: On opening abdominopelvic cavity, no blood clot, visceral organ and external surface of uterus are intact.](image)
On examination of placental site: Placental site as an irregular nodular and elevated area. Placental site present at lower uterine segment which completely encircling the internal os and make the diagnosis of ‘Complete Placenta Previa’ (figure 2).

On examination of cervix: Edge torn and lacerated.

DISCUSSION

Autopsy of mother who died due postpartum haemorrhage as a complication of Placenta Previa who vaginally delivered baby is rarely reported in medical literature. Haemorrhage in obstetrics is one of the life-threatening emergencies, especially in the last trimester which should be managed immediately. In placenta previa, placental site situated in lower uterine segments which stretch at term or during labour which results in inevitable bleeding. Due to the fact that since one part of the placenta is partially detached, while the other part of placenta has grown into the uterus, postpartum haemorrhage with lethal outcome may occur, unless the mother is hospitalized. Such complications can be prevented by legal abortions. Placenta previa prevents a safe vaginal delivery and requires the delivery of the neonate to be via caesarean delivery. Transvaginal sonography, if available, may be used to investigate placental location at any time in pregnancy when the placenta is thought to be low-lying. It is significantly more accurate than transabdominal sonography, and its safety is well established. Complete placenta previa and the majority of the placetas less than 1 cm from the cervical internal os (CIO) do not migrate and a significant risk of haemorrhage at delivery was observed. Above 1 cm, the majority of the placetas migrated three to four weeks later and risk of haemorrhage significantly reduced. Thus, prophylactic caesarean section is required for CIO-PE (placental edge) distances <1 cm. Through monitoring the length of the cervical canal by perineal ultrasound can make a better decision for the patients of complete placenta previa to choose the time of delivery. A new suture technique called “cervical internal os plasty” to control obstetrical haemorrhage in caesarean delivery for patients with placenta previa accreta. The UAE (uterine artery embolization)-DBC (double balloon catheter)-curettage combined treatment is safe and effective for patients with placenta previa who undergo pregnancy termination and suffered massive antenatal haemorrhage in the 2nd trimester. Future studies are needed to advance these observations.

Unfortunately, in our case, it was the post-mortem diagnosis of complete placenta previa. At autopsy, a bulky, congested uterus with placental site present at lower uterine segment and encircling entire internal os.

CONCLUSION

Most cases of placenta previa are diagnosed early in the pregnancy via transvaginal or abdominal sonography and others may presents an emergency with painless vaginal bleeding in the second or third trimester. Complete placenta is an obstetrics emergency and requires caesarean section. Vaginal bleeding secondary to placenta previa can lead to postpartum haemorrhage requiring a blood transfusion and intravenous fluids.
In some cases, tocolytic drugs (medications that slow down or inhibit labour), such as magnesium sulfate or terbutaline are necessary. Corticosteroids may be given to enhance lung development in the foetus prior to Caesarean delivery.

Placental insertion abnormalities require anaesthetic and obstetric coordination. Delivery must be planned in a suitable structure.

**Conflict of interest:** Nil.

**Ethical Clearance:** Not Required because my manuscript is a case report and the case report doesn’t require any ethical approval.

**Consent:** Taken

**Source of funding:** Not required

**REFERENCES**

Study of Deaths due to Hanging on Autopsied Cases at Mortuary Government Medical College Hospital Jammu – A Retrospective Study

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ABSTRACT

Background: Hanging is a form of asphyxia caused by external pressure on upper airways derived from a band tightened by the gravitational weight of the body. It could be suicidal or homicidal.

Method: 50 dead bodies (35 males and 15 females) aged between 20-70 years old who died due to hanging were studied. The autopsies were carried out to rule out gender differences, pattern of ligature marks on neck, ligature material used, fractures of hyoid bone or thyroid cartilage in the neck, significant findings in dissection of neck caused by death due to hanging, differences between antemortem and postmortem hanging, associated injuries in hanging etc.

Results: 35 (70%) males, 15 (30%) females dead bodies due to hanging 19 (38%) were summer, 20 (40%) in rainy, 11 (22%) in winter season, 14 (28%) outdoor, 36 (72%) were outdoor hanging deaths, 36 (72%) ligatures were above the thyroid cartilage, 9 (18%) at the level of cartilage, 5 (10%) below the level of thyroid cartilage. The significant findings of neck dissection were 30 (60%) in the present study.

Conclusion: The present study of deaths due to hanging will certainly help the medico-legal experts to differentiate between suicidal and homicidal hanging.

Keywords: Ligature, Strangulation, Asphyxia, Thyroid cartilage, Hyoid bone.

INTRODUCTION

Hanging is a form of asphyxia caused by external pressure on the upper airways derived from a band tightened by gravitational weight of the body (1).

It is classified as complete when the whole body is suspended and incomplete when suspension regards only part of the body (3).

When the loop of the ligature band lies on the anterior region of neck and the knot is on the back hanging is defined as typical all other conditions are defined as atypical. Hanging is a common method of suicide, although rarely a murderer chooses hanging to commit homicide (3). In few cases hanging occurs as an accidental event. Hanging is the second common method used as it causes sudden death with less pain.
The incidences of hanging is predominantly in males especially in rural areas including farmers, labourers who are more prone to hang when they are humiliated socio-economically\(^{4,5}\). Hence attempt was made to evaluate the hanging in sexes, different places and different seasons.

**MATERIAL AND METHOD**

50 cadavers (35 males and 15 females) aged between 20 to 70 years old brought to Mortuary Department of Forensic Medicine and Toxicology, Government Medical College Jammu who died of hanging were autopsied. The autopsies were conducted to rule out gender differences, age, places, seasons, pattern of ligature marks on the neck, and significant findings in the dissection of neck, to differentiate between suicidal and homicidal hanging etc.

Duration of study was July-2018 to December-2021.

**Statistical analysis**

Genders, different seasons, places, different sites of ligature marks on the neck, and significant findings in the dissection of neck were studied and classified with parentage. The statistical analysis was carried out in SPSS software. The ratio of male and female was 2:1.

**OBSERVATION AND RESULTS**

**Table 1**: In the study of death due to hanging 35 (70\%) were males, 15 (30\%) were females.

**Table 2**: The different seasons in which deaths of hanging occurred 19 (58\%) in summer, 20 (40\%) in rainy, 11 (22\%) in winter.

**Table 3**: Places of hanging death study – 14 (28\%) were outdoor hanging and 36 (72\%) were indoor hanging.

**Table 4**: Study of different sites of ligature marks on the neck in hanging deaths – 36 (72\%) ligature marks above the thyroid cartilage, 9 (18\%) at the level of thyroid cartilage, 5 (10\%) below the level of thyroid cartilage.

**Table 5**: Study of significant findings of neck dissection in deaths due to hanging – 12 (24\%) Haemorrhages in strap muscles, 4 (8\%) injury to neck muscles, 5 (10\%) injury to thyroid cartilage, 4 (8\%) tear of carotid artery, 5 (10\%) fracture of hyoid bone. Total number of significant findings were 30 (60\%).

**DISCUSSION**

Present study of deaths due to hanging on autopsied cases at mortuary of Government Medical College Hospital Jammu, 35 (70\%) were males and 15 (30\%) females (Table 1).

**Table 3**: Study of hanging deaths at different places

<table>
<thead>
<tr>
<th>Places of Incidence</th>
<th>No. of cases (50)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>Indoor</td>
<td>36</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
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</table>

**Table 4**: Study of different sites of ligature marks on the neck in hanging deaths

<table>
<thead>
<tr>
<th>Site of ligature marks on neck</th>
<th>No. of patients (50)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above the level of thyroid cartilage</td>
<td>36</td>
<td>72</td>
</tr>
<tr>
<td>At the level of thyroid cartilage</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Below the level of thyroid cartilage</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>
In many cases of murderer after strangulations to stimulate a suicidal event committed by the victims. It was also reported that, accidental auto erotic hanging deaths and accidental hangings in the paediatric population. It was also noted that males of rural area more prone to hang for death. It could be due to depression caused by poverty, drought, un-employment, failure in love affair, divorcee, and addiction towards alcohol or narcotic drugs, ganja, morphine takers etc etc. These addicted people due to hallucinations and euphoria cannot understand that hanging may end their life, submit themselves to hanging when they don’t get addicted things\(^{(8)}\).

Moreover many adults were over ambitions (mega mania) whenever they could not fulfil their dreams, feel humiliation and end their life by hanging with rope, plastic ropes, cloths are easily available to hang themselves hence they end their life by hanging \(^{(9)}\). In old age, the elders are ignored and neglected in the family; elderly people become alone when they lose their life partners and develop depression, cannot tolerate the dependent life and end their life by easily available rope or any clothes\(^{(10)}\).

In addition to this, jealously greediness are the vital factors for hanging. Greedy and jealous people kill the affluent relatives or friends, then portray or present these murders as hanging\(^{(11)}\).

In addition to this schizophrenic patients may have major depression, delusions or fluctuating moods may also hang themselves without knowing the consequences \(^{(12)}\). Hence the psychiatric patients must be kept under surveillance of family members or attenders because their attitudes are un-predictable.

**SUMMARY AND CONCLUSION**

Present study of deaths due to hanging caused by rope as a ligature material. The ligature mark on neck observed in all cases with characteristics (position, direction, depth, continuity, thickness etc) on the other hand internal neck findings/fractures were observed in some cases. The ligature mark was easily detectable through, external examination; A careful and complete analysis of the characters of the ligature mark is very important to differentiate whether hanging is suicidal or homicidal for medico-legal experts.

This research work was approved by Ethical committee of Government Medical College, Jammu-180001.

**Conflict of Interest:** No

**Funding:** No

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Significant findings</th>
<th>No. of cases</th>
<th>Percentage (%)</th>
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<tbody>
<tr>
<td>1</td>
<td>Haemorrhages in strap muscles</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>Injury to Neck muscles</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Injury to Thyroid cartilage</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Injury to cricoid cartilage</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Tear of carotid artery (intimal layer)</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Fracture of hyoid Bone</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>Total Number of significant findings</td>
<td>30</td>
<td>60</td>
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Chronological Age Estimation by Physiological Changes in the Teeth Among Deceased Human Adults

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ABSTRACT

Background: Age can be estimated from the teeth by various methods like eruption of teeth which is known to be a good indicator of the age of the person. Aims & Objectives: The current study aimed to estimate the chronological age by physiological changes (Modified Gustafson’s method) occurring in teeth and also to find out the effect of the diet, other habits and socio demographic factors on physiological changes in the teeth. Materials and Method: Present study was done by using the teeth extracted from the deceased bodies sent for post mortem examination to the Department of Forensic Medicine, Sri Venkateswara Medical College, Tirupati, during the period of January 2016 to December 2016. A total of 70 cases were studied in the age group between 25 to 60 years. Six physiological changes were studied in each case that were Attrition, Periodontosis, Secondary dentin deposition, Root resorption, Transparency of the root and Cementum opposition using modified Gustafson’s formula. Results: The mean score of these physiological changes was directly proportional to age. Male to female ratio and non-vegetarian to vegetarian ratio was 3:1. The mean total score was high among males, urban residents, belonged to upper middle-class socio-economic status and alcoholics. However, means total score was low among smokers. Conclusion: Thus, in our study we found that when all the six physiological age factors were scored and used together collectively, we will get better results, rather than using a single physiological factor for estimation of age. Socio demographic factors, diet and habits have no effect on age estimation. Keywords: Modified Gustafson’s criteria, teeth, Physiological changes, Age estimation,

INTRODUCTION

Age is one of the essential factors in establishing the identity of the person. Estimation of the human age is a procedure adopted by anthropologists, archaeologists and forensic scientists. Different factors have been used for age estimation but none has withstood the test of time for adults above 25 years.¹

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Age estimation can prove critical part in victim identification process. It can be done in precious archaeological skeletal material dating back to hundreds of years.\(^2\)

Age can be determined from a variety of general physical factors like from height and weight which is applicable in early periods of life, dental development and changes occurring at puberty.\(^3\)

Teeth are strongest parts in human body and are therefore highly durable and very resistant to external influences like putrefaction, fire etc, from teeth age can also be estimated from microscopic examination of a section of central part of teeth by counting the cross striations which appear daily as devised by Boyde and Gustafson’s method is used for age estimation from teeth specially for the age above 25 years.\(^4\)

Newer modifications like killian’s method uses subjective evaluation of six markers: The degree of attrition, the periodontosis, the secondary dentine deposition, cementum opposition, transparency of the root and root resorption. Whereas some like koteswarrao and Kashyap attempted the quantitative evaluation of four markers: the attrition, the secondary dentine deposition, cementum opposition and transparency of the root.\(^5\)

In 1950 Gosta Gustafson was the first to devise the microscopic method for age estimation based on the histological examination of ground sections of the teeth.\(^6\) This study is done to estimate the age of person, to note the various physiological changes occurring in teeth which help in age estimation and to find the effect of chewing tobacco, pan effects, sex, socio economic status, diet on these physiological changes of teeth, that are helpful in age estimation.

**AIMS AND OBJECTIVES**

The current study aimed to estimate the chronological age by physiological changes (Modified Gustafson’s method) occurring in teeth and also to find out the effect of the diet, other habits and socio demographic factors on physiological changes in the teeth.

**MATERIALS AND METHODS**

Present study was done by using the teeth extracted from the deceased bodies sent for post mortem examination to the Department of Forensic Medicine, Sri Venkateswara Medical College, Tirupati, during the period of January 2016 to December 2016. A total of 70 cases were studied in the age group between 25 to 60 years. Six physiological changes were studied in each case that were Attrition, Periodontosis, Secondary dentin deposition, Root resorption, Transparency of the root and Cementum opposition using modified Gustafson’s formula.

The teeth were extracted from the dead bodies with informed consent and information regarding age, sex, occupation, monthly income, diet, place of living, education, personal habits like alcohol and smoking were taken from the family members/ relatives / friends and from police officials. The socio-economic status of the diseased persons studied according to Modified Kuppuswamy scale of classification which was updated in the year 2016.

The following apparatus used for teeth extraction and preparation of ground section : Periosteal elevator, Tooth extracting forceps, Extracted teeth, 10% Formalin, Micro motor, Diamond shaped disc, Carborundum stone, Absolute alcohol, Xylene, DPX, glass slides and cover slips.

**Method of preparation of ground section of a extracted teeth**

For preparation of ground section, the extracted teeth are thoroughly washed with soap and water and then treated with 10% formalin solution, for about 17 days allowing fixation. The degree of attrition and degree of periodontosis are studied at the time of extraction of teeth from the jaw and noted in the proforma. The teeth after removal from the formalin are washed thoroughly with water and in a wet condition their both edges are sliced with a micro motor having a straight handle fixed to a diamond tipped disc. The mid
portion of each tooth thus obtained, is rubbed manually against rough carborundum stone till to the thickness of 1mm and observed for the degree of translucency at this level. The teeth are further rubbed against rough and smooth surfaces of the carborundum stone up to the thickness of 0.25 mm. At this level they are dried in absolute alcohol for 15 minutes and in xylene for clearing dust for further 15 minutes, and allowed to dry. After drying, the teeth are mounted on to a glass slide with DPX (mixture of distyrene, a plasticizer and xylene) These slides are seen under light microscope with 10x power and the degree of cementum opposition, root resorption and secondary dentin deposition are observed and noted. The various physiological changes thus observed in the teeth are recorded using 4 Point allotment system.

After collection of the data, the total score of all these physiological changes is calculated and compared with known age and age calculated by using Gustafson’s formula of age estimation. so as to know their reliability and to note the effect of socio demographic factors such as sex, diet, smoking, alcohol, residence, socio-economic status on the outcome of age with physiological changes of teeth. Mean total score and mean difference between known age and age estimated by Gustafson’s formula were calculated. The following formula used for age estimation:

Gustafson’s Formula (I):

\[ y = 4.56x + 11.43 \]

(y=age, x=Mean total score). This study was approved by Institute ethics committee, S.V. Medical College Tirupati. Informed consent was taken from the family members/relatives/friends and from police officials.

Data was entered in Microsoft excel and checked for errors and analysed with IBM SPSS, version 26 software. Qualitative data was presented as frequency and percentage. Quantitative data was presented as Mean(SD). Student t test was used to test the significant difference between two means and one way ANOVA was used to test the significant difference between more than two means. p value <0.05 was considered as statistically significant.

RESULTS

The ages ranged from 25 to 65 years with mean 40.43 (11.23). Gustafson’s scores ranged from 25.11 to 61.59 with mean 41.14 (11.51). The differences between actual age and ages calculated by modified Gustafson’s formula ranged from -3.77 to 4.23 with mean 0.71 (1.84).

Majority of the study subjects were in the 25-30 years followed by 36-40 years. Lowest were in the 46-50 years. Majority were males from rural areas belonging to lower socioeconomic status, non vegetarians, non-smokers and non alcoholics. (Table 1)

Below table shows grades of various physiological changes in the teeth. In all physiological changes most of the teeth were

<table>
<thead>
<tr>
<th>Table 1: Socio-demographic characteristics of study subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
</tr>
<tr>
<td>25-30</td>
</tr>
<tr>
<td>31-35</td>
</tr>
<tr>
<td>36-40</td>
</tr>
<tr>
<td>41-45</td>
</tr>
<tr>
<td>46-50</td>
</tr>
<tr>
<td>51-55</td>
</tr>
<tr>
<td>56-60</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td><strong>Residence</strong></td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td><strong>Socio economic status</strong></td>
</tr>
<tr>
<td>Upper</td>
</tr>
<tr>
<td>Upper middle</td>
</tr>
<tr>
<td>Lower middle</td>
</tr>
<tr>
<td>Upper lower</td>
</tr>
<tr>
<td>Lower</td>
</tr>
<tr>
<td><strong>Diet</strong></td>
</tr>
<tr>
<td>Vegetarian</td>
</tr>
<tr>
<td>Non-Vegetarian</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
</tr>
<tr>
<td>Smokers</td>
</tr>
<tr>
<td>Non-smokers</td>
</tr>
<tr>
<td><strong>Alcoholism</strong></td>
</tr>
<tr>
<td>Alcoholics</td>
</tr>
<tr>
<td>Non-Alcoholics</td>
</tr>
</tbody>
</table>
in grade 1 (51.4%, 67.1%, 80%, 71.4%, 51.4% and 52.9% respectively among attrition, periodontosis, Secondary dentin deposition, Root resorption, Transparency of the root, and Cementum). Grade 3 was seen in all physiological changes. (Table 2)

The mean age estimation by age groups measured by modified Gustafson’s formula is significant. The mean age estimation by gender, Residence, Socio economic status, Diet, Smoking and Alcoholism status measured by modified Gustafson’s formula is not significant. The mean age difference by age groups, gender, Residence, Socio economic status, Diet, Smoking and Alcoholism status measured by modified Gustafson’s formula is not significant. (Table 3)

<table>
<thead>
<tr>
<th>Physiological change</th>
<th>Grade</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attrition</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>36</td>
<td>51.4%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>34</td>
<td>48.6%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Periodontosis</td>
<td>0</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>47</td>
<td>67.1%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>16</td>
<td>22.9%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Secondary dentin deposition</td>
<td>0</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>56</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>12</td>
<td>17.1%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Root resorption</td>
<td>0</td>
<td>4</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>50</td>
<td>71.4%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>16</td>
<td>22.9%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transparency of the root</td>
<td>0</td>
<td>15</td>
<td>21.4%</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>36</td>
<td>51.4%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>19</td>
<td>27.1%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cementum</td>
<td>0</td>
<td>33</td>
<td>47.1%</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>37</td>
<td>52.9%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2: Distribution according to grades of physiological changes in the tooth

Table 3: The mean age estimation and age difference as measured by modified Gustafson’s formula

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Age by MGF Mean (SD)</th>
<th>P value</th>
<th>Age difference by MGF Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td>25-30</td>
<td>28.07 (2.67)</td>
<td>&lt;0.001</td>
<td>0.37 (1.59)</td>
<td>0.438</td>
</tr>
<tr>
<td></td>
<td>31-35</td>
<td>34.88 (1.72)</td>
<td></td>
<td>1.59 (1.50)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>36-40</td>
<td>38.48 (2.71)</td>
<td></td>
<td>0.28 (2.11)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41-45</td>
<td>45.63 (2.49)</td>
<td></td>
<td>1.46 (1.75)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>46-50</td>
<td>50.64 (2.49)</td>
<td></td>
<td>1.64 (1.18)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51-55</td>
<td>55.07 (2.43)</td>
<td></td>
<td>0.93 (1.93)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>56-60</td>
<td>58.39 (3.07)</td>
<td></td>
<td>0.29 (2.28)</td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

In the present study, six physiological changes in the teeth were used for age estimation in deceased adults. These were Attrition, Periodontosis, secondary dentin deposition, Cementum opposition, Translucency of the root, and Root resorption. The association between socio demographic factors such as sex, place of residence, socioeconomic status, habits like diet, smoking and alcoholism with mean total score of Gustafson and mean difference of known age and estimated age were also studied and analysed.

In the present study, a total of 70 cases were studied. The selected teeth in this study are premolars, canines, incisors and first molars and importance was given from left to right.7 The second and third molar teeth are excluded, as they are greatly affected with diet due to mastication of food and not suitable for preparation of ground section being hard and tough. So only normal teeth which are free from decay, caries are included in the present study. The teeth that are broken during the process of ground sectioning are excluded.

The mean total scores from physiological changes of the teeth calculated from various age groups and it is observed that the total score is constantly increasing with increase in age. This increase was statistically analysed and found to be significant. Maximum mean total score is observed in the age group of 56 to 60 years i.e. 10.3 followed by the age group of 51 to 55 years i.e. 9.57. least score i.e. 3.65 is observed in the age group of 25 to 30 years. These findings were similar to the observations made by studies of P.S.Pillai and G.Bhaskar and Amandeep Singh et.al.8

According to the observations made in the above table 1, the mean total score in vegetarians was 6.7 ± 2.8 which is higher than that of non-vegetarians 6.45 ± 2.43. These findings were in contrast to the observations made of P.S.Pillai and G.Bhaskar and Amandeep Singh et.al.8 The mean total score of people living in urban area was 6.62 ± 2.75, which is higher than that of people living in rural areas is 6.48 ± 2.47. But this difference was statistically insignificant. These findings were similar to the observations made by of P.S.Pillai and G.Bhaskar and Amandeep Singh et.al.8

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Age by MGF Mean (SD)</th>
<th>P value</th>
<th>Age difference by MGF Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>41.72 (10.96)</td>
<td>0.359</td>
<td>0.79 (1.84)</td>
<td>0.695</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>39.33 (13.28)</td>
<td></td>
<td>0.44 (1.88)</td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>40.99 (11.30)</td>
<td>0.484</td>
<td>0.86 (1.76)</td>
<td>0.318</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>41.64 (12.56)</td>
<td></td>
<td>0.20 (2.09)</td>
<td></td>
</tr>
<tr>
<td>Socio economic status</td>
<td>Upper</td>
<td>43.35 (11.77)</td>
<td>0.041</td>
<td>0.78 (1.88)</td>
<td>0.858</td>
</tr>
<tr>
<td></td>
<td>Upper middle</td>
<td>50.19 (11.17)</td>
<td></td>
<td>1.07 (1.73)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower middle</td>
<td>42.39 (10.59)</td>
<td></td>
<td>0.86 (1.49)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper lower</td>
<td>35.14 (9.32)</td>
<td></td>
<td>0.81 (2.29)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>40.09 (12.08)</td>
<td></td>
<td>0.33 (1.94)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>41.14 (11.51)</td>
<td></td>
<td>0.71 (1.84)</td>
<td></td>
</tr>
<tr>
<td>Diet</td>
<td>Vegetarian</td>
<td>42.01 (12.97)</td>
<td>0.208</td>
<td>0.30 (1.76)</td>
<td>0.765</td>
</tr>
<tr>
<td></td>
<td>Non-Vegetarian</td>
<td>40.85 (11.12)</td>
<td></td>
<td>0.83 (1.86)</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>Non – smokers</td>
<td>39.88 (12.09)</td>
<td>0.244</td>
<td>0.88 (1.81)</td>
<td>0.820</td>
</tr>
<tr>
<td></td>
<td>Smokers</td>
<td>43.54 (10.11)</td>
<td></td>
<td>0.37 (1.91)</td>
<td></td>
</tr>
<tr>
<td>Alcoholism</td>
<td>Non – Alcoholics</td>
<td>39.02 (11.31)</td>
<td>0.780</td>
<td>0.59 (1.82)</td>
<td>0.728</td>
</tr>
<tr>
<td></td>
<td>Alchoholics</td>
<td>43.96 (11.34)</td>
<td></td>
<td>0.86 (1.89)</td>
<td></td>
</tr>
</tbody>
</table>
score among smokers was 7 ± 2.21 and among non-smokers is 6.23 ± 2.65 respectively. The mean total score in smokers is slightly higher than that of non-smokers and it was non significant. Among alcoholics mean total score was 7.13 ± 2.48 and in non-alcoholics is 6.07 ± 2.5. The mean total score in alcoholics is slightly higher than that of non-alcoholics and it was non significant. Mean total score was highest in upper middle class i.e. 8.17 ± 2.43 and it was found to be lowest in the upper lower class of socio-economic group i.e. 5.2 ± 2.04. The mean total score of various socio-economic groups of the study population is insignificant.

After comparison of the maximum and minimum differences in known age with mean calculated age using Gustafson’s method appears to be the best method showing least deviation of the calculated age from the actual age (4.23 to -3.77). The rest of the formulae i.e. Pillai and Bhasker, Singh and Multiple regression formulae are showing large range of deviation.

CONCLUSIONS

Thus, in our study we found that when all the six physiological age factors were scored and used together collectively, we will get better results, rather than using a single physiological factor for estimation of age. Socio demographic factors, diet and habits have no effect on age estimation.

Conflict of Interest: None declared.

Source of Funding: Self

Ethical Clearance: S V Medical College, Tirupati.

Conflict of Interest: None

REFERENCES


Diatom Examination From Ganga River at Vindhyachal -
A Forensic Approach

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ABSTRACT
Diatoms are unicellular, photosynthetic (autotrophic), eukaryotic organisms often classified as among the algae. They are scientifically known as Bacillariophyceae. Diatoms study can be used in medico-legal purpose to solve the cases of unclaimed drowned or dumped bodies. The detection of diatoms in the organs can contribute to a diagnosis of death by drowning, a process referred to as the ‘diatom test’. This study was conducted in the department of Forensic Science, SHUATS, Prayagraj which included the extraction and identification of diatoms from the collected water samples from three different sites of Ganga River in Vindhyachal. The acid-digestion method was used for diatom extraction. 27 samples were collected (3 from each site) in the month of January, February, March 2022 from 3 different ghats of Vindhyachal, i.e., Babu Ghat, Pakka Ghat, Diwan Ghat. Samples were taken from surface, 1 feet and 2 feet deep inside river. After examination and analysis total 18 genera of diatoms were found. The identified diatoms were of great ecological importance and play an important role in criminal investigations related to pre-mortem or ante-mortem drowning deaths in Ganga river at Vindhyachal, district of U.P, India

Keywords: diatom, gangariver, vindhyachal, drowning death

INTRODUCTION
Diatoms are unicellular, eukaryotic, photosynthetic (autotrophic) algae that has more distinctive feature of crystalline extra cellular coat or frustules composed of silica and having unique patterns of symmetry and microstructure. They belong to kingdom Protista and class Bacillariophyceae. There are more than 200 genera and 100,000 species of diatoms that are known Round et al. (1990)1

Diatoms are microscopic eukaryotic organisms ranging in size approx 5 micron to 1000 microns and of the most common types of phytoplankton. A special characteristic feature of diatom cell is that they are enclosed within a cell wall made up of silica (hydrated silicon dioxide) called frustules found in almost aquatic environment including fresh and marine waters, soils in fact anywhere where moist environment present. Warner (1997)2.

Numerous studies have shown that diatoms are valuable supportive evidence in cases of drowning Horton et al. (2006)3. The basic principle of “Diatom test” in drowning is based on correlation between diatoms which are present in the medium where the possible drowning took place and recovery of diatom from deceased body.
When a dead body is recovered from water, there is usually a suspicion as to whether death was due to drowning or if it was a case of post-mortem submersion. In such cases, detection of diatoms from internal organs of victim of wet drowning is considered as a positive proof of ante mortem immersion by the forensic pathologists nationwide.

The size of the diatoms is also important in order to eventually reach the bone marrow of dead victim when water is inhaled. Hence presence of large number of diatoms of same species as that of putative drowning medium in the bone marrow of the deceased is used to confirm the cause of death as drowning. Peabody (1977)4. Presence of diatoms in the biological sample serves as an indicator of drowning proving that such organisms are present in the submerging medium Krystic (2002)5. The diatom test is considered as a standard to confirm drowning as a cause of death and localize the site of drowning Pollanen (1998)6.

Ganga river is very well known for its drowning cases. With such high case of drowning there is very high possibility of post mortem submersion Mishra (2014)7. Diatom test and its study can also be useful in cases where body is found at places far away from the actual site of drowning or dumping. The objective of the study is to extract and identify diatoms from water samples of Ganga River at Vindhyachal from three different drowning prone sites.

MATERIALS AND METHODS

The present dissertation work entitled “Identification of Diatom Flora from Ganga River at Vindhyachal for Forensic Consideration” was carried out in the Department of Forensic Science Laboratory, SHUATS, Prayagraj.

The materials required for conducting experimental work are Beakers, Forceps, Tarson tubes, Disposable pipettes or droppers, Measuring cylinder, Microscopic glass slides, Cover slips, Gloves all were taken new and fresh to avoid any contamination. Chemical used are 2% Formalin solution, Conc. Nitric acid (HNO3), Lugol’s iodine solution and Emersion Oil were of analytical grade. Instruments used are Microscope, Hot plate and Centrifuge machine were cleaned well to avoid pre presence of any diatom of related material.

Collection of water samples

Total 27 samples were collected from Ganga river in the month of January, February, March 2022 from 3 different ghats of Vindhyachal i.e Babu Ghat, Pakka Ghat, Diwan Ghat. Samples were taken from surface, 1 feet and 2 feet deep inside river. Before collection in a plastic bottle, it was washed with plenty of the same water media 2-5 times. After thorough washing, water samples containing diatoms were collected (500 ml).

Sites of water sample collection of Ganga river at Vindhyachal were Pakka ghat (S1) Babu ghat (S2) and Diwan ghat (S3). The GPS locations of ghats were noted down.

Extraction of Diatoms from Water Samples

The collected water samples were brought to the laboratory for examination of diatoms. After that 2-3 drop of 2% formalin solution was added to the water samples to fix the diatoms. The water samples were kept for 5 days to ensure all the binding of diatoms. Then the water samples were filtered through a 50 µm filter paper to separate the diatoms from the water media. The extracted diatoms were identified and recorded.
(as preservative to prevent further growth of diatoms) was added with the help of dropper and was left as such for overnight. 500ml of water sample was taken into the beaker from each bottle and 4-5 drops of Lugol’s iodine was added in the beaker and was covered with brown paper. Lugol’s iodine is used as a preservative of water samples and was left overnight Ludes et al. (1999). 50ml of Conc. HNO₃ was added in the beaker the next day. They oxidize the organic matter present in the water sample except the diatoms because the diatoms cell wall is resistant to them. The following day samples were taken intarson tubes & centrifuged at 1000-1500rpm for 10 minutes. After centrifugation pellet is obtained and supernatant was discarded. Again remaining sediments was taken in the centrifuged tube and this process was repeated till complete water sample contained in the beaker was centrifuged.

Preparation of Microscopic slide

For the examination of diatoms, the slide was prepared by taking one drop of deposited pellets from the bottom of centrifuge tube with the help of a dropper and put it on microscopic slide. After that the slides were kept on hot plate for 2-3 minutes at 50-60°C temperature and was allowed to dry. Now, one drop of DPX (mounting medium) was put on the slide and was covered gently with the help of cover slip to fix the slide. After fixation of slide they were observed under microscope at 10X, 40X and 100X (oil immersion) magnification respectively. These same process was repeated for all sample Taylor et al. (2007).

Identification of Diatoms

For identifying the diatoms, photographs were taken from the microscopic slide and then the structure was matched with the standard database Diatoms of North America (https://diatoms.org).

RESULTS

After collection, extraction and isolation of diatoms from water samples, various types of diatom were identified by using standard online Data base of diatom of United States. They were examined on the basis of their characteristic features such as raphea, cell wall, diameter and shape for identification, these morphological parameters were compared and matched with the standard online database of diatoms.

As per result reported a total of 18 genera of diatoms were identified at different mentioned sites of Ganga river at Vindyachal. 18 diatoms genera were identified with following characteristics. Synedra, Achnanthidium, Ulnaria, Nitzschia, Bacillaria, Cyclotella, Humidophila, Tryblionella, Aulacoseira, Surirella, Anomoeoneis, Fragilariforma, Pinnularia, Odontidium, Thalassiosira, Fragilaria, Cyclostephanos, Pseudostaurosira-Aspergillum.

As per table no. 2 some common genera are identified at three different sites of Ganga river at Vindyachal. A common type of diatom at three different sites has shown that there are little variations in diatom at nearby areas. This means that living diatoms often have specific salinity, temperature and other environmental tolerances. Some common genera among the sites are Synedra, Bacillaria, Fragilariforma and Pseudostaurosira.
As per Table no. 3 some specific genera of diatoms were identified at three different sites of Ganga river at Vindhyachal.

In accordance with Table no. 1, it was observed that the pennales are found in abundant amounts as compared to centrales. The pennales which (bilaterally symmetric) are 84% of the total no. of diatoms found whereas the centrales which (radially symmetric) are only 16% of the total diatoms found. Total 18 genera of diatoms were found at Vindhyachal ghat out of which only 3 were centrales and rest 15 were pennales.

Table 1: Identified Diatoms at all sites of Ganga river at Vindhyachal

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Genera</th>
<th>Pakka ghat (S1)</th>
<th>Babu ghat (S2)</th>
<th>Diwan ghat (S3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Synedra</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>2.</td>
<td>Achnanthidium</td>
<td>+ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>3.</td>
<td>Ulnaria</td>
<td>-ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>4.</td>
<td>Nitzschia</td>
<td>+ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>5.</td>
<td>Bacillaria</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>6.</td>
<td>Cyclotella</td>
<td>+ve</td>
<td>-ve</td>
<td>+ve</td>
</tr>
<tr>
<td>7.</td>
<td>Humidophila</td>
<td>+ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>8.</td>
<td>Tryblionella</td>
<td>-ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>9.</td>
<td>Aulacoseira</td>
<td>+ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>10.</td>
<td>Surirella</td>
<td>+ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>11.</td>
<td>Anomoeoneis</td>
<td>+ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>12.</td>
<td>Fragilariforma</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>13.</td>
<td>Pinnularia</td>
<td>-ve</td>
<td>-ve</td>
<td>+ve</td>
</tr>
<tr>
<td>14.</td>
<td>Odontidium</td>
<td>+ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>15.</td>
<td>Thalassiosira</td>
<td>+ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>16.</td>
<td>Fragilaria</td>
<td>-ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>17.</td>
<td>Cyclostephanos</td>
<td>+ve</td>
<td>-ve</td>
<td>+ve</td>
</tr>
<tr>
<td>18.</td>
<td>Pseudostaurosira</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
</tbody>
</table>

As per table no. 3 some specific genera of diatoms were identified at three different sites of Ganga river at Vindhyachal.

Table 2. Common Diatoms genera at all sites of Ganga river at Vindhyachal.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Genera</th>
<th>Pakka ghat (S1)</th>
<th>Babu ghat (S2)</th>
<th>Diwan ghat (S3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Synedra</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>2.</td>
<td>Bacillaria</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>3.</td>
<td>Fragilariforma</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>4.</td>
<td>Pseudostaurosira</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
</tbody>
</table>

Table 3. Specific Diatoms genera at sites of Ganga river at Vindhyachal.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Sites</th>
<th>Genera</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pakka ghat (S1)</td>
<td>Nitzschia, Cyclotella, Aulacoseira, Surirella, Anomoeoneis, Odontidium</td>
</tr>
<tr>
<td>2.</td>
<td>Babu ghat (S2)</td>
<td>Fragilaria, Tryblionella</td>
</tr>
<tr>
<td>3.</td>
<td>Diwan ghat (S3)</td>
<td>Pinnularia</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Diatoms are highly unicellular, microscopic, photosynthetic algae. They are found in water bodies. The most distinctive features of this unicellular organism are its extracellular coat or frustules, which is composed of silica. Diatoms can be picked up from anywhere, where there is a water body including seas, lakes, some domestic water supplies, even from moist surfaces or some marine plants and tree bark. The main goal of identification
of diatoms in this field is to differentiate a death by submersion from an immersion of a body. Silica based skeletons do not readily decay and they can sometimes be detected even in heavily decomposed bodies. On the basis of their unique features like that raphe, cell wall diameter and shape were examined for their identification Metzeltin et al. (2009)\[10\]. In the present study diatoms of Ganga River from Vindhyachal Ghat were identified to be used as indicators of drowning and dumping sites. Diatoms provide a freely ecological assessment of forensic evidence in suspected in dumping and drowning cases, linking crime scene locations, sites of accidental or suicide. Only a short-term (e.g. the perpetrator leaving a crime scene) contact between clothing and water body can cause significant transfers of diatoms, which could be collected for analysis in a criminal investigation Scott et al. (2014)\[11\]. In this study a total 18 diatom genera were identified. The work performed in this study was discussed in accordance with the work performed earlier by Ludes et al. (1999)\[12\] for continuous river monitoring of diatoms in the diagnosis of drowning for diatom extraction. With the help of this work, we can also identify the site-specific diatoms which are present at some particular sites which can also help to justify the drowning sites. Pollanen et al. (1997)\[13\] It is seen that common diatoms were found at all the sites. It shows that there are few variations in diatom at nearby areas. This study is in lined with the research work performed by Mishra and Kumar (2017)\[14\] where diatoms were used for site specification in Yamuna River at Delhi. The individual species or the species composition in forensic sample can provide important information about the habitat or location at a particular time of a year by Williams and Kociolek (2003)\[15\].

**SUMMARY**

In this study entitled “Identification of Diatom Flora from Ganga River at Vindhyachal for Forensic Consideration” was carried out in the Department of Forensic Science Laboratory, SHUATS, Prayagraj, with objective “To extract and identify diatoms from water samples of Ganga River at Vindhyachal from three different sites.”

Water samples were collected from 3 different site of Ganga River at Vindhyachal, water samples were collected from each selected site from January to March 2022. Collected water sample were treated for the digestion by using acid-digestion method.

4-5 drops of Lugol Iodine solution was added to the water samples, after that it was left overnight so that the impurities get digested. Diatoms are the unique genera which is undissolved because of their outer layer of silica Ludes et al. (1996)\[16\]. Next day, water sample which was mixed by formalin solution would be stunned strongly and relocated into a clean 500ml beaker and then 50ml of Conc. HNO₃ was added to 500ml water sample in the beaker. Now the sample was centrifuged at 1000rpm for 10 minutes to get pellets. Then the microscopic slides were prepared by spreading the thin layer of pellets on slide and then heated on hot plate. The slide is now ready for further observation. After that, diatoms were observed at 10X, 45X and 100X magnification. All observed diatom were identified and matched by “Diatom Data Bank of North America”.

After the laboratory analysis total 18 genera were identified in Ganga River at Vindhyachal from 3 sites that is Pakka ghat, Babu ghat, Diwan ghat. Out of which 4 diatoms were common at all 3 sites. They are Synedra, Bacillaria, Fragilariforma, Pseudostaurosira.Pakka ghat had specific diatoms: Nitzschia, Cyclotella, Aulacoseira, Surirella, Anomoeoneis and Odontidium.

Babu ghat had specific diatoms: Fragilaria and Tryblionella.Diwan ghat had unique diatom: Pinnularia.

**CONCLUSION**

This study concluded that after extraction and identification total 18 diatoms genera were identified from all 3 different sites of Ganga River at Vindhyachal, acid digestion method
is suitable for the extraction and isolation of diatom flora. Out of which 9 diatoms genera are site-specific and 4 common diatom genera were identified from all 3 different sites, which can be utilized for examination, evaluation and identification of drowning death cases.

This work confirmed that the specific diatoms population is useful in determining anti-mortem or post-mortem submersion of the decomposing body and its decomposing phase if aquatic medium or any crime which is related to submersion in water in Ganga river at Vindhyachaloccoured.

Diatom study can be useful in medico legal purposes to solve the cases of unclaimed drowned or dumped body. Diatom finding from the water as well as biological sample provide a lot of information about the cause of death, locality and probable season also.

ACKNOWLEDGMENT

The author would like to thank the Authorities of Sam Higginbottom University of Agriculture Technology and Sciences,Prayagraj, U.P-211007, Faculty members, Student advisory committee members and staff of the Department of Forensic Science, SHUATS for their valuable support and help.

CONFLICT OF INTEREST: Nil.

SOURCE OF FUNDING: All fundings for this research work was received from Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, U.P-211007.

ETHICAL CLEARANCE: Not Required.

REFERENCES


Profile of Alleged Accused in Sexual Offence Cases Examined in Kilpauk Medical College – Chennai- A Retrospective Study

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ABSTRACT

Despite strict laws like POCSO (Protection of Children Against Sexual Offenses), the cases of sexual violence against children are not declining in India, relatively it is snowballing year by year. Apart from metros, such heinous crimes are being carried out in small towns as well. The National Crime Records Bureau (NCRB) report for the year 2020 states that 47,221 cases of child sexual abuse were registered in the country. Most of the victims in these cases were girls. According to NCRB, the maximum happenings of sexual violence and sexual abuse happened with girls aged 16 to 18 years. Activists working in this field say that many times the cases do not reach the police or the family overpowers them for fear of defamation. The POCSO Act was enacted years ago to protect children from sexual abuse. The question is, has the law been successful in rewarding its objective? According to the 2016 to 2020 (NCRB) report, the number of reported child sexual abuse cases increased from 36,321 in 2016 to over 47,000 in 2020. This is an increase of 31 percent. According to experts, this number is also just the tip of the iceberg. In the 2020 report of NCRB, it has been said that only 36 percent of the crimes against children are registered under POCSO. The research paper examines the retrospective study of the alleged accused in sexual offence cases examined in Kilpauk Medical College.

Keywords: Sexual Offences, POCSO Act, Alleged Accused, Social Stigma.

INTRODUCTION

Sexual offence is a highly prevalent menace in our society. All walks of our community is affected and unreported cases outweigh the reported ones due to widespread stigma surrounding the offence. Most of the times the perpetrator is a known personal and has the aura of trust with the victim. Sexual offences involve physical as well as mental trauma and the victim can be of any age group. There are various legislations formulated for the protection of women and children and the recent prerogative of POSCO has also been a landmark where the gender of the victim was done away with in less than 18 years old children given the current trend of raising violence against children regardless of gender. The profile of the accused is important to be ascertained so as to better identify the pre-existing factors and the deviancy and for better targeted reforms.

The United Nations Convention on the Rights of the Child (CRC) is an International agreement to protect child rights, which legally binds member states to protect child rights. The most prominent law against child
sexual abuse and exploitation in India is the Protection of Children from Sexual Offenses Act (POCSO) passed in 2012. In this, crimes have been marked and strict punishment has been fixed for them. Along with this, there is a provision of special court for speedy trial. The law also criminalises the intention of child sexual abuse and gives guidelines to the police, media and doctors regarding any such offence.¹

By the way, there is a provision of strict law to curb sexual crimes under sections 375 (rape), 372 (sale of girls for prostitution), 373 (purchase of girls for prostitution) and 377 (unnatural act) of the Indian Penal Code.

MATERIAL AND METHODS

This study is a retrospective study conduction in Department of Forensic Medicine, Government Kilpauk Medical College, Chennai in period between Jan 2021 to July 2021. The alleged accused of sexual offence cases brought to the department was included in the study. The documents such as history of the case, First Information Report, Potency certificate, forensic science report and other documents in the concerned case sheet were analyzed.

RESULTS AND DISCUSSION

A total of 50 case sheets of alleged victims were analyzed out of which 47(94%) cases belong to Hindu religion and 2(4%) cases to Muslim and one case(2%) belong to Christian religion. In relation to marital status 37(74%) cases were unmarried and 13(26%) cases were married. In analyzing place of offence 15(30%) cases incidence took place in accused house and 5(10%) cases in victims house. In 21(42%) cases place of occurrence was not mentioned, in 5(10%) cases relative house of the accused, this is in contrast with study conducted by Punpale et al[²] in which 21.72% was in house of relative of the accused and in 4(8%) cases incident occurred in open space. In relation to manner of offence 8(16%) cases were consensual. And forcible in 35(70%) cases. Manner of offence is not mentioned in 7(14%) cases. In analyzing age of the accused 27(54%) cases was seen in 19-25 years and 11(22%) cases was seen in 26-32 years. 4(8%) cases seen in age group 41-48 years, 3(6%) cases seen in age group 11-18 and 33-40 years. 2(4%) cases was seen in age group 49-64 years (Figure:1)

In relation to age of the victim maximum number of cases seen in 13-18 years of age group – 43(86%) cases this consistent with other studies.³⁴⁵ In age group of 5-12 years 5(10%) cases was seen. Above 32 years of age one case (2%)was noted. In analyzing relationship between the accused and victim 30(60%) cases was boy friend, this consistent with Vadysighe AN et al[⁶] blood relative in 15(30%) cases and neighbour in 5(10%) cases. None of the cases stranger was noted as accused. This is in contrast with study done by Yadukul S et al,⁸ in which 80% of accused was strangers.

In relation to number of sexual attempts 34(68%) cases multiple acts was seen i.e more than 3 times. In 5(10%) cases 2-3 attempts was seen.

![Fig. 1: Distribution of accused age](image1)

![Fig. 2: Number of sexual attempts](image2)
seen and in 6(12%) cases it is not mentioned. (Figure 2)

Pressing of rubbing genital parts only is seen in 5(10%) cases only. Out of 40 cases with penetrative act, ejaculation was seen in 12(30%) cases and not mentioned in 28(70%) cases. In relation to time between the incident and report to the police, 33(66%) cases was reported with in 5 days this consistent with study conducted by others[7,8] and 5(10%) cases reported between 6-15 days. In between 16-45 days 2(4%) cases was reported and above 60 days 7(14%) case was reported. (Figure 3)

LIMITATIONS OF STATUTORY PROVISIONS AGAINST CHILD SEXUAL ABUSE

Section 375 defines rape as a criminal act. But some of the provisions and interpretation of this section are narrow. There seems to be a lack of clear provisions regarding eve-teasing, touching in wrong ways, long staring and harassment etc. While such acts cause deep trauma to the victim mentally and emotionally. Section 375 of the Indian Penal Code decriminalizes relationships in which a man has sex with a 15-year-old wife, while our law (Prohibition of Child Marriage Act, 2006) prohibits child marriage.

Children who have already been subjected to some form of abuse are at a significantly increased risk of being sexually abused. For example, children from families that are neglected are at greater risk. Children with disabilities, especially those with speech or language problems, are three times more likely to be victims of sexual abuse.[9] This risk is also high in children who use the Internet. Social media, chat rooms and web forums are all used by sexual harassers to locate potential victims.[10]

Sexual abuse can cause serious physical and emotional harm to children over a long period of time. Overall, children can have health problems, such as sexually transmitted diseases, physical injuries, and unwanted pregnancies.[11] Long-term victims of sexual abuse are more likely to develop depression, anxiety, eating disorders, and post-traumatic stress disorder (PTSD). Suicidal tendencies increase in such people, they get involved in criminal activities, can become addicted to drugs and alcohol and commit suicide at a young age.[12]

CONCLUSION

Religion prevalence with Hinduism can be attributed to the population distribution in the study population. More unmarried men were involved in sexual violence due to better family support system and societal standing. Majority of the offence took place at accused home probably due to privacy. 16% of cases reported were consensual. Young 19-25 years age group is more involved and the victims were mostly juvenile in 13-18 years of age pointing towards the prevalence of pedophilia in the society and so taking advantage of the more defenseless section of the society. Most of the reported cases showed complete multiple penetrations and ejaculation was also seen in 30% of cases though it was not mentioned in the rest. Majority of the reported cases were reported within 5 days.

Way forward

Although India has a comprehensive legal framework against child sexual abuse and abuse. But in spite of so many laws and schemes, these incidents happen due to their technical lapses and irregularities in their
implementation, lack of prompt action. For this awareness and awareness is necessary. In such a situation, it is necessary that at the primary level, the family, parents and relatives should be aware of those who meet and play with children, while children should also be motivated to be aware of unusual ‘behavior’. There should be mandatory psychological camps in schools, doctors, media and police should also be sensitive to these incidents. Obscene content of internet, mobile, social media should be banned without any delay. The option of parental control on the same internet sites should be strengthened.

**Conflict of interest:** Nil

**Ethical clearance:** Nil

**Funding:** Nil

**REFERENCES**


INTRODUCTION

Death by ligation around the neck are in practice from the time immemorial and before adventure of civilization. Out of all the various modes of suicide, hanging is one of the most chosen methods. Hanging is defined as a form of death which is produced by suspending the body with a ligature encircling the neck, the constricting force being the weight of the body or a part of the body.  

According to National Crime Bureau Report 2016, in India, death due to hanging constitutes 46.2% of suicide.  

Hanging is one of the most common methods of choice for the individuals who commit suicide due to its higher success rate, painless death and easy availability of materials that can be used to produce hanging.

In 2019-2021, around 4.7 crore, including 17.56 lakh women, ended their life by taking recourse to various means to commit suicide. While in 2020, 88,460 persons and 93,580 in 2021 hanged themselves from ceiling fans and roofs, more than 58% of the total suicides. According to NCRB data, 1.53 lakh deaths by suicide were recorded across the country in 2020. The report revealed that the number of

ABSTRACT

In the day-to-day practice of Forensic expert, hanging deaths is more commonly encountered. According to National Crime Bureau Report of 2016, death due to hanging constitutes 46.2% of suicide in India. Hanging is defined as a form of death which is produced by suspending the body with a ligature encircling the neck, the constricting force being the weight of the body or a part of the body. Testicular cancers have been proven to cause paraneoplastic dermatomyositis and psychological depression in long term survivors. We report the case of a 31-year-old man who was found hanging from a ceiling fan in his hostel room. He had a past medical history of Schizophrenia & Depression for the past 5 years and a history of skin disease with lesions all over his body. Histopathological examination revealed Mixed Germ Cell Tumours – Seminoma Testis which was incidentally found during the autopsy.

Keywords: Seminoma testis, suicidal hanging, typical hanging, asphyxia, suspension.
people who committed suicide in 2019 was 1.39 lakh, in 2018 it was 1.34 lakh, in 2017 it was 1.29 lakh. Whereas, in 2020 and 2021 it was more than 1.50 lakh.

CASE REPORT
A 31-year-old man was found hanging from a ceiling fan by his friends in his hostel room and they informed the police, who recovered the body of the deceased and was sent to the mortuary of Govt. Kilpauk Medical College and Hospital, Chennai. Based on the information obtained from deceased’s brother, he was suffering from Schizophrenia and Depression for the past 5 years for which he was taking medications. The deceased was also suffering from a skin disease with lesions all over his body, especially in his upper and lower limbs. He was found to be as less confident, low self-esteem and depressed most of the time. There was a history of a refusal of marriage by a girl after citing the skin lesions over his body, before the day of his demise.

On autopsy, external examination revealed rigor mortis was present all over his body. Moderately built male body with finger and toe nails bluish in appearance. Scattered black colour scab skin lesion of varying sizes was present over his both upper and lower limbs. No other external injuries of violence elsewhere in the body was seen. An incomplete, asymmetrically oblique, dark brownish ligature mark of size on front and sides of the neck above the suprasternal notch. The skin of the ligature mark was dark in colour and hard in consistency.

On dissection of the neck, the underlying soft tissues appears pale and there was no extravasation of blood in surrounding soft tissues. No fracture of larynx and hyoid was seen. Genital organ examination revealed enlarged scrotum on the right side of size 13 x 12 cm (Figure:1), which was firm in consistency. On cut section, multiple lobular lesions with necrotic material (Figure: 2) were seen and the left testis was normal. Right testis was sent for the histopathological examination. The cause of death was given as asphyxia due to Hanging. Toxicological analysis did not reveal the presence of alcohol or any other drugs.

Histopathological Findings
Section studied from the testicular mass shows a neoplasm composed of sheets and nests of cells which are round to polygonal having moderate to abundant clear to pale eosinophilic cytoplasm and round hyperchromatic nuclei exhibiting mild pleomorphism. The tumour cell nests are separated by thin and thick fibro collagenous septae, which is infiltrated by numerous lymphocytes (Figure: 3), (seminomatous component). An area of tumour shows yolk sac differentiation which is arranged in reticular pattern and schiller – Duval Bodies formation. Also seen are areas
of mature teratoma (Figure: 4) with benign stratified squamous epithelium, lobules of mature cartilage, skeletal muscle bundles, few areas of glands lined by mucinous columnar epithelium. Areas of necrosis are evident.

![Figure 3: Seminoma component (Nests of clear polygonal cells separated by septae infiltrated by lymphocytes)](image)

![Figure 4: Mature Teratoma component (Keratinizing squamous epithelium)](image)

![Figure 5: Yolk sac component](image)

![Figure 6: Mixed Components](image)

It was given that the section studied revealed right side – Mixed Germ Cell Tumours (Figure: 6) with 65% seminomatous component, 20% mature teratoma component and 15% yolk sac tumour component.

**DISCUSSION**

Testicular cancers have been proven to cause paraneoplastic dermatomyositis and psychological depression in long term survivors. In 10% of the cases, testicular cancer is asymptomatic and is identified incidentally. The 4 main types of testicular cancer are Seminoma (40%), Teratoma (32%), Lymphoma (7%) and Interstitial tumours (1.5%). The 2 main predisposing factors for testicular malignancy are undescended testis and testicular atrophy. The lifetime prevalence of developing testicular cancer is 0.2%. The Seminoma Classic form is the most common type typically occurring in middle age. Grossly the tumour is lobulated, fleshy, homogenous, and pinkish in colour.

Histologically, the malignant cells resemble spermatocytes containing clear cytoplasm with large nucleus arranged in sheets with fibrous stroma in between. The inguinal nodes are involved when the tumour breaches tunica albuginea. The paraneoplastic dermatomyositis skin lesions associated with testicular cancer are gottron’s papules, heliotrope rash, V-sign erythema and shawl sign.

Long term survivors of testicular malignancy are more prone to develop
paraneoplastic dermatomyositis and psychological depression. In this case, the decedent had a 5-year history of psychological depression and schizophrenia for which he was under medication. Suicide is the most common cause of death in patients who are diagnosed with schizophrenia. Previous research studies revealed that about 5 - 13% of patients who are diagnosed with schizophrenia ends their life by suicide.⁴

Legal position regarding attempted suicide in India

According to section 309 of Indian penal code, Whoever attempts to commit suicide, and does any act towards the commission of that offence, shall be punished with simple imprisonment for a term which may extend to one year, or with fine shall be punished with fine, or with both³.

According to Article 21 of the Indian Constitution, “No person shall be deprived of his life or personal liberty except according to procedure established by law.” While the Constitution includes the right to life or liberty, it does not include the ‘right to death’. Attempts to take one’s life are not considered within the purview of the constitutional right to life. Section 309 of the Indian Penal Code (IPC) states that whoever attempts to commit suicide and does any act towards the commission of such offence, shall be punished with simple imprisonment, or with fine, or with both. which can be extended up to one year. It is to be noted that the punishment for abetment to suicide has been provided under section 306 of the IPC and the punishment for abetting a child to commit suicide has been provided under section 305 of the IPC³.

As per section 115(1) of the Mental Health Care Act, 2017, notwithstanding any provision contained in section 309 of the Indian Penal Code, any person who attempts to commit suicide shall, until such time, be deemed to be of serious under stress unless it is proved otherwise and shall not be prosecuted or punished. However, this law only applies to people suffering from mental illness.

Severe stress is anticipated in case of suicide attempt.

Decriminalize attempt to commit suicide:
The government has decided to decriminalize attempt to commit suicide. That is, now those who try to kill themselves will not go to jail. The central government announced the abolition of Section 309 of the IPC. Under this law, the person who tried to commit suicide was punished with imprisonment of up to 1 year and a fine.

The present Minister of State for Home told in the Lok Sabha that the Law Commission in its report has recommended that section 309 should be decriminalised. The commission had said that this law is not correct from a human point of view. With the removal of this law, people who are facing mental harassment after attempting suicide will not have to worry separately by getting stuck in legal hurdles. Accordingly the Home Ministry is also considering repealing the CrPC and some other laws of the IPC. The bench of the then Supreme Justice Markandey Katju and Gyan Sudha Mishra had also suggested to the Parliament that this law should be abolished. He had said that a person tries to commit suicide after coming into depression, so he needs help, not punishment. Those who were opposing the abolition of this law argued that suicide is an immoral act and its abolition may lead to an increase in suicide cases.⁶

Long legal battle
Efforts to remove this law have been going on for a long time. In 1978, the IPC Amendment Bill was passed in the Rajya Sabha, through which section 309 was to be abolished. But before the bill could reach the Lok Sabha, the Parliament was dissolved and the bill could not be passed. In 1987, the Bombay High Court ruled that the Right to Life under the Indian Constitution includes both the right to live and the right to die. With this, section 309 was abolished. The Supreme Court also
upheld this decision in 1994. However, in 1996, a five-judge bench ruled that the Right to Life, being constitutionally guaranteed, did not include the right to die and that Section 309 was valid. After this, in 2008, the Law Commission suggested its removal.7

In this case, the manner of death was suicide since there were no external injuries during the autopsy and also crime scene revealed that the door was locked inside. Depression is frequently present in people with schizophrenia. Depression is considered to be a major risk factor for suicidal behaviour among populations.

The present case describes that the decedent had a strong history of psychiatric illness and depression for many years. In addition to this, his mental status was shattered by the girl’s refusal to marry him citing his skin lesions, which made him to commit suicide. Testicular cancer (Seminoma testis) was incidentally identified during autopsy.

CONCLUSION

Hanging is the most common method of suicide worldwide and second most common method in India. Because of the ready availability of the ligature materials and because of the various types of the ligature materials available at home, hanging seems to be the most preferable method of committing suicide.8 Males predominantly seems to be the victims to suicidal hangings. We thereby conclude that in order to reduce the number of suicides by hanging, regular suicide risk assessments in therapy services must be provided to those vulnerable group of people if and when identified.

Ethical clearance: None
Source of funding- Nil
Conflict of Interest: None

REFERENCES:

INTRODUCTION

The sympathetic trunks consist of two ganglionated nerve trunks that extend along the length of the vertebral column. In the neck, there were 3 ganglia; in thorax:11 or 12; in the lumbar region 4 or 5 and in pelvis, 4 or 5. In the neck, trunks lie anterior to the transverse processes of the cervical vertebrae; in the thorax they are anterior to the heads of the ribs or lie on the sides of the vertebral bodies, in the abdomen, it lies anterolateral to the sides of the bodies of the lumbar vertebrae; and in the pelvis, they are anterior to the sacrum.

The thoracic sympathetic trunk possesses 12 ganglia, corresponding to each thoracic nerve, but often 1st is fused with inferior cervical ganglion to form a large stellate ganglion above the neck of the 1st rib. The ganglion is attached...
to spinal nerve by white and grey rami and it gives communicantes to spinal nerves. 2There were three splanchnic nerves of the thoracic sympathetic trunk; arising from the lower eight ganglia. The greater splanchnic nerve (GSN) is formed by branches of the 5th to 9th thoracic sympathetic ganglia, the lesser splanchnic nerve (LSN) from 10th to 11th thoracic sympathetic ganglia and the least splanchnic nerve from the 12th thoracic ganglion. Splanchnic nerves contain predominantly visceral efferent fibers and pain conducting visceral afferent fibers. Splanchnic ganglia of the greater splanchnic nerve was first described by Lobstein in 1823. 3 These ganglia give off numerous medial branches to the aortic coat, and sometimes to the coeliac plexus, superior mesenteric plexus, renal plexus or oesophageal plexuses. 3 Preganglioc axons are coming from the lateral grey column (horn) of the spinal cord. The myelinated axons of these cells leave the cord and join the paravertebral ganglia of the sympathetic trunk through the white rami communicantes while postganglionic axons leave the trunk through the grey rami communicantes. The axons of postganglionic neurons are nonmyelinated and distributed to target organs in various ways. 6

The group of visceral nerves that arise from the thoracic sympathetic trunks which carry pre and post ganglionic sympathetic and afferent nerve fibres supplying upper abdominal organs. 7 The pattern of connections of pANS don’t change significantly between the fetal period and the adult according to Kuntz 7 and Pick. 8 Anatomical variations of the thoracic sympathetic trunk in relation to intercostal nerves may be one of the reasons that cause surgical failures.

AIMS AND OBJECTIVES
The present study was undertaken to

- To find out variations in the number of ganglia in the thoracic part of the sympathetic chain.
- To observe the variations in the formation of splanchnic nerves in the thoracic part of the sympathetic chain.
- To study histogenesis of thoracic ganglia.

MATERIALS AND METHOD
50 formalin preserved fetus specimens from 11-28th week of gestation from spontaneous abortions received at Department of Anatomy, Government medical college and hospital 32 Chandigarh were the part of study. The research work was conducted after obtaining necessary permission from the parents and ethical clearance from the institute. The age estimation was obtained from the fetuses’ medical records as well as through standard crown rump length measurements. General anatomical features were recorded. The congenitally malformed fetuses were excluded from study. Then fetuses were fixed in formalin. Then the fetuses were dissected by anterior midline and lateral incisions, organs were eviscerated and the sympathetic chains were dissected from cervical to sacral region. The thoracic part of sympathetic chain was exposed bilaterally. (as shown in fig 1 & 2)

The fetuses were divided into four gestational age groups: Group A (11-15 weeks) Group B (15+ -20 weeks) Group C (20+ -25 weeks) and Group D (25+ onwards).

The length of thoracic sympathetic chain and number of thoracic ganglia were measured. It was not possible to measure the size of thoracic sympathetic ganglia as these were very small. The dissections were done

Fig 1: Anterior midline incision
under a dissecting microscope or with the help of a convex lens. Next, Light microscopic study of fetal thoracic ganglia was done with H &E staining in different gestational age groups to note the histological changes.

**OBSERVATION**

The thoracic part of sympathetic chain was present bilaterally in all fetus specimens with variation in number of ganglia.

**Morphological**

The number of thoracic ganglia and length of thoracic part of sympathetic chain was noted and discussed as under (Table 1).

In group A 22 chains were dissected ,followed by 26 in Group B,28 in group C and 24 in group D (Table 2).

The mean length of thoracic chain ranged from 2.88cm to 6.75cm. There was slight increase in length from A-B group but there was significant increase from group C to D. The length of chain was increasing with the gestational age.

In most of the chains (48%) 12 ganglion were present. While in 36% cases there were 11 ganglion in thoracic sympathetic chain. In 3% cases the 2-3 ganglia were seen fused (Table 3).

The origin of splanchnic nerve was quite variable in present study .In fetus from 20 weeks onward we were able to locate the splanchnic nerves. However in small age groups the splanchnic nerves were not

---

**Table 1: Showing age distribution in groups**

<table>
<thead>
<tr>
<th>Group</th>
<th>Gestational age</th>
<th>Number of fetus</th>
<th>Total number of chains</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11-15</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>B</td>
<td>15+_20</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>C</td>
<td>20+_25</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>D</td>
<td>25 onwards</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>

**Table 2: Showing mean length of thoracic part of sympathetic chain**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean length (in cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.88</td>
</tr>
<tr>
<td>B</td>
<td>3.16</td>
</tr>
<tr>
<td>C</td>
<td>4.24</td>
</tr>
<tr>
<td>D</td>
<td>6.75</td>
</tr>
</tbody>
</table>

**Table 3: Showing total number of ganglia**

<table>
<thead>
<tr>
<th>Number</th>
<th>Number of cases</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7</td>
<td>14%</td>
</tr>
<tr>
<td>11</td>
<td>18</td>
<td>36%</td>
</tr>
<tr>
<td>12</td>
<td>22</td>
<td>42%</td>
</tr>
</tbody>
</table>

---

Fig 2: Evisceration of thoracic and abdominal viscera

Fig 3: Showing origin of splanchnic nerves (arrow marked)
distinguished. The origin of GSN was seen arising from 6, 7, 8 and 9th in 37% cases, LSN arising from 10 and 11th in 63% cases, Least SN from 12th in 8% cases.

**Histological observations**

The thoracic ganglia were removed and fixed in Paraffin wax. The paraffin blocks were section and stained with H& E staining to examine the changes in appearance of cells, their differentiation in different age groups according to their gestation.

**DISCUSSION**

The formation of sympathetic chain was noted in 9cm stage of human embryo. Neurons to the human sympathetic chain are contributed by ventromedial aspect of the dorsal root Ganglia and are also derived from the ventral aspect of neural tube which pass along the ventral nerve roots. The aggregation of cells, representing the primordia of the future ganglia of the sympathetic trunk, are first evident in the lower thoracic and upper lumbar regions, and they are located on the

![Image of histological observations](image-url)

Group A: The Capsule was very well defined at 11 week onwards. The neuroblast cells were small and numerous with connective tissue fibres and blood vessels.

Group B: The neuroblasts were increased in size and few neuroblast were seen surrounded by satellite cell sheath. Blood vessels were numerous with connective tissue fibres.

Group C: In group C the neuroblast were quite big in size with perinuclear halo space and satellite cell sheath. Blood vessels were numerous seen with connective tissue fibre intervening. Few neuroblast were seen undergoing mitosis.
posterolateral aspects of the aorta. Such aggregations of primordial cells are arranged initially in an ill-defined column, and in embryos at the 15 mm stage, they are present in all except the cervical region.

In present study the presence of sympathetic chain was noted in all fetuses from 11 weeks onwards and it could be a quide for the forensics in determination of age.

The thoracic sympathetic branches in man show a complex, segmentally organized pattern and may have a considerable component of somatosensory nerve fibers. The segmental organization of the thoracic sympathetic trunk and all its ramifications was studied in 6 human fetuses (16-22 weeks) by means of the acetylcholinesterase in to staining method. Each trunk was divided into 12 sympathetic segments. A segment is defined as that part of the sympathetic trunk which is connected via its rami communicantes with one spinal nerve. Three categories of nerves are discerned: (1) large splanchnic rootlets confined to the greater, lesser and least thoracic splanchnic nerves, (2) medium-sized splanchnic nerves directed towards thoracic viscera, some of which give off branches to the aorta and form nerve plexuses in the capsule of the costovertebral joints. Hemanth Kommuru et al conducted study on 31 embalmed cadavers and found the stellate ganglion was unilaterally present in 15 cadavers, bilaterally in 4 cadavers. There were 11 thoracic ganglion in 11 cadavers. The highest origin of splanchnic nerve was from 4th thoracic ganglion and lowest from 11th ganglion. Lesser splanchnic nerve was seen originating from 10th & 11th ganglia in 63% specimens. Least was seen originating from 11th in 27% and from 12th in 11% cases. In the study done on 6 adult and 14 fetal cadavers, the origin of splanchnic nerve was bilaterally asymmetrical in all cases. The greater splanchnic nerve was seen in all cases whereas lesser and least were inconsistent. The splanchnic nerve were observed most frequently over range: GSN T6-T9 in 73%, LSN from T10-T11 in 29% and Least from T11-T12 in 14% cases. The higher origin of greater splanchnic nerve above T5 has clinical complications in technique of taking thoracic splanchnicectomy.

Excision of the sympathetic chain during video assisted thoracic sympathectomy is a safe and effective method in treating hyperhidrosis, facial flushing and intractable angina with good long term results and satisfaction. A variable number of thoracic splanchnic branches leave the chain, especially in the upper part of the thorax to join the cardiac and pulmonary plexus; others join the aortic plexus and are distributed through them. The thoracic cardiac branches contain about twice as many fibres as that reach the cardiac plexus by the larger cervical sympathetic cardiac branches. Information on the variability of the anatomy of the thoracic sympathetic chain and splanchnic nerves may be important for the success of subdiaphragmatic neuroablative surgical approaches to pain control and splanchnic neurectomy for the management of chronic abdominal pain.

In present study done on 50 preserved fetus specimens the number of ganglia was usually 11-12 at all the stages of gestational age. There were 10 thoracic ganglion in 7 cases.
in 18 cases and 12 in 22 cases. The origin of splanchnic nerve was seen in fetus of higher gestational age and it was quite variable. The greater splanchnic nerve was seen originating from 7, 8, and 9th thoracic ganglia in 37% , lesser from 10-11th in 63% cases and least from 12th in 8% cases.

Kiran studied 90 samples of human fetal sympathetic chains ranging from 8th week to full term were analyzed. Serially cut paraffin sections were stained with H&E, Cresyl fast violet, Marshland silver impregnation method and neuron specific enolase immunohistochemical stain. Results demonstrated the sympathetic chain attained its adult position extending from cervical level to the sacral level by 12th week of gestation. Histologically, the sympathetic chain had a primitive appearance up to 10th week of gestation. The early sympathoblast stage extended from 12 to 16 weeks. The sympathoblasts were committed to form neurons by 18th week of gestation. This process of differentiation took 10 weeks from 18th to 28th week of gestation. Maturation involved a further 6 weeks, from 30th to 36th weeks of gestation, at which time there was an increase in cell size, RER, neuronal filaments and number of dendrites.

In present study the neuroblast were seen with perinuclear halo space surrounded by satellite cell sheath in group C (20 week onwards). In 11 weeks the capsule surrounding ganglia was clearly seen. Fully adult like mature neuron was seen from 25 week onwards. Hence, the study done on fetuses, the variation in the thoracic ganglion, splanchnic nerves and the cytoplasmic and nuclear changes at different gestational ages will add knowledge to the existing literature. In forensic science the histology of ganglion could help to note the age of fetus.

**Clinical importance:** T2 is the key ganglion for the palmar hyperhidrosis and in addition to stellectomy for Raynaud's disease. So it is essential to know the details, pattern, and variations of the sympathetic chain for thoracic dorsal sympathectomy.

**Medico-legal aspect:** The remains of fetus with sympathetic chain and histology of ganglion could be helpful in determining age.

**CONCLUSION**

The present work on examining the number of thoracic ganglion, its histogenesis and presence of splanchnic nerves their origin, it would be baseline for further research as work done on fetuses is very less. The variations in the thoracic sympathetic chain and the formation of splanchnic neural pattern were identified and inconsistent results of splanchnectomies may be due to anatomical variations in the formation of splanchnic nerves.

**Ethical Clearance:** Taken from Institutional Ethical Committee Of GMCH Chandigarh and Maharishi Markandeswar Deemed university, Mullana(Ambala).

**Source of funding-** Self

**Conflict of interest -** Self

**REFERENCES**


Characterization of Physical Assault Related Injuries in a Tertiary Care Center In North India.

Ravdeep Singh1, Harvinder S. Chhabra2, Karan Pramod3, Rajiv Joshi4

1Assistant Professor, 2Forensic Expert 3Junior resident, 4Professor, 1,3,4Department of Forensic Medicine, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, 2Civil Hospital, Fatehgarh Sahib, Punjab.

ABSTRACT

Introduction: Physical violence and aggression has been extensively studied in relation to different forms of aggression, gender differences, its effects, risk factors etc. Violence not only results in physical problems but it also has economic and psychological impact on the victim. Cases of physical violence are usually brought to emergency and vary from minor injuries to fatal outcome.

Methods: This research aims to understand patterns of physical assault and identify ways to prevent and reduce the incidence. The two year retrospective study was carried out between 1st June 2020 to 31th June 2022 from the causality data of tertiary care center in Punjab.

Results: Of the total, 76.5% of the cases were male. 35.2% cases fall in age group of 21 to 30 years. Most commonly encountered injury sites were head-face-neck region in 39.6% of the cases. 60.89% cases were seen in rural area. Use of blunt weapon was seen in 64.80% of cases. Bruise was most common type of injury seen in 38.42% cases.

Keywords: Physical assault, Injuries, Violence, Medicolegal

INTRODUCTION

The definition of violence as per world health organisation is, the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group of people or community that either leads to or has a high probability of leading to injury, death, psychological harm, mal-development or deprivation.1

Violence not only results in physical problems but it also has economic and psychological impact on the victim. Beside loss of earning and productivity, the economic cost includes medical and legal expenses. Physical violence cases are routinely seen in emergency department. Besides giving medical treatment, It is the duty of medical officer posted in emergency to prepare medicolegal report and inform the police about such cases.2

The present study is aimed to identify the demographic profile, characteristics of assault and injuries sustained to provide real data to various authorities to formulate policy in order to reduce these Incidences.

MATERIAL AND METHODS

The present retrospective observational, descriptive study involves medicolegal cases which came to the causality of a tertiary care
center in Faridkot, Punjab from 1st June 2020 to 31st June 2022. The data was collected from hospital medicolegal register case sheets. Record of all the cases of alleged physical assault that came to the emergency department of hospital during the above said period was included in this study. Further available injury reports, radiological reports, specialist opinions were taken into consideration in each case. From these records relevant general information, demographic data, brief history of the alleged incident mode of injuries, types of injuries, relevant investigation related to injuries were recorded. Data was collected in various parameters like age, gender, residence, and indication for medico-legal cases. The collected data was analyzed and depicted in the form of tables, graphs and pie charts by using various parameters and compared with other similar studies.

**OBSERVATIONS AND RESULTS**

In the present study 1950 trauma cases presented in the causality department during the period of two year (from 1st June 2020 to 31st June 2022). Out of these 1950 cases 583 (29.8%) cases were reported to be of physical assault (Table 1).

In the present study the majority of victims fall in the age group of 21-30 yrs constituting 35.2% cases followed by 31-40 years (28.3%). The mean age of the victims was 37 years. The gender ratio was observed to be 3.25 males per female cases. Males constitute 76.5 % and Females constituted 23.50% of the total caseload. While the majority of male cases (37.0%) was seen in 21-30 yrs, for females peak incidence was seen in the age group of 31-40 years (31.4%).

Areas wise, most of the cases (60.89%) were seen in rural areas, while urban areas constitute 39.11% of cases (Table 2).

Table 3 shows the distribution of cases, according to time period in a day. Most of the cases (45.80%) occurred during the time period of 2 pm to 8 pm, followed by a time period of 8 pm to 12 am (36.54%). Least number of cases was seen in the early morning time (2.00 am to 8.00 am) (Table 4).

The most common used weapon of offence was blunt in 324 (64.80%) cases followed by sharp weapon in 127 (25.40%) cases. Firearm was used in 24 (4.80%) cases (Table.4).

The most common type of injury encountered was bruise (n=224, 38.42%), followed by laceration (n=221, 37.91%) and abrasion (n=212, 36.36%). Among the injuries by sharp weapon incised wound was most commonly observed (n=102, 17.50%). Multiple injuries were seen in 45.80% cases (Table 5).

The head and neck region was involved in 38.95% cases, followed by lower limbs 30.7% and upper limbs 26.9%. Pelvic region, 4.6% and genitalia 0.5% were less commonly involved. (Table 6)

<table>
<thead>
<tr>
<th>Age group (yrs)</th>
<th>Male</th>
<th></th>
<th>Female</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-10</td>
<td>013</td>
<td>02.90</td>
<td>004</td>
<td>02.90</td>
<td>017</td>
</tr>
<tr>
<td>11-20</td>
<td>050</td>
<td>11.20</td>
<td>009</td>
<td>06.60</td>
<td>059</td>
</tr>
<tr>
<td>21-30</td>
<td>165</td>
<td>37.00</td>
<td>040</td>
<td>29.20</td>
<td>205</td>
</tr>
<tr>
<td>31-40</td>
<td>122</td>
<td>27.40</td>
<td>043</td>
<td>31.40</td>
<td>165</td>
</tr>
<tr>
<td>41-50</td>
<td>054</td>
<td>12.10</td>
<td>026</td>
<td>19.00</td>
<td>080</td>
</tr>
<tr>
<td>51-60</td>
<td>022</td>
<td>04.90</td>
<td>009</td>
<td>06.60</td>
<td>031</td>
</tr>
<tr>
<td>61-70</td>
<td>017</td>
<td>03.80</td>
<td>003</td>
<td>02.20</td>
<td>020</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>003</td>
<td>00.70</td>
<td>003</td>
<td>02.20</td>
<td>006</td>
</tr>
<tr>
<td>Total</td>
<td>446</td>
<td>100.0</td>
<td>137</td>
<td>100.0</td>
<td>583</td>
</tr>
</tbody>
</table>
Table 2: Area wise distribution of cases

<table>
<thead>
<tr>
<th>Area</th>
<th>No of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>355</td>
<td>60.89%</td>
</tr>
<tr>
<td>Urban</td>
<td>228</td>
<td>39.11%</td>
</tr>
<tr>
<td>Total</td>
<td>583</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Table 3: Time of occurrence

<table>
<thead>
<tr>
<th>Time of day</th>
<th>No of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 am to 8 am</td>
<td>030</td>
<td>05.15</td>
</tr>
<tr>
<td>8 am to 2 pm</td>
<td>073</td>
<td>12.52</td>
</tr>
<tr>
<td>2 pm to 8 pm</td>
<td>267</td>
<td>45.80</td>
</tr>
<tr>
<td>8 pm to 12am</td>
<td>213</td>
<td>36.54</td>
</tr>
<tr>
<td>Total</td>
<td>583</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4: Type of weapon used

<table>
<thead>
<tr>
<th>S. no</th>
<th>Weapon</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Blunt</td>
<td>324</td>
<td>64.80</td>
</tr>
<tr>
<td>2.</td>
<td>Sharp</td>
<td>127</td>
<td>25.40</td>
</tr>
<tr>
<td>3.</td>
<td>Blunt and sharp</td>
<td>108</td>
<td>21.60</td>
</tr>
<tr>
<td>4.</td>
<td>Firearm</td>
<td>024</td>
<td>04.80</td>
</tr>
<tr>
<td>5.</td>
<td>Total</td>
<td>583</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 5: Types of injury

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple injuries</td>
<td>267</td>
<td>45.80</td>
</tr>
<tr>
<td>Contusion</td>
<td>224</td>
<td>38.42</td>
</tr>
<tr>
<td>Laceration</td>
<td>221</td>
<td>37.91</td>
</tr>
<tr>
<td>Abrasion</td>
<td>102</td>
<td>17.50</td>
</tr>
<tr>
<td>Incised wound</td>
<td>101</td>
<td>17.32</td>
</tr>
<tr>
<td>Firearm</td>
<td>026</td>
<td>04.46</td>
</tr>
<tr>
<td>Stab wound</td>
<td>021</td>
<td>03.60</td>
</tr>
<tr>
<td>Chop wound</td>
<td>007</td>
<td>01.20</td>
</tr>
<tr>
<td>Fractured tooth</td>
<td>006</td>
<td>01.03</td>
</tr>
</tbody>
</table>

Table 6: Part of body involved

<table>
<thead>
<tr>
<th>Part of body</th>
<th>Number of Cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>231</td>
<td>39.60</td>
</tr>
<tr>
<td>Lower limbs</td>
<td>179</td>
<td>30.70</td>
</tr>
<tr>
<td>Multiple region</td>
<td>169</td>
<td>29.00</td>
</tr>
<tr>
<td>Upper limbs</td>
<td>157</td>
<td>26.90</td>
</tr>
<tr>
<td>Anterior chest</td>
<td>135</td>
<td>23.20</td>
</tr>
<tr>
<td>Posterior chest</td>
<td>090</td>
<td>15.40</td>
</tr>
<tr>
<td>Posterior abdomen</td>
<td>066</td>
<td>11.30</td>
</tr>
<tr>
<td>Anterior abdomen</td>
<td>041</td>
<td>07.00</td>
</tr>
<tr>
<td>Pelvic region</td>
<td>027</td>
<td>04.60</td>
</tr>
<tr>
<td>Genitalia</td>
<td>003</td>
<td>00.50</td>
</tr>
</tbody>
</table>

DISCUSSION

Medical professionals frequently come across cases of physical assault in the emergency department. It is a duty of the medical officers to register these cases and prepare a medicolegal report. Careful description of injuries is utmost important as it serves as evidence in judicial courts.

In the present study, the most frequently affected age group was 21-30 years (Table 1). This is consistent with previous studies.3,4 Being one of the most active phases of life in terms of physicality and socially, they are more involved in outdoor, sports and recreation activities, which lead to increased interaction with other people and a more chance of arguments and disagreements resulting in physical assaults. Risk-taking behaviour and being mentally a bit immature with little experience of life are other factors contributing to physical violence. Males were predominantly affected (78%) while females constituted only 22% of the total caseload. Similar results were seen in previous studies.5,6,7,8 This may be because the majority of the population are in the profession of farming in this region; males are more involved in outdoor activities and are more vulnerable to interpersonal conflicts.

Area wise, most of the cases (60.89%) were seen in rural areas (Table 2), while urban areas constitute 39.11% of cases. The findings are comparable to the findings of previous studies,5,7,9 however our findings are in contrast to studies done by Hussini et al6, Tigne et al10, Mayurya et al11 where more cases were seen in urban areas. This may be due to the fact that the study population in our study is more concentrated in the rural areas, probably more affected because of frequent quarrels relating to agricultural land disputes, distribution of water etc. Further rural areas
have a lower level of education, relatively lower level of policing, poor condition of basic amenities and also the land disputes that run into generations contributing to more number of cases in rural areas.

The majority (43.4%) of the incidents of physical assault fall in between time period of 6 pm-12 pm i.e. in the evening hours while minimum number (11.5%) of the incidents took place in between 6 am to 12 pm i.e. morning hours (Table 3). Similar findings were seen in previous studies. 9-14 During the evening time people gather at homes and public places after completing their duties that increases the chances of conflict. The trend of Consumption of alcohol in the evening also becomes the one major contributing factor for the events that lead to physical assault. Minimum incidences of cases (10.75%) were seen in between 12 a.m. to 6 a.m. this may be because people usually remain asleep while in morning hours people are fresh, stress level is at its lowest hence least incidents take place during morning hours.

In the present study most frequently used weapon of offence was blunt seen in 324 (64.80%) cases (Table. 4). Similar results were seen in other studies.3-5,10,11,15,16 Sharp weapon was seen in 127 (25.40%) cases. Use of firearm was seen in 4.80% cases (n=24). The use of blunt weapon may be explained in the fact that blunt objects are more easily available, are desirable if no intention is there to inflict any grievous injury.

Multiple types of injuries were seen in 45.80% cases (Table. 5). The most common injury type encountered in our study was bruise seen in 224 cases (38.42%). Our finding is consistent with other studies.3,4,11,16,17 Laceration was the next most common injury seen in 37.91% (n=221) cases followed by abrasion 36.36% (n=212). Our findings are in contrast to findings of a study by Tomar et al17 and Thube HR et al18 where the most common type of injury was laceration. Among the injuries caused by sharp weapon, incised wounds 17.50% (n=102) were most commonly observed. Like many previous studies head and neck were observed to be main body region involved (39.60%).3,5,10,11,19 Next commonly affected region was found to be the lower extremities (Table. 6) with 179 cases (30.70%). This is in contrast to study by Subba et al4 where upper limbs were second most common site involved. Pelvic region 4.60% and genitalia 0.50% was least commonly involved part of body. As different types of physical aggressions may have different motives, the involvement of different anatomical sites may reflect the intention of the assailant and defense put up by the victims. The head and is most commonly affected in physical assault cases as it is the most vital part of the body, injury to head not only produce desired results but also disorient the victim so that he is not able to put much fight.

**CONCLUSION**

Young males were more involved in physical assault cases. Majority of cases were seen in evening hours. Rural population was more affected in comparison to urban population. Bruise was the most common type of an injury observed which implicates use of blunt weapons. Head and neck was the commonest target area of assault. Considering most of the population in this region being rural special focus is needed specifically on the complexities of rural agricultural societies and the circumstances that lead to violent events. Similar studies over different time periods will help provide contextual information about local and socio-cultural differences, helping to plan and implement injury prevention strategies.

Ethical approval: Not required as the data was collected from already available records in the department and is retrospective in nature.

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**Conflict of Interests:** Nil

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Evaluating Foramen Magnum Surface Area in Males and Females for Morphological Differences Using 3D Computed Tomography Among Maharashtrian Population

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ABSTRACT

Background: Bones play a vital part in the process of individual identification in medico-legal cases, as they resist decomposition for a long period. The foramen magnum, which is located at the cranial base, is also a good parameter for identifications with reasonable accuracy. The surface area of the foramen magnum can be calculated using 3D reconstructed computer tomography of the head to assess the morphological differences in males and females, which is useful in forensic sciences.

Objectives: To measure the antero-posterior length of the foramen magnum, the transverse diameter of the foramen magnum, the surface area of foramen magnum in males and females and to compare surface area of male and female foramen magnum to find morphological difference.

Method: CT scan was performed in 40 patients (20+20) in two groups consist male and female, using SIEMENCE SOMATOM 16 SLICE machine, in patients referred to Acharya Vinoba Bhave Rural Hospital for CT head scan with 3D skull. Scan will include the vertex to C3, received images then reconstructed into 3D images. From the 3D images the foramen magnum was measured; anterior-posterior, transverse and surface area in two groups of patients includes males and female. Teixeria’s and Radinsky’s formulae was used. Descriptive analysis to measure area of foramen magnum. Independent sample T test to determine any significant difference between male and female foramen magnum area and Discriminant analysis.

Result: 70% of original group cases were correctly classified using the derived data

Conclusion: foramen magnum can be used in forensic science as gender determination tool in the case where other identifying methods are inconclusive and modern imaging technology can be very useful.

Keywords: foramen magnum, 3D CT, antero-posterior, transverse, surface area.

INTRODUCTION

In medico-legal scenarios the individual Identification is one such required and important variable. Since bones resist decomposition for a considerable long time therefore, they provide a plethora of information for the pretension of identification of an individual. Skull among the list and also
the suitable parameters for identifications with reasonable accuracy\[^1\]

The human skull is considered as one of the most dependable bones for sex identification. The skull is fundamentally founded on contrasts in the size and robusticity and is additionally populace explicit being impacted by different components including hereditary and ecological.\[^2\]

Numerous scientists have embraced a few examinations in various populaces to decide the sex with sensible precision utilizing various estimations of the skull including those of the foramen magnum.\[^2\]

Williams and Roger in their study revealed 80% precision of sex assurance utilizing cranial morphological qualities in their investigation.\[^3\]

The current investigation is to find any sexual dimorphism of the foramen magnum by measuring FM using 3D CT.

Many factors that can affect the precision of identification from remains of the adult skeletal. Multiple anatomical gaps between the skeleton element of males and females are not significantly specified. If consider skeletal dimensions than males and females differ only by approximately 8%,\[^4\] The validity and accuracy of traditional approaches for identification highly depends on a preservation method and skeletal completeness, especially with different morphologic element of the body such examples are skull and pelvis.\[^4\]

In most Medico-Legal procedures, identification from the morphology of the skull is one of essential. Especially in Forensic studies were the remaining of skeletons are sometimes incomplete and this will make the sex identification very difficult.

Clearly distinguishing proof is a subject of intrigue and is very significant. This could be clarified by the accompanying reasons; good and helpful contemplations, to declare the positive demise of an individual, and to satisfy lawful and official necessities for personality enrolment.\[^5\]

The reason why base of skull attracting the researcher because the basal area of the occipital bone is probably going to endure the physical abuses than different pieces of the skull as a result of the bountiful soft-tissue spread, skull thickness in the district, furthermore, anatomical position which is moderately all around ensured, in this manner protecting it for scientific assessment.\[^6\]

Territories, for example, air sinuses and foramen magnum in the skull are among the safest body components which can oppose risks like flames, blasts, and different mishaps. In this manner, the skull is one of the most well-known participants that remains to be worked out for sexing of the dead bodies. Notwithstanding pelvic, cranial bone can give the most precise data about sexuality that are already proven for the same purpose.

Foramen Magnum among the primary capitals of ossification during the process of growth and development, situated at cranial base. Therefore, Foramen Magnum might be important in the identification process specifically in forensic studies.\[^6\]

Anatomically, the Foramen magnum is a major gap in the base of the skull through which the spinal line converges with the mind. There are a few contrasts in the qualities of the skull bones and foramen magnum among people. Apparently, foramen magnum can be useful in deciding the sex; notwithstanding, the related highlights may fluctuate in various ethnic groups. One of the upsides of foramen
magnum is that after pubescence, the width of the foramen magnum doesn’t change and it isn’t influenced by age.[5]

The FM is a significant structure of the skull base and is of significant enthusiasm for human studies, life structures, legal medication, and other clinical fields. It is a three-dimensional (3D) roundabout or on the other hand oval opening inside the occipital bone halfway. FM passage for the medulla oblongata and its layers.[7]

Primarily, it can be measured with traditional methods, but it can only be possible on dead bodies. By Using imaging modalities such as CT scans on living persons and by measuring the dimensions of Foramen Magnum, previous researchers able to provide data on similar topic and able to differentiate between male female FM.[1] From the mentioned study, and other researchers and authors also claims the efficacy of Foramen Magnum in gender determination.[8]

Imaging modalities play a crucial role in such studies and many researchers uses imaging modalities as a tool, D.P Mohite.[9] uses orthopantomography (OPG) in his research for mandible assessment, Prajakta Kale.[10] use CBCT to study morphology of Atlas vertebrae in different skeletal pattern, Prasheelkumar Premnarayan Gupta.[11] use computed tomography craniovertebral junction.

AIM
To evaluate foramen magnum area in males and females for morphological differences using 3D computed tomography among Maharashtrian population.

RADIOGRAPHIC APPEARANCE
The foramen magnum is located in the posterior cranial fossa’s most inferior region. [25] The medulla oblongata and other essential structures pass through it. The basion is the anterior margin and the opisthion is the posterior margin in the midline.[23-25]

With the help of advanced modalities such as computed tomography (CT) and Magnetic Resonance Imaging (MRI) it is possible to get thin section, 3D volume rendering of the area of interest.

METHODOLOGY AND STUDY DESIGN
CT scan was performed in total 40 patients in which 20 male and 20 females, using SIEMENS SOMATOM 16 SLICE machine in patients referred to Acharya Vinoba Bhave Rural Hospital for CT head scan with 3D skull, patient was positioned for the head scan. Scan include the vertex to C3 area of the head, received images then reconstructed into 3D images. From the 3D images the foramen magnum was measured in two separate groups of males and females, both groups with 20 participants and a total 40 patients.

The measurement parameters are,

a. anterior-posterior
b. transverse diameter and
c. surface area calculated by below formula

Teixeira’s and Radinsky’s formula was used.
1. Teixeira’s [12] formula: \( A = \pi \times \left(\frac{APL+TD}{4}\right)^2 \)

Were,
- \( A \) = Area
- \( \pi \) = 3.14
- \( APL \) = Antero-posterior length
- \( TD \) = Transverse distance

2. Radinsky’s [13] formula: \( A = \frac{1}{4} \times \pi \times TD \times APL \)

Were,
- \( A \) = Area
- \( \pi \) = 3.14
- \( TD \) = Transverse distance
- \( APL \) = Antero-posterior length

**Inclusion criteria**

- Patients referred to radio-diagnosis department for CT HEAD scan
- Patients aged between 21-80 years

**Exclusion criteria**

- Patient with history of head Trauma affecting region of interest
- Patients with history of any mass/space occupying lesion involving the mastoid air cells.

**OBSERVATIONS**

The age of the participants in the present study ranged from 21-80 years with a mean age of 46.82 ± 14.27 years (Table-1) and with equal numbers of males (n=20) and females (n=20) (Table 1).

The mean of the antero-posterior (AP) length of the foramen magnum was measured 3.30 cm (33 mm approx.) whereas the mean of the transverse (TR) width was measured 2.76 (27.6 mm approx.).

The gender wise comparison shows that the mean value of antero-posterior (AP) length in males was measured 3.36 cm (33.6 mm approx.) in males and 3.25 cm (32.5 mm approx.) in females whereas the mean value of transverse width in males was measured 2.89 cm (28.9 mm approx.) in males and 2.63 cm (26.3 mm approx.) in females.

Using the derived values, the area of the foramen magnum was calculated with two different methods Teixeira and Radinsky.

Mean area calculated by Teixeira in males was 7.74 cm and in females it was 6.83 cm. whereas mean area calculated by Radinsky in males was 7.68 cm and in females it was 6.74 cm. Correlation was performed using Pearson’s Correlation and p value of 0.0001 achieved (Table-2)

**RESULTS**

70% of original group cases were correctly classified using the derived data.

**DISCUSSION**

Identification in forensic science or gender determination is not always easy and most complicated especially when the skeleton is not in full form or the skeletal fragmentation or from the decomposing human skeleton remains.

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
<th>Correlation ‘r’</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teixeira</td>
<td>7.28</td>
<td>1.09</td>
<td>40</td>
<td>0.999</td>
<td>0.0001,S</td>
</tr>
<tr>
<td>Radinsky</td>
<td>7.21</td>
<td>1.08</td>
<td>40</td>
<td></td>
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</tbody>
</table>
This type of study helps to evaluate the accuracy and reliability of the foramen magnum (FM) in gender estimation or identification.\textsuperscript{[14]}

Based on Uthaman et al.\textsuperscript{[14]} study results, they find that, 1.8\% or higher accuracy rate of FM in females, while in males was lower than the present study by 12.2\%.\textsuperscript{[14]} Uysal et al.\textsuperscript{[8]} also in their study finds the mean values of FM diameters statistically different in each sex (p , 0.001), with a sex determination accuracy rate of 81\%.\textsuperscript{[8]}

FM measurement helps in forensic studies to find morphological differences in individual identification and CT reconstruction technique is perfect tool to measure FM dimensions in living individuals and to find any morphological differences.\textsuperscript{[15]}

In this study FM was evaluated based on some previous studies that suggest, there is significant morphological difference of FM dimensions in male and female, which may prove useful and efficient for prediction of sex in forensic identification from skeletal remains.\textsuperscript{[15]}

Comparable studies have also been performed in India, one by by RP Singh\textsuperscript{[16]} and one by S. Sukumar\textsuperscript{[6]} using mastoid triangle formed by asterion, porion and mastoidale for sex determination and other by mastoid process.

Uysal stated in his research that using imaging modalities such as CT scans on living persons and by measuring the dimensions of Foramen Magnum, able to prove that it is larger in males compare to the females.\textsuperscript{[8]}

Mayuri Jaitley\textsuperscript{[17]} and Heba I. Lashin\textsuperscript{[20]} also used computed tomography as a tool in their respective studies.

The results from the present study have also suggested the morphological difference in foramen magnum between males and females with 70 percent accuracy.

CONCLUSION

Based on the derived results it can be concluded that foramen magnum can be used in forensic science as a gender determination tool in the case where other identifying methods are inconclusive and the technological advancement in the medical imaging field such as multidetector computed tomography can be used as an accurate method.

CONFLICT OF INTEREST: Nil

SOURCE OF FUNDING: Self

ETHICAL CLEARANCE

Ethical clearance taken from Institutional Ethical Committee of Datta Meghe Institute of Medical Sciences (Deemed to be University), Sawangi, Wardha, Maharashtra-442004.

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A Study of Unnatural Death Profile in Mangalore, Southern India 2011-2020

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ABSTRACT

When death is unexpected, sudden, litigious, or unexplained, or if it is a criminal death, an autopsy becomes imperative. A forensic autopsy or medicolegal autopsy is “an examination conducted postmortem to address medicolegal objectives. A comprehensive profile of medicolegal autopsies undertaken over ten years (2011-2020) was evaluated at the A.J. Institute of Medical Sciences & Research Centre, Mangaluru/Mangalore. Of the 1842 autopsied incidents, Sixty-two per cent of the autopsied victims were males. Seventy per cent of the overall deaths were between 20 and 49 years old. Road Traffic Accidents (R.T.A.) accounted for 45% of autopsied cases. The 3rd and 4th decades showed peak incidences of Road Traffic Accidents, fall from height, drowning, and burns. Seventy-six percent of unnatural deaths were accidental, 71.9% were due to road traffic incidents. Unnatural deaths do have medicolegal, social and preventive facets. Despite preventive measures, the dominance of Road traffic fatalities is a crucial cause of concern. The multipronged approach involving individuals, family, society, and law enforcement agencies will go a long way in preventing this vast and unfortunate loss of human lives because of accidents.

Keywords: Medicolegal autopsy; Postmortem; Road Traffic Accidents (R.T.A.) Unnatural deaths.

INTRODUCTION

When death is unexpected, sudden, i.e. rapid in its course, suspicious in nature, mysterious, or even unwitnessed, ambiguous, litigious, or unexplained, or if it is a criminal death, industrial death, death accompanying surgical/medical treatment and where medical negligence is supposed or anaesthetic deaths, an autopsy becomes imperative.1,2 A forensic autopsy or medicolegal autopsy is “an examination conducted postmortem to address medicolegal objectives”. Medicolegal postmortem examinations are carried out according to the law of the land so that justice is delivered.
In India, medicolegal autopsies are hence undertaken out either on appeal of the police investigating authorities or the magistrate. In both, the key aim is to uncover the cause of death and to assess if this and the hypothesised type of death match.

A.J. Institute of Medical Sciences & Research Centre, Mangaluru/Mangalore, is the premier teaching tertiary health care centre in coastal Karnataka, which lies in India’s southern part. It is one of the largest healthcare institutions in this part of the world, catering to the needs of the population of not only Karnataka but also extending to the areas in the neighbouring states of Kerala, Maharashtra, and Goa. A comprehensive profile of medicolegal autopsies undertaken over ten years (2011–2020) was evaluated to illustrate their complete epidemiological features. An attempt was also made to evaluate the extent and form of unnatural deaths that occur in this region in order that probable protective actions can be recommended and consequently taken up.

MATERIALS AND METHODS

This retrospective ten-year research was conducted in the Department of Forensic Medicine & Toxicology, A.J. Institute of Medical Sciences & Research Centre, Mangalore and comprised a sum of 1842 cases that were autopsied in our mortuary between January 2011 and December 2020. The applicable data was analysed from inquest papers, chemical analysis reports, postmortem reports, findings on histopathology examination and a victimological report with highlighting of the cause and manner of death.

A causal sequence of events that in the end leads to death is the cause of death, and the type of death/manner is the way in which this was brought about. The type/manner of death may either be natural or violent i.e. unnatural, or indeterminate. It is determined mainly by the evidence arising out of the investigation and the postmortem findings. The type/manner of death remains indeterminate/unresolved if either the information about the situation(s) is lacking or when the cause of death is ambiguous/unidentified.

RESULTS

It is evident from Table 1 that the year 2020 recorded the highest number of medicolegal autopsies (n=253), followed by the years 2018 (n=216), 2019 (n=208), and 2016 (192), as depicted in Fig. 1.

Of the 1842 autopsied incidents, 62% (n = 1142) of victims were male, and 38% (n = 700) were females.

The age of the victims varied from a three-year-old child to older individuals as old as 93 years old, the highest being the fourth decade (n=479, 26%). Around 70% (n=1233) of the overall fatalities were in the age band of 20-49 years. (Fig. 2)

Frequency distribution of the cause of death revealed Road Traffic incidents/accidents (R.T.A.) as the leading cause, making up 45% (n = 825), followed by sudden natural death (n=327, 18%), hanging (n=169, 9%), fall from height (n=155, 8%), Poisoning
(n=148, 8%), Burns (n=104, 6%) and Drowning (n=66, 4%) as shown in Table 1. Road Traffic Accidents (R.T.A.) remained at the top as the leading cause, except in 2020, wherein sudden natural deaths outnumbered all the other causes. Assault cases accounted for 2% (n=41) of unnatural deaths, comprising of victims of violence with blunt and sharp force. In 5 cases, the cause of death remained undetermined. Males predominated over females in every type of cause of death across the age groups, ranging from 1.4:1 (Burns and drowning) to 2.6:1 (fall from height). However, personal characteristics of the individual cause of death diverged from one to another. The third and fourth decades showed peak incidences of Road Traffic Accidents, fall from height, drowning, and burns; the fourth and fifth decades showed peak incidences of assault, Poisoning, and hanging. The sudden natural deaths peaked during the sixth and seventh decades.

Of the total 1842 autopsied cases, 81.9% of victims (n = 1508) had unnatural death, 17.8% (n=327) victims had natural death, and in 0.3% (n=7) victims, the cause of death remained undetermined. 76% (n = 1146) of unnatural deaths were accidental or inadvertent, and 71.9% (n = 825) were because of road traffic incidents/accidents. Poisoning and hanging made up 90% (n = 289) of total suicides.

**DISCUSSION**

Due to its increasing prevalence, unnatural deaths pose a considerable public health challenge worldwide. This has caused an enduring negative impact on an individual’s family, in addition to the society and the nation at large. It is also a vital indicator of social and mental well-being.

A substantial share of unnatural mortality, even globally, results from suicides, homicides and road traffic incidents/accidents (R.T.A.s). In 2019, suicide resulted in the deaths of an approximated 703,000 people. The global age-standardised suicide rate was 9.0 per 100,000 population for 2019, greater in males (12.6 per 100,000) than in females (5.4 per 100,000). Region wise, “The suicide rates in South-East Asia (10.2 per 100,000), Europe (10.5 per 100,000) and Africa (11.2 per 100,000), were higher than the global average (9.0 per 100,000) in the same year. The least suicide rates were in the Eastern Mediterranean regions (6.4 per 100,000)”.

Victims of intentional homicide numbered 464,000 in 2017. This corresponded to an overall worldwide homicide rate of 6.1 per 100,000 population. Men add up to almost eighty per cent of all homicide victims worldwide. America and Africa surpass the global average with 17.2 and 15 victims per 100,000.

### Table 1: Age-wise and gender-wise distribution of cases based on the cause of death

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<tbody>
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<td></td>
<td>10</td>
<td>8</td>
<td>31</td>
<td>12</td>
<td>121</td>
<td>91</td>
<td>154</td>
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<td>104</td>
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<td>2</td>
<td>1</td>
<td>16</td>
<td>10</td>
<td>15</td>
<td>7</td>
<td>28</td>
<td>13</td>
<td>45</td>
<td>30</td>
<td>98</td>
<td>62</td>
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<td>0</td>
<td>2</td>
<td>0</td>
<td>19</td>
<td>11</td>
<td>35</td>
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<td>28</td>
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<td>14</td>
<td>10</td>
<td>10</td>
<td>7</td>
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<td>Fall from height</td>
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<td>7</td>
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<td>10</td>
<td>6</td>
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<td>9</td>
<td>35</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>2.5:1</td>
</tr>
</tbody>
</table>
populations. By comparison, the homicide rate calculated in Europe was 3.0 per 100,000 population. The region with the lowest homicide rate of 2.3 per 100,000 population was Asia, which houses sixty per cent of the global population but accounts for only twenty-three per cent of total homicide victims.

An estimated 1.35 million people die yearly due to Road traffic incidents/accidents (R.T.A.s) globally. The deceased profile among these shows that it is primarily the vulnerable road users who account for most of these deaths: pedestrians, motorcyclists, and cyclists. The annual death rate due to road traffic incidents is around eighteen per hundred thousand population globally. The numbers are greatest in the African and South-East Asian regions, following countries in the Eastern Mediterranean and Western Pacific regions. Countries in Europe and the Americas have the lowest regional death rates of 9.3 and 15.6 deaths per hundred thousand people, respectively. It is the number one cause of death among young adults under the age of 30 years.

Deaths resulting from road traffic incidents, suicides, and homicides represent a prevalent and challenging public health issue in India. An estimated 173,347 completed suicides occur annually in India, which is around 12 per 100,000 population. To also be considered is that there are considerable variations in the rates of suicide among the socioeconomic classes and the Indian states. WHO estimated 299,091 road traffic fatalities in India in 2016 and a death rate of 22.6 per 100,000 people, far higher than the global average. In 2019, there were “close to 29 thousand murders reported across India and furthermore, more than 57 thousand attempted murder cases were filled in the country that year”.

In this study, the subjects of medicolegal autopsies were predominantly males, similar to other studies from India, Bangladesh, Indonesia, Nigeria, South Africa, and Denmark. When examining the Male to female ratio, it differed for different causes of death, ranging from 1.4:1 for burns and drowning to 2.6:1 for falls from a height which was in unison with the overall trend reported from various regions of India, Libya, and Norway. Sex ratio reversal was apparent for assaults and road traffic incidents in a Norwegian study.

In this study, 70% of the aggregate fatalities were aged 20-49 years. A similar trend of peak incidence in middle-aged adults was observed in studies published in India, Bangladesh, and Nigeria.

Road traffic accident is the leading contributor of medicolegal autopsies (45%) conducted with the population between 20 and 39 years, forming the bulk of R.T.A.s (57%). This finding is in concurrence with earlier findings encountered across the globe. This vulnerability of the younger age group to Road traffic accidents could be the fact that this is the most active phase of a person’s life in all aspects, be it physical, mental or even social. This is also the phase wherein youth are exposed to the exterior world’s perils, such as raised stress, pressure, and traffic. This finding of a preponderance of R.T.A.s amongst medicolegal autopsies is not in agreement with studies reported from some parts of India.

The occurrence of suicidal and homicidal fatalities in our study was comparable to those in other parts of India. This was true for cases seen in Norway as well, but not in Great Britain and Libya, where suicides were low and homicidal deaths were greater in Libya, where it was twenty percent as contrasted to our 2.7%.

The occurrence of unnatural deaths was quite comparable to trends reported from various parts of India and globally. The findings regarding inadvertent/accidental deaths remains consistent regardless of the territory’s diversity in landscape and demography. Unnatural deaths do have medicolegal, social and preventive facets. Despite preventive measures, the dominance of Road traffic fatalities is a crucial cause
of concern. The multipronged approach involving individuals, family, society, and law enforcement agencies will go a long way in preventing this vast and unfortunate loss of human lives because of accidents.

CONFLICT OF INTEREST: NIL

SOURCE OF FUNDING: NIL

ETHICAL CLEARANCE: Ethical clearance was obtained before undertaking the research study from Institutional Ethical Committee of A.J. Institute of Medical Sciences & Research Centre, Mangalore.

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A Postmortem Study of Pattern and Distribution of Intracranial Haemorrhages in Fatal Head Injuries Following Road Traffic Accidents in Basaveshwara Teaching and General Hospital, Gulbarga

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ABSTRACT

Background: The present study was conducted to know, pattern and distribution of intracranial haemorrhage in fatal head injuries in RTAs along with victim’s age and sex and survival period. In addition, an attempt was also made to know the cause of death.

Methodology: The present study was both retrospective and prospective study. The study material comprised of 75 victims of RTA cases, who were admitted and died in Basaveshwara teaching and general Hospital, MRMC, Gulbarga and subsequently autopsied, during the 3 year period from May 2011 to April 2014.

Results: In this study, males outnumbered females in the ratio 2.9:1. Age group most commonly involved was 21 – 30 years (24%). Most of the victims died < 24 hours following accident (58.66%). Most common victims involved were motor cycle occupants (37.33%). Intracranial haemorrhage was present in maximum number of victims (58.67%), followed by lung injuries (33.33%). Subdural haemorrhage was seen in majority of cases (38.67%). Intracranial injuries alone were responsible for death in 57.33% followed by hemorrhagic shock in 36%.

Conclusion: RTA’s are the penalty paid by us for rapid transportation and have become the commonest cause of unnatural deaths. The rise in the number of fast moving vehicles, semi-skilled drivers, drunken drivers, congested and ill-maintained roads has led to the increase in the number of RTA’s. Intracranial injury was the most common finding in the study. It was observed that in majority of cases, intracranial injury contributed either directly or indirectly to death especially with skull fracture. Hence stricter implementation of traffic rules and promotion of road safety measures by the concerned authority viz. the use of helmets and seatbelts, avoidance of over speeding, using footpaths, etc. is the need of the hour. It also highlights the need of emergency trauma services at site of the occurrence for reducing morbidity and mortality in such cases.

Keywords: Road traffic accidents, fatal head injuries, Intracranial Haemorrhage.
INTRODUCTION

Road traffic accident is any vehicle accident occurring on the roadway (i.e. originating on, terminating on, or involving a vehicle partially on the roadway)\(^1\). Amongst all traffic accidents, road traffic accidents have largest claim on human life and most serious health related problems. This occur when a road vehicle collides with another vehicle, pedestrian, animal, geographical or architectural obstacle causing injuries or death of involved individuals.

Intracranial hemorrhages/ Hematoma are classified by anatomical location as Extradural, Subarachnoid, Subdural, Intracerebral hemorrhage. Its a common complication of head injury and is the most common cause of death in patients who experienced a lucid interval, ‘talk and die’, or ‘talk and deteriorate after injury’. In several cases of death due to blunt force head trauma, the only intracranial injuries that are evident at autopsy include subdural and subarachnoid hemorrhage\(^2\).

Extradural/Epidural Hematoma (EDH) is the bleeding occurring between the inner table of the skull and meninges (dura). It is seen in falls and road traffic accidents (upto 10% of severe head injury cases). Its common in adults between 20-40 years as the dura is able to strip more readily off the underlying bone. Mostly traumatic in origin be due to impact over lateral convexity of head, resulting in linear fracture of squamous temporal bone with rupture of underlying middle meningeal artery which is a direct branch of internal maxillary artery\(^2\).

Subdural Hematoma (SDH) occurs between the under surface of dura and outer surface of arachnoid mater. It is essentially venous or capillary involving rupture of bridging or communicating veins traversing the subdural space to drain into parasagittal sinus and tears in the dural venous sinuses and not arterial bleeding. It is usually traumatic, following an assault or fall (70-75%), accidents account for another 20-25% of cases\(^2\).

Subarachnoid Hematoma (SAH) is the hemorrhage in the subarachnoid space between the arachnoid and pia mater, mixed with CSF. It is common in TBI and even in minor head trauma, small amount of localized SAH over the cerebral convexities is almost invariably seen. It is mostly venous in origin and has traumatic and non-traumatic causes\(^2\).

Intracerebral Hematoma (ICH) are hemorrhage found within the cerebral parenchyma that is not in contact with the surface of the brain. Traumatic ICH is seen in 15% of all patients who sustain fatal head injuries. Most likely result from a direct rupture of intrinsic cerebral blood vessel in relation to contusions at the time of injury. Hypertension, trauma and cerebral amyloid angiopathy cause the majority of these hemorrhages\(^2\).

AIMS AND OBJECTIVES

1. To study the various pattern and distribution of intracranial hemorrhages in Road Traffic Accidents.
2. To find out the duration of survival and cause of death.
3. To determine the age and sex incidence in victims of fatal Road Traffic Accidents.
4. To suggest measures to reduce the incidence and number of deaths due to Road Traffic Accident.

METHODS & MATERIALS

The present study was both retrospective and prospective study. The study material comprised of 75 victims of RTA cases, who were admitted and died in Basaveshwara teaching and General Hospital, MRMC, Gulbarga and subsequently autopsied at the same centre during the 3 year period from May 2011 to April 2014.

In the present study information regarding the bio-data of the deceased and various characters regarding the circumstances of the accident and time of accident were gathered from all possible sources like police records and hospital records. In addition to these X-ray report of each case was reviewed and the radiograph was examined for the presence of
fracture. In retrospective study, postmortem findings from the reports were noted, whereas in each case of prospective study, a thorough external and internal examination was done for the injuries and opinion as to the cause of death was made after the examination. The data thus obtained was recorded in the proforma, which comprised relevant data that is concerned with the objectives of the study and analyzed.

**SAMPLE SIZE:**

The sample size was calculated to be 75 for 3 years, by taking 25% of the average of similar cases, in Basaveshwara teaching and general Hospital, MRMC, Gulbarga over a period of 1 and half years of retrospective cases (May 2011 to October 2012) which comprised of 37 cases and this was covered during the above said period.

**INCLUSION CRITERIA:**

All the victims of RTA cases admitted and died in the Basaveshwara Teaching and General Hospital, MRMC, Gulbarga and subsequently autopsied at the same centre, were included in the present study.

**EXCLUSION CRITERIA:**

Cases other than RTAs were excluded from the study.

**RESULTS**

The findings obtained in the present study were tabulated as in Table 1.

In the present study (Table 2), 44 victims (58.66%) died within 24 hours after the accident, 13 victims (17.33%) died after 24 hours but within 3 days. The number of cases decreased with increase in survival period. Only 2 victims (2.67%) survived for more than 4 weeks.

Majority of the victims (Table 3) who died due to road traffic injuries were a motor cycle (two-wheeler) occupants comprising of 28 cases (37.33%) followed by occupants of light motor vehicle in 25 cases (33.33%) and pedestrians in 16 cases (21.34%) and least cases were of pedal cyclist and heavy motor

| Table 1: Age and sex wise distribution of cases of fatal RTA |
|-----------------|-----|-----|-----|
| Age group (in years) | Male | Female | Total |
| ≤10 | 2 | 3 | 5 | 6.67 |
| 11-20 | 5 | 4 | 9 | 12 |
| 21-30 | 15 | 3 | 18 | 24 |
| 31-40 | 9 | 3 | 12 | 16 |
| 41-50 | 9 | 3 | 12 | 16 |
| 51-60 | 10 | 1 | 11 | 14.67 |
| 61-70 | 6 | 2 | 8 | 10.66 |
| Total | 56 | 19 | 75 | 100 |

| Table 2: Period of survival following accident |
|-----------------|-----|-----|
| Survival period | No. of cases | Percentage (%) |
| <24 hours | 44 | 58.66 |
| 24 hours to 3 days | 13 | 17.33 |
| 3 days to 1 week | 6 | 8 |
| 1 week to 2 weeks | 5 | 6.67 |
| 2 to 4 weeks | 5 | 6.67 |
| >4 weeks | 2 | 2.67 |
| Total | 75 | 100 |

| Table 3: Distribution of types of the victim |
|-----------------|-----|-----|
| Status | No. of cases | Percentage (%) |
| Pedestrians | 16 | 21.34 |
| Pedal cyclist | 3 | 4 |
| Motor cyclist | 28 | 37.33 |
| Light motor vehicle | 25 | 33.33 |
| Heavy motor vehicle | 3 | 4 |
| Total | 75 | 100 |
vehicle occupants seen in 3 cases each (4%). Most of the two-wheeler occupants were riding the motor cycle.

In the present study (Table 4), soft tissue/organ injuries were classified as head & neck, thorax, abdomen & pelvis. In head & neck, brain injuries were seen in 21 cases (28%) and brain haemorrhages was seen in 44 cases (58.67%). In thorax, lung injuries were seen in 25 cases (33.33%), heart injuries in 2 cases (2.67%) and major large vessels were injured in 9 cases (12%). In abdomen, splenic injuries were seen in most cases (10) comprising 13.33%, followed by injury to liver 8 cases (10.66%) and then kidneys, stomach and intestine. In pelvis, bladder is injured in 2 cases (2.67%) and genitalia in 1 case (1.33%).

In our present study (Table 5), brain haemorrhages were classified as extradural haemorrhage, subdural haemorrhage, subarachnoid haemorrhage and intra cerebral/cerebellar haemorrhage. Subdural haemorrhage was most commonly seen (29 cases), followed by subarachnoid haemorrhage (26).

### Table 4: Pattern and Distribution of Soft tissue/organ injuries involvement

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of cases</th>
<th>Percentage (%)</th>
<th>Total cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head &amp; neck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intracranial haemorrhage</td>
<td>21</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>58.67</td>
<td></td>
</tr>
<tr>
<td>Thorax</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lungs</td>
<td>25</td>
<td>33.33</td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td>2</td>
<td>2.67</td>
<td></td>
</tr>
<tr>
<td>Diaphragm</td>
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<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Large vessels</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Abdomen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach and intestine</td>
<td>5</td>
<td>6.67</td>
<td></td>
</tr>
<tr>
<td>Liver</td>
<td>8</td>
<td>10.66</td>
<td></td>
</tr>
<tr>
<td>Spleen</td>
<td>10</td>
<td>13.33</td>
<td></td>
</tr>
<tr>
<td>Kidneys</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Pelvis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td>2</td>
<td>2.67</td>
<td></td>
</tr>
<tr>
<td>Organs of generation</td>
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<td>1.33</td>
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</tr>
</tbody>
</table>

### Table 5: Distribution of Intracranial haemorrhage and their relation to each other:

<table>
<thead>
<tr>
<th></th>
<th>Extradural haemorrhage</th>
<th>Subdural haemorrhage</th>
<th>Subarachnoid haemorrhage</th>
<th>Intra-cerebral / cerebellar haemorrhage</th>
<th>Skull fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extradural haemorrhage</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Subdural haemorrhage</td>
<td>3</td>
<td>29</td>
<td>14</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Subarachnoid haemorrhage</td>
<td>4</td>
<td>14</td>
<td>26</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>Intra-cerebral / cerebellar haemorrhage</td>
<td>2</td>
<td>4</td>
<td>11</td>
<td>14</td>
<td>7</td>
</tr>
</tbody>
</table>
intra cerebral/cerebellar haemorrhage (14) and least seen was extradural haemorrhage (6). Subarachnoid haemorrhage was associated with subdural haemorrhage in 14 cases, with intra cerebral haemorrhage in 11 cases, with extradural haemorrhage in 4 cases respectively. Extradural haemorrhage was seen in only 6 cases as it was swept out due to fracture of skull and hence it was not appreciated at autopsy. Among 6 cases of extradural haemorrhage, fracture of the skull was seen in 5. Among the 29 cases of subdural haemorrhage, 20 had fracture of skull. Among the 26 cases of subarachnoid haemorrhage, fracture of the skull was seen in 20. Among the 14 cases intra cerebral/cerebellar haemorrhage, 7 had fracture of skull.

In this research study, maximum cause of death was intracranial injuries (57.33%) followed by hemorrhagic shock (36%), respiratory insufficiency (5.34%) and thromboembolism (1.33%). Most of the deaths due to hemorrhagic shock are due to blunt thoraco-abdominal injuries.

DISCUSSION

Out of 75 cases, 56 (74.67%) were males and 19 (26.33%) were females indicating that a large majority of victims were male. Male to female ratio was 2.9:1. Maximum numbers of victims were in the age group 21 - 30 years comprising of 18 cases (24%) as they lead an active life & the findings are consistent with the studies done by Khajuria B et al 3, R.M.Tandle et al 4, Chaitanya R et al 5 & Jakkam Surender 6.

In the present study, 44 victims (58.66%) die within 24 hours after the accident, 13 victims (17.33%) died after 24 hours but within 3 days. The number of cases decreased with increase in survival period similar to the study done by Jakkam Surender 6, J.R. Shinde et al (2012)7 & Hetal C. Kyada et al (2012)8.

Majority of the victims who died due to road traffic injuries were a motor cycle (two-wheeler) occupants comprising of 28 cases (37.33%) and most common offending vehicle involved in road traffic accidents was heavy motor vehicle seen in 34 cases (45.33%) in accordance with studies done by R.M.Tandle et al (2012)4 and Dr. Dhaval J. Patel (2009)9.

The internal injuries were classified like soft tissue/organ injuries and bone fracture. Soft tissue/organ injuries were seen in almost all i.e. 75 cases and bone fracture was seen among 66 cases. In soft tissue/organ injuries, in head & neck, brain injuries were seen in 21 cases (28%) and brain haemorrhages was seen in 44 cases (58.67%). In thorax, lung injuries were seen in 25 cases (33.33%), heart injuries in 2 cases (2.67%) and major large vessels were injured in 9 cases (12%). In abdomen, splenic injuries were seen in most cases (10) comprising 13.33%, followed by injury to liver 8 cases (10.66%) and then kidneys, stomach and intestine. In pelvis, bladder is injured in 2 cases (2.67%) and genitalia in 1 case (1.33%). The findings of the present study were similar to the study done by, Jakkam Surender 6 and Dr. Harman Singh et al (2004)10.

In our present study, brain haemorrhages were classified as extradural haemorrhage, subdural haemorrhage, subarachnoid haemorrhage and intra cerebral/cerebellar haemorrhage. Subdural haemorrhage was most commonly seen in 29 cases (38.67%), followed by subarachnoid haemorrhage in 26 cases (34.67%), intra cerebral/cerebellar haemorrhage in 14 cases (18.67%) and least seen was extradural haemorrhage in 6 cases (8%). Subarachnoid haemorrhage was associated with subdural haemorrhage in 14 cases, with intra cerebral haemorrhage in 11 cases, with extradural haemorrhage in 4 cases respectively. Extradural haemorrhage was seen in only 6 cases as it was swept out due to fracture of skull and hence it was not appreciated at autopsy. Among 6 cases of extradural haemorrhage, fracture of the skull was seen in 5. Among the 29 cases of subdural haemorrhage, 20 had fracture of skull. Among the 26 cases of subarachnoid haemorrhage, 20 had fracture of the skull. Among the 14 cases of intra cerebral/cerebellar haemorrhage, 7 had fracture of the skull. Subdural haemorrhage was the most commonly seen haemorrhage...
according to the various studies conducted by Khajuria B et al\(^3\) (79.31%), Chaitanya R et al\(^5\) (39.1%), Dr. Harman Singh et al\(^10\) (44.7%) which are consistent to the findings in the present study. In the first two studies subarachnoid haemorrhage followed subdural haemorrhage with 34.7% and 79.31% of cases respectively. A combination of SDH with SAH was most commonly observed in studies conducted by R.M. Tandle et al\(^4\) (61.95%) which is consistent with the present study.

In maximum cases cause of death was intracranial injuries (57.33%) followed by hemorrhagic shock (36%) consistent with the findings in the study done by Khajuria B et al\(^3\), Jakkam Surender \(^6\), J.R. Shinde et al (2012)\(^7\), Hetal C. Kyada et al (2012)\(^8\) and Dr. Harman Singh et al\(^10\).

**CONCLUSION AND RECOMMENDATIONS**

Road Traffic Accidents constitute a complex phenomenon. Road traffic accident accounts for major epidemiological, medical and medico legal problem in developing countries like India. Road vehicles have no respect for anatomical boundaries or surgical specialties. Majority of the victims were males and more than 50% of the victims were between the age group 21 to 50 years who are at the most active phase of life both physically and socially. This study shows that most of the deaths in road traffic accidents (58.66%), brought to the hospital took place within 24 hours after sustaining multiple injuries which is very alarming and highlights the need for taking urgent steps for establishing good pre-hospital care and provision of trauma services. Intracranial injuries were seen in (58.67%) of the cases. In majority of victims, intracranial injuries contributed either directly or indirectly to death. Subdural haemorrhage was seen in majority of cases (38.67%). Intracranial injuries cause alone was responsible for death in 57.33% of cases, followed by hemorrhagic shock (36%), respiratory insufficiency (5.34%) and thrombo-embolism (1.33%). This shows that intracranial injuries are most common fatal injuries in road traffic accidents in this region. This could be due to the fact that, the intracranial injuries cannot be treated successfully, even in tertiary level hospitals. Hence, fatalities due to injuries of road traffic accidents can be reduced by preventing the occurrence of such injuries. Encouraging the use of protective measures especially head protective’s like use of crash helmets by motorcyclists, use of seat belts by occupants of motor vehicle, inclusion of air bags in cars. Education to the general public regarding traffic rules, safety precautions and risk factors. Proper maintenance of roads, by improving the surface and road signals during both day and night.

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- The Dean, MRMC, Gulbarga.
- The staffs of Medical Record Department of BTGH, Gulbarga.

**Conflict of interest:** Nil

**Source of funding:** Self

**Ethical Clearance:** Ethical clearance was obtained before undertaking the research study from Institutional Ethical Committee of Basaveshwara teaching and general Hospital, Mahadevappa Rampure Medical College (MRMC), Gulbarga.

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The Estimation of Time Since Death by De Saram et al. Method Applied to the Corpses Brought to Ggh Mortuary, Guntur


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ABSTRACT

A physical change that may occur in a corpse after death would be heat exchange from the body to the surrounding environment. An attempt has been made by the investigators to estimate time since death by De Saram method which takes into account the rate of fall of temperature. A total of 100 human corpses selected for the study. The study was conducted from October to December of the year 2022. It is very difficult to specify normal body temperature, as this value can vary considerably between individuals. Rectal temperatures in a group of healthy subjects can vary between 34.2°C- 37.6°C, with a mean of 36.9°C. Rectal temperature is often referred to as deep central temperature, similar in value to that of brain, heart, lungs and abdominal organs. The estimated time since death by De saram method is either underestimated or over estimated and is not suitable for tropical countries like India. The applied method is suitable in winter season of the year particularly where there is significant fall in body temperature noted when compared to other seasons of the year.

Keywords: Core Temperature; Deep central temperature, Diurnal variation.

INTRODUCTION

A remarkable physical change that may occur in a corpse after death would be heat exchange from the body to the surrounding environment provided there might have been temperature gradient existed between the body and the environment. It is very difficult to specify normal body temperature, as this value can vary considerably between individuals. Rectal temperatures in a group of healthy subjects can vary between 34.2°C- 37.6°C, with a mean of 36°C. Rectal temperature is often referred to as deep central temperature, similar in value to that of brain, heart, lungs and abdominal organs. Many factors influence body temperature. Most individuals show diurnal variation in which the body temperature fluctuates by ± 0.5°C around the person’s normal mean temperature. There are so many factors influence body temperatures like emotional stress of pleasure and displeasure, febrile diseases and endocrine disorders like hyperthyroidism, exposure to a cold environment, peripheral circulatory disorders etc. Age also affects body temperatures, children tend to have higher rectal and oral

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temperatures than adults. Conditions that prevent heat loss or heat production and which lead to thermoregulatory imbalance are like heat stroke, fainting, heat exhaustion etc.

MATERIALS AND METHODS

In this study a total of 100 human corpses were taken to estimate the time since death from Rule of thumb method where time since death is known. Of the 100 cases, 50 were males and another 50 were females. Fig. 1. The study was conducted for a period of 3 months in the winter season from October to December of the year 2022. The winter season is ideal for studying the cooling pattern of the human corpse because ambient temperature is always less than body temperature which is unlike in summer where ambient temperatures recorded is always far high than the body temperature\textsuperscript{1,2}. All these cases are collected from the Acute Medical Care unit of the Government General Hospital who were admitted and undergone treatment as Medico Legal Cases and sent to the mortuary for autopsy. The recording of rectal temperature of the corpse was done in the Acute Medical Care Unit of the hospital after death declaration by the duty doctor to the attenders (. Then corpse was shifted to the mortuary by the ward attenders for autopsy.

After admission to the mortuary, the name, sex, age, height & built, weight, Medico Legal Case Number & In-patient Number, date and time of death, cause of death were recorded. Then the bodies were stripped, made naked, placed over the mortuary table in prone position with both upper limbs lying side by the body. Thermometer (chemical), graduated from 0° to 50° C was inserted into the rectum of the corpse by keeping the buttocks wide apart, such that at least 10cms of it from its tip should be there in the rectum\textsuperscript{3,4}. (Image 1 and 2)

The chemical thermometer, as such kept there undisturbed, and reading is taken after 5mts interval, the time being required for its stabilization\textsuperscript{3,4}. The recording of rectal temperature was made by the investigator without disturbing the corpse and thermometer\textsuperscript{3,4}( at time \( t_1 \)). Another reading of rectal temperature taken with an interval of 1 hour at \( t_2 \). The readings are substituted in the given set of formulae to obtain calculated time since death. The results thus obtained are analyzed with the original time since death of the chosen corpses. Informed consent was taken from the deceased’s attenders for the same. Institutional ethics committee gave no objection certificate for the project.

The method used by De saram et al to calculate the postmortem period involved the following formula which is in degrees Fahrenheit\textsuperscript{5,7}.

\[
\frac{TSD}{t_2-t_1} = \frac{\log \theta_0 - \log \theta_1}{\log \theta_1 - \log \theta_2} = (\text{all temperatures in } ^\circ\text{F})
\]

\( = \text{rectal temperature at time of death.} \)
\( = \text{rectal temperature at } t_1 \text{ after death.} \)
\( = \text{rectal temperature at } t_2 \text{ after death.} \)
\( = \text{time interval between } t_2 \text{ and } t_1 \text{ i.e., one hour.} \)
RESULTS

In total 100 cases were studied (50 males and 50 females). Cases included in the study were; Road Traffic Accidents (n=60), Burns (n=10), Asphyxial deaths (n=10), Poisoning (n=10) and Natural deaths (n=10). Fig 1.

The time since death estimated by Desaram et al method is more or less compatible with the original time since death.

The estimated time since death by Desaram et al method and original time since death fluctuates by ± 0.5-4 hours in all the studied cases. Fig 2.

![Image of percent wise distribution of cases.](image1)

Fig. 1: Percent wise distribution of cases.

![Image of calculated TSD vs. Original TSD.](image2)

Fig. 2: Calculated TSD VS. Original TSD.

![Image of fluctuation in calculated TSD vs. Original TSD.](image3)

Fig. 3: Fluctuation in Calculated TSD vs. Original TSD.

![Image of calculated TSD in hours vs. 2 hours.](image4)

Fig. 4: Calculated TSD vs. Original TSD.

![Image of calculated TSD in hours vs. 2 hours.](image5)

Fig. 5: Calculated TSD vs. Original TSD.

The over estimation of time since death in violent death cases by +2 to +4 hours is due to production of metabolic heat after death which continues for about 02-04 hours. Fig 3, 4, 5.

The under estimation of time since death in poisoning cases, natural death cases by -0.5 to -2 hours is due to decrease in the production of metabolic heat after death. Fig 3, 4, 5.

Discussion

The estimation of time since death by Desaram et al method is an acceptable method in a human corpse by recording the rectal temperature either at the scene of offence where the body was first found dead or at the time of conducting the postmortem examination. To study the cooling patterns of the human corpses, it is ideal to choose winter season of the year, where the body temperature is always significantly high than the ambient temperature. During the process of recording rectal temperatures, the ambient temperature was almost remained more or same for the entire 3 months of study period and it was...
27°C-28°C. The rectal temperatures recorded from the selected human corpses varied from 36°C-39°C. All the cases selected had died due to unnatural deaths of varied etiology showing significant rise in body temperature at the time of death. The elevated body temperature recorded from all the corpses signifying the occurrence of post-mortem caloricity probably due to violence & exertion they faced at the time of death. On average, it took 18-20 hours for the thin built bodies to reach the ambient temperature, whereas 20-22 hours for moderately built bodies and for thick built bodies 22-24 hours\(^1\>2\).

The shape of the cooling curve of a human corpse is of great importance as it is inevitably the basis on which all post mortem temperature investigations were made. The human body cools in a manner adequately described mathematically by the double exponential formula. The cooling curve obtained from the observed data of the investigators show more or less double exponential one.

the cooling of a human corpse does not follow the Newton’s law of cooling and it is adequately described by a double exponential formula, and the shape of the curve is a sigmoid one\(^7\). The initial stages of cooling reported a “lag period”, known as temperature plateau for a variable length on the cooling curve; the calculated period of plateau on the curve is 2-4 hours in all observed cases. The steeper part of the cooling curve shows two different components of variable length i.e., the upper sloping and lowers more (or) less linear part\(^7\). The duration of the sloping part on the curve is proportional to the original body temperature at the time of death\(^7\). The duration of the linear part on the curve is proportional to the original body temperature at the time of death\(^7\). The initial rate of cooling to be 0.5°C/ hour and reaches the 1°C/hour during the period of maximum cooling. The rate of cooling varied from 0.3-0.6°C/hour the average being 0.5°C / hour. With such a small rate of fall in temperature, it is not advisable to estimate the time since death, based on the cooling process of the body\(^8\>-10\).

The average rate of fall in temperature thus obtained is during winter season, hence the applicability of this data to the temperature based – time estimation methods are restricted to winter season only\(^8\>-10\). The over estimation of time since death by De Saram et al method is due to over production of metabolic heat which may be continued for 02-04 hours in violent death cases i.e. Asphyxial deaths, Burns, RTA cases\(^8\>-10\). The under estimation of time since death in natural death cases is due to cessation of metabolic heat after death\(^8\>-10\).

**Conflict of interest:** None.

**Source of funding:** None.

**REFERENCES**


Polymicrobial Necrotizing Fasciitis – A Fatal Outcome following Motor Vehicle Accident

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ABSTRACT
Necrotizing fasciitis is an uncommon skin infection characterized by rapidly progressing, extensive skin necrosis involving the soft tissues and superficial fascia. It usually begins with non-specific local cutaneous signs and often leads to life-threatening systemic toxicity. Trauma is often known to be a causal infective etiology. The presence of underlying comorbidities has been observed in cases of necrotizing fasciitis. Various microorganisms, including a mix of anaerobes and aerobes, marine creatures like vibrio, or even fungi, can cause necrotizing fasciitis. Thus, necrotizing fasciitis may be polymicrobial or monomicrobial. We report a case of an 80-year-old pillion rider of a motorbike involved in a road traffic accident. The injury sustained resulted in an uncommon complication of polymicrobial necrotizing fasciitis, causing the individual’s death. The microbial invasion of the skin is considered to release toxins, damaging tissues and causing necrosis. Coagulase-negative staphylococci is a common human skin aerobic, gram-positive coccus. It has shown the propensity to cause bacteremia. Candida, a known invasive organism, can play a potential role in fasciitis. This inter-microbial synergism may stimulate an aggressive systemic inflammation leading to septic shock.

Keywords: Necrotizing Fasciitis, Polymicrobial, Motor Vehicle Accident, Coagulase-Negative Staphylococci, Candida Albicans.

INTRODUCTION
Necrotizing fasciitis (NF) is an uncommon skin infection characterized as a rapidly progressing extensive necrosis of the skin involving the soft tissues and superficial fascia. It usually begins with non-specific local clinical signs and often leads to life-threatening systemic toxicity. Wilson first used the term NF in 1952 to describe the necrosis involving the subcutaneous tissues and layers of superficial fascia with sparing of deep fascia and muscle. Trauma is the most identified initiating infective etiology, including a chronic abscess, peripheral vascular disease, osteomyelitis, injury by fish fins, etc. Mostly, the trauma can be minor or significant, such as abrasion, bruise, laceration, penetrating injuries, or surgical procedure. Diabetes mellitus is the most predominant underlying co-morbid disease condition. Other underlying conditions include peripheral vascular disease,
smoking, alcoholism, intravenous drug use, immunosuppression, obesity, old age, etc. Lower limbs were more frequently involved than the upper limbs.\textsuperscript{4} NF is more typical in individuals of more than 50 years.\textsuperscript{5}

Erythema is the most frequent presenting sign, followed by a hallmark out-of-proportion pain beyond the areas of apparent involvement along with fever.\textsuperscript{2} In later stages of NF, cutaneous manifestations such as bullae or blister formation with infected pus discharge, which finally extends into a total thickness skin necrosis leading to skin anesthesia.\textsuperscript{5,6} At least one underlying comorbidity has been frequently observed in cases of NF.\textsuperscript{6} The microbial etiology of NF can be monobacterial, polymicrobial or fungal.\textsuperscript{7,8} The mortality rates reaching from 25\% to 73\%.\textsuperscript{9} The present case discusses how injury sustained during a road traffic accident, developed into a fatal polymicrobial NF.

**CASE REPORT**

Alleged history of a motor vehicle accident where another 2-wheeler hit a 2-wheeler, and an 80 years old male pillion rider injured his right leg from the wheel spoke. He was treated at a local hospital and discharged the next day. The patient had known diabetes mellitus and hypertension comorbidities, but he was not on regular medications. After two months, the patient presented to our hospital with purplish-black discoloration of the right lower limb, pain, and multiple blisters with putrid discharge from the same injury site with a non-healing penetrating injury. The patient was febrile, and tenderness of the right leg was present. Yellowish-green pus discharge was noted from an ulcerated lesion on the right leg. Hematological screening showed hemoglobin (Hb) of 7.8 g/dl, a white blood cell (WBC) count of 25,420/µL, and a platelet count of 85,000/µL. The urea and creatinine levels were elevated to 183 mg/dl and 5.38 mg/dl, respectively, and the physician did a urine culture. The random blood glucose was 209 mg/dl. The liver enzymes were all raised.

On day two of hospital re-admission, fasciotomy and extensive debridement of the right leg were performed. A tissue section from the debrided region was sent for culture, and a repeat urine culture was sent. Procalcitonin levels of 75.59 ng/mL. Blood for culture was collected. The patient’s condition further deteriorated; he developed shortness of breath with a drop in saturation and was intubated. On day five, blood for fungal culture was sent. On day 8, Hb was 6.6 g/dl, and WBC was 18,280/µL. The peripheral smear examination demonstrated neutrophilic leucocytosis with toxic changes in WBCs, and the Red blood cells (RBCs) were microcytic hypochromic. Both urine cultures isolated budding yeast cells. The debrided tissue culture isolated Coagulase-Negative Staphylococci (CoNS) and Candida albicans, while the blood culture isolated only Candida albicans. On day nine, the patient died, and the body was referred for a medicolegal autopsy.

During the autopsy, extensive debridement with areas of blackish discoloration was present over the right leg, with skin sloughing over the right knee and thigh. Unhealthy granulation tissues were present covering the debrided areas of the right leg (Figure-1). Multiple tiny blebs were noted over the dorsum of the right foot. Blackening and purplish discoloration of the toe and sole were present (Figure-2). On internal examination, the lung cut surfaces were markedly congested and edematous. Fluid-filled cysts were present over both kidneys’ surfaces, and on the right kidney’s cut section, a cortical cyst was present. The other internal organs were grossly unremarkable. Histopathology (H & E staining, 200X) of skin from the right leg showed epidermal disruption and necrosis beneath the basement membrane involving the upper dermis (Figure-3). Lung histology showed broncho-pneumonic changes with intra-alveolar edema. Kidneys had focal lymphoplasmacytic infiltration. The cyst wall on histology demonstrated a simple cortical cyst. The other internal organs were histologically within normal limits.
Fig. 1: (A) Extensive debridement with areas of blackish discoloration (black arrow) over the right leg, with sloughing of skin over the right knee and thigh. (B) Unhealthy granulation tissues covering the debrided areas of the right leg.

Fig. 2: (A) Multiple tiny blebs (black arrow) over the dorsum of the right foot. (B) Blackening and purplish discoloration of the toe and sole (black arrow).
DISCUSSION

Classifying Necrotizing Fasciitis

The NF is categorized into four types I to IV. Type I NF, is usually polymicrobial and etiology of mixed bacterial anaerobes or aerobes. Type I NF have greater causative tendency in patients with diabetes mellitus, old age, and immunocompromised status. Study conducted in Scotland, found polymicrobial NF of majority type (58%) with Streptococcus pyogenes as the most frequently associated organism. Type II involves a single bacterial species, usually group A Streptococci or Staphylococcus Aureus as reported by other authors. Type III NF is associated with gram-negative and marine organisms. Type IV NF is related to traumatic etiology and has fungal involvement. Among fungi, candida species had shown high mortality. A prospective study from India has identified more of monomicrobial (55.6%) involvement in NF than polymicrobial (44.4%) NF. To the best of our literature search, the co-infection of CoNS and Candida albicans in causing NF has not been conversed.

Pathogenesis of necrotizing fasciitis and coagulase-negative staphylococci

The exact pathogenesis of NF is yet to be understood, mostly considered a microbial invasion of dermal layers releasing toxins, tissue damage, and advancing to skin necrosis. Bacterial toxins stimulate cytokine production, severe systemic inflammatory reaction, progressing into septic shock, causing multiorgan dysfunction. Clinically significant in immunocompromised individuals. Shen et al. described NF with CoNS, an aerobic, gram-positive coccus commonly found on human skin, increasingly recognized as a role in bacteremia. They isolated CoNS in 11 patients. Similar to the present case, lower limb skin lesions and underlying diabetes mellitus were common associations in eight and nine patients, respectively. Sato et al. also isolated CoNS...
in a case of NF from right lower extremity, similar to our case.\textsuperscript{16}

**Candida as a pathogen in NF**

Candida is a well-recognized human pathogen known to cause a variety of diseases.\textsuperscript{17} Candida albicans is the most frequently isolated organism in human fungemia. Candida albicans are known invasive organisms that play a potential role in causing fasciitis. Eisen et al. reported candida spp. as the solely isolated organism from tissue culture in a case of NF following a motor vehicle accident. One of the few pieces of literature available on Candida albicans NF.\textsuperscript{18} Buchanan et al., has reported isolation of Candida albicans from sputum, blood and central catheter site cultures in a patient who was admitted with gunshot injuries and progressed into complications of NF and septicemia.\textsuperscript{19} In our case, tissue culture isolated CoNS along with yeast cells. On microscopy, fungal culture revealed Candida albicans as an organism grown. The management of NF requires awareness of the causative spectrum of microbes to initiate targeted antimicrobial therapy.\textsuperscript{20}

**Microbial involvement in the case**

Our case demonstrated putrid discharge from an ulcerated wound and blisters over the leg, suggesting the NF has already progressed to the intermediate to late stage of cutaneous manifestation.\textsuperscript{2,6} In the present case, massive leucocytosis and hyperglycemia was present. Hung et al. noted similar observation in there case of NF caused by Staphylococcus lugdunensis, a CoNS.\textsuperscript{21} In the present case, the patient had severely raised procalcitin (75 ng/ml, normal - <0.05 ng/ml), a clinical marker of septic shock. These findings suggested systemic infection and evolvement into septicemia. The histopathology examination in reported cases of NF had observed dermo-epidermal necrosis.\textsuperscript{1-3,7} Similar histopathological findings were noted in our case, and additional bronchopneumonia was noted. Our case demonstrated the cause of polymicrobial NF and septicemia as mixed infection due to CoNS and Candida albicans. In contrast to our case, literature reports polymicrobial NF involvment mainly in the trunks and perineum while monomicrobial NF in the limbs.\textsuperscript{11} The cause of death in our case was opined as polymicrobial NF and septicemia as complications of injuries sustained due to the road traffic accident. Inter-microbial synergism is still not studied well and may result in highly aggressive infection, as considered in Type I NF involving multiple species.\textsuperscript{20}

**CONCLUSION**

The lack of definitive pathognomonic signs makes NF an early diagnostic challenge for clinicians and may threaten medical negligence claims against the treating physicians. The physicians must be vigilant while managing wounds in motor vehicle accidents, and the consequence of NF must be considered. Predisposing factors may decide the kind of microbial involvement. In patients with a history of diabetes and trauma following injuries, CoNS and Candida species, though rare, with only a handful of literature, should be considered as a differential in fatal NF. Therefore, histopathology examination, wound tissue, and blood culture should complement gross findings and clinical history. If microbial culture reports are available, clinicians and forensic pathologists can determine the progression toward systemic complications due to the spectrum of microbes and opine such death due to NF.

Declarations

**Conflict of Interest:** There is no conflict of interest.

**Source of Funding:** Nil.

**Ethical Clearance:** Not required.

NF - Necrotizing Fasciitis

CoNS - Coagulase-Negative Staphylococci

**REFERENCES**


Evaluating the Use of Apache II Score in Predicting the Severity and Clinical Outcomes of Organophosphorous Poisoning-Original Study

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ABSTRACT

Objectives: To identify predictors of mortality in OPC poisoned patients and also to evaluate the performance of APACHE II scoring systems for predicting severity and the outcome of patients poisoned with OPC who were admitted to the ICU.

Methods: A single centre observational study conducted in ICU of a tertiary care teaching hospital in chennai, INDIA. Patients are subjected to history questioning, clinical examinations and blood sampling for complete blood count, renal function test, serum sodium and potassium, arterial blood gas and also vital parameters including rectal temperature, oxygen saturation, respiratory rate, pulse rate and blood pressure were recorded. The APACHE score is calculated from the worst values obtained during the first 24 hours of ICU admission. The 24 hour time window is necessary to allow us to measure all the needed variables to calculate the APACHE score. Each variable is given the weightage of 0-4. The total score obtained will be in the range of 0-71.

Results: 75 patients with confirmed history or documented OPC poisoning were enrolled for study. The difference in APACHE II score is statistically significant among the survivors (5.70 ± 3.01) and non survivors (19.57 ± 3.93) with p value (<0.0001). Other parameters which are shown to be statistically significant [p<0.05] in our study are age, Glasgow coma scale, rectal temperature, respiratory rate, pH, oxygenation, serum urea, serum creatinine and serum potassium.

Conclusion: APACHE II score predicts the severity of acute physiological dysfunction due to multi organ involvement in OPC poisoning and can be recommended as a useful scoring system in OPC poisonings in ICU settings.

Keywords: APACHE scoring; ICU; Organophosphorus (OPC)

INTRODUCTION

Organic phosphorus compounds (OPC) groups of cholinesterase-inhibiting insecticides that most commonly produce toxicity in humans. OPC’s act by inhibiting the enzyme acetylcholinesterase thereby increasing the acetylcholine levels in the nicotinic and muscarinic receptors. This increased Ach will produce the features of cholinergic excess syndrome. The most common mode of death in OPC poisoning is respiratory failure. Most of the severely poisoned patients need intubation and mechanical ventilation.
and must be closely monitored in ICU settings. Multiple organ system involvement is common in OPC poisoning as this muscarinic and nicotinic receptors are virtually present in almost all organ systems. Many studies\textsuperscript{2,3,4,5} shown the discriminative value of APACHE II score in the assessment of outcomes of OPC poisoning. The APACHE II score is useful especially in patients with multiple organ dysfunction due to acute insult like OPC poisoning. Most of the OPC poisoned patients are managed in ICU settings. And the new advanced treatment modalities have resulted in increased survival in these patients. Such measures also prolong the in-hospital stay and increases the hospital expenses. So there is a need of scoring system for prognostication of these patients and also for avoiding expensive procedures and treatments.

The Acute Physiology and Chronic Health Evaluation (APACHE) Score\textsuperscript{6} is the most widely used scoring system in ICU setting. It has 12 variables and each variable’s score ranges from 0-4. It includes the acute physiology score which represents the severity of present illness, the Glasgow coma scale and the chronic health status of the patients. The maximum score is 71. The score must be calculated using the worst clinical parameters obtained in the first 24 hours of ICU admission. The APACHE-II score has good discriminatory, reliability and calibration compared to other scores in many range of disease process\textsuperscript{7}. The objective of our study was to identify predictors of mortality in OPC poisoned patients and also to evaluate the performance of APACHE II scoring systems for predicting severity and the outcome of patients poisoned with OPC who were admitted to the ICU.

**MATERIALS AND METHODS**

**SELECTION OF PATIENTS**

Patients admitted to toxicology unit of tertiary hospital with confirmed history of OPC poisoning are included in the study. On admission 10 cc of blood is withdrawn from the patient after obtaining informed consent either from the patient or the relatives.

The sample is tested for complete blood count, renal function tests, liver function tests, arterial blood gases and serum electrolytes.

**STUDY DESIGN:** Observational study conducted in tertiary care centre, Chennai, INDIA during the period of 3 months.

**DATA COLLECTION AND METHODS:**

Patients are subjected to history questioning, clinical examinations and blood sampling for complete blood count, renal function test, serum sodium and potassium, arterial blood gas and also vital parameters including rectal temperature, oxygen saturation, respiratory rate, pulse rate and blood pressure were recorded.

The APACHE score is calculated from the worst values obtained during the first 24 hours of ICU admission. The 24 hour time window is necessary to allow us to measure all the needed variables to calculate the APACHE score.

Each variable is given the weightage of 0-4. The total score obtained will be in the range of 0-71.

**INCLUSION CRITERIA**

- Age: above 15 years.
- Sex: both genders.
- Patients presenting with confirmed consumption of organophosphorous compounds.
- Patients willing to give written informed consent.

**EXCLUSION CRITERIA**

- Age less than 16 years.

Patients who consumed substances other than organophosphates and mixed compound poisonings.

**STATISTICAL METHODS**

The statistical analysis is done using SPSS software. Baseline variables and clinical characteristics were summarized with frequencies (percentages) for categorical variables and mean (standard deviation
RESULTS

We enrolled 75 patients in our study. 78.6% were males and 21.4% were females. Among them, less than 45 years (64%) constituted larger group. Higher mortality (100%) is seen in age group of 65-74 years. 18.66% of study population expired. (TABLE 1). As per WHO class about 50% of the poisonings belong to class II group, 33% belong to class Ib group. And only one patient in class III group. Among OPC compounds, patients consumed Monocrotophos (20%) were higher. 56 (75%) of patients were presented to hospital within 6 hours of consumption. There was a significant difference among survivors and non survivors in relation to variables like age, rectal temperature, GCS scoring, respiratory rate, oxygenation, pH, serum urea and creatinine, serum potassium and APACHE II scoring. (TABLE 3)

Median GCS scoring among survivors was 12 (8-15) ± 1.576 and non survivors was 8 (6-12) ± 1.557. Though the initial rate is normal in OPC poisoned patients. They develop bradycardia at some point of time during the first 24 hours of hospital admission. As our patients are not maintained in atropine infusion and atropine was given as per the atropine requirement chart.

DISCUSSION

75 patients with confirmed history or documented OPC poisoning is taken for study. Most of the severely poisoned patients are referred cases from nearby government hospitals in view of respiratory failure. The minimum APACHE II score obtained in our study was 0 and the maximum score obtained in our study was 27. The mean APACHE II score in survivors was 5.70 with standard deviation of 3.01 and in non survivors was 19.57 with standard deviation of 3.93. No one patient survived with APACHE II score of more than 15. The difference in APACHE II score was statistically significant among the survivors and non survivors. Other parameters which are shown to be statistically significant [p<0.05] in our study are age, Glasgow coma scale, rectal temperature, respiratory rate, pH, oxygenation, serum urea, serum creatinine and serum potassium. Patients with a low GCS had higher mortality than those with

Table 1: Table showing baseline characteristics of the study

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Survived</th>
<th>Not survived</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age (years)</td>
<td>&lt; 45</td>
<td>43</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45-54</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>55-64</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65-74</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>Sex</td>
<td>Male</td>
<td>46</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>13</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2: Table showing the number of patients who consumed each OPCs

<table>
<thead>
<tr>
<th>OPC</th>
<th>Number of patients(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Methyl parathion</td>
<td>11(15)</td>
</tr>
<tr>
<td>2. Phorate</td>
<td>2(3)</td>
</tr>
<tr>
<td>3. Monocrotophos</td>
<td>15(20)</td>
</tr>
<tr>
<td>4. Trizophos</td>
<td>5(7)</td>
</tr>
<tr>
<td>5. Dichlorvas</td>
<td>5(7)</td>
</tr>
<tr>
<td>6. Quinalphos</td>
<td>2(3)</td>
</tr>
<tr>
<td>7. Chlorpyriphos</td>
<td>8(10)</td>
</tr>
<tr>
<td>8. Dimethoate</td>
<td>7(9)</td>
</tr>
<tr>
<td>9. Fenthion</td>
<td>2(3)</td>
</tr>
<tr>
<td>10. Prophenophos</td>
<td>8(10)</td>
</tr>
<tr>
<td>11. Phenthoate</td>
<td>7(9)</td>
</tr>
<tr>
<td>12. Acephate</td>
<td>1(1.3)</td>
</tr>
<tr>
<td>13. Ethion</td>
<td>1(1.3)</td>
</tr>
<tr>
<td>14. Malathion</td>
<td>1(1.3)</td>
</tr>
</tbody>
</table>
Table 3: Table showing comparison of variables among survivors and non survivors:

<table>
<thead>
<tr>
<th>S. no</th>
<th>Variables</th>
<th>Survivors</th>
<th>Non survivors</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age(years)</td>
<td>37.18 ± 12.92</td>
<td>47.28 ± 15.3</td>
<td>0.001</td>
</tr>
<tr>
<td>2.</td>
<td>Rectal temperature(ºC)</td>
<td>37.53±0.76</td>
<td>36.47±0.72</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>3.</td>
<td>GCS</td>
<td>12(8-15) ± 1.576</td>
<td>8(6-12) ± 1.557</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>4.</td>
<td>MAP(mmhg)</td>
<td>87.57±15.76</td>
<td>82±26.70</td>
<td>0.30</td>
</tr>
<tr>
<td>5.</td>
<td>Heart rate(per minute)</td>
<td>67.91±13.62</td>
<td>62.71±22.30</td>
<td>0.262</td>
</tr>
<tr>
<td>6.</td>
<td>Respiratory rate(per minute)</td>
<td>18.88±4.15</td>
<td>23.50±7.37</td>
<td>0.002</td>
</tr>
<tr>
<td>7.</td>
<td>pH</td>
<td>7.381±0.05</td>
<td>7.25±0.04</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>8.</td>
<td>Oxygenation(mmhg)</td>
<td>111.88±28.66</td>
<td>60.57±26.78</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>9.</td>
<td>Serum urea(mg/dl)</td>
<td>33.75±7.99</td>
<td>53.35±18.40</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>10.</td>
<td>Serum creatinine(mg/dl)</td>
<td>0.95±0.19</td>
<td>1.50±0.59</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>11.</td>
<td>Serum sodium(meq/L)</td>
<td>136.50±5.91</td>
<td>137.42±4.41</td>
<td>0.586</td>
</tr>
<tr>
<td>12.</td>
<td>Serum potassium(meq/L)</td>
<td>3.73±0.53</td>
<td>4.23±0.79</td>
<td>0.005</td>
</tr>
<tr>
<td>13.</td>
<td>Haematocrit</td>
<td>38.08±5.01</td>
<td>38.07±4.25</td>
<td>0.994</td>
</tr>
<tr>
<td>14.</td>
<td>WBC count(per cu.mm)</td>
<td>6667.21±2171.23</td>
<td>9228.57±2893.42</td>
<td>1.993</td>
</tr>
<tr>
<td>15.</td>
<td>APACHE II score</td>
<td>5.70 ± 3.01</td>
<td>19.57 ± 3.93</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

better GCS. Though insignificant the WBC count is increased in non survivors group may be due to aspiration pneumonia.

Parameters that are responsible for increased APACHE II score in survivors group is age, GCS, oxygenation and pH. The chronic health history is present in only two of our patients. Both have immunodeficiency one due to retroviral disease and the other active malignancy and was on chemotherapy and both patients expired.

There are no validated scoring systems for categorizing severity of predicting outcome, although many have been proposed. The highly variable history and the fact to determine the ingested dose make it difficult to predict the outcome for an individual. Hence, early discovery, quick access to medical care careful maintenance of patency of airway, meticulous attention towards presenting aspiration pneumonia and aggressive oxime and atropine therapy may reduce morbidity and mortality.

**LIMITATIONS OF THE STUDY:**

Further studies with large sample size and multicentre studies with different population are needed to confirm the use of APACHE II score in predicting the severity and clinical outcomes of organophosphorous poisoning.

**CONCLUSIONS**

APACHE II score predicts the severity of acute physiological dysfunction due to multi organ involvement in OPC poisoning and can be recommended as a useful scoring system in OPC poisonings in ICU settings.

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- The authors have no relevant financial or non-financial interests to disclose.
- The authors have no competing interests to declare that are relevant to the content of this article.
- All authors certify that they have no affiliations with or involvement in any organization or entity with any financial
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ETHICS APPROVAL:

- The Institutional Ethics Committee approval was obtained before starting the study ECR/270/Inst./TN/2013/NO. 55072014/DATED 01.07.2014.

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Informed Consent: How much information is enough?  
In a Obstetrics and Gynaecology Department in Tertiary Care Hospital – An Interventional Study

R. Shreen, R. N. Kagne, S.N. Rathod, Jayashree

Permission granted in full knowledge of the possible consequences, typically that which is given by a patient to a doctor for treatment with knowledge of the possible risks and benefits. A process in which patients are given important information, including possible risks and benefits, about a medical procedure or treatment, genetic testing, or a clinical trial. This paper was an interventional study. It was conducted in the Department of Forensic Medicine and Toxicology, Sri Manakula Vinayaga Medical College and Hospital, Madagadipet, Puducherry to audit and to improve it was conducted in the Department of Obstetrics and Gynaecology. The deficiencies were identified and it was analysed. The results of both pre-interventional and post-interventional were recorded, which showed the significant improvement in the consent form of the major and minor procedures. It is essential that this information be discussed in simple terminology that can be easily readily understood and help the patient give proper consent for the procedures.

Keywords: Informed Consent, Documenting, Analysing & Intervention.

INTRODUCTION
Informed consent can be defined as “the voluntary and revocable agreement of a competent individual to participate in a therapeutic or research procedure, based on an adequate understanding of its nature, purpose and implications”. An ethical debate persist on the informed consent process on four basic elements for discussion.

- Decision-making capacity is a requirement.
- The Physician should disclose sufficient details to the decision-maker to produce an informed consent.
- Decision-maker should show her agreement of the disclosed information.
- Decision-making should freely pass the handling plan.

In current clinical practice, these four components are translated into five elements which are included in a discussion seeking to obtain informed consent.

- Diagnosis.
- Proposed treatment.
- Risk and benefits of the surgery.
- Alternative treatment and their risk and benefits of the procedure.
The most aim of our audit was to judge the method of consent within the surgical procedures within the busy regional medical Specialty and the medical Specialty unit. It absolutely was aimed to judge post interventional observe of consent for surgery.

MATERIALS AND METHODS

This study was done at Department of Forensic Medicine and Toxicology, Sri Manakula Vinayaga Medical College and Hospital, after obtaining approval from Institutional Ethics Committee (IEC No: 98/2016). It was a hospital based Interventional study conducted in the period of 24 months from October 2016 to October 2018. The informed consent form of the major and minor cases was taken in the Department of Obstetrics and Gynaecology. It was divided in to three category of A, B & C. Already the category of A and B category was published with the checklist of the preliminary variables prepared from the informed consent form were published. Now the category of B the Procedure variables of Nature of the disease, Benefits of surgery, Risk of surgery, Alternative treatments, Type of anaesthesia, Complications of surgery and consequences of surgery were also analysed and it got published. Now category C like.

Category C : Procedure Variables

1. Details of alternative treatment available were informed
2. Need of blood / blood products during / after surgery informed
3. Given opportunity to ask questions and clarify doubts
4. Patient satisfied with the information provided
5. Consent signed by the patients

Sampling method was by using systemized random sampling method. The total sample was 690 consent forms using “Epi info Software Version 7.2.2.6”, taking in to the account the improvement in practice of documenting Informed Consent form 34% based on previous study with 95% confidence interval and 90% power. 690 consent forms were taken and it is analysed in which 345 consent forms were analysed in Pre – Interventional and 345 in Post – Interventional.

A check list Proforma of the informed consent form contains 18 variables which was prepared after going through the guidelines of MCI, Royal college of Obstetricians and Gynaecologist of London. The 18 variables were securitized and validated by the Department of Forensic Medicine and Toxicology, in these it was divided in to 3 categories. In which categories B (Procedural variables) 345 consent form analysed in the period of pre - intervention. After identifying the deficiencies we kept the interventional workshop for the faculty of Department of Obstetrics and Gynaecology aiming is to emphasise the importance of documenting the informed consent forms. Post – interventional of checklist of 345 consent forms were again analysed, “Student T test” was used to compare the data obtained from the Pre and Post – interventional period. This is to find the effect of documentation of the Informed Consent forms.

RESULTS

PRE-INTERVENTIONAL

The table 1 shows details of surgical treatment explained and doubt clarified (category C).

Details of alternative treatment available were explained to 253 (73.33%) of patients. Need of blood / blood products during / after surgery was informed to 233 (67.54%) patients. Given the opportunity to ask questions and clarify doubts to 296 (85.80%) patients. Patients were satisfied with the information given by doctor 326 (94.49%) patients. The consent forms were voluntarily signed by 344 (97.71%) patients.

Table 1: Information regarding surgical treatment and their clarifying doubts YES Response

<table>
<thead>
<tr>
<th>Informations</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Details of alternative treatment available were informed</td>
<td>253 (73.33%)</td>
</tr>
<tr>
<td>2. Need of blood / blood products during / after surgery informed</td>
<td>233 (67.54%)</td>
</tr>
<tr>
<td>3. Given opportunity to ask questions and clarify doubts</td>
<td>296 (85.80%)</td>
</tr>
<tr>
<td>4. Patient satisfied with the information provided</td>
<td>326 (94.49%)</td>
</tr>
<tr>
<td>5. Consent signed by the patients</td>
<td>344 (97.71%)</td>
</tr>
</tbody>
</table>
POST - INTERVENTIONAL

The table 2 shows details of surgical treatment explained and doubt clarified (category C). Details of alternative treatment available were explained to 315 (91.30%) of patients. Need of blood/blood products during/after surgery was informed to 317 (91.88%) patients. Given opportunity to ask questions and clarify doubts to 345 (100%) patients. Patient were satisfied with the information given by doctor to 344 (99.71%) patients. The consent form was voluntarily signed by 345 (100%) patients.

DISCUSSION

In the present study, during pre-interventional interview of the patients, 342 patients (99.13%) were informed about the patient present condition before the surgery and an audit study done by Temidayo O Ogundiran et al, titled “Surgeons opinion and practice of informed consent in Nigeria” at College of Medicine, University of Ibadan, Ibadan, Nigeria, the results showed that (61.8%) were not informed about the patient present condition before the surgery.7

Pre-interventional interview of the patients, 300 patients (86.96%) were informed about the relative chances of success or failure of the procedure, but in a study conducted by Pragnesh Parmar et al, titled “Consent in medical practice - Perceptions of patients towards legal aspects of informed consent” at GMERS Medical college, Valsad, Gujarat, the results showed that 91% of the patients informed about the relative chances of success or failure of the procedure.6,9

In the present study, during pre-interventional interview of the patients, 315 patients (91.30%) were informed about the details of the alternative treatment available, whereas in a study conducted by Amina T. Ghulam et al, titled “Patients satisfaction with the preoperative informed consent procedure: A multicentre questionnaire survey in Switzerland” at University hospital Zurich, Zurich, Switzerland, it was observed that out of 885 patients, 375 patients got excellent information about the alternative treatment available, 423 patients were well informed about the details of the alternative treatment available, 70 patients were neutral about the

Table 2: Information regarding surgical treatment and their clarifying doubts YES Response

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Questions</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Details of alternative treatment available were informed</td>
<td>315 (91.30%)</td>
</tr>
<tr>
<td>2.</td>
<td>Need of blood / blood products during / after surgery informed</td>
<td>317 (91.88%)</td>
</tr>
<tr>
<td>3.</td>
<td>Given opportunity to ask questions and clarify doubts</td>
<td>345 (100%)</td>
</tr>
<tr>
<td>4.</td>
<td>Patient satisfied with the information provided</td>
<td>344 (99.71%)</td>
</tr>
<tr>
<td>5.</td>
<td>Consent signed by the patients</td>
<td>345 (100%)</td>
</tr>
</tbody>
</table>

Table 3: Comparison of pre-interventional and post-interventional variables of category C

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variables of patient questionnaire</th>
<th>Pre-interventional n (%)</th>
<th>Post-interventional n (%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Details of alternative treatment available were informed</td>
<td>253 (73.33%)</td>
<td>315 (91.30%)</td>
<td>0.003</td>
</tr>
<tr>
<td>2.</td>
<td>Need of blood / blood products during / after surgery informed</td>
<td>233 (67.54%)</td>
<td>317 (91.88%)</td>
<td>0.005</td>
</tr>
<tr>
<td>3.</td>
<td>Given opportunity to ask questions and clarify doubts informed</td>
<td>296 (85.80%)</td>
<td>345 (100%)</td>
<td>0.003</td>
</tr>
<tr>
<td>4.</td>
<td>Patient satisfied with the information provided</td>
<td>326 (94.49%)</td>
<td>344 (99.71%)</td>
<td>0.005</td>
</tr>
<tr>
<td>5.</td>
<td>Consent signed by the patient</td>
<td>344 (97.71%)</td>
<td>345 (100%)</td>
<td>0.004</td>
</tr>
</tbody>
</table>
details of the information provided about the
details of the alternative treatment available, 14 patient got poor information about the
details of the alternative treatment available, and 3 patients got very poor information
about the details of the alternative treatment available.3,6,1

In the present study, during pre-
interventional interview of the patients, 315 patients (91.30 %) were informed about the
details of the alternative treatment available, whereas in a study conducted by
Pragnesh Parmar et al, titled “Consent in medical practice - Perceptions of patients
towards legal aspects of informed consent” at GMERS Medical college, Valsad, Gujarat,
it was observed that, out of 121 patients, 91 patients were informed about the alternative
course of treatment available and in another study conducted by M Jawaid et
al, titled “Preoperative informed consent: Is it truly informed?” at Dow University of
Health Sciences, Karachi, Pakistan, the results showed that out of 345 patients, 11 patients
were informed about the alternative course of the treatment available and in another
study conducted by Mikayla MC keague et al, titled, “Patients perception of the adequacy
of informed consent: a pilot study of elective general surgical patients in Auckland” at
Auckland Hospital, the results showed that out of 79 patients, 8 patients were informed
about the alternative course of treatment available.5,6, and 10

Ethical Clearance: Sri ManakulaVinayagar Medical College and Hospital, after obtaining
approval fromInstitutional Ethics Committee (IEC No: 98/2016)

Conflict of Interest: Nil

Source of Funding: Nil

CONCLUSION

The study have recorded and analysed the existing standards of documenting informed
consent form and the defencies were analyzed during the intervention workshop,
which increased knowledge of faculties of appropriate literature determined by post-
intervention analysis, knowledge of faculties of appropriate literature determined by post-
intervention analysis. This will improve patient comprehension, satisfaction and expectations.
The exercise of consent is an important process for transmitting information to the patient
and should be accompanied by meticulous and accurate documentation. Documentation
is an essential final step. It records the process that is vital for proper patient care and can be
the only evidence that a discussion took place. Legal advice provides little detail on what
constitutes adequate documentation.

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