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Study of Dermatoglyphic Patterns of Digits in Patients with Primary Generalized Epilepsy

Vinay Kumar K¹, Suresh NM², Asha³, Shivaleela¹, Lakshmi Prabha²
¹Assistant Professor, ²Professor, ³Associate Professor, Department of Anatomy, Sri Siddhartha Medical College, Tumkur, Karnataka

ABSTRACT

The pattern of papillary ridges in human beings consists of three main types, loop, whorl, arches, although various combination if these, and minor pattern variations in orientation, distortion, ridge width and number. These three major patterns & many other minor factors are determined by multifactorial inheritance along Mendelian lines, although prenatal disturbance of metabolism also affects their inheritance, as a result these findings may form a useful diagnostic tool in certain circumstances.¹

The present research is to study these patterns in patients with primary generalized epilepsy.

Keywords: Epilepsy, Dermatoglyphics

INTRODUCTION

Dermatoglyphics, derived from Greek (derma - skin, glyphic - carve), is a branch of science which deals with the study of ridge patterns on fingertips, palms, soles, and toes. Glyphologics is a branch of genetics dealing with skin ridge systems. Fingerprints are constant and individualistic. Abnormalities in the epidermal ridges may result from genetic alterations occurring around the first trimester, during organogenic period, between 13th & 60th days after fertilization.² On this basis it has been opined that any epidermal ridge alterations in individuals prone to epilepsy may have a distinctive dermatoglyphic feature, which remain unchanged throughout life.³

Skin on the fingertips of palmar and plantar surfaces of humans is not smooth. It is grooved by ridges, which form a variety of configurations. Each individual’s ridge configurations are unique and it has been utilized as a means of personal identification, especially by law enforcement officials. Handprints of an individual are unique and remain unchanged from womb to tomb. Inspection of skin ridges, therefore, promised to provide a simple and inexpensive means of determining whether a patient had a particular chromosomal defect. So knowledge of the types of deviations associated with various medical disorders can add appreciably to the diagnostic tests of the clinician. It is particularly of use in diseases with definite genetic background.⁴

The pattern of papillary ridges in human beings consists of three main types, loop, whorl, arches, although various combination if these, and minor pattern variations in orientation, distortion, ridge width and number. These three major patterns & many other minor factors are determined by multifactorial inheritance along Mendelian lines, although prenatal disturbance of metabolism also affects their inheritance, as a result these findings may form a useful diagnostic tool in certain circumstances.¹

The present research is to study these patterns in patients with primary generalized epilepsy.⁵

MATERIAL AND METHOD

Sample size: Material for the study consists of 60 patients of primary generalized epileptics & 60 controls of same age & sex. The mean age was 5-40 yrs. 41 male & 19 female patients had family history of epilepsy. Patients with generalized tonic clonic seizure were taken into account.

Selection of patients

Patients with primary generalized seizure attending Medicine OPD of Sri Siddhartha Medical College also patients admitted in wards were the cases out of which 38 were males and 22 were female epileptics. The controls were mixed population but age & sex are matched. The controls were medical students,
In a loop a series of ridges enters the pattern area on one side of the digit, recurves abruptly and leaves the pattern area on the same side. If the ridge opens on the ulnar side the resulting loop is termed an ulnar loop (Lu), whereas if it opens toward the radial margin, it is called a radial loop (Lr). A loop has a single triradius. This is located laterally on the finger and always on the side where the loop is closed.

A whorl (W) in Galton’s classification is any ridge with two or more triradii. One triradius is on the radial and the other on the ulnar side of the pattern. The ridges in a simple whorl are commonly arranged as a succession of concentric rings or ellipses called concentric whorls.

**METHOD OF COUNTING**

In a loop: A line was drawn from the core to the triradius and the ridges crossing the line were counted. The opening of the loop to ulnar or radial side was noted as Lu or Lr.

In a whorl: A whorl has two triradii and hence the counting was done with both triradii. From the core a line was drawn to one triradius and in the same manner to the other triradius and counting was done.

In an arch: The triradius is the core and hence the count is zero.

In the present study only fingertips were studied.

**Parameters observed**

**Quantitative**

- Total finger ridge count (TFRC).
- Absolute finger ridge count (AFRC)

**Qualitative**: Finger ridge patterns.

**OBSERVATIONS & RESULTS**

Table 1: Arithmetic mean of fingertip ridge count in left hand of male & female patients & controls is as follows.

<table>
<thead>
<tr>
<th>Digits of left hand</th>
<th>Male patients</th>
<th>Male controls</th>
<th>Female patients</th>
<th>Female controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>First digit</td>
<td>17.14</td>
<td>16.67</td>
<td>16.95</td>
<td>14.79</td>
</tr>
<tr>
<td>Second digit</td>
<td>13.26</td>
<td>14.26</td>
<td>16.00</td>
<td>15.32</td>
</tr>
<tr>
<td>Third digit</td>
<td>14.36</td>
<td>14.27</td>
<td>15.91</td>
<td>14.05</td>
</tr>
<tr>
<td>Fourth digit</td>
<td>16.29</td>
<td>16</td>
<td>16.03</td>
<td>15.13</td>
</tr>
<tr>
<td>Fifth digit</td>
<td>14.28</td>
<td>13.98</td>
<td>13.77</td>
<td>12.93</td>
</tr>
</tbody>
</table>
Table 2: Arithmetic mean of fingertip ridge count in right hand of male & female patients & controls is as follows.

<table>
<thead>
<tr>
<th>Digits of right hand</th>
<th>Male patients</th>
<th>Male controls</th>
<th>Female patients</th>
<th>Female controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>First digit</td>
<td>18.43</td>
<td>19.34</td>
<td>17.93</td>
<td>16.31</td>
</tr>
<tr>
<td>Second digit</td>
<td>15.00</td>
<td>14.55</td>
<td>13.91</td>
<td>14.06</td>
</tr>
<tr>
<td>Third digit</td>
<td>14.13</td>
<td>14.74</td>
<td>15.31</td>
<td>13.77</td>
</tr>
<tr>
<td>Fourth digit</td>
<td>16.64</td>
<td>16.72</td>
<td>15.70</td>
<td>15.46</td>
</tr>
<tr>
<td>Fifth digit</td>
<td>13.68</td>
<td>14.82</td>
<td>13.94</td>
<td>12.95</td>
</tr>
</tbody>
</table>

Finger ridge count in all digits, hands separate

There was a trend towards significant decrease in right and left hands of male patients. There was a trend towards significant increase in left hand of female patients. There was no significant difference between patients and controls in the right hand of females.

Finger ridge count in each digit, hands separate: There was no significant difference between patients and controls in right and left hands of males except a trend towards significant decrease in the fifth digit of right hand of male patients.

In right hand of female patients, there was a trend towards significant increase in the first, third and fifth digits. There was no significant difference in second and fourth digits. In left hand of female patients, there was a significant increase in first digit. There was a trend towards a significant increase in third digit of female patients. There was no significant difference in second, fourth and fifth digits.

Table 3: Arithmetic mean of finger tips ridge count of all fingers in each hand is as follows:

<table>
<thead>
<tr>
<th>Hand</th>
<th>Male Patients</th>
<th>Male Control</th>
<th>Female patients</th>
<th>Female Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand</td>
<td>14.42</td>
<td>15.30</td>
<td>13.62</td>
<td>12.95</td>
</tr>
<tr>
<td>Left hand</td>
<td>13.62</td>
<td>14.23</td>
<td>13.54</td>
<td>12.69</td>
</tr>
</tbody>
</table>

Table 4: Arithmetic mean of Total finger ridge count (TFRC) & Absolute finger ridge count (AFRC) is as follows:

<table>
<thead>
<tr>
<th>Arithmetic mean</th>
<th>Male Patients</th>
<th>Male Control</th>
<th>Female patients</th>
<th>Female Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFRC</td>
<td>140</td>
<td>148</td>
<td>136</td>
<td>128</td>
</tr>
<tr>
<td>AFRC</td>
<td>193</td>
<td>201</td>
<td>185</td>
<td>169</td>
</tr>
</tbody>
</table>

Total finger ridge count

There was no significant difference between patients and controls in males or females.

Absolute finger ridge count

There was no significant difference between patients and controls in males or females.

Finger ridge count in all digits, hands separate: In the present study there was a significant decrease in right and left hands of male patients. There was a significant increase in left hand of female patients. There was no significant difference between patients and controls in the right hand of females.

Finger ridge count in each digit, hands separate: There was no significant difference between patients and controls in right and left hands of males except a trend towards significant decrease in the fifth digit of right hand of male patients.

In right hand of female patients, there was a significant increase in the first, third and fifth digits. There was no significant difference in second and fourth digits. In left hand of female patients, there was a significant increase in first digit. There was a significant increase in third digit of female patients. There was no significant difference in second, fourth and fifth digits.

DISCUSSION

Unlike many body traits, dermal ridges once formed do not change except in dimensions, that is, they are age stable. They are also environment stable. Individuals prone to primary generalised epilepsy have a distinctive dermatoglyphic features from birth which remain unchanged throughout life.

Dermatoglyphics is often neglected aspect of physical examination. Abnormal dermatoglyphics may provide important clues to the diagnosis.
The present study deals with the determination of significant dermatoglyphic parameters in primary generalised epileptic patients with mostly Tumkur based population.

The present study includes: The arithmetic mean of fingertip ridge count in the right & left hand of male patients:

### Table: 5 Arithmetic mean of finger ridge count in left & right hand of Male & Female patients.

<table>
<thead>
<tr>
<th>Digits of left hand</th>
<th>Male patients left hand</th>
<th>Male patients right hand</th>
<th>Female patients left hand</th>
<th>Female patients right hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>First digit</td>
<td>17.14</td>
<td>18.43</td>
<td>16.95</td>
<td>17.93</td>
</tr>
<tr>
<td>Second digit</td>
<td>13.26</td>
<td>15.00</td>
<td>16.00</td>
<td>13.91</td>
</tr>
<tr>
<td>Third digit</td>
<td>14.36</td>
<td>14.13</td>
<td>15.91</td>
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<tr>
<td>Fourth digit</td>
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<td>16.64</td>
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<td>15.70</td>
</tr>
<tr>
<td>Fifth digit</td>
<td>14.28</td>
<td>13.68</td>
<td>13.77</td>
<td>13.94</td>
</tr>
</tbody>
</table>

In present study there is no significant difference in hands of both male & female patients.

### Table 6: Comparative study of arithmetic mean of fingertip pattern with hands separate in present study.

<table>
<thead>
<tr>
<th>Digits</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand male patient</td>
<td>LOOP</td>
<td>27</td>
<td>29</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>28</td>
<td>22</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Right hand female patient</td>
<td>LOOP</td>
<td>19</td>
<td>22</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>2</td>
<td>13</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>1</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Right hand female patient</td>
<td>LOOP</td>
<td>19</td>
<td>22</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>2</td>
<td>13</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>1</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Left hand male patient</td>
<td>LOOP</td>
<td>29</td>
<td>30</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>26</td>
<td>21</td>
<td>18</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
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<td>7</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Left hand female patient</td>
<td>LOOP</td>
<td>17</td>
<td>14</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>22</td>
<td>17</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>3</td>
<td>11</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

### Table 7. The frequency of fingertip pattern types with hands separate in Saldana et al study (37)

<table>
<thead>
<tr>
<th>Digits</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
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<td>28</td>
<td>27</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>24</td>
<td>19</td>
<td>24</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Right hand female patient</td>
<td>LOOP</td>
<td>27</td>
<td>29</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>28</td>
<td>22</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Left hand male patient</td>
<td>LOOP</td>
<td>28</td>
<td>29</td>
<td>31</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>25</td>
<td>22</td>
<td>19</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>3</td>
<td>8</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Left hand female patient</td>
<td>LOOP</td>
<td>18</td>
<td>30</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>WHORL</td>
<td>21</td>
<td>21</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>ARCH</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>
In the present study there was a significant decrease in right & left hands of male patients. There was a significant increase in left hand of female patients. There was no significant difference between patients and controls in the right hand of females.

Finger ridge count in each digit, hands separate: There was no significant difference between patients and controls in right and left hands of males except a trend towards significant decrease in the fifth digit of right hand of male patients.

In the right hand of female patients, there was a significant increase in the first, third and fifth digits. There was no significant difference in second and fourth digits. In left hand of female patients, there was a significant increase in first digit. There was a significant increase in third digit of female patients. There was no significant difference in second, fourth and fifth digits.

According to saldana et al there was no significant difference between patients and controls in right and left hands of males except a trend towards significant decrease in the fifth digit of right hand of male patients.

This is in accordance with study done by saldana etal(37).

Table 8: Comparative study of arithmetic mean of fingertip pattern in hands combined

<table>
<thead>
<tr>
<th>Digits</th>
<th>Male patient</th>
<th>Female patient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOOP 56</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>WHORL 54</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>ARCH 6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>13</td>
</tr>
</tbody>
</table>

In the present study there was a significant increase in loops, whorls and arches in male patients and a significant increase in arches and decrease in loops and whorls in female patients.

CONCLUSION

Dermatoglyphic pattern forms an expensive method for screening the population for primary generalised epilepsy. In the present study there was a significant increase in finger ridge count in the first finger of left hand of female epileptics. With hands combined in all digits there was a significant increase in loops, whorls and arches in male patients and a significant increase in arches and decrease in loops and whorls in female patients.

The knowledge of dermatoglyphic pattern of a typical epileptic with the above finger print pattern can hope to have a better quality of life by taking precautions and avoid epileptic trigger factors in genetically predisposed individuals.4,5

Acknowledgement: Nil.
Conflict of Interest: Nil
Source of Funding: Self.
Ethical Clearance: Taken from Institutional ethical committee.

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7. Book JA, “A finger print method for genitical studies Heriditis” 1948, 38; 368
Fatal Case of Diazepam and Paraquat Poisoning - a Case Report

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ABSTRACT

A very dangerous activity among youth and young adults is the indiscriminate mixing and sharing of prescription drugs, often in combination with alcohol or other drugs. The effects of these combinations of substances can be fatal. A 28 years old adult male with alleged history of diazepam and paraquat poisoning and expired on the next day. Diazepam even though considered to be a safer drug, has risk of drug abuse and is fatal when taken in overdose along with other central nervous system depressants.

Keywords: Diazepam, Paraquat, Central Nervous System

INTRODUCTION

Diazepam and other benzodiazepines (chlordiazepoxide, alprazolam, lorazepam) are frequently used as sedatives and anti-anxiety drugs. The effects of over dosage are drowsiness, stupor, coma, respiratory depression and hypotension. Benzodiazepines misuse is associated with increased risk of tolerance, abuse and dependence. Drug abuses remain a major problem in developing countries and are associated with several social and economic consequences.

Acute paraquat poisoning continues to be a major public health concern in many developing countries. Paraquat poisoning is by far one of the most clinically significant herbicides in terms of morbidity and mortality. The main target organ for paraquat toxicity is the lung and death occurs due to respiratory failure. In India, most of the concentrates of paraquat are available as 10-20% solutions. Following ingestion of large amounts of concentrated formulation, the rapid development of multi-organ failure and cardiogenic shock is almost universally fatal. When smaller amounts are ingested, paraquat is actively taken up into pulmonary epithelial cells where redox cycling and free radical generation trigger a fibrotic process that may lead to death.

CASE REPORT

Herein, we report the case of a 28-year-old male admitted to the casualty ward-JIPMER, with alleged history of consumption of 25 tablets of 5mg diazepam followed by ingestion of 150ml of paraquat solution. About 6hrs later the patient was brought to the hospital with symptoms of vomiting, epigastric pain, chest discomfort and drowsiness. The patient was given bowel wash and was put on immunosuppressive therapy namely cyclophosphamide, and methylprednisolone. The pulmonary gas exchange parameters revealed respiratory acidosis and decreased paO₂. Despite standard supportive measures given, the patient’s clinical condition worsened and he developed acute respiratory distress syndrome, multiple organ dysfunction syndrome followed by shock and expired. The deceased was brought to the department of Forensic Medicine & Toxicology at JIPMER. The body was that of an adult male, with rigor mortis present all over the body. Post-mortem lividity was present on the dependent parts.

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of the body in the supine position. The autopsy found that he was a well-built male with no external injuries. The internal findings revealed multiple petechial haemorrhages over the base and postero-lateral surface of the left lung (Figure 1). Both the lungs were found to be oedematous and congested. Heart was intact with multiple petechial haemorrhages over the posterior surface of the left ventricle (Figure 2) and the right chambers contained clotted blood. The liver, spleen, kidney, adrenal glands, brain and intestine were also found to be congested. Toxicological analysis of viscera and blood revealed the presence of paraquat and a benzodiazepine, although the exact nature and concentration of the latter could not be established.

**DISCUSSION**

More than one lakh persons (1,34,599) in the country lost their lives by committing suicide during the year 2010. Suicides due to ‘Drug Abuse/Addiction’ have shown an increasing trend during last 3 years. The Benzodiazepines are widely prescribed for anti-anxiety disorders, insomnia, epilepsy, and other psychiatric conditions. Although benzodiazepines are generally safe and well-tolerated, the potential for misuse and abuse is considerable. Benzodiazepines depress alveolar ventilation and cause respiratory acidosis. As a result of their sedative, anxiolytic, and amnestic properties and their ability to control acute agitation, these compounds are considered to be the drugs of choice for premedication. Benzodiazepines mediate its actions by acting upon the GABA-A receptors, an inhibitory neurotransmitter.

Acute paraquat intoxications are mostly due to ingestion of the concentrated liquid herbicide formulations. Death in paraquat poisoning is due to its capacity to generate huge amounts of free oxygen radicals. Death occurs mostly as a consequence of damage to the alveolar epithelial cells (type I and II pneumocytes) and bronchiolar Clara cells resulting in pulmonary edema, infiltration of inflammatory cells into the interstitial and alveolar spaces, proliferation of fibroblasts and excessive collagen deposition leading on to pulmonary fibrosis, as a result respiratory failure ensues. The ingestion of a large dose of paraquat (over 40 mg paraquat ion/kg body weight) invariably proves fatal. Less severe poisoning (20-40 mg paraquat ion/kg body weight) is fatal in most cases, but death may be delayed by weeks, the ultimate cause usually being lung damage characterised by pulmonary fibrosis.

Benzodiazepine overdose is rarely fatal when taken alone without other drugs. At the same time when multiple medications are in benzodiazepine overdose, severe symptoms include difficulty in breathing, slowed heart rate, low blood pressure, loss of coordination, and loss of consciousness leading to coma and, potentially, death. Any suspected overdose should be treated as an emergency. The person should be taken to the emergency department for observation and treatment.
CONCLUSION

Diazepam even though considered to be a safer drug, has high chance of drug abuse and act as a potent central nervous system depressant when taken along with other drugs resulting in stupor, coma and death. Paraquat poisoning has high mortality even in small quantity due to multi organ dysfunction syndrome. Surveillance of misuse should be undertaken in the current use. Effective mental health treatment, which often includes pharmacologic therapy, is important to prevent suicide, however to adequately promote the safety and well-being of individuals at risk of suicide, consumers, family members, and others should be aware of the associated risk these substances pose. There are actions that state and local communities, policy-makers, and family members can take to reduce the number of suicides due to substance overdose. The medical professional should counsel the patient on the harm of misuse and limit the amount of medicine, with necessary dispensing. Strict legislation measures must be imposed by the government regarding the sales of herbicides and pesticides.

Source of Funding: Nil

Ethical Issues: Nil

Conflict of Interest: Nil

REFERENCES


INTRODUCTION

Poison is any substance that causes harm if it gets into the body. Acute poisoning is defined as acute exposure (less than 24 hrs) to the toxic substance. Poisoning is an important cause of both morbidity and mortality in many parts of the world. It is the fourth common cause of mortality in India. Progress in the industrial and agricultural field has led to an availability of vast number of poisons including pesticides, rodenticides and other chemicals. Advancement in medical sciences has led to the development of large number of therapeutic agents which are misused as poisons. Sometimes drug overdose and accidental ingestion may also occur. In general, accidental poisoning is more common in children whereas suicidal poisoning is more common in young adults.

The nature of poison used varies in different parts of the world depending on access and availability of the poison, socio-economic status of the individual and various other factors. Commonest poisoning in India and other developing countries is due to pesticides, the reason being agriculture based economy. In developed countries, poisoning deaths are mainly due to cleansing agents, detergents, drugs and other compounds. It is important to know the nature and severity of poisoning in order to take appropriate preventive measures to reduce the morbidity and mortality. So, this study has been aimed to characterize acute poisoning cases admitted to our hospital with the objective of determining the various parameters of poisoning such as mode of poisoning, the vulnerable sex and age group, the common toxic agents involved, relation to occupation, marital status and outcome of treatment.

MATERIALS AND METHOD

The present study was a retrospective study conducted during June 2010 - June 2011 in a tertiary care hospital, Dharwad. The study included 136 cases of acute poisoning due to drugs and chemicals. Cases of snake bite, insect bite, food poisoning and allergic reaction to the drugs were not included in the study. Data regarding age, gender, marital status, occupation, toxic agent and other information like duration of hospital stay, circumstances of poisoning and outcome
of treatment were collected from hospital records and documented in the pre-structured format. The data were analyzed.

RESULTS

A total of 136 patients were admitted for acute poisoning in study period, of these 55.88% were males and 44.12% were females. The majority (49.26%) of cases were in the age group of 21-30 years, followed by 11-20 Years (25%). Only 4% cases accounted for children less than 10 years (Table No 1).

Incidence of poisoning was more common in married people (58.82%) including males and females (Table No 2). By occupation, 29.41% of the cases were farmers followed by housewives (24.26%), students (21.32%), other professionals including teachers, electricians, businessmen, bank employees, drivers, laborers 13.24% and unemployed accounted for 11.76% (Table No 3).

The commonest manner of poisoning was suicide (85.29%) followed by accidental poisoning (11.76%). In four cases the manner of poisoning was unknown. No case of homicidal poisoning was reported (Table No 4).

The most important agents implicated in acute poisoning were organophosphorus compounds (54.41%), followed by drugs (19.85%), rodenticides (5.88%), Phenol (5.15%), Lice powder (4.41%), kerosene (2.94%), alcohol (1.47%), naphthalene (0.73%) and Cyanide (0.73%) (Table No 5). The exact nature of consumed poison could not be determined in 6 cases. The most common drugs used were benzodiazepines, carbamazepine, phenytoin, asthalin and multiple drugs. In majority (90%) of cases, route of exposure was oral, followed by inhalation (10%).

The duration of hospitalization ranged from 1 to 60 days, with mean hospital stay of 6.76 days. Mortality was seen in 6% cases and all deaths were due to organophosphorus compound poisoning.

Table 1: Distribution of cases by their age and sex

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of Males (%)</th>
<th>Number of Females (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>4 (2.94)</td>
<td>-</td>
<td>4 (2.94)</td>
</tr>
<tr>
<td>11-20</td>
<td>13 (9.56)</td>
<td>21 (15.44)</td>
<td>34 (25)</td>
</tr>
<tr>
<td>21-30</td>
<td>37 (27.21)</td>
<td>30 (21.44)</td>
<td>67 (49.26)</td>
</tr>
<tr>
<td>31-40</td>
<td>9 (6.62)</td>
<td>4 (2.94)</td>
<td>13 (9.56)</td>
</tr>
<tr>
<td>41-50</td>
<td>7 (5.15)</td>
<td>3 (2.11)</td>
<td>10 (7.35)</td>
</tr>
<tr>
<td>51-60</td>
<td>3 (2.21)</td>
<td>1 (0.74)</td>
<td>4 (2.94)</td>
</tr>
<tr>
<td>&gt;61</td>
<td>3 (2.21)</td>
<td>1 (0.74)</td>
<td>4 (2.94)</td>
</tr>
<tr>
<td>Total</td>
<td>76 (55.88)</td>
<td>60 (44.12)</td>
<td>136</td>
</tr>
</tbody>
</table>

Table 2: Distribution of cases according to marital status

<table>
<thead>
<tr>
<th>Marital status</th>
<th>Males (%)</th>
<th>Females (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>40 (29.41)</td>
<td>40 (29.41)</td>
<td>80 (58.82)</td>
</tr>
<tr>
<td>Unmarried</td>
<td>36 (26.47)</td>
<td>20 (14.71)</td>
<td>56 (41.18)</td>
</tr>
<tr>
<td>Total</td>
<td>76 (55.88)</td>
<td>60 (44.12)</td>
<td>136</td>
</tr>
</tbody>
</table>

Table 3: Distribution of cases according to occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>40 (29.41)</td>
</tr>
<tr>
<td>Housewife</td>
<td>33 (24.26)</td>
</tr>
<tr>
<td>Student</td>
<td>29 (21.32)</td>
</tr>
<tr>
<td>Others</td>
<td>28 (16.76)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>16 (11.76)</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
</tr>
</tbody>
</table>

Table 4: Distribution of cases by the manner of poisoning

<table>
<thead>
<tr>
<th>Manner</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suicidal</td>
<td>61 (44.8)</td>
<td>55 (40.44)</td>
<td>116 (85.29)</td>
</tr>
<tr>
<td>Accidental</td>
<td>13 (9.56)</td>
<td>3 (2.21)</td>
<td>16 (11.76)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (1.47)</td>
<td>2 (1.47)</td>
<td>4 (2.94)</td>
</tr>
<tr>
<td>Homicidal</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>76 (55.76)</td>
<td>60 (44.12)</td>
<td>136</td>
</tr>
</tbody>
</table>

Table 5: Distribution of cases by the type of poison and number of deaths

<table>
<thead>
<tr>
<th>Type of poison</th>
<th>Number of patients (%)</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organophosphorus compound</td>
<td>74 (54.41)</td>
<td>6</td>
</tr>
<tr>
<td>Drugs</td>
<td>27 (19.85)</td>
<td>1</td>
</tr>
<tr>
<td>Rodenticide</td>
<td>8 (5.88)</td>
<td>2</td>
</tr>
<tr>
<td>Phenol</td>
<td>7 (5.15)</td>
<td>0</td>
</tr>
<tr>
<td>Lice powder</td>
<td>6 (4.41)</td>
<td>2</td>
</tr>
<tr>
<td>Kerosene</td>
<td>4 (2.94)</td>
<td>0</td>
</tr>
<tr>
<td>Alcohol</td>
<td>2 (1.47)</td>
<td>0</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>1 (0.73)</td>
<td>0</td>
</tr>
<tr>
<td>Cyanide</td>
<td>1 (0.73)</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>6 (4.41)</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>13</td>
</tr>
</tbody>
</table>

DISCUSSION

In the present study, majority of the patients were males with a male to female ratio of 1.2:1. The preponderance in males may be due to higher exposure to mental stress because of financial difficulties, loss of job, discordance at home or workplace. This demographic distribution of poisoning cases is consistent with other studies in the region. 8, 9 The higher incidence of poisoning in the younger age
group of 21-30 years can be explained by the fact that the people in this age group are prone to stress of modern life style, failure in love or exams, professional failure, family problems etc. This finding is similar to most of the studies done in India as well as other parts of the world.\textsuperscript{10, 11}

Poisoning was more common in the married group which shows that married people are more prone to greater stress than single individuals. These findings are consistent with studies done in other parts of India as well.\textsuperscript{12} But contradicting to studies in the other parts of world where unmarried people accounted for the most cases.\textsuperscript{13}

Most of the poisoning cases admitted were of suicidal nature, which is comparable to other studies and suggests that suicide by poisoning has increased because of easy availability of the poisons and also because of the general belief that poison terminates life by minimal suffering.\textsuperscript{14,15} The most common poison consumed was organophosphorus compound, because of its low cost and easy availability and this finding is comparable to most of the studies in India.\textsuperscript{16} But the scenario in the other parts of the world is quiet different with Pharmaceutical agents being most common.\textsuperscript{17} Some studies in North India have reported Aluminium phosphide as the most common poison.\textsuperscript{18} Farmers who depend solely on agricultural income for their living, were the major victims possibly due to illiteracy and financial constraints.

CONCLUSION

There is an alarming increase in the cases of poisoning, especially suicidal poisoning. Legislations regarding the sale of insecticides should be strictly implemented which will help curb morbidity and mortality associated with poisoning. Farmers should be educated about the safety measures while handling the pesticides which will help to reduce deaths due to accidental poisoning. Persons with psychosocial problems should be identified at the earliest and should be referred for psychiatrist counseling. Epidemiological surveillance for each region is necessary to identify problems prevalent in that region so that preventive measures can be taken accordingly.

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Ethical Clearance: Taken from institutional ethical committee.

REFERENCES


Ideal Mortuary for Medicolegal Autopsy

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ABSTRACT

Need for a modern Mortuary in all the ways as in health, ventilation, protection of staff, equipment, construction of building, facilities to mourners, etc are widely discussed in this paper, all health hazards vaccination, various courses offered keeping in view of future development in field of Forensic Medicine, and allied sciences studied in various levels health care facilities provided in Andhra Pradesh.

Keywords: Medicolegal Autopsy, Mortuary, Mortician, Bio-hazard

INTRODUCTION

The Medico legal Autopsy is specialized type of examination of a dead body as per laws of the land towards administration of justice and prosecution. “Mortuary” means a place where the dead bodies will be kept and examined, until paying its last tributes.

1The word “autopsy” comes from the Greek words “auto” and “opsis”, and literally means “to see for one self”. In India medico legal investigation of sudden, suspicious, or unnatural deaths, Post - Mortem Examinations are imperative. India is now a speedily developing country, which is developing in all the aspects, as in medical and health, establishment of corporate hospitals, multi-specialty Government hospitals.

In the same way development of Death care system, services are not sufficient in the field of Forensic Medicine, because of acute dearth Forensic personnel and morticians or the technical staff. As Andhra Pradesh new developing state, Modern Mortuaries are an essential need at all levels of health care system like Teaching Hospitals, District Government hospitals, Area hospitals, and even Community Health Centres.

When a medico-legal autopsy is conducted at govt. hospitals this facility should also be a minimum required service, depending on the patient treating criteria.

Now a days the conditions of Primary Health Centres are in very needy state in medico-legal work and facing lot of problems in several parts Andhra Pradesh, that the hospitals which do not have mortuary facility, and technical staff and more over instruments,

The first recorded autopsies were carried out around 300 BC by doctors living in Alexandria. 500 years later, in 200 AD, medicine had advanced. 1The Greek doctor Galen actually compared what he found at autopsy, with what he had seen on his patients and what they had complained of. The first known legal autopsy, to try to find the cause of death, was ordered by a Magistrate in Bologna in 1302.

To understand the human anatomy better, and to Improve their skills, the artists Leonardo Da Vinci and Michelangelo each perform autopsies. But the autopsy really became significant in 1761, when Giovanni Morganni published his great work On the Seats and Causes of Diseases as investigated by Anatomy. In August of 1923, Clarence Arthur Cowan Thermopolis took over the undertaking part of C. H. long & sons, which became Cowan’s mortuary later, which is still present. After that all lot of changes occur as separation
of funerals business and furniture business and an embalming board established in 1924. [1]

Nowadays concept of Modern mortuary with all facilities like good running and maintaining cold storage, embalming facility, body making, and packing in sterile bag with zip etc. are more or less needed from the starting of Modern Medicine. Private Mortuaries are also coming up in western atmosphere to attend the needs of the people.

**AIMS AND OBJECTIVES**

- To study various mortuary conditions in community hospitals, area hospitals, district hospital and teaching hospitals.

The problems faced are lack of Forensic Experts, Technical staff, Sufficient instruments and well built mortuary buildings, Proper Lighting, Ventilation, Running Water source, Proper working & maintaining Cold Storages, Clean and tidy surrounding area observed, any residential houses nearby to the mortuary building and facilities for mourners or relatives for sitting and drinking water etc.

- To correlate the above in constructing a modern Mortuary for medico-legal Autopsies.

**Review of Literature**

**Coroner’s Autopsy:** A report of the National Confidential enquiry into the patient out come and death, (2006) conducted a research work on mortuary management in United Kingdom in the year 2006 which emphasized regarding mortuary building the Number of Cases and protective measures to the staff of mortuary, precautionary immunization to the infectious diseases to the staff, and clinical pathological accreditation of mortuaries to the standards of world class. ( mentioned in ref:no-3 www.rcpath.com)

**DISCUSSION**

**The Mortician:** technical staff that assists the Forensic expert in dissection. The principal duties and responsibilities of an autopsy staff includes:

a) To maintain the Mortuary entry registers.

b) The Exit register should have: at what the Body handed over to whom, name and signature of the relative who received.

c) Tie a Dead body Chelan to the body kept inside the mortuary time, date.

d) Wear a full protective dress.

To maintain cleanliness in mortuary, see that all instruments and equipments in good function. Especially the cold storage is very delicate.
A **Standard Mortuary Complex** should be boarded in 600 sq. meters area approximately. Here dead bodies performing autopsy and handed over dead bodies to the relatives after autopsy. Standard mortuary should have facilities of:

a. Embalming if necessary

b. Viewing dead bodies by family members of deceased when preserved.

c. There should be a transitional area between the storage area and dissection area. This helps in keeping the body storage area clean from any contamination.

**Mortuary Office** is usually between entrance and storage area. Here Mortuary clerk will sit and police inquest room etc

**Cold Chambers:** The dead bodies when ever preserved in cold storage at 4°C. These cold storage plants should have deep freeze facility.

**Cleanliness of the Mortuary**

Maintenance of washing floor every day after each case, with 1:10 bleaching powder in water, which protects from H.I.V and Hepatitis B, C, D and E. They should wear a clean dress or apron.

All the dissection waste material should be incinerated every day

**Instruments and Equipments**

At least 10 sets of autopsy instruments should be prepared every day in proper condition. The following instruments must present in the mortuary room:

- Bernard’s saw - 9” and 11”, Scissors - 8”, 6” 11” bunt and sharp ended, Bone Cutter - 10” straight and angled, Cartilage knives of 4” and 5½” blade, Dissection forceps - Blunt and toothed - different sizes, Electric autopsy saw with accessories, Scissors - 5” fine, pointed and dissecting, Glass slides, bowls, sterilized swabs and test tubes, Gauge ¼”, Half curved and double curved post-mortem suturing needles and twine.

Blunt instruments should be boiled in 1% solution of sodium carbonate for 20 minutes; Cutting instruments should be placed in 88% phenol solution for 15 minutes, Rubber gloves sterilized for 15 minutes at less than 15 pounds of steam pressure.

Other instruments required are Hammer and Chisel, Rectal Thermometer, Syringes and needles, sterile, Hand Lens, Measuring and graduated glass / porcelain containers, Metal / Plastic measuring tape, Organ knives of 6” to 10” blade, Pointed probe, Resection Knife, Rib shears - 9½”, Scalpels of different sizes, Sym’s speculum for examination of the female genitalia, Sponges, Thick PM gloves, Trays, Vials with stopper for collecting blood, Wide mouthed glass bottles with stoppers of one litre capacity for viscera.

**Major Equipments**

Though these are expensive, it is preferable to be made available in the department and they are Cadaver weighing machine, Organ weighing machine, Embalming machine, Dead body cold chambers, Portable X-Ray machine, X-ray viewer or lobby, Camera with zoom lenses, Video Camera.

**Embalming Machine:**

Embalming is an artificial method of preserving the dead body. Modern embalming is defined as the study and science of treating a dead human body to achieve an antiseptic condition, a pre-mortem appearance and preservation.

**Chemicals**

Chemicals essential in a modern mortuary are Antiseptic lotions/soaps/ disinfectants, Sodium hypochlorite, sealing wax, clothes, Fixative like formalin 10%, Glycerine for preserving brain in suspected rabies case.

Liquid paraffin for topping blood sample in case of death due to suspected irrespirable gas inhalation and preservatives like common salt, rectified spirit.

**Bio-safety Considerations**

The post-mortem examination room has always been a potential source for infection, long before the concept of bacteria had been developed. The Forensic Medicine experts, Forensic pathologists, Forensic anthropologists and other persons engaged directly or indirectly in post-mortem work are at greater risk of exposure to blood-borne viruses and other infections including human immunodeficiency virus, hepatitis B, hepatitis C, hepatitis D and G viruses, non-A, non-B hepatitis (NANB), tuberculosis, Creutzfeldt Jakob Disease, herpes, Hantavirus pulmonary syndrome,
smallpox, human T-cell lymphotropic virus type I and infections from other pathogenic organisms. (Brown et al., 1984; Rosenberg et al., 1986; Gerbert 1988; Ratza and Schneiderman 1988; Geller 1990; Douceron et al., 1993a; Templeton et al., 1995; Fink 1996; Ajmani 1997; Galloway and Snodgrass 1998; Riddle and Sherrard 2000; Sagoe-Moses et al., 2001).

Scientific investigation has confirmed that with the cessation of life, certain bacteria are released which, if allowed to go unchecked, can be a health hazard. Moreover, with death, there is neither the reticulo-endothelial system nor the blood -brain barrier to restrict the translocation of micro-organisms within the dead human remains (Rossa and Hockett 1995; Ajmani 1997). So these bacteria and microorganisms pose serious threat to Forensic medicine persons working in the mortuary.

**Autopsy room Infections are acquired by one or more of the following routes**

a) A wound resulting from a blood or body fluid contaminated object or needle-stick injury.

b) Splash of blood or other body fluid onto an open wound or area of dermatitis.

c) Contact of blood or other body fluids with mucous membranes of the eyes, nose or mouth.

d) Inhalation and ingestion of aerosolized particles.

Forensic medicine personnel who come in direct contact with the body fluids, soft tissues of the dead and skeletal material in various stages of decomposition, are at continuous risk of acquiring various kinds of infections including blood-borne viral and other bacterial infections.

However, limited data are available regarding these risks to persons who are usually exposed to large number of traumatized bodies in India, a country that has an existing and growing HIV epidemic and high hepatitis virus seroprevalence. Safety is an issue not only relevant to the team performing the autopsy, but also has direct implications regarding the protection of the environment.

Prevention strategies include immunization, exposure avoidance by the use of universal precautions. Transmission of infection may occur by cutaneous injury, which comes in contact with infected blood or by aerosol exposure. In these cases, the autopsy workers should protect the eyes, skin and mucous membranes by wearing a surgical gown, mask and cap, goggles, shoe covers, and double surgical gloves. When there is risk of aerosolized pathogen such as M. Tuberculosis, it is better to wear specialized face mask such as N-95 respirators, which filters particles of 1mm diameter.

**Disinfectants for Instruments**

For the sake of safety, the instruments or items, which are used in postmortem examination, should be placed in a plastic container with 0.5 sodium hypochlorite solutions. Later they may be cleaned and should be autoclaved before being used again.

Instruments, which can be autoclaved, should be sterilized in 1% gluteraldehyde for at least 10 minutes. Alluminium and stainless steel are damaged by hypochlorite; so these instruments should be decontaminated with 2% aqueous gluteraldehyde solution. (Geller, 1990)

The 10% formalin solution is found effective against all kinds of viruses and is recommended for the disinfections of instruments, tables and other surfaces after the postmortem examination of HIV and viral hepatitis infected person.

However, it should be taken into consideration that the formalin is highly irritant to the eyes. 1-2% soluble phenolics are recommended against bacterial pathogens including M. tuberculosis. In a case of Creutzfeldt Jakob disease, prolonged soaking on sodium hydroxide solution is recommended. (Geller, 1990)

**Universal Work Precautions**

- All infected bodies should be wrapped and tied in double layer touch plastic bag, with a red colour tag mentioning “Biologically Hazardous”.

- Proper protective clothing: Full sleeves overalls instead of simple surgical gowns, head cap, face mask, goggles if eye glasses are not worn, double gloves (heavy autopsy gloves over surgical gloves), and waterproof rubber gumboots.

- Avoid accidental pricks and cuts from needles, scalpels, etc.

- Used instruments should be dipped in 2% glutaraldehyde (cidox) for half-an-hour, washed with soap and water, dried and then rinsed in methylated spirit and air dried.
• All soiled gauze and cotton, etc. should be collected in a double plastic bag for incineration.

• Laundry material, such as aprons, towels, etc. should be soaked in one percent bleach for half-an-hour, washed with detergent and hot water, and autoclaved.

• Disinfectants: 1:10 dilution of common household bleach or a freshly prepared sodium hypochlorite solution is recommended. Liquid chemical germicides commonly used in health care facilities and laboratories are effective against HIV.

• After autopsy the body should be wrapped in double layer heavy plastic sheet bag and secured properly, so that there is no leakage. A tag should be attached for identification.

• Periodic training and education in safe postmortem procedures, prevention of sharp injuries and other kinds of exposures should be imparted to the forensic personnel regularly.

• The expenditures associated with the post-exposure treatment of the occupationally infected individual, institutional insurance premiums and workers compensation benefits should be covered by the appropriate health authority.

Suggestions and Conclusion

A Clinical pathology accreditation (CPA) to all laboratory facilities in health services, includes mortuaries, should function to certain standards of operation, and the process of inspecting and certifying that these standards operate is through a clinical pathology accreditation organization. The most well known such organization is Clinical Pathology Accreditation (UK) Ltd.

It is now recommended by central Govt (DGHS) to all the states that at least one Forensic Expert with M.D. in Forensic Medicine in each P.H.C with 50 beds hospitals, two Forensic experts with above 300 beds in each District Hospitals.

Mortuary building should constructed in all teaching hospitals, District Hospitals, Area hospitals and Community health centres where medico legal Autopsies are conducted. All autopsy instruments should supply to all the hospitals.

The Mortuary should be located in the premises of the Hospital building and away from the Hospital main building with direct road to it. There should be residential houses nearby mortuary.

There should be a perfect exhaust system inside air is sent to out. The Mortuary should have a continuous Electricity and water supply.

Now days in western countries mortuary technicians are trained in medical lab technology (MLT) courses, they should only take as mortician or autopsy Technician. Forensic Nursing course is already being introduced in number of north Indian colleges which are providing three year bachelor degree.

There should be Forensic Photography where photographers are trained to take photographs of dead and crime scene. Forensic radiology is a branch where forensic personnel are being taught in the fields of X-Ray, MRI, and ultrasound with respect to track the fire arm injuries, stab injuries, hemorrhages in the body cavities etc is the need of hour.

A well ventilated and proper lighting should be there over each and every table with a spot light. A good body packing is essential, so the relatives should not think that it is a post-mortem undergone body. A plastic bag with zip must be used for all cadavers unlike other indigenous methods. Adequate washing facilities and running water source must be there for each table.

Mortuary technicians should be immunized against Hepatitis A, B and taking injections of T.T for every 6 months. Entry register and exit register should be properly maintained.

The decomposed bodies should be placed in a separate room. Double latex gloves, plastic shoe covers, protective goggles or face shield should be used while doing autopsy over HIV cases or suspected HIV cases. Periodic Training programmes for all mortuary staff with regard to the better enhancing their skills are recommended.

The author has visited several mortuaries throughout the state, Community Health Centres, Area Hospitals, District Hospitals and Teaching Hospitals of various bed strength and he feels that mortuaries in the various hospitals are in very primitive stage in rendering services to dead. Fulfillment of minimum standards for performing a good autopsy is strongly recommended and for these efforts must be made not only by the authorities but also by the forensic personnel is required.
Acknowledgement: My teachers and colleagues.

Ethical Clearance: Not required

Source of Funding: Self funding

Conflict of Interest: Nil

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INTRODUCTION

Food losses due to rodents are staggering. In Asia alone, annual food losses due to rodents would be enough to feed 200 million people each year. Rice pre-harvest losses are estimated to be between 5-10% in most Asian countries. Arotdenticide is any product commercially marketed to kill rodents, mice, squirrels, gophers and other small animals. They are heterogenous group of chemicals bearing little or no relationship to one another, apart from their current or historic use as rodenticide. They exhibit markedly different toxicities to humans and rodents. They are among the most toxic substances found in homes. In 2011, 12886 case mentions of exposure to rodenticides were recorded in National Poison Date System (NDPS) administered by American Poison Control Centre (AAPCC). Today aluminiumphosphide is the leading cause of suicidal death in northern Indian states such as Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, and Rajasthan. In the present era of increasing poison deaths, fatalities due to consumption of rodenticides are not uncommon. Owing to their lethality and easily availability they are being used more and more. Therefore it is highly essential for a forensic pathologist to understand about different types of rodenticides, their toxic effects on the humans and associated clinical features.

MATERIAL AND METHOD

The present retrospective study was conducted at department of Forensic Medicine, Victoria hospital, Bangalore Medical College and Research Institute, Bangalore. The study was done on autopsies conducted during the period from JAN 1st 2012 to DEC 31st 2012 for 1 year. After going through the facts provided by the police, complete medico legal autopsy was done along with relevant forensic science laboratory reports and study of the hospital case sheets to arrive at the conclusions.

Fig. 1. Sex wise distribution

Keywords: Rodenticide, Suicide, Ill-Health
RESULTS

In this study period, 3806 autopsies were conducted. Out of these 426(11.19%) were poison related deaths. Among these poison related deaths, 41(9.62%)deaths were due to rodenticides. In total rodenticides constituted 1.06% of all deaths. Maximum number of deaths(56.09%) belonged to 21 to 30years age group followed by 11 to 20 year age group(17.07%). This is in contrast to the facts observed by them where peak incidence occurred in 2nd decade of life 5. There was only one death in 0 to 10year age group, manner of death was accidental in this particular case. Males constituted 65.8% of cases, females constituted 31.7% of cases, one case being a transgender. Maximum number of deaths were suicide amounting to 85.36% of cases followed by accidental deaths 9.75%. Ill health(42.8%) was the common cause for suicide followed by unknown causes in 37.14% of cases.

DISCUSSION

Rodenticide is classified in several different ways. 1) As inorganic and organic compounds. 2)by animal selectivity. 3)by nature and onset of symptoms. 4) according to their LD50 in rats6. Highly toxic rodenticides are those substances with a single dose LD50 of less than 50mg/kg/body weight. The strongest warning issued by the consumers product safety commission is DANGER. This group includes thallium, sodium monofluoracetate. Moderately toxic rodenticides are those with an LD50 of 50 to 500mg/kg/body weight with signal word WARNING. This includes á-Naphthyl-Thiourea(ANTU) and cholecalciferol. Low toxicity rodenticides with LD50 50 to 5000mg/kg/body weight include red squill(Urgineamaritima), norbormide, bromethalin and anticoagulants, signal word is CAUTION2.

Metal phosphides are highly effective insecticides and rodenticides. These are frequently used to protect grains in stores and during its transportation. Poisoning with these compounds may be direct due to ingestion of salts and indirect from accidental inhalation of phosphine generated during their approved use7. Aluminium phosphide is used extensively as a cheap and effective grain fumigant and rodenticides in developing countries8. It is highly potent against broad spectrum of insect species, cost effective, does not affect seed viability and leaves little residue on food grains9.

Usual clinical features include metallic taste, vomiting, garlicky(or fishy) odour of breath, intense thirst, burning epigastric pain and diarrhea, in severe cases there may be tachycardia/bradycardia, hypotension, sinus arrhythmia with ST segment depression in lead II, III and AVF. Convulsions are reported in some cases. Respiratory distress, hepatic damage, renal failure and metabolic acidosis are possible. Autopsy feature include hypoxic organ damage with congestion and petechiae, contents of stomach are often hemorrhagic with mucosal shedding and there is usually an intense garlicky odour. Microscopy reveals necrotic changes in liver and kidneys, toxic myocarditis with fibrillar necrosis. Lungs may demonstrate evidence of ARDS4.
CONCLUSION

Deaths due to rodenticide are not uncommon. Understanding of the classification, clinical and autopsy features of various rodenticides is very much essential in day to day autopsy practice. Proper history accompanied by meticulous autopsy and FSL analysis is necessary while dealing a case of death due to rodenticide. Health education to the Farmers and Industrial workers regarding the toxicity of rodenticide is the need of the hour. Parenteral monitoring can prevent accident death in children. Strict legislation is very much necessary to prevent rampant availability of the rodenticides over the counter.

Acknowledgment: Head of the Department and Postgraduates Department of Forensic Medicine, Bangalore Medical College And Research Institute

Ethical Clearance: Not applicable, as it is a Retrospective studies based on Data and Medico Legal autopsy and there was no Trials conducted on the Study group

Source of Funding: Self

Conflict of Interest: Nil

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Explosive Deaths by Land Mines Blast

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1Assistant Professor, 2Associate Professor, 3Prof & HOD of Forensic Medicine, Department of Forensic Medicine, Kamineni Institute of Medical Sciences, Narketpally, District Nalgonda, Telangana, India

ABSTRACT

Objectives: To make an in-depth analysis of land mine blast effect on the human body, and quantify pattern of Injuries.

Method: In a descriptive study, data was collected retrospectively from medical records of Osmania, Gandhi and Kakatiya Medical College, Dr. NTR University of Health Sciences, Vijaywada, India. All the cases of explosive deaths by Land Mines Blast were included and analysed.

Result: The study covered 54 victims. Pattern I was dominant in 47 (44.76%), followed by pattern III in 29 (27.62%) victims. There were 16 (15.24%) victims with pattern II injuries according to International Committee of the Red Cross (ICRC) classification. Eleven (10.48%) victims suffered from shrapnel fragments to their torso and neck. Eye and face injuries occurred in 2 (1.90%) victim.

Conclusion: Land Mine awareness programs should be conducted amongst civilians who live in high-risk areas. Land mines cause a substantial physical, mental, social, and economic disability. Strategies should be established to prevent and reduce the casualties because landmine clearing is expensive and time consuming. Improved health infrastructure with trained personals for emergency care and early transfer of the casualties would reduce morbidity and mortality. More studies are required to understand the social and public health consequences of this problem. It is recommended that a standard format for reporting of Land mine incidents and injuries should be developed.

Keywords: Land Mine Blast Injuries, Civilians Victims, Terrorism, Autopsy

INTRODUCTION

Terrorism has become a global phenomenon and most of the countries, are facing terror activities for one or the other reasons. The manmade disasters have the potential to rival the natural ones in enormity and the impact on human life.

Acts of terrorism, recent catastrophes, and disasters have created an urgent need for new classifications to characterize, report, and analyze injuries, sequela of injuries and deaths associated with these events.

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Blast injuries are physically and psychologically devastating. Although explosions can result from industrial or recreational accidents, terrorist acts that cause injury in military and civilian settings are taking place at an increasing rate. Conservative estimates show that these events have risen four-fold from 1999, to 2006, worldwide, and injuries related to these acts have increased eight-fold.

The International Committee of the Red Cross (ICRC) has identified three common patterns of injuries caused by antipersonnel landmines. In pattern I the victims trigger an explosion by standing on a buried landmine. They usually have a traumatic amputation of a part of the lower limb with less severe injury elsewhere. Earth, grass and a portion of the foot are blown upwards. Such mines consist of an explosive and may include fragments of metal or plastic. Pattern II injuries are a random collection of penetrating injury caused by multiple fragments from an exploding landmine. There is less chance of a traumatic...
amputation. Injuries to the head, neck or abdomen are common. Pattern III injuries result from the handling of a landmine. The victims sustain severe upper limb and facial injuries. Eye injuries are common in all groups. The present study aims to make an in-depth analysis of land mine blast effect on the humans and quantify the pattern of Injuries.

MATERIAL & METHOD

Total 54 no of cases of explosive deaths by land mines blast injuries reported to Osmania, Gandhi and Kakatiya Medical College, Warangal, Dr. NTR University of Health Sciences, Vijayawada, India, were studied for the present study. The age, sex, civilian or combatant, planned unplanned incidence, rural urban mortalities, time of injury, spot death or medically attended death, causes of death and the pattern of injury according to the classification of ICRC developed by Coupland and Korver were recorded, the data obtained was computed and analyzed.

RESULTS

Table No 1: Showing the planned and unplanned incidence

<table>
<thead>
<tr>
<th>Planned /Unplanned</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned Target</td>
<td>22</td>
<td>41%</td>
</tr>
<tr>
<td>Unplanned</td>
<td>10</td>
<td>18%</td>
</tr>
<tr>
<td>Accidental</td>
<td>22</td>
<td>41%</td>
</tr>
</tbody>
</table>

Table No 2: Showing Time of Incidence

<table>
<thead>
<tr>
<th>Day/ Night</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 AM to 6PM</td>
<td>36</td>
<td>66%</td>
</tr>
<tr>
<td>6PM to 6 AM</td>
<td>18</td>
<td>34%</td>
</tr>
</tbody>
</table>

Table No 3: Showing the positional incidence

<table>
<thead>
<tr>
<th>Distance</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near</td>
<td>49</td>
<td>90%</td>
</tr>
<tr>
<td>Far</td>
<td>5</td>
<td>10%</td>
</tr>
</tbody>
</table>

OBSERVATION AND DISCUSSION

The description and adaptation or preparations of an explosive is defined in section 4 (d) of Indian Explosive Act 1884. Explosions can be atomic, mechanical and chemical. A bomb blast is a type of chemical explosion. Explosives are classified into low and high explosives. Primary high explosives like mercury fulminate and lead azide are too sensitive to be used in bulk and are ideal for detonators. Secondary high explosives are less sensitive and do not explode on handling. To produce an explosion they must be subjected to shock wave from other detonating explosive, usually supplied by a detonator or blasting cap.

In our study 90% of the cases were identified when they were submitted and subjected for autopsy. In only 10% cases the help of medical officer was sought to establish and complete the identity. In majority of the cases, as the explosion resulted from the blast of land mines, the upper part of the body, particularly the head remained intact with good facial features, by which identity was established at the scene of occurrence itself, apart from other personal effects like clothing, ornaments etc. In cases where there was extreme utilization and disruption, the services of the Forensic Pathologist were utilized for anatomical reconstruction and identify the features like sex, age, height, dental etc, with final approval obtained through DNA Profile.
Males were 87% of victims and remaining 13% were female victims. Fig. 1 reveals that the affected victim’s age range from 10 years to 60 years, but maximum incidence of 2% is seen in the young and middle age group i.e. between 20 to 40 years. As persons in this age group are mostly the bread earners of their family and go out for other household works too. In India, being a patriarchal society, most of the outdoor activities are performed by male. So, male were common victims in this attack.

Table no 1 shows that 41% of the victims were intended targets whereas the remaining 59% were unintended and accidental victims who lost their life on account of their misfortune. 66% of all the cases the explosion has occurred during day time, while the remaining 34% incidents are seen either in the late evening hours or early hours of morning.

90% of the cases the victims were in the immediate vicinity of the blast, in 10% of the cases the victims are far off the targets and were subjected to effects of explosion or blast, like radiant heat and flying missiles.

30% of victims affected were urbanites and the remaining 70% of the victims had rural background. As most of the explosive were carried out by way of a land mine blast, the exposure of urban people to this mode of violence is minimal or negligible. Land mines cause a substantial physical, mental, social, and economic disability. Strategies should be established to prevent and reduce the casualties because landmine clearing is expensive and time consuming.

Table no 5 Shows that the intended victims are police engaged in an anti extremist activities, a target cannot be obtained alone and an equal or greater number of civilians have also became unintended victims.

External injuries were seen in 53 cases whereas an internal injury alone was noted in only one case. In this case the victim was far off from the sight of the blast and he only sustained injury by the blast wave in the form of bleeding into the thoracic cavity and collapsed lung. The classical triads of injury were noted in almost all 53 cases i.e. Abrasion laceration, contusion etc. Yavuz et al in their study reported that there were fractures of the several bones in majority of the cases.
In a study in Eritrea, a high percentage of injuries were to the upper body due to the victims picking up suspicious objects. According to ICRC data, 28% of mine injured patients end up with an amputation of the lower limb. From a survey conducted by Jahunlu et al., in Eylam (another western province in Iran), in a subgroup of 138 survivors 78.5% had injury to their extremities with 24.6% having upper extremities and 54.4% the lower extremities involvement. Only 3.6% of the survivors had torso injuries.

In our study, Pattern I was dominant in 47 (44.76%), followed by pattern III in 29 (27.62%) victims. There were 16 (15.24%) victims with pattern II injury. eleven (10.48%) victims suffered from shrapnel fragments to their torso and neck. Eye and face injuries occurred in 2 (1.90%) victims.

50 people (91%) died on spot where as 4 cases (9%) died in the hospital after admission. The delay in providing emergency medical care leads to death from hemorrhage within first few hours of the blast. Therefore training in hemorrhage control with application of tourniquet and basic life support system will reduce mortality. Mine awareness programs should be conducted on how to avoid, recognize and report mines found. Signs around high-risk areas should be erected to avoid trespassing and maps of the mine infested areas should be widely distributed.

81% cases death has occurred from blasts or from its related effects, in 5% of cases death was caused by radiant heat generated by the blast. 9% cases showed the cause of death to be head injuries also from tertiary effect of blast, But, Yavuz et al reported head injuries as the leading cause of deaths due to bomb explosions. Incidence of mine injuries varies according to the type (blast, fragmentation, bounding fragmentation) and the composition of the mine (explosive, metal fragments, plastic). Bounding mines produce more penetrating injuries to the torso, while blast mines cause traumatic amputations.

CONCLUSIONS

The problem of identity establishment is less marked even with high degree of disruption and mutilation compared to other mass disaster, where burning is an associate feature and absent in present category. If at all burns were presented they are only flash burns from the radiant heat but not flame burns. Male sex is the only one who is primarily targeted and the female mortalities which happened were mostly as a result of becoming an unintentional target. Age has no influence on the blast mortality and morbidity. But the major mortality of morbidity is seen in the 3rd and 4th decade of life and the targeted group fall in this range. The victims outside this are range 20 – 40 years are mostly unintended targets.

People from particular professionals like police, politics and personal involved in real estate activities are subjected to this mode of violence. It is recommended that a standard format for reporting of mine incidents and injuries should be developed and details of incidents, where mines detonated unintentionally without causing injuries should also be collected.

Land mines cause a substantial physical, mental, social, and economic disability. Strategies should be established to prevent and reduce the casualties because landmine clearing is expensive and time consuming. From the Forensic Pathologist view a blast case is nothing but a case for reconstruction and establishment of cause of death. But the actual challenge lies beyond this where corporal evidence reveals nature of explosive, mechanism of explosion, location and position of the victim if studied in proper perspective. The authors strongly recommend that further studies should be carried out to understand the impact of this problem and its consequences, in order to reduce the number of casualties and provide better care for the victims of landmine injuries.

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Conflicts of Interest: Nil.

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INTRODUCTION

A death, sudden, suspicious and unnatural, is always a mystery. In solving the mystery, law depends on forensic experts. Many a times the job starts with no history or clue regarding the cause and manner of death but it’s their expertise that makes the sterile ground of investigation a fertile one. Various means of suicide are adopted by different age groups of people. Hanging and intake of poison are two very common ways of suicidal attempts. Sometimes one individual adopts multiple means to make the death sure. Sometimes people fail in one attempt and try again with some other method in the same episode. These types of multiple attempts at one time or at different times become difficult to be detected by post mortem examination. Such a happening also reflects the hesitative status of mind of the person.

HISTORY

It was a homely matter and purely family affair. A 14 years old girl locked herself in a room after a quarrel with her mother. After a while when she did not open the door, the family members knocked the door and still the door was not opened by the girl. There was even no response from the room. Ultimately the door was broken and the girl was found lying on the bed in unconscious state. The girl was immediately taken to the nearest hospital. Medical officer in the emergency ward declared the girl brought dead. With no anticipation about cause of death, the dead body was sent to the mortuary of NRS Medical College and Hospital for post mortem examination. History was obtained from police inquest and family members.

POST MORTEM FINDINGS

It was much unexpected to observe a round mark of pressure abrasion surrounding the neck. The mark was 9" long and 1" wide. Upper end of the mark was 2.5" below tip of right mastoid process, 2' below right angle of mandible, 1" below left angle of mandible and 1" bellow tip of left mastoid process. Lower end of the mark was 4" above suprasternal notch in the midline. The mark was oblique, non-continuous and there was a gap of 4" over posterior aspect of neck starting from a point 1" posterior to tip of left mastoid process and ending at a point 1" right to midline over posterior aspect of neck. The mark of pressure abrasion...
was reddish in colour and non scabbed. There was an abrasion measuring 1”x0.5” over left chin 1” medial to left angle of mandible. This abrasion was brown scabbed which was not consistent with the nature of previously mentioned abrasion. No other external injury was found over body.

Internally all organs were grossly congested. There was about 200 ml yellowish fluid within the stomach. The content of stomach had a peculiar pungent smell like that of a smell of insecticide. Inner wall of stomach showed presence of sub-mucosal haemorrhage. Content of stomach along with 200 gm of liver, proximal part of duodenum and half of each kidney were sent to Forensic Science Laboratory for chemical examination to detect whether there was any poison or not.
DISCUSSION

High risk factors include leaving suicide notes, family history of suicide, and history of previous attempt. Almost 95% of persons who attempt or commit suicide have a diagnosed mental disorder, of which 80% accounts for depression. Suicide note was there in this case though no previous history of attempt was there. Firearm injury and hanging are active suicidal methods whereas poisoning and drowning are help-seeking methods. Male suicide attempts are more violent. So, this case is a rare combination of complex mode of suicide by through multiple means. In 2011 in India, occupational statistics among suicide victims showed highest incidence among self-employed (38.3%) persons.

CONCLUSION

The evaluation and diagnosis of suicidal risk and attempt are the most complex as well as difficult tasks. The surrounding persons & clinician must always try to find out the suicidal ideation or probability of attempts if a person is depressed or emotionally unstable. No single approach is appropriate for all persons in similar situations as suicide is an outcome of complex interactions of various risk factors and protective mechanisms. WHO suggested broad array of its preventive interventions addressing different factors at different levels required to achieve overall reduction in the population suicide rate. An overall psychiatric awareness and lifestyle modification is very essential to stop this kind of incidences.

Acknowledgement: We are grateful to all our respected teachers for helping us in every aspect in making this case report a complete work. Especially we are grateful to Prof Biswajit Sukul, Head of the Department, Forensic & State Medicine, Medical College, Kolkata, and Prof. Prabir Kumar Deb, Head of the Department, Forensic & State Medicine, Nil Ratan Sircar Medical College, Kolkata, We are also thankful to our beloved retired Prof. Prabhas Chandra Chakraborty and Prof. Rabindra Nath Karmakar for sharing their valuable knowledge and advices to us.

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Ethical Clearance: Not applicable

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Battered Till Death: a Case Report

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ABSTRACT

A recent WHO estimate shows that 40 million children in the world aged 0–14 years are abused and neglected. Physical abuse on children is seen more commonly in families of low socio economic status, especially if the child is a female. A female child is thought to be a burden to the family more so when the mother is dead. In physical abuse on children, easily available domestic material like belt, clothes, utensils etc are used as weapon of abuse. In the present case a rolling pin used in kitchen is used as a weapon of abuse. The child is battered by the father or the step mother, but usually will not be fatal. Here one such fatal case of battered female child is recorded and is evident in this literature.

Keywords: Female Child, Battery, Physical Abuse, Neglect

INTRODUCTION

A battered child is one who has received repetitive physical injuries as a result of non accidental violence, produced by parent or guardian. It is also known as child abuse syndrome or Caffey’s syndrome.1 In 1962, Dr. C. Henry Kempe and his colleagues published a seminar article on child abuse and introduced the term “battered child syndrome.”

In many states of USA, child abuse is defined as the infliction of injury on a child by parent or guardian. Abuse is differentiated from neglect, which usually refers to failure of parents or caretaker to provide the child with adequate physical care and supervision. Abandonment of a child also constitutes neglect.

Parents are young aged often between 20-30yrs, belong to lower socio-economic status and also are poorly educated usually. Many of the battering parents were battered children themselves.

In 2007, India published a report on one of the largest surveys done on child abuse and found that two out of every three children were physically abused and 88.6% of them suffered at the hands of their own parents. A recent estimate by WHO shows that 40 million children in the world, aged 0–14 years are abused and neglected.

The common method of assault comprises of giving kicks, blows, slaps, strikes with cane or sticks, forcible gripping of limbs, squeezing of body parts, violent shaking of the body.

The Child Abuse Prevention & Treatment Act was passed in 1974 & has been amended several times, most recently in 2003. This act seeks to provide for better protection & treatment of child abused and for that purpose provides for establishment of child abuse prevention & protection service councils and other authorities and for matters connected there with or incidental they’re to. Newer amendment includes an act/failure to act that presents an imminent risk of serious harm in definition of child abuse.

In this present case is a female child of 8 year old, was physically abused by her own father. Child was living with his father and step mother.

CASE REPORT

Autopsy was conducted at the department of Forensic Medicine and Toxicology, Bangalore Medical College & Research Institute, Bangalore, Karnataka, INDIA.
Body of an 8 year old female child was brought to our mortuary. As per the history provided by the concerned police, the child is said to have lost her mother when she was 8 months old, later the father getting married to another women. The child was brought up at her grandparents’ house. When the father brought his daughter to his house stating that further the child will be looked after by him in future, the child was said to be living with the father and the step mother. At the age of physically abused by her father with a rolling pin.

On external examination, the length of the child was 122cm, built to the age and moderately nourished. Rigor mortis present all over the body and post mortem staining could not be appreciated due to injuries over the body.

**External injuries**

- Abrasions 3cmx2cm, 3.5cmx2.5cm 3.5cmx1cm were present over outer aspect of upper part of left arm, outer aspect of lower part of left arm and back of left elbow respectively
- Contusions 24cmx10cm, 20cmx8cm, 21cmx9cm, 18cmx8cm, 8cmx5cm and 6cmx4cm were present over left arm, left forearm, right arm, right forearm, over both left and right palm respectively. On incision the contusions were of a depth of a range measuring 0.7cm to 1cm.
- Tram-track contusions multiple in number ranging from 20cmx12cm to 12cmx8cm present over back of chest and abdomen. On incision the depth of wound ranged from 1.5cm to 2.5cm.
- Contusion over an area of 30cmx15cm, present over buttocks. On incision depth of the wound was 2cm.
- Contusions, 15cmx14cm and 16cmx14cm, present over front and outer aspect of right and left thigh respectively. On incision depth of the wound was 1cm and 1.5cm respectively.

**Internal examination**

On reflection of scalp, blood extravasation of 3cmx2cm present over right parietal region. Brain showed patchy sub-arachnoid hemorrhage over left parietal lobe. Lungs were pale, cut section exudes very minimal blood.

Cause of death was opined as “DEATH IS DUE TO MULTIPLE INJURIES SUSTAINED”.

**DISCUSSION**

Detection of physical abuse is dependent on the doctor’s ability to recognize suspicious injuries, such as bruising, bite marks, burns, bone fractures, or trauma to the head or abdomen. Neglect is the most common form of child maltreatment. It can be caused by insufficient parental knowledge; intentional negligence is rare. Suspected cases of child abuse should be well documented and reported to the appropriate public agency which should assess the situation and help to protect the child. What happens within the walls of someone’s home, be it child abuse, is not considered as a neighbor’s problem and thus most child battery cases go unnoticed and unreported. With poverty and lack of health care threatening survival, child battery does not receive much attention. The nature of the human mind has to be changed towards protection of the child, be it belongs to their neighbor.

**CONCLUSION**

Child battery is a common problem in almost all countries, especially in developing countries. The parents need to be educated regarding the right of the child. Fatal cases of physical abuse on children are unreported or under reported, which needs a thorough study and survey related to child abuse and death, especially female child. The reporting authority needs to be more equipped with advanced knowledge to deal with such cases. A recent act, Protection of children from sexual offence (POCSO) 2012 deals only with sexual offences on children which does not involve physical abuse on children. Similar stringent Act needs to be passed to protect the life of the child.
Fig. 2. Contusion & abrasion over right upper limb

Fig. 3: Contusion over right thigh.

Fig. 4: Contusion over left thigh.

Fig. 5. Contusions over back of chest and abdomen with tram-track appearance

Fig. 6. Contusion over buttocks

Fig. 7. Pale lungs
Acknowledgement: To all the staff members Department of Forensic Medicine, Bangalore Medical College and Research Institute, Bangalore.

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Ethical Clearance: Not applicable.

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INTRODUCTION

In the recent years there has been a rapid development and expansive growth in the use of computer applications such as the Internet. Child pornography procured by this rapidly improving technology is of worrying issue to whether the viewers of such materials will become an active abuser of children. In the recent times, majority of the convictions on Internet sex crimes are related to child pornography. It has been argued by Taylor and Quayle that there is no clear evidence that exposure to child pornography leads to a person to commit a contact sexual offence with a child. Henceforth, researchers in this area of study began to think, “What role does this ICP play in the development of paedophilic offending behaviour?” Therefore, researchers investigating in this area of study needs to focus on the issues of risk and dangerousness of these Internet sex offenders. Clear efforts to control child pornography proliferation through the Internet must focus on the offender. Surprisingly, little is known about the characteristics of these Internet sex offenders in Australia and additional research is imperative. Characteristics in better sense, the

Data-Based Profiling of Internet Child Pornography Offenders: a Study of the Characteristics of these Internet Sex Offenders

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ABSTRACT

This current topic was of interest of study by the researchers after the controvertial arrest of child pornography traffickers and abusers in Victoria on October 2004. However, this was a startling revelation to the extent of propogation of child pornography in Australia and Internationally. Thereafter, the issue of child pornography has become a major area of investigation for law enforcement authorities, as it parallels increasing concerns for the children in our society. However, this research study is to focus only on Internet sex offenders knowingly possessing child pornography. As it will be interesting to know, from the findings of this research study, the association between the usage of the Internet medium and its contribution to the development of sexually abusive behaviours towards minors. In addition, to investigate whether there were any other associated risk factors involved in this offending processes. One of the major challenges to a researcher in this study was to provide concrete evidence about the characteristics of these types of Internet sex offenders. However, two types of characteristics were studied in this research demographic and offending characteristics of two risk-categories such as the non-contact Internet sex offenders and contact Internet sex offenders. The findings of this research were startling that the low-risk and high-risk group of Internet sex offenders had significant differences in their characteristics in terms of education, occupation, criminal history, and most importantly the risk factors associated with the high-risk group was related with history of childhood sexual abuse. By studying their characteristics it is more likely to play a vital role in determining the possibility for these Internet sex offenders to progress from just viewing or collecting these images to potentially cause sexual violence against children.

Keywords: Female Internet Child Pornography, Characteristics, Non-Contact Internet Sex Offender, Contact Internet Sex Offender

INTRODUCTION
demographic and offending characteristics to these Internet sex offenders. For instance, how the non-contact Internet sex offenders differ from contact Internet sex offenders in demographic characteristics (such as, education, occupation and family background). Although, this research will focus more specifically on these two characteristic features (i.e. demographic and offending characteristics) to represent the risk issues of how the non-contact and contact Internet sex offenders differ from each other. Likewise, to explore what could be the offending characteristics of these Internet sex offenders? Whether they were having any prior convictions for criminal non-sexual and sexual offences? Needs to be investigated. Therefore, these evaluations of characteristics will help to gain better understanding to the risk issues and dangerousness posed by these group of offenders. However, it will be significant to evaluate these Internet sex offenders concerning their characteristics and dangerousness in a criminological prospective. Considering, this important risk issue about the dangerousness of these offenders, attempted the researchers to initiate the research aim. To identify the differences between the characteristics of Internet child pornography offenders with non-contact Internet sex offences and with contact sex offences against child (ren). However, it will be interesting to know the characteristics of these Internet sex offenders and to understand the role what child pornography plays in expressive sexual violence against children.

MATERIAL AND METHOD

Design of this study: Since, in this research these Internet child pornography offenders as considered are of two distinct risk groups. Firstly, the non-contact Internet sex offender or low-risk group as individuals with paedophilic fantasies of possession of child pornography without any active sexual intervention with minors. Secondly, the contact Internet sex offenders or the high-risk group, who not only tend to possess these abusive materials but also are predatory to sexually molest child victims. Therefore, this differentiation between “High” and “Low” risk levels were evaluated based on the offender’s conviction or index offence related to Internet child pornography (fig.1).

SOURCE OF DATA

Statistical data collection

- Subjects: Researchers intended to use de-identified information about these Internet sex offenders from clinical reports (Tier Two specialist assessment and management plan) from Sex Offenders Program, Corrections Victoria, Australia. The Sex Offender Program (SOP) is a community-based and government-funded organization, which provides with specialist assessment and intervention plan for rehabilitation and treatment of these sex offenders. These clinical reports comprised of the following data; background information, previous offence history, sexual development history, and risk factors.

- Offence type(s)
- Offenders charged only on conviction of knowingly possess child pornography.
- Offenders charged and convicted of knowingly possess child pornography and produce/distribute/sexual penetration/indecet act/indecet exposure of a child under the age of 16.

- Number of subjects: The current study included 133 clinical reports
- Age range: It is proposed that this study involved offenders’ over the age of 18 years.
- Sex: Male subjects.

Henceforth, the research methods needed to incorporate four tools in this study namely:

1) Sex Offender Program, clinical report
2) INCOP (Internet Child Pornography Offenders Profile) case file
3) SPSS 16.0 Data Editor for Mac (Software program for analysis of data)
4) SPSS Data Code book (Spread sheet with data and variables)

Data Entry: These statistical data comprising of de-identified clinical reports of Internet sex offenders are expected to be qualitative data foreseen by forensic clinicians during clinical-based practice with sex offenders. Hence, this study attempts to analyse this qualitative data into a quantitative data that required a database INCOP (Internet Child Pornography Offenders Profile). This database INCOP is in a checklist format that reflects predominantly more static and systematically collected and recorded demographic and criminological information of these Internet sex offenders from the 133 case files at the Sex Offender program database. The INCOP database comprised information that was arranged either as categorical or numerical variables relevant to the...
current study. Systematically, these variables were uploaded into SPSS 16.0 data sheet on Mac and transferred into a SPSS data codebook for this current research.

OBSERVATION AND RESULTS

Statistical data analysis was performed from the sample size of 133 subjects, which enabled researcher to examine the differences between characteristics of the two levels of risk in paedophilic offending behaviours’ of Internet child pornography offenders. However, in this current study a statistical analysis was performed on 245 variables from the sample size (n = 133). Henceforth, 133 subjects were classified into two risk categories, the “High” risk category consisted of 68 subjects (Internet contact sex offenders), and the “Low” risk groups included 65 subjects (Non-contact Internet offenders). As mentioned earlier, the variables were analysed statistically in a three-fold method (see Table 1). However, Chi-square analysis were conducted to determine the significant difference between the two levels of risk in offending behaviour.

Moreover, the scale measures were analysed by an independent samples t test in estimating the significant difference between the two groups of low and high-risk participant. The significance was tested to be <0.001 in this current study. However, the study examined whether there was a relationship between categorical independent variables (e.g., demographic characteristics, offending, characteristics, and criminal history) and categorical dependent variables (low-risk and high-risk offender status).

When summarising the first-fold of data variables from the demographic information it was noticed. The demographic variables measured were background, education, occupation, family background, social activities, and recreational activities between low and high-risk groups of Internet sex offenders. However, it was reported that there was no significant differences between the two risk groups in terms of their background such as age, physical characteristics, ethnicity and living arrangement. However, low-risk Internet sex offenders showed higher marks for educational achievement and level of education (see Table 2). Moreover, similar significant differences were also observed in demographic variables representing occupation. The low-risk group of Internet sex offenders were employed, as white-collar workers in their occupational skill, with a stable employment. Whereas, the high-risk group were more commonly blue-collar workers, and were unstable or (see Table 3).

<table>
<thead>
<tr>
<th>Table 1: Three-fold of variables to be examined in this current study</th>
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<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>Demographic variables</td>
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<tr>
<td>Offending variables</td>
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<tr>
<td>Risk factors-related variables</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Demographic characteristics (Education) for the sample size (n = 133)</th>
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<tbody>
<tr>
<td>Demographic variables (Education)</td>
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<tr>
<td>Education level</td>
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<tr>
<td>Postgraduate degree level</td>
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<tr>
<td>Graduate diploma/Advanced diploma level</td>
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<tr>
<td>Bachelor degree level</td>
</tr>
<tr>
<td>Certificate level</td>
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<tr>
<td>Secondary education</td>
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<th>Table 3: Demographic characteristics (Occupation) for the sample size (n = 133)</th>
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<tbody>
<tr>
<td>Demographic variables (Occupation)</td>
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<tr>
<td>Occupational status</td>
</tr>
<tr>
<td>Unemployed</td>
</tr>
<tr>
<td>Stable employment</td>
</tr>
<tr>
<td>Unstable employment</td>
</tr>
<tr>
<td>Occupational skill</td>
</tr>
<tr>
<td>White collar worker</td>
</tr>
<tr>
<td>Blue collar worker</td>
</tr>
<tr>
<td>None</td>
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<th>Table 4: Offending characteristics (Criminal history) for the sample size (n = 133)</th>
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<tbody>
<tr>
<td>Offending characteristics (Criminal history)</td>
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<tr>
<td>Previous criminal history</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Non-sexual criminal history</td>
</tr>
<tr>
<td>No</td>
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<tr>
<td>Yes</td>
</tr>
<tr>
<td>History of sexual offences</td>
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<td>No</td>
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<td>Yes</td>
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<tr>
<th>Table 5: Risk factors-related variables (History of childhood abuse) for sample size (n=133)</th>
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<tr>
<td>Risk-related variables (History of childhood abuse)</td>
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<tr>
<td>Childhood abuse history</td>
</tr>
<tr>
<td>No</td>
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<tr>
<td>Yes</td>
</tr>
<tr>
<td>Childhood abuse history (sexual abuse)</td>
</tr>
<tr>
<td>No</td>
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<tr>
<td>Yes</td>
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</tbody>
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Table 6: Demographic-related risk factors according to their paedophilic offending behaviours

<table>
<thead>
<tr>
<th>Demographic-related factors</th>
<th>Low-Risk</th>
<th>High-Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>Living alone / with partner with children</td>
<td>Living alone / with wife or parents</td>
</tr>
<tr>
<td>Education</td>
<td>Higher academic achievement</td>
<td>Lower academic achievement</td>
</tr>
<tr>
<td>Higher education levels</td>
<td>Mostly trained in information technology</td>
<td>Mostly trained in mixed field programs</td>
</tr>
<tr>
<td>Occupation</td>
<td>White-collar worker</td>
<td>Blue collar worker</td>
</tr>
<tr>
<td>Financially independent</td>
<td>More stable employment</td>
<td>Unstable employment/unemployed</td>
</tr>
<tr>
<td>Family background</td>
<td>Secure attachment to parental figure</td>
<td>Non-secure attachment to parental figure</td>
</tr>
<tr>
<td>Social and community interaction</td>
<td>Non-involvement in negative social activities</td>
<td>Active involvement in negative social activities</td>
</tr>
</tbody>
</table>

Table 7: Offending-related risk factors according to their paedophilic offending behaviours

<table>
<thead>
<tr>
<th>Offending-related factors</th>
<th>Low-risk</th>
<th>High-risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior criminal convictions</td>
<td>Not/Less likely to have criminal records</td>
<td>More likely to have extensive criminal records</td>
</tr>
<tr>
<td>Non-sexual criminal history</td>
<td>Not/Less likely involved in non-sexual crimes</td>
<td>More likely involved in non-sexual crimes</td>
</tr>
<tr>
<td>Sexual criminal history</td>
<td>Non-involvement in sexual crimes</td>
<td>Active involvement in sexual crimes</td>
</tr>
<tr>
<td>Possession of ICP</td>
<td>Personal/Collection (Newsgroup/own credit cards)</td>
<td>Intention to apply for grooming and sexual contact</td>
</tr>
<tr>
<td>Production of ICP</td>
<td>Less likely involved in production of ICP (Copies in CDs, floppy disks or take printouts)</td>
<td>More likely involved in production of ICP involving direct contact with child victims (photographs)</td>
</tr>
<tr>
<td>Distribution of ICP</td>
<td>Less likely involved in distribution of ICP</td>
<td>More likely involved in distribution of ICP to children and paedophiles</td>
</tr>
</tbody>
</table>

The second-fold of data variables for analysis were from the offending information. The offending variables measured were: criminal histories (sexual and non-sexual). According to the findings of the described offending variables, it was significant that the high-risk participants were more likely to have prior criminal histories or convictions of both non-sexual and sexual offences (see Table 4). High-risk group of Internet sex offenders were more likely to be engaged in all types of sexual offences and interventions, such as indecent assault, indecent exposure and sexual contact with child victim(s).

The risk factors-related variables were the third-fold of data variables for statistical analysis that measured childhood abuse, relationship factors, negative emotional factors both in childhood and adulthood, alcohol/substance abuse, psychological factors, and illness (medical and psychiatric). Remarkably, according to the findings in the current study, the high-risk group of Internet sex offenders were more likely to be abused in childhood, by all means emotional, physical and sexual. Especially, with childhood sexual abuse, it was estimated that almost seventy five percent of the high-risk participants were being sexually abused (see Table 5). The other factors were not of much significance.
When discussing the characteristics of these two risk-groups of Internet sex offenders. It was taken into consideration of the two main characteristics of these offenders on the basis of demographic information and offending information. According to the findings in demographic characteristics, low-risk Internet sex offenders tended to have more advanced level of education and were less likely to be unemployed and also more financially stable than their high-risk counterparts. Whereas, in offending characteristics high-risk Internet sex offenders were found to be more likely to have criminal histories, both sexual and non-sexual. This finding comes as no surprise given the previous results discussed regarding their demographic tendencies. Low-risk participants have more advanced education, more stable jobs, secure family relationships, and engage in less risky recreational activities. However, high-risk Internet sex offenders may be easier for law enforcement authorities to identify due to their extensive criminal records, but this finding is still troubling for reasons that low-risk Internet sex offenders may be difficult to be identified with their less or no criminal records. Basically, this group of Internet sex offenders with possession of child pornography could either remain dormant without involving in any form of contact with minors. However, it is important to emphasize that 75% of the high-risk group reported being sexually abused at a young age as opposed to less than 25% of the low-risk participants. This is perhaps the most interesting finding that there is an obvious difference between the two risk-groups with regard to their childhood sexual abuse history.

CONCLUSION

The general conclusion of this study make sense given that low-risk Internet sex offenders continuously commit non-contact Internet crimes while high-risk Internet sex offenders committed to pursue to contact sexual crimes involving children. Specifically, when statistically analysing the demographical aspects and in their patterns of offending behaviours with its relation to the risk factors associated with these low-risk and high-risk category of Internet sex offenders. However, the differences in the demographic characteristics and offending characteristics between the two risk groups of low-risk and high-risk Internet sex offenders are demonstrated (see Table 6&7). Remarkably, the findings are suggestive that being sexually abused at a young age could be an important risk factor and also promote a progression from non-contact Internet sex offences to contact sex offences. Which is questionable?

While considering, the importance of identifying the characteristics of these Internet sex offenders it is expected to be beneficial not only for the researchers in future but also for law enforcement officers investigating in this area. These characteristical features could provide a clear distinction between the non-contact and contact Internet sex offenders.

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A Case Report an Apple a Day, Can Make it Your Last Day

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ABSTRACT

Asphyxial death is one of the commonest modes of death which may be homicidal, suicidal or accidental in nature. Accidental death is defined as unexpected or unplanned event that may result in death. Asphyxia refers as lack of oxygen in blood & tissues due to impaired or absence of exchange of oxygen and carbon dioxide leading to death. Choking is a form of asphyxia caused by mechanical occlusion within various sites of air passages by foreign object. It is more common among those people who laugh and talk during their meal, when food is accidentally inhaled. Choking of both organic and non-organic foreign bodies continues to be a common cause of mortality, requiring prompt recognition and early treatment to minimize the potentially serious and sometimes fatal consequences. The other most common cause of aspiration is general anaesthesia with full stomach or when patient is unconscious, under any intoxication or drowsiness. Such a case is brought to casualty of Sri Aurobindo Medical College and PG Institute, Indore with the history of drowsiness due to severe acute diarrhoea. At first site this case appeared a case of food poisoning but autopsy revealed that, it is a case of aspiration of mashed apple, which the deceased had consumed just before the death.

Keywords: Apple, Accidental, Choking, Asphyxia

INTRODUCTION

In an Indian review, over 70% of patients had a positive history of aspiration. Only 60% of the patients presented immediately; that is, within 24 hours after aspiration. Common symptoms were cough and respiratory distress¹. According to the national safety council, choking remained the fourth leading cause of unintentional injury deaths in the United States as of 2004. In 2006, a total of 4,100 deaths (1.4 deaths per 100,000 populations) from unintentional suggestion or retaliation of food or other objects resulting in airway obstruction was reported. A retrospective analysis of airway foreign bodies in 132 children (80 male, 52 female) over a period of 20 years was conducted by Yadav et al². Shlizerman et al³ prepared a retrospective review of all the charts of children under 16 years of age, who underwent bronchoscopy for suspected foreign body aspiration in Ha’Emek Medical Center, from 1994 to 2004. The review presented cases concerning 136 children who had undergone bronchoscopy. Foreign bodies were found in 73% of the cases. Sudden death can be both natural and unnatural. In sudden natural deaths, the immediate cause of death is usually found in the cardiovascular system [45-50%] followed by the respiratory system [10-15%]⁴. According to Modi, vomited matter may regurgitate into the larynx and by inspiratory efforts may be aspirated into the smaller bronchioles so as to result in suffocation. If there is post mortem spill, these contents cannot reach the smaller bronchi and bronchioles⁵. According to Saukko and Knight, there is no reliable method of distinguishing agonal or even early post mortem over-spill from true vital aspiration unless clinical or other witnessed evidence is available⁶.
CASE REPORT

On 13/08/2013, an 18 years old male brought to the emergency of Sri Aurobindo Medical College & P.G. Institute, Indore. On examination he was unconscious with pulse and blood pressure not recordable, both the pupils were dilated & fixed and was declared brought dead. He had a history of vomiting (4-5 episodes) and diarrhoea (3-4 episodes) since one day after attending the wedding ceremony in the village. He was rushed to the local district hospital, from where he was given primary treatment along with one bottle of normal saline and was referred to Sri Aurobindo Medical College & P.G. Institute, Indore. The body was shifted to the mortuary for the post mortem examination.

Autopsy findings

External examination: On examination the body was of a thin built male wearing green coloured T shirt smudged with vomiting material, face congested, both eyes partially open, sub-conjunctival haemorrhage, cornea hazy, pupil dilated & fixed (Fig.-1), nails showing bluish discolouration over both sides of terminal phallynx. Rigor mortis is in appearing phase in eyelids, jaw & both upper limbs. Post mortem lividity present and not fixed. There were no external injuries seen.

Internal findings

1. Both lungs show small petechial haemorrhages, froth mixed blood oozing out from the bronchioles of both lungs. On dissection of trachea (Fig.2) & bronchioles (Fig.3) shows yellow coloured partially digested pieces (similar to the gastric content) resembling fruit like substance.

2. Stomach contains yellow coloured partially digested fruit like substance, mucosa grossly normal.(Fig.4)

3. Liver, kidney, spleen and brain were congested.

4. Viscera has been preserved for chemical analysis, sealed and handed over to police constable concerned.

The opinion given was “Death was due to asphyxia as a result of aspiration of gastric content”.

Fig. 1. Sub-conjunctival haemorrhage
Fig. 2. Semi-digested crushed pieces of apple in trachea
Fig. 3. Semi-digested Crushed pieces of apple in bronchioles
DISCUSSION

The asphyxial condition is caused by an obstruction of air influx into the respiratory tract. Asphyxial death is caused also by compression of nerves and vessels of the neck. The three mechanical components of the asphyxial phenomenon, in different cases, define suffocation, smothering, hanging, choking (death caused by bolus) and death caused by aspiration of foreign bodies. Asphyxial death can be suicidal, homicidal or accidental in nature.

On the first instance, our case looked like a case of food poisoning or from severe dehydration. After detailed and meticulous autopsy, we found crushed pieces of apple in the trachea and also up to the bronchioles, which was same as found in the stomach. After that, again history was taken from the attendants and it was found that they had fed him the apple in supine position on their way in the ambulance. Reports have indicated that 60 – 66% of cases are males. Children affected are predominantly from the first and second year of life.

Most frequently aspirated objects are food which is involved in 75% of the cases, other organic materials, are bones, teeth, and plants - 7%, non-organic materials such as metals and plastics - 13%, rocks - 1% and toys or parts of toys - 1%. However, flexible bronchoscopy is less invasive, more cost-effective, does not require general anesthesia and seems more helpful in children with insufficient historical, clinical or radiological findings for foreign body aspiration. In Asian countries such as India, the more common organic material aspirated are peanut, ground nut and dried nuts. Food asphyxiation remains a common problem whenever and wherever people eat. To reduce its incidence, the medical community as well as the general public should be made more aware of the simple methods of manually removing inhaled food or other foreign material from the oropharynx, as well as learning and using the Heimlich maneuver. Instruments to extract foreign objects should be readily available in nursing homes, restaurants, and other public facilities.

Conflict of Interest: None to declare.

Source of Funding: No source of financial assistance was obtained from any individual or agency.

Acknowledgement: Nil.

Ethical Clearance: Identity of the deceased not revealed. (doesn't require ethical clearance)

REFERENCES

INTRODUCTION

The change is essence of life. Since 1991 over two decades India has changed in leaps and bounds due to adoption of economic reform. Last two decades have brought radical changes in many spheres of Indian lives including psychosocial behavior. This study encompasses the trend in violent asphyxial deaths in a city of India over a last decade.

Nanded is one of the major cities in Maharashtra State, situated on the banks of Godavari River. The city act as a major medical treatment centre and referral centre for the rural population of this area as well as nearby districts. Most of the medico-legal autopsies are performed by the Department of Forensic Medicine, Dr Shankarrao Chavan Government Medical College, Nanded.

The term ‘Asphyxia’ is applied to those circumstances in which mechanical interference either impedes access of air to the lungs or interferes with the cerebral blood supply.1 Violent deaths resulting chiefly from asphyxia includes death due to hanging, strangulation, suffocation and drowning.2 Most of the asphyxial deaths occur suddenly raising reasonable suspicion as to manner of death or at times associated with misleading history. Therefore such deaths pose great challenge to Forensic expert to comment about cause of death and manner of death. A complete and careful autopsy helps investigating authorities to unfold manner of death.

MATERIAL AND METHOD

This is a record review of deaths due to asphyxia during the period January 2001 to December 2010. In this study period, all the medico-legal autopsies were performed by Department of Forensic Medicine, Dr S.C. Government Medical College, Nanded. A careful and complete autopsy examination was carried out in every case. Routine viscera and blood preserved for chemical analysis in suspected cases of

ABSTRACT

An analysis of cases of violent asphyxial deaths for 10 years at Dr Shankarrao Chavan Government Medical College, Nanded, Maharashtra State, India is presented. Total 554 violent asphyxial deaths were grouped for study purpose, which comprises 5.9% of all medico-legal autopsies performed during January 2001 to December 2010. Males constitute 63.2% of all the cases with male:female ratio 1.71:1. The study showed the highest deaths in the age group of 21-30 years (31.9%). Drowning (49.1%) and hanging (46.6%) constitute major cause of death among violent asphyxial deaths followed by ligature strangulation (2.5%), Throttling (0.5%), Smothering (0.5%), Traumatic asphyxia (0.5%) and choking (0.2%). The distribution of manner of death showed commonest method of asphyxiation was suicide (57.4%), followed by accidental (30.68%) and homicidal (5.05%).

Keywords: Asphyxia, Drowning, Hanging, Manner of Death
intoxication. All medico-legal autopsies were recorded in relation to names, address, age, sex and cause of death. The various epidemiological characteristics of the cases and their medico-legal aspects were obtained from police papers, autopsy reports, the investigating police officers and the relatives of the deceased. The data of 554 cases of asphyxial deaths was recorded, compiled and analyzed statistically.

RESULTS

During the period of 10 years from January 2001 to December 2010, total 9388 medico-legal autopsies were performed, out of which 554 (5.9%) cases of death due to asphyxia were grouped for study purpose.

In this study group, there were 350 males (63.2%) and 204 females (36.8%). The male to female ratio was found to be 1.71:1. The detailed distribution of the asphyxial deaths (Table No 1) showed Drowning (49.1%) and Hanging (46.6%) form the major bulk of cases among asphyxial deaths. Other cases consist of Ligature strangulation (2.5%), Throttling (0.5%), Smothering (0.5%), Traumatic asphyxia (0.5%) and choking (0.2%).

METHODS OF ASPHYXIATION IN DETAIL

Death due to Drowning

In this study, the significant number of cases was of Drowning (272 cases; 49.1%). Most of the cases (143 cases; 52.5%) were in the age group of 11-30 years. (Table No 2) In maximum number of cases, body was found in river (159 cases; 58.4%) and well (69 cases; 25.36%). The distribution according to the manner of death (Table No 3) showed that accidental drowning accounted for 58.45% (111 male & 48 female), suicidal drowning accounted for 23.5% (24 male & 40 female) and homicidal drowning accounted for 0.36% (5 male & 6 female).

Death to Hanging

Hanging comprises significant number of asphyxiation method (258 cases; 46.6%). Most of the cases were in 11-40 years of age group (217 cases; 84.1%) while 21-30 years age group showed 38.37% of cases. (Table No 2) The materials used for hanging were hard material (57.75%) like rope, wire and soft material (34.1%) like saree, chunni. (Table No 4) Most of the hanging cases were suicidal (98.44%) while in 3 cases accidental hanging was noticed and in 1 case, homicidal hanging was registered as per police record with multiple injuries over body. (Table No 3)

Death due to Ligature and manual strangulation

Amongst asphyxial deaths, 14 cases (2.5%) were due to ligature strangulation. Among 14 cases, 11 cases (78.57%) were homicidal and 3 cases (21.42%) were accidental in nature. Two cases of accidental ligature strangulation occurred due to clothing trapped in crop thrasher and in one case, new born baby trapped in cradle due to convulsion. There were 3 cases (0.5%) of manual strangulation. All the cases of manual strangulation were homicidal in nature.

Death due to smothering and traumatic asphyxia

There were 3 cases each (0.5%) of smothering and traumatic asphyxia. The manner of death in smothering showed that 2 cases were homicidal and 1 case was accidental; while in traumatic asphyxia, all cases were accidental in nature.

Death due to choking

Only one case of death due to choking was noticed and the manner of death was accidental. The 16 year boy died suddenly due to impaction of lemon at the hypopharynx level.

<table>
<thead>
<tr>
<th>Table No 1. Table showing method of Asphyxiation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method of Asphyxiation</strong></td>
</tr>
<tr>
<td>Drowning</td>
</tr>
<tr>
<td>Hanging</td>
</tr>
<tr>
<td>Ligature Strangulation</td>
</tr>
<tr>
<td>Throttling</td>
</tr>
<tr>
<td>Smothering</td>
</tr>
<tr>
<td>Traumatic Asphyxia</td>
</tr>
<tr>
<td>Choking</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Table No 2. Table showing age wise distribution of Asphyxiation

<table>
<thead>
<tr>
<th>Age</th>
<th>Drowning</th>
<th>Hanging</th>
<th>Ligature</th>
<th>Strangulation</th>
<th>Throttling</th>
<th>Smothering</th>
<th>Traumatic</th>
<th>Choking</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>21</td>
<td>03</td>
<td>02</td>
<td>01</td>
<td>01</td>
<td>00</td>
<td>01</td>
<td>00</td>
<td>28    (5.05%)</td>
</tr>
<tr>
<td>11-20</td>
<td>71</td>
<td>59</td>
<td>01</td>
<td>00</td>
<td>00</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td>133   (24.0%)</td>
</tr>
<tr>
<td>21-30</td>
<td>72</td>
<td>99</td>
<td>03</td>
<td>01</td>
<td>01</td>
<td>00</td>
<td>00</td>
<td>01</td>
<td>177   (31.94%)</td>
</tr>
<tr>
<td>31-40</td>
<td>47</td>
<td>59</td>
<td>03</td>
<td>01</td>
<td>00</td>
<td>00</td>
<td>01</td>
<td>00</td>
<td>110   (19.85%)</td>
</tr>
<tr>
<td>41-50</td>
<td>20</td>
<td>23</td>
<td>02</td>
<td>00</td>
<td>01</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>46    (8.30%)</td>
</tr>
<tr>
<td>51-60</td>
<td>28</td>
<td>07</td>
<td>02</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>37    (6.67%)</td>
</tr>
<tr>
<td>61-70</td>
<td>06</td>
<td>07</td>
<td>02</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>15    (2.70%)</td>
</tr>
<tr>
<td>Above 71</td>
<td>07</td>
<td>01</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>08    (1.44%)</td>
</tr>
<tr>
<td>Total</td>
<td>272</td>
<td>258</td>
<td>14</td>
<td>03</td>
<td>03</td>
<td>03</td>
<td>01</td>
<td></td>
<td>554</td>
</tr>
</tbody>
</table>

Table No 3. Table showing manner of death among asphyxial death

<table>
<thead>
<tr>
<th>Method of Asphyxiation</th>
<th>Accidental</th>
<th>Suicidal</th>
<th>Homicidal</th>
<th>Not Known</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drowning</td>
<td>159</td>
<td>64</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>Hanging</td>
<td>03</td>
<td>254</td>
<td>01</td>
<td>00</td>
</tr>
<tr>
<td>Ligature Strangulation</td>
<td>03</td>
<td>00</td>
<td>11</td>
<td>00</td>
</tr>
<tr>
<td>Throttling</td>
<td>00</td>
<td>00</td>
<td>03</td>
<td>00</td>
</tr>
<tr>
<td>Smothering</td>
<td>01</td>
<td>00</td>
<td>02</td>
<td>00</td>
</tr>
<tr>
<td>Traumatic Asphyxia</td>
<td>03</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Choking</td>
<td>01</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>170 (30.68%)</td>
<td>318 (57.4%)</td>
<td>28 (5.05%)</td>
<td>38 (6.85%)</td>
</tr>
</tbody>
</table>

Table No 4. Table showing distribution of material used for hanging

<table>
<thead>
<tr>
<th>Material used for hanging</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rope</td>
<td>54</td>
<td>26</td>
</tr>
<tr>
<td>Nylon Rope</td>
<td>43</td>
<td>07</td>
</tr>
<tr>
<td>Jute Rope</td>
<td>10</td>
<td>00</td>
</tr>
<tr>
<td>Coconut rope</td>
<td>03</td>
<td>01</td>
</tr>
<tr>
<td>Wire</td>
<td>03</td>
<td>01</td>
</tr>
<tr>
<td>Cotton (Cloth) Rope</td>
<td>01</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>35</td>
</tr>
<tr>
<td>Soft Material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saree</td>
<td>18</td>
<td>26</td>
</tr>
<tr>
<td>Chunni</td>
<td>04</td>
<td>17</td>
</tr>
<tr>
<td>Dhoti</td>
<td>04</td>
<td>00</td>
</tr>
<tr>
<td>Long Handkerchief</td>
<td>09</td>
<td>00</td>
</tr>
<tr>
<td>Bedsheet</td>
<td>05</td>
<td>00</td>
</tr>
<tr>
<td>Lungi</td>
<td>03</td>
<td>00</td>
</tr>
<tr>
<td>Shirt</td>
<td>01</td>
<td>00</td>
</tr>
<tr>
<td>Towel</td>
<td>01</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>43</td>
</tr>
<tr>
<td>Not Known</td>
<td>10</td>
<td>11</td>
</tr>
</tbody>
</table>

**DISCUSSION**

In the present study, the incidence of asphyxial deaths was 5.9% (554/9388) amongst all medico-legal autopsies conducted during study period. Similar findings were noticed by Patel A et al³ (5.63%), Amandeep Singh et al⁴ (5.26%). The incidence of asphyxial deaths was higher in study conducted by Azmak D⁵ (15.7%). The difference in incidence of asphyxial deaths might be due to different region for study purpose and socio-economic variations. Out of 554 cases of asphyxial deaths, 350 (63.2%) were male
and 204 (36.8%) were female with male:female ratio 1.71:1. Similar male preponderance was observed in other studies.5-8

Among the asphyxial deaths, drowning (49.1%) and hanging (46.6%) constitute major causes of death. Drowning (59.4%) was found to be the commonest cause followed by hanging (24.3%) among various asphyxial deaths in the study of Amandeep Singh et al. Other studies5-8 showed hanging as the most common method of asphyxiation followed by drowning with varying percentage. As Nanded city is situated on the bank of Godavari River, the major river in Maharashtra State and one Asana River nearby, deaths due to drowning are common features.

In the present study, among the drowning cases, significant number of cases (52.57%) was observed in the age group of 11-30 years. Amandeep Singh et al4 reported 45.4% cases & Shetty M reported 42% of drowning in 11-30 years age group. The manner of death amongst drowning cases showed accidental deaths (58.45%) were common followed by suicidal (23.5%) and homicidal (0.36%). Similar findings were observed by Lunetta P. et al7 (58%), Patel A. et al8 (57.14%), Shetty M9 (59.71%) where accidental deaths were more common. While higher percentage of accidental deaths due to drowning were reported by Azmak D.5 (78.1%), Batra AK et al8 (82.9%), Sheikhazadi A. et al9 (85.1%). Suicidal drowning deaths were frequently reported with varying percentage in different studies depending upon locality.5-10 In the present study, among drowning deaths, homicidal deaths were observed mostly in females and foetus and most of the cases were related to dowry allegation. In India, in spite of vast development in many spheres, dowry custom continues to be major social evil forcing females to end their life. Homicidal drowning were reported by Shetty M10 (0.28%), Sheikhazadi A. et al9 (0.3%), Lunetta P7 (0.48%), Wirthwein11 (2.5%) and Azmak D.5 (4.8%).

In the present study, 58.4% of drowning cases were found in river followed by well (25.36%). The study by Azmak D.5 showed 73.1% cases were found in river which is somewhat higher as compared to our study while Patetta MJ et al11 reported 39% of cases were found in lakes & ponds and 29% were found in river & creeks. This variation is due to difference in the proximity of people to water reservoir.

In the present study, most of the hanging deaths (38.37%) were observed in 21-30 years of age group. Similar findings were reported by other authors with varying percentage.4,5,8,12-14 Deaths due to hanging in children and early adolescent are rare in occurrence but due to depression in early age, stressful life situations and drug addiction, these children commit suicide. In the present study, 20 cases (7.75%) were observed in less than 15 years of age group, of which 17 were suicidal and 3 were accidental. Meel BL et al14 reported 13% cases of hanging below 15 years age group, Wyatt JP15 reported 12 cases below 15 years age group of which 6 were suicidal and 6 were homicidal, Cooke CT16 reported 7 cases (2.5%) below 15 years of age group.

In the present study, 98.44% cases of hanging were suicidal which is similar to the study carried out by Patel A. et al9 (97.5%), Cooke CT16 (93.21%), Azmak D5 (100%), Batra AK8 (100%). Age group of 21-30 years, married females, unmarried males, dowry related stress, unemployment, prolonged illness, failure in examinations, relationship and financial problems were associated more frequently with suicidal hanging.17

Accidental hangings were noticed in present study (1.16%), all were male in age group of 7-13 years. Accidental hanging usually occurs while playing in children1 and during autoerotic activity especially in adults2. Isolated cases of accidental hanging in different age group and by various means were reported by authors.3-5,16-20 Only one case (Male / 35 years) of homicidal hanging was noticed in present study & was presented with multiple contusions over body. Homicidal hanging, though rare in occurrence, were reported in some studies.16,21,22

In the present study, hard material like rope, wire was commonly (57.75%) used for hanging purpose which is similar to study by Cooke CT et al16 (59%), Dixit PG23 (52%), Sharma BR et al24 (50.9%). The findings are contrary to study carried out by Sharija S14 (29.2%), Naik S14 (45.25%), Patel A5 (20%) where soft material like chunni was commonly used for hanging purpose.

In this study, there were 14 cases (2.5%) of ligature strangulation.4,5,25 Ligature strangulation cases are mostly (78.57%) homicidal in nature.3,25,30 In the present study, 3 cases of accidental strangulation were reported of which 2 cases of accidental ligature strangulation were due to soft material (sari, long handkerchief) around neck trapped in crop thrasher while in one case, neck of one year baby got trapped
in cradle during fit. Accidental ligature strangulation due to soft material trapped in crop thrasher\textsuperscript{27,28} was reported. In the present study female predominance (64.3\%) was noticed among deaths due to ligature strangulation which is consistent with other studies.\textsuperscript{4,5,13,25,26}

In the present study, manual strangulation comprises of 0.5\% of all asphyxial deaths. The manual strangulation is mostly homicidal in nature and similar findings were reported by previous authors.\textsuperscript{4,5,13,25,26} Females were mostly associated with manual strangulation.\textsuperscript{4,5,13}

The present study constitutes 0.5\% of smothering cases. The manner of death showed 2 (66.6\%) smothering cases were homicidal\textsuperscript{5,26} while one case (33.3\%) was accidental.\textsuperscript{29,30} In the present study, 3 cases (0.5\%) were due to mechanical asphyxia, all were male. The manner of death in all cases was accidental,\textsuperscript{30} out of which one case occurred due to stampede, in other case person got trapped under heavy object at home and in third case death occurred due to road traffic accident with fixation of chest.

In the present study, only one case of choking due to lemon was noticed and the manner of death was accidental. Other studies showed choking by different objects like grape\textsuperscript{32}, food particle.\textsuperscript{33}

Acknowledgement: Nil

Conflict of Interest: There is no conflict of interest. All authors do hereby declare that this is an original work and it has not been sent to any other journal for publication.

Source of Funding: Nil

Ethical Clearance: Not Applicable

REFERENCES


Attitude Towards Forensic Medicine as a Career Option: a Survey amongst Medical Students

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¹Assistant Professor, ²Associate Professor, Department of Forensic Medicine, ³Assistant Professor, Department of Pathology, SLIMS, Pondicherry, India

ABSTRACT

Forensic Medicine and Toxicology, an important subject and integral part of medical education, has been seen many up and downs in recent past. This specialty plays pivotal role at places in aiding criminal justice, it has unfortunately failed to sustain the impetus and its importance. Student’s views in relation to its relevance in medical education are necessary in order to justify its inclusion in medical school curriculum.

Aims and Objectives: To assess the attitude of medical students towards Forensic Medicine as subject and as a career option. To find out their attitude towards post mortem examination, assess their awareness and knowledge about Clinical Forensic Medicine.

Methodology: A survey conducted among medical students from four states of India. Opinion of 572 students from eleven medical colleges was taken in predesigned proforma.

Results: 42 (7.34%) students were ready to take Forensic Medicine as career option.

Conclusion: There is need to take effective measures so that medical students in India look towards subject as a better career option. MCI should utilize Forensic faculty effectively in integrated teaching and increase faculty strength in medical colleges and also increase PG seats and encourage youngsters to enter this field.

Keywords: Forensic Medicine, Clinical Forensic Medicine, Medical students, Career Option

INTRODUCTION

Forensic Medicine is an important medical specialty that is practiced at the interface with the law. It provides scientific evidence in the administration of justice. Judiciary relies more on the evidences given by forensic experts. Medico legal work is main pillar of emergency work in hospitals and trauma centres. In present scenario, apart from conducting medico legal autopsies and medico legal cases, teaching in medical colleges, attending judicial courts and expert opinion in medico legal cases, training of police and judiciary, research activity and other institutional work including administration are the main duties of Forensic faculties. Having its glory in past, playing very important bridge between medical science and law, as per amendment of 17th September 2010, MCI has reduced weightage and thereby importance of this subject.¹

In early days, Civil surgeons and pathologist except at few places usually taught this subject. In 1980’s this subject was recognized as separate specialty and separate department started its existence in all medical colleges. Since its inception, deterioration of subject is still going on. Most of the medical colleges are having inadequate infrastructure, lack of staff and faculties. Mortuaries are present generally far away and in isolated corner of hospital. Most deplorable condition is due to shortage of trained personal, absent of
ordinary facilities like cold storage, transport, instruments, etc. Moreover, this subject is not lucrative like other branches of Medicine and absence of any incentive for medico legal practitioners are some of the reasons for not choosing this subject as a career option by most of medical students in India. Lack of recognized postgraduate seats in Forensic Medicine, social stigma, lack of incentives, working under difficult condition, working under social and political pressure and had to do so called dirty work of postmortem are the reasons to create disinterest about the subject. Apart from this, step fatherly treatment is given by MCI by reducing its marks and teaching hours leads to further deterioration of subject. Most of students consider it as minor subject and relatively of less importance compared to other subjects.

Medical profession is considered as a noble profession and it is heavily dependent on knowledge and attitude of people providing the services. Attitude and knowledge of its future ambassador is responsible for the development of field. In most of the colleges medical students passed in Forensic medicine without attaining postmortem and medico legal cases. In the present study, attempt has been made to find out the attitude of Indian medical students towards Forensic Medicine as subject and as a career option. Their attitude towards post mortem examination and medico legal work was assessed. Attempt has been made to find out their awareness and knowledge about Clinical Forensic Medicine which is application of forensic medicine techniques to living.

MATERIAL AND METHOD

Present study is conducted amongst 572 medical students from eleven different medical colleges from four states of India (i.e. Maharashtra, Tamilnadu, Andhra Pradesh and Pondicherry). All students participated in study were natives of various places from different part of country. All participants are medical students of fifth term and above and interns who have seen at least one autopsy. They were asked to fill a self administered, predesigned, multiple choice questionnaire. Informed consent obtained from all the participants and permission has been obtained from institutional ethical committee and Head of Department, Forensic Medicine of respective institutes, prior to the study. Questionnaire related to knowledge about different aspect of subject and attitude about subject as a career option were asked. Response was collected back immediately to assess above mentioned facts at the point of study. Data collected and entered in Microsoft excel sheet and statistically analyzed using SPSS (version 16.0). Data was analyzed for frequency distribution and student’s response. Percentage was calculated.

RESULTS

In present study, proforma containing self administered, predesigned, multiple choice questionnaire were distributed among 600 medical students from eleven medical colleges situated in four states of India. Medical colleges are situated in central, southern and western part of India. Participants in the study represent all parts of India. Out of 600 proforma 584 were received back. So total response rate was 97.33%. Out of 584 proforma, 12 were incompletely filled hence excluded from study. Finally, total 572 participants from second year third semester (i.e. fifth semester) and above and interns participated in study. Age and sex distribution are as follows.

Table 1: Age and Sex distribution of participants.

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20</td>
<td>163</td>
<td>214</td>
<td>377</td>
</tr>
<tr>
<td>21-23</td>
<td>88</td>
<td>90</td>
<td>178</td>
</tr>
<tr>
<td>&gt;24</td>
<td>09</td>
<td>08</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>260 (45.45%)</td>
<td>312 (54.55%)</td>
<td>572 (100%)</td>
</tr>
</tbody>
</table>

This cross sectional study was conducted to explore the current attitude of a undergraduate medical students regarding medico legal autopsy which is integral part of Forensic Medicine curriculum. Distribution of Medical student as per number of autopsies observed by them is as follows.

Table 2: Number of autopsies watched by students in relation to sex.

<table>
<thead>
<tr>
<th>Sex</th>
<th>&lt; 5</th>
<th>5-10</th>
<th>&gt;10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>202</td>
<td>31</td>
<td>27</td>
<td>260</td>
</tr>
<tr>
<td>Female</td>
<td>262</td>
<td>31</td>
<td>19</td>
<td>312</td>
</tr>
<tr>
<td>Total</td>
<td>464 (81.18%)</td>
<td>62 (10.83%)</td>
<td>46 (8.04%)</td>
<td>572 (100%)</td>
</tr>
</tbody>
</table>

Response related to importance of subject in medical curriculum, role of autopsy, awareness about clinical forensic medicine and Forensic Medicine as a career option was assessed.
Table 3: Response of participants to the Questions related to subject.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Response (Out of 572)</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Can’t say (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that Forensic Medicine is important subject as a part of medical curriculum?</td>
<td>549 (95.97%)</td>
<td>07 (1.22%)</td>
<td>16 (2.79%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that autopsy (post mortem examination) is important and necessary?</td>
<td>558 (97.55%)</td>
<td>02 (0.34%)</td>
<td>12 (2.09%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that undergraduate medical student should watch autopsies?</td>
<td>535 (93.53%)</td>
<td>18 (3.14%)</td>
<td>19 (3.32%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that undergraduate medical students should actively participate in performing autopsies?</td>
<td>319 (55.76%)</td>
<td>138 (24.12%)</td>
<td>115 (20.10%)</td>
<td></td>
</tr>
<tr>
<td>Do you think number of autopsies you have observed are enough?</td>
<td>73 (12.76%)</td>
<td>375 (65.55%)</td>
<td>124 (21.67%)</td>
<td></td>
</tr>
<tr>
<td>Did you learn anything from autopsies you have seen?</td>
<td>363 (63.46%)</td>
<td>94 (16.43%)</td>
<td>115 (20.10%)</td>
<td></td>
</tr>
<tr>
<td>Do you think, understanding subject Forensic Medicine without watching autopsies is possible?</td>
<td>97 (16.95%)</td>
<td>398 (69.58%)</td>
<td>77 (13.46%)</td>
<td></td>
</tr>
<tr>
<td>Do you think Observation of autopsies should be omitted from undergraduate MBBS curriculum?</td>
<td>55 (9.44%)</td>
<td>472 (82.51%)</td>
<td>45 (7.86%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that postmortem examination have role in health care delivery system?</td>
<td>352 (61.53%)</td>
<td>82 (14.33%)</td>
<td>129 (22.55%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that autopsy is disrespect to the dead body?</td>
<td>54 (9.44%)</td>
<td>441 (77.09%)</td>
<td>77 (13.46%)</td>
<td></td>
</tr>
<tr>
<td>Would you like autopsy to be performed on your near and dear ones, if required?</td>
<td>277 (48.42%)</td>
<td>196 (34.26%)</td>
<td>99 (17.30%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that instead of watching live autopsy, video of same will be better alternative?</td>
<td>99 (17.30%)</td>
<td>389 (68%)</td>
<td>84 (14.68%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that only books are sufficient to understand this subject?</td>
<td>29 (5.06%)</td>
<td>509 (88.98%)</td>
<td>34 (5.94%)</td>
<td></td>
</tr>
<tr>
<td>Do you have any idea about CLINICAL FORENSIC MEDICINE?</td>
<td>203 (35.48%)</td>
<td>275 (48.07%)</td>
<td>94 (16.43%)</td>
<td></td>
</tr>
<tr>
<td>Is their existence of separate Clinical Forensic Medicine Unit in your medical institute?</td>
<td>281 (49.12%)</td>
<td>150 (26.22%)</td>
<td>141 (24.65%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that Undergraduate medical student should watch live recording of medical evidences in court?</td>
<td>432 (75.52%)</td>
<td>80 (13.98%)</td>
<td>60 (10.48%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that watching medico legal cases in casualty/Clinical Forensic Medicine Unit should be mandatory for Undergraduate students?</td>
<td>397 (69.40%)</td>
<td>86 (15.03%)</td>
<td>89 (15.55%)</td>
<td></td>
</tr>
<tr>
<td>Do you think that there should be compulsory Rotatory clinical posting to observe medico legal work?</td>
<td>440 (76.92%)</td>
<td>73 (12.76%)</td>
<td>59 (10.31%)</td>
<td></td>
</tr>
<tr>
<td>Would you like to choose Forensic Medicine as a carrier option?</td>
<td>42 (7.34%)</td>
<td>413 (72.20%)</td>
<td>117 (20.45%)</td>
<td></td>
</tr>
</tbody>
</table>

In this study, 549 out of 572 (95.97%) participants were of opinion that Forensic Medicine is important subject as a part of medical curriculum and 97.55% think that autopsy is important and necessary. However, only 42 out of 572 (7.34%) would like to opt Forensic Medicine as a career option.

Reason for not specializing in this subject were also analyzed and responses obtained were tabulated as follows.

Table 4: Reasons for not specializing in Forensic Medicine.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Male Out of 260 (%)</th>
<th>Female Out of 312 (%)</th>
<th>Total Out of 572 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deals with dead bodies</td>
<td>32 (12.3%)</td>
<td>45 (14.42%)</td>
<td>77 (13.46%)</td>
</tr>
<tr>
<td>Stressful job</td>
<td>63 (24.23%)</td>
<td>66 (21.15%)</td>
<td>129 (22.55%)</td>
</tr>
<tr>
<td>Not lucrative</td>
<td>14 (5.38%)</td>
<td>15 (4.80%)</td>
<td>29 (5.06%)</td>
</tr>
<tr>
<td>Not feminine</td>
<td>00 (00%)</td>
<td>48 (15.38%)</td>
<td>48 (8.39%)</td>
</tr>
<tr>
<td>Subject not relevant</td>
<td>09 (3.46%)</td>
<td>10 (3.20%)</td>
<td>19 (3.32%)</td>
</tr>
<tr>
<td>Social Stigma</td>
<td>14 (5.38%)</td>
<td>19 (6.08%)</td>
<td>33 (5.76%)</td>
</tr>
<tr>
<td>Causes difficulty at the time of marriage</td>
<td>12 (4.61%)</td>
<td>20 (6.41%)</td>
<td>32 (5.59%)</td>
</tr>
<tr>
<td>Not Interested</td>
<td>55 (21.15%)</td>
<td>75 (24.03%)</td>
<td>130 (22.72%)</td>
</tr>
<tr>
<td>Any other reason</td>
<td>53 (20.38%)</td>
<td>36 (11.53%)</td>
<td>89 (15.55%)</td>
</tr>
</tbody>
</table>
Apart from these reasons seven participants stated corruption in government autopsy centre, political and social pressure, frequent visit to courts related to medico legal cases, threatening from accused are main reasons for not opting this subject as a career option.

**DISCUSSION**

In present study, attempt has been made to find out the attitude of Indian medical students towards Forensic Medicine as subject and as a career option. Their attitude towards post mortem examination and medico legal work and knowledge regarding clinical forensic medicine was assessed. This is first study of its own kind conducted amongst medical students from various medical colleges situated in different part of widely spread country.

95.97% participants in study agreed that forensic medicine is important subject and 76.92% student feel that there should be compulsory rotatory clinical posting to observe medico legal work which shows positive attitude towards the subject. There is no statistical difference in the view of male and female participants possibly because they all had similar educational background.

Value of postmortem examination is appreciated by almost all the students and 93.53% students agreed that medical student should watch autopsies. Similar findings were also observed by Gulfreen Waheed et al (2011) in a study conducted amongst Pakistani medical students and by Victor James Ekanem et al (2005) in Nigeria.

It has been found from previous studies that value of medico legal autopsy is large in undergraduate teaching but its importance is diminished and medical students in some institute passed second MBBS exam without even entering in mortuary. Insufficient hospital autopsies, lack of competent expert staff, lack of infrastructure, poorly designed mortuaries with inadequate viewing and listening facilities are some of factors responsible for this decline.

As per guideline of MCI, broad goal of teaching of Forensic Medicine in our country is to produce a physician who is well informed about the medico-legal responsibilities in the practice of medicine. Medical student should watch at least ten medico legal autopsies, each one made a positive and lasting impression and facilitate learning Forensic medicine in general.

In present study 81.18% student watched less than 5 autopsies, 10.83% watched between 5 to 10 and only 8.04% watched more than 10 autopsies. 65.55% students said that number of autopsies they observed was not enough and 55.76% students agreed that there should be active participation of students in performing autopsies. Similar opinion was given by Nigerian students in the study conducted by Victor Ekanem et al (2005). 48.82% of students responded positively to the question that they would like autopsy to be performed on near and dear once, if required and 34.26% participant gave negative answer. Almost similar answers are given in a study conducted by Verma SK (1999) amongst medical students in Delhi where 53% responded positively.

Most of participants are of view that autopsy cannot be learnt by reading books alone. 68% students in present study gave negative reply for watching video instead of watching live autopsy. Most of student gave importance for watching live autopsy. 88.98% student said that books are not sufficient to understand subject and practical aspects should be taught along with theory. The exposure of student to medic legal work i.e both clinical forensic medicine work and medico legal autopsies is very important since those who are not exposed will not be able to execute properly in subsequent years of their practice.

In present study, only 42 (7.32%) students would like to opt this subject as a career option while 413 (72.20) and 117 (20.45%) said no and can’t say respectively. As most of participants are undergraduate, students comment on taking Forensic Medicine as a career in later stage has been ignored being premature at this stage.

**CONCLUSION AND SUGGESTIONS**

There is still scarcity of Forensic experts in India. Lack of recognized postgraduate seats in the subject, lack of faculty and facilities in medical colleges, lack of interest of medical students in subject, political and social pressure, lack of incentives and social stigma are some of the important reasons for not opting this subject as a career option. Moreover, reduction in number of faculties in subject will have long term effect on level of undergraduate teaching and future shortage of postgraduate students will affect entire medico legal work.
Some of the suggestions for improving the standard of this very important subject are

1) The fraternity in the Forensic Medicine needs to develop sincerity and interest towards the subject.

2) Upgradation and upliftment of department is important aspect as most of the departments in country are not recognized by Medical Council of India.

3) In all medical institutes, it should be made mandatory to handle all sorts of medico legal work by Forensic department. Then only requirement of faculty will be increased.

4) Forensic teachers must give emphasis on teaching practical aspects of medico legal cases rather than only teaching theory.

5) Functional clinical forensic medicine unit and functional mortuary should be made mandatory by MCI before giving recognition to medical colleges.

6) Teaching hours for subjects should be increased with compulsory clinical posting for observing medico legal cases for undergraduate students.

7) Internship for at least one month should be made compulsory in Forensic Medicine.

8) Provision of bedside practical examination related to medico legal work for undergraduate student should be made compulsory.

9) Postgraduate student should be trained meticulously in all the branches of Forensic Medicine.

10) Police surgeon like post should be created in all the district head quarters and all medico legal work should be handled by Forensic experts only.

11) There should be compulsory provision of incentives for doctors handling medico legal cases like in the state Karnataka.

12) Provision should be made for development of regional medico legal centres and centres at each district for training of doctors related to medico legal work.

13) In private and corporate hospitals, there should be provision of post of medico legal expert like hospital administrator who can handle all medico legal work.

There is urgent need to take effective measures by various academies of subject, MCI and government and nongovernment organization to make this subject more lucrative.

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Conflict of Interest: Nil

Source of Funding: Nil

Permission: Institutional Ethical committee, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

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Estimation of Humeral Length from its Proximal and Distal Fragments in South Indian Population

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¹Assistant Professor, ²Associate Professor, ³Professor, Dept of Anatomy, Sri Siddhartha Medical College, Tumkur, Karnataka

ABSTRACT

The objective of the present study was to formulate reconstruction of total length of the humerus from its proximal and distal segments in South Indian population. For this purpose 200 (100 right and 100 left) adult fully ossified dry processed humeri were studied. The humeri were measured using the standard anthropometric techniques for total length, 7 proximal and 5 distal fragments (P1-P7 and D1-D5). The length of each fragment was compared with the total length of humerus. These were subjected to relevant statistical analysis for formulating means of bone length reconstruction. A high degree of correlation was found between length of each fragment and total length except for P5 in right humeri. Analysis of data reveals significant bilateral differences of 4 proximal (P1, P5, P6, P7) and 2 distal (D2, D5) measurements.

Keywords: Humeral Length, Proximal Fragments, Distal Fragments, Correlation, Regression Equation

INTRODUCTION

In a vast and thickly populated country like India, establishment of a deceased person assumes great medico legal importance. Anatomists and forensic experts have been consulted frequently regarding identification of skeletal remains found under suspicious circumstances and are asked to pronounce an opinion which may form an important evidence in the court of law.¹

Bones especially long ones played an important role right from the onset of medical revolution, in understanding the physiological, racial and ethnographic affinities besides providing the major forensic experts with the anatomical and compositional data. ²

Bone fragments, often with ends destroyed, are brought for forensic case works. In both Archeological and forensic practice, fragments of long bones [because of injury, mutilation, destruction, or postmortem gnawing by wild animals] are often presented as the only available source to establish identity.³

Such broken bones could not attract the attention of investigating official at the initial stage but subsequently scientists developed technique to use the broken fragments of the bones to reconstruct respective bone length, which could eventually be used to reconstruct the stature.⁴

Few studies have presented regression equations for stature estimation from fragments of the humerus. Because these equations are population specific, it was the aim of this study to derive regression equations for estimation of maximum length of humerus from measurements of its proximal and distal fragments.

This will help to solve medico legal problems giving due consideration to regional factors.

MATERIAL AND METHOD

Data for the present study comprises of 200 humeri (100 right and 100 left) of South Indian origin. Information about sex was not available considering that material belongs to the didactic collection of Anatomy department of Sri Siddhartha Medical College, Tumkur, Karnataka.
For the measurements of the humeral length, an osteometrical board was used. The measurements of proximal and distal fragments were made by means of sliding calipers. Each measurement was made thrice by the same examiner and the mean value was considered.

Humeral length (MHL) was measured as vertical distance from tip of humeral head to the horizontal line passing through apex of trochlea.

Seven proximal (P) and five distal (D) fragments considered in the study were measured as followed,

P1 – distance between the highest point on greater trochanter and lowest point on the articular margin of the head.

P2 – distance between greater trochanter and lesser trochanter.

P3 – distance between head and greater trochanter.

P4 – distance from anterior to posterior margin of greater trochanter.

P5 - distance from medial to lateral margin of lesser trochanter.

P6 – distance between the highest and lowest point on the articular margin of the head taken at right angle to the transverse diameter.

P7 - transverse diameter of the head.

D1 - distance between most medial point on medial condyle and most lateral point on lateral condyle.

D2 - distance between medial margin of trochlea and lateral margin of capitulum.

D3 - measurement of trochlea.

D4 - distance between medial margin of trochlea and lateral point on lateral condyle.

D5 – distance between lower margin of olecranon fossa and lower margin of trochlea.

Data was subjected to relevant statistical analysis to formulate regression equations to reconstruct humeral length from proximal and distal fragments.

RESULTS

Table 1 shows mean values of maximum length of the humerus (MHL), proximal and distal fragments (right and left sides). Statistical test for analysis of differences between right and left sides was accomplished.

It is apparent from table 1 that right humeri have greater dimensions than the left ones for all measurements except for D5 where the values are similar bilaterally. But bilateral differences were significant for 4 proximal (P1, P5, P6, P7) and 2 distal (D2, D5) measurements at p<0.005 level of significance.

Table 2 and 3 presents Karl Pearson co-efficient which ranges between 0.588 and 0.261 for right side and 0.708 and 0.285 for left side. The relationship of these fragmentary measurements with maximum humeral length is variable for both the sides for example P6 exhibits sufficiently high correlation for left side (0.649) as against right side (0.445).

Table 4 presents regression equations when individual fragments are available.

<table>
<thead>
<tr>
<th>Humerus</th>
<th>Right</th>
<th></th>
<th>Left</th>
<th></th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>MHL</td>
<td>31.25</td>
<td>1.88</td>
<td>30.31</td>
<td>2.04</td>
<td>0.001</td>
</tr>
<tr>
<td>P1</td>
<td>4.15</td>
<td>0.34</td>
<td>4.08</td>
<td>0.37</td>
<td>0.74</td>
</tr>
<tr>
<td>P2</td>
<td>3.93</td>
<td>0.32</td>
<td>3.72</td>
<td>0.38</td>
<td>0.001</td>
</tr>
<tr>
<td>P3</td>
<td>4.48</td>
<td>0.33</td>
<td>4.31</td>
<td>0.37</td>
<td>0.001</td>
</tr>
<tr>
<td>P4</td>
<td>2.90</td>
<td>0.29</td>
<td>2.73</td>
<td>0.34</td>
<td>0.001</td>
</tr>
<tr>
<td>P5</td>
<td>1.51</td>
<td>0.22</td>
<td>1.43</td>
<td>0.24</td>
<td>0.05</td>
</tr>
<tr>
<td>P6</td>
<td>4.14</td>
<td>0.38</td>
<td>4.08</td>
<td>0.39</td>
<td>0.18</td>
</tr>
<tr>
<td>P7</td>
<td>3.86</td>
<td>0.30</td>
<td>3.78</td>
<td>0.36</td>
<td>0.10</td>
</tr>
<tr>
<td>D1</td>
<td>5.70</td>
<td>0.44</td>
<td>5.52</td>
<td>0.53</td>
<td>0.001</td>
</tr>
<tr>
<td>D2</td>
<td>4.04</td>
<td>0.33</td>
<td>3.97</td>
<td>0.39</td>
<td>0.26</td>
</tr>
<tr>
<td>D3</td>
<td>2.11</td>
<td>0.22</td>
<td>1.91</td>
<td>0.25</td>
<td>0.001</td>
</tr>
<tr>
<td>D4</td>
<td>5.33</td>
<td>0.56</td>
<td>4.54</td>
<td>0.38</td>
<td>0.001</td>
</tr>
<tr>
<td>D5</td>
<td>1.52</td>
<td>0.21</td>
<td>1.52</td>
<td>0.24</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Table 2. Karl Pearson co-efficient and p value in the correlation between maximum length and proximal and distal fragments of right humeri.

<table>
<thead>
<tr>
<th>Humerus Rt</th>
<th>Characteristics</th>
<th>Karl Pearson’s co-efficient</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MHL-P1</td>
<td>0.479238</td>
<td>0.001</td>
</tr>
<tr>
<td>2</td>
<td>MHL-P2</td>
<td>0.553066</td>
<td>0.001</td>
</tr>
<tr>
<td>3</td>
<td>MHL-P3</td>
<td>0.588293</td>
<td>0.001</td>
</tr>
<tr>
<td>4</td>
<td>MHL-P4</td>
<td>0.554769</td>
<td>0.001</td>
</tr>
<tr>
<td>5</td>
<td>MHL-P5</td>
<td>0.261462</td>
<td>0.008</td>
</tr>
<tr>
<td>6</td>
<td>MHL-P6</td>
<td>0.445318</td>
<td>0.001</td>
</tr>
<tr>
<td>7</td>
<td>MHL-P7</td>
<td>0.559484</td>
<td>0.001</td>
</tr>
<tr>
<td>8</td>
<td>MHL-D1</td>
<td>0.518089</td>
<td>0.001</td>
</tr>
<tr>
<td>9</td>
<td>MHL-D2</td>
<td>0.582675</td>
<td>0.001</td>
</tr>
<tr>
<td>10</td>
<td>MHL-D3</td>
<td>0.38637</td>
<td>0.001</td>
</tr>
<tr>
<td>11</td>
<td>MHL-D4</td>
<td>0.470769</td>
<td>0.001</td>
</tr>
<tr>
<td>12</td>
<td>MHL-D5</td>
<td>0.287091</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Table 3. Karl Pearson co-efficient and p value in the correlation between maximum length and proximal and distal fragments of left humeri.

<table>
<thead>
<tr>
<th>Humerus Lt</th>
<th>Characteristics</th>
<th>Karl Pearson’s co-efficient</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MHL-P1</td>
<td>0.708012</td>
<td>0.001</td>
</tr>
<tr>
<td>2</td>
<td>MHL-P2</td>
<td>0.578104</td>
<td>0.001</td>
</tr>
<tr>
<td>3</td>
<td>MHL-P3</td>
<td>0.630382</td>
<td>0.001</td>
</tr>
<tr>
<td>4</td>
<td>MHL-P4</td>
<td>0.438065</td>
<td>0.001</td>
</tr>
<tr>
<td>5</td>
<td>MHL-P5</td>
<td>0.297396</td>
<td>0.002</td>
</tr>
<tr>
<td>6</td>
<td>MHL-P6</td>
<td>0.648891</td>
<td>0.001</td>
</tr>
<tr>
<td>7</td>
<td>MHL-P7</td>
<td>0.670215</td>
<td>0.001</td>
</tr>
<tr>
<td>8</td>
<td>MHL-D1</td>
<td>0.710146</td>
<td>0.001</td>
</tr>
<tr>
<td>9</td>
<td>MHL-D2</td>
<td>0.583662</td>
<td>0.001</td>
</tr>
<tr>
<td>10</td>
<td>MHL-D3</td>
<td>0.284701</td>
<td>0.004</td>
</tr>
<tr>
<td>11</td>
<td>MHL-D4</td>
<td>0.636607</td>
<td>0.001</td>
</tr>
<tr>
<td>12</td>
<td>MHL-D5</td>
<td>0.344996</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 4. Regression Equations for reconstruction of humeral length

<table>
<thead>
<tr>
<th>Right Humerus</th>
<th>Left Humerus</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHL = 20.35 + 2.62 P1 ± 2.02</td>
<td>MHL = 14.45 + 3.88 P1 ± 1.60</td>
</tr>
<tr>
<td>MHL = 18.29 + 3.29 P2 ± 1.97</td>
<td>MHL = 18.84 + 3.07 P2 ± 1.64</td>
</tr>
<tr>
<td>MHL = 16.27 + 3.34 P3 ± 2.08</td>
<td>MHL = 15.22 + 3.5 P3 ± 1.88</td>
</tr>
<tr>
<td>MHL = 20.72 + 3.62 P4 ± 1.60</td>
<td>MHL = 23.12 + 2.63 P4 ± 1.50</td>
</tr>
<tr>
<td>MHL = 27.90 + 2.22 P5 ± 1.26</td>
<td>MHL = 26.75 + 2.49 P5 ± 1.17</td>
</tr>
<tr>
<td>MHL = 22.22 + 2.18 P6 ± 1.84</td>
<td>MHL = 16.36 + 3.41 P6 ± 1.65</td>
</tr>
<tr>
<td>MHL = 18.29 + 3.35 P7 ± 2.04</td>
<td>MHL = 15.76 + 3.85 P7 ± 1.63</td>
</tr>
<tr>
<td>MHL = 18.51 + 2.23 D1 ± 2.13</td>
<td>MHL = 15.67 + 2.65 D1 ± 1.48</td>
</tr>
<tr>
<td>MHL = 17.93 + 3.32 D2 ± 1.88</td>
<td>MHL = 18.23 + 3.04 D2 ± 1.70</td>
</tr>
<tr>
<td>MHL = 24.29 + 3.29 D3 ± 1.68</td>
<td>MHL = 25.94 + 2.28 D3 ± 1.49</td>
</tr>
<tr>
<td>MHL = 23.06 + 1.54 D4 ± 1.57</td>
<td>MHL = 15.26 + 3.32 D4 ± 1.86</td>
</tr>
<tr>
<td>MHL = 27.34 + 2.57 D5 ± 1.33</td>
<td>MHL = 25.79 + 2.96 D5 ± 1.25</td>
</tr>
</tbody>
</table>
DISCUSSION

One of the information required for the identification is the height of the individual. For that the length of long bones is taken into consideration to assess the height of individual. The long bones thus obtained may not be intact. If segments of long bones are obtained then it is required to assess the length of the bone by that fragment and calculate the height of the individual. Therefore the present study deals with the assessment of the ratio between various segments of the bone with the length of that bone. Once the length of the bone is obtained, the height of the individual can be calculated using various standard regression formulae.

Regression analysis is a more appropriate method to define relationships between length of measurements of long bone fragments and their maximum length.

Data have shown that estimation of living height of individuals could be influenced by ethnicity. Systematic use of regression formulae obtained in a specific population can under or over estimate stature, when applied in another population. Thus authors have recommended that regression formulae obtained in a certain population should not be applied to the other.

It has been shown that in forensic and archaeological studies, the mean value of total humerus length gives an important evidence to indicate the characteristic features of a population as a whole. In our study, we obtained the mean values of the maximum humerus length (HL) of the adult humerus in South Indian population, on both sides. They were found to be 31.25 & 30.31 cm on the right and left side respectively. Our values were comparable to study by Somesh et al on Indian population (MHL = 309.6 + 20.6 & 299.6 + 22.5 mm on the right and left side respectively).

To estimate maximum length of long bones from fragmentary remains, it is important that accurately recognizable landmarks be used. As a result, the measures used to develop regressions formulae for estimation of long bones length are restricted. In general, measures of transversal dimensions along the diaphyses are not appropriate because difficulties to define precise landmarks. Therefore, the only remaining locations suitable for measurements on fragmentary remains are the proximal or distal epiphyses. For this reason, both proximal and distal segments of humeri were selected in the present study.


The approach followed in the present study is different from above mentioned studies. The method incorporated by us was similar to that of Salles A D et al who conducted study on 40 humeri. Compared to it the sample size used in present study (280) was better for establishing a relationship between humeral length and its fragments. A high degree of correlation was found between length of each fragment and total length except for P5 in right humeri. Analysis of data reveals significant bilateral differences of 4 proximal (P1, P5, P6, P7) and 2 distal (D2, D5) measurements.

CONCLUSION

Regression equations were derived for estimation of maximum humeral length from measurements of proximal and distal fragments of the humerus among South Indian population. All the fragmentary measurements in our study showed positive correlations with the humeral length. Therefore the maximum humeral length can be estimated from fragmentary remains of the humerus. In the absence of intact long bones, equations presented in this study can offer a reasonable estimate of maximum humeral length from which the stature can be estimated in sex and population sample.

Acknowledgement: Nil

Ethical Clearance: Taken from Institutional Ethical Committee.

Source of Funding: Self

Conflict of Interest: Nil
REFERENCES


INTRODUCTION

Rise in crime in any place is a worrying factor for everyone and especially crime against women (CAW), children and weaker sections of the society. It leaves deep scars in the society; therefore we need to study the causes, patterns and nature of crimes affecting the human being to find out the reasons of such crimes.\(^1\)

In common parlance, sexual offence constitutes the most shocking crime against conscience and morality. The sufferings of a girl abducted, molested or raped far exceed than that of the man committing it. It is the depraved passion and uncontrolled sex urges seeking gratification through force or fraud against the natural law of mating by mutual consent and as per accepted legal and social principles, that constitutes the root cause of almost every sexual offences.\(^2\)

The rape and murder of two teenaged sisters in Budaun and a minor in Bangalore; rape at gunpoint in Mumbai; an attempt to rape a judge in Aligarh; molestation followed by murder of an women in front of her children in Meghalaya are the rising incidents of crime against women have caused outrage not just in India, but across the world.\(^3\)

The various crimes against women under the Indian Penal Code (IPC) are rape (Sec. 376 IPC); kidnapping and abduction for specified purposes (Sec. 363-373 IPC); homicide for dowry, dowry deaths or their attempts (Sec. 302/304-B IPC); torture both mental and physical (Sec. 498-A IPC); assault on women with intent to outrage her modesty (Sec. 354 IPC); insult to the modesty of women (Sec. 509 IPC) and importation of girl from foreign country up to 21 years of age (Sec. 366-B IPC).

The WHO, in its research on Violence against Women (VAW), categorized it as occurring through five stages of the life cycle: “1) pre-birth, 2) infancy, 3) girlhood, 4) adolescence and adulthood and 5) elderly”.\(^4\)

Although, all laws are not gender specific, the provisions of law affecting women significantly have been reviewed periodically and amendments are carried out to keep pace with the emerging
requirements. The gender specific laws for which crime statistics are covered throughout the country are known as the crimes under the special and local laws (SLL) and they are: Immoral Traffic (Prevention) Act 1956, Dowry Prohibition Act, 1961, Indecent Representation of Women (Prohibition) Act, 1986 and Commission of Sati Prevention Act, 1987.

Although women may be the victims of any of the general crimes such as ‘murder’, ‘cheating’, etc., only the crimes that are directed specially against women are call crimes against women. Violence against women and girls is a problem of pandemic proportions. At least one out of every three women around the world has been beaten, forced into sex, or otherwise abused in her lifetime with the abuser usually someone known to her.5

In this paper ground realities in India are analyzed and important conclusions are sketched for a proactive medico legal approach.

**MATERIAL AND METHOD**

Different data has been collected from books, journals, newspapers, NCRB (National Crime Records Bureau) and CID, police station, etc., for the period mainly from 2008 to 2012. The data thus collected were compared and important conclusions were drawn for analyzing ground realities in India.

**DISCUSSION**

**Reported Incidents Of Crime Committed Against Women**

A total of 2,44,270 incidents of crime against women (both under IPC and SLL) were reported in the country during the year 2012 as compared to 2,28,650 in the year 2011 recording an increase of 6.4% during the year 2012. These crimes have continuously increased during 2008 to 2012 with 1,95,857 cases in the year 2008, 2,03,804 cases in 2009 and 2,13,585 cases in 2010 (Table 1).

<table>
<thead>
<tr>
<th>Year</th>
<th>Crime registered</th>
<th>Incidence of CAW</th>
<th>Percentage of CAW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2093379</td>
<td>195857</td>
<td>9.36</td>
</tr>
<tr>
<td>2009</td>
<td>2121345</td>
<td>203804</td>
<td>9.61</td>
</tr>
<tr>
<td>2010</td>
<td>2224831</td>
<td>213585</td>
<td>9.60</td>
</tr>
<tr>
<td>2011</td>
<td>2325575</td>
<td>228650</td>
<td>9.83</td>
</tr>
<tr>
<td>2012</td>
<td>2387188</td>
<td>244270</td>
<td>10.23</td>
</tr>
</tbody>
</table>

**CRIME RATE**

The rate of crime committed against women is shown in Table 2.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Incidence of CAW</th>
<th>Female population in lakhs</th>
<th>Rate of cognizable CAW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>228650</td>
<td>1210193</td>
<td>18.9</td>
</tr>
<tr>
<td>2012</td>
<td>244270</td>
<td>5851.89</td>
<td>41.74</td>
</tr>
</tbody>
</table>

Assam has reported the highest rate of CAW at 89.5 during the year 2012 as compared to 41.7, crime rate at the national level.

**TREND ANALYSIS OF CAW**

The details of trend of crime against women from 2008 to 2012 with percentage of variation are shown in Table 3.

<table>
<thead>
<tr>
<th>Crime Head</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Rape (Sec. 376 IPC)</td>
<td>21,467</td>
</tr>
<tr>
<td>Kidnapping &amp; abduction (Sec. 363 to 373 IPC)</td>
<td>22,939</td>
</tr>
<tr>
<td>Dowry death (Sec. 302/304 IPC)</td>
<td>8,172</td>
</tr>
</tbody>
</table>
Table 3: Crime head-wise incidents from 2008-2012 and % of variation^5(Contd.)

<table>
<thead>
<tr>
<th>Crime Head</th>
<th>Year</th>
<th>% Variation in 2012 over 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Cruelty by husband and relatives (Sec. 498-A IPC)</td>
<td>81,344</td>
<td>89,546</td>
</tr>
<tr>
<td>Assault on women with intent to outrage her modesty (Sec. 354 IPC)</td>
<td>40,413</td>
<td>38,711</td>
</tr>
<tr>
<td>Insult to the modesty of women (Sec. 509 IPC)</td>
<td>12,214</td>
<td>11,009</td>
</tr>
<tr>
<td>Importation of girl from foreign country (Sec. 366-B IPC)</td>
<td>67</td>
<td>48</td>
</tr>
<tr>
<td>Total IPC crime against women</td>
<td>186,616</td>
<td>194,835</td>
</tr>
<tr>
<td>Commission of Sati Prevention Act, 1987</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Immoral Traffic (Prevention) Act, 1956</td>
<td>2,659</td>
<td>2,474</td>
</tr>
<tr>
<td>Indecent Representation of Women (Prohibition) Act, 1986</td>
<td>1,025</td>
<td>845</td>
</tr>
<tr>
<td>Dowry Prohibition Act, 1961</td>
<td>5,555</td>
<td>5,650</td>
</tr>
<tr>
<td>Total SLL crime against women</td>
<td>9,240</td>
<td>8,969</td>
</tr>
<tr>
<td>Total (A+B)</td>
<td>195,856</td>
<td>203,804</td>
</tr>
</tbody>
</table>

The CAW during the year 2012 has increased by 6.8% over the year 2011 and by 24.7% over the year 2008. The IPC component of CAW has accounted for 95.2% of total crimes and the rest 4.8% were SLL crimes against women.

The proportion of IPC crimes committed against women towards total IPC crimes has increased during last 5 years from 8.9% in the year 2008 to 10.2% during the year 2012 (Table 4).

Table 4: Proportion of IPC of CAW towards total IPC crimes

<table>
<thead>
<tr>
<th>Year</th>
<th>Total IPC crimes</th>
<th>CAW (IPC cases)</th>
<th>% of total IPC crimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>20,93,379</td>
<td>1,86,617</td>
<td>8.9</td>
</tr>
<tr>
<td>2009</td>
<td>21,21,345</td>
<td>2,03,804</td>
<td>9.2</td>
</tr>
<tr>
<td>2010</td>
<td>22,24,831</td>
<td>2,13,585</td>
<td>9.6</td>
</tr>
<tr>
<td>2011</td>
<td>23,25,575</td>
<td>2,19,142</td>
<td>9.4</td>
</tr>
<tr>
<td>2012</td>
<td>23,87,188</td>
<td>2,44,270</td>
<td>10.2</td>
</tr>
</tbody>
</table>

CRIME HEAD-WISE ANALYSIS

Rape (Sec. 376 IPC): A decreasing trend in rape cases during the year 2003, 2008 to 2009 with an increasing trend of it has been observed from 2009 to 2012 (Table 5).

Table 5: Incidence of CAW during Last 12 Years

<table>
<thead>
<tr>
<th>Year</th>
<th>CAW</th>
<th>Incidence of rape (Sec. 376 IPC) cases</th>
<th>% of rape cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>143795</td>
<td>16075</td>
<td>11.18</td>
</tr>
<tr>
<td>2002</td>
<td>143034</td>
<td>16373</td>
<td>11.44</td>
</tr>
<tr>
<td>2003</td>
<td>140601</td>
<td>15847</td>
<td>11.27</td>
</tr>
<tr>
<td>2004</td>
<td>154333</td>
<td>18233</td>
<td>11.81</td>
</tr>
<tr>
<td>2005</td>
<td>155553</td>
<td>18359</td>
<td>11.80</td>
</tr>
<tr>
<td>2006</td>
<td>164765</td>
<td>19348</td>
<td>11.74</td>
</tr>
<tr>
<td>2007</td>
<td>185312</td>
<td>20737</td>
<td>11.19</td>
</tr>
</tbody>
</table>
Table 5: Incidence of CAW during Last 12 Years (Contd.)

<table>
<thead>
<tr>
<th>Year</th>
<th>CAW</th>
<th>Incidence of rape (Sec. 376 IPC) cases</th>
<th>% of rape cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>195857</td>
<td>21467</td>
<td>10.96</td>
</tr>
<tr>
<td>2009</td>
<td>203804</td>
<td>21397</td>
<td>10.49</td>
</tr>
<tr>
<td>2010</td>
<td>213585</td>
<td>22172</td>
<td>10.38</td>
</tr>
<tr>
<td>2011</td>
<td>228650</td>
<td>24206</td>
<td>10.58</td>
</tr>
<tr>
<td>2012</td>
<td>244270</td>
<td>24923</td>
<td>10.20</td>
</tr>
</tbody>
</table>

Madhya Pradesh has reported highest number of rape cases (3,425) accounting for 13.7% of total such cases reported in the country. Mizoram has reported the highest crime rate of 20.8 as compared to national average of 4.3. Rape cases have been further categorized as incest rape and other rape cases.

**Incest Rape:** Incest rape cases have increased by 46.8% from 267 cases in 2011 to 392 cases in 2012 as compared to 3.0% increase in overall rape cases. Maharashtra (77 cases) has accounted for the highest (19.6%) of the total such cases reported in the country.5

**Rape Victims:** Amid empty talk of ‘empowerment of women’ rapes have become a routine affair with girl-children or teenagers being regularly targeted in every city, town or rural area. It is as if wolves have been set on the second-sex feticide to outright killing.7

There were 24,915 victims of rape out of 24,923 reported rape cases in the country during the year 2012. 12.5% (3,125) of the total victims of rape were girl under 14 years of age, while 23.9% (5,957 victims) were teenage girl (14-18 years). 50.2% (12,511 victims) were women in the age group 18-30 years. However, 12.8% (3,187 victims) were in the age group of 30-50 years while 0.05% (135 victims) was over 50 years of age (Table 6).5

Table 6: Incidence of rape cases (Sec. 376 IPC) during last 12 years

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases under IPC</th>
<th>Rape cases</th>
<th>% of rape cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1769308</td>
<td>16075</td>
<td>0.91</td>
</tr>
<tr>
<td>2002</td>
<td>1780390</td>
<td>16373</td>
<td>0.92</td>
</tr>
<tr>
<td>2003</td>
<td>1716120</td>
<td>15847</td>
<td>0.92</td>
</tr>
<tr>
<td>2004</td>
<td>1832015</td>
<td>18233</td>
<td>0.99</td>
</tr>
<tr>
<td>2005</td>
<td>1822602</td>
<td>18359</td>
<td>1</td>
</tr>
<tr>
<td>2006</td>
<td>1878293</td>
<td>19348</td>
<td>1.73</td>
</tr>
<tr>
<td>2007</td>
<td>1989673</td>
<td>20737</td>
<td>1.04</td>
</tr>
<tr>
<td>2008</td>
<td>2093357</td>
<td>21467</td>
<td>1.02</td>
</tr>
<tr>
<td>2009</td>
<td>2121345</td>
<td>21397</td>
<td>1.01</td>
</tr>
<tr>
<td>2010</td>
<td>2224831</td>
<td>22172</td>
<td>0.99</td>
</tr>
<tr>
<td>2011</td>
<td>2325575</td>
<td>24206</td>
<td>1.04</td>
</tr>
<tr>
<td>2012</td>
<td>2387188</td>
<td>24923</td>
<td>1.04</td>
</tr>
</tbody>
</table>

**Offenders:** The various data also tell us that the victims in as knew the offenders as many as in 24,470 (98.2%) cases. Parents/close family members were involved in 1.6% (393 out of 24,470), neighbors in 34.7% (8,484 out of 24,470) and relatives in 6.5% (1,585 out of 24,470) cases.

Kidnapping and Abduction (Sec. 363-373 IPC): These cases have reported an increase of 7.6% during the year 2012 as compared to previous year. Uttar Pradesh with 7,910 cases has accounted for 22.2% of the total cases at the national level. Delhi reported the highest crime rate at 25.3 as compared to the national average of 6.5.7 Who is doing the same in our country which was recently bracketed by the United Nations as the top two nations recording majority of “117 million is missing girls” in Asia?

**Dowry Deaths (Sec. 302, 304B IPC):** There are lakhs of instances where rich parents of daughters have paid
cores of rupees succumbing to the 'black mail' of in-laws or that of the husband but did not have the courage to bring their daughters back home. The end result in a majority of such cases is no secret daughters are done to death by in laws lusting for more money.7

The cases of dowry deaths have decreased by 4.5% during the year 2012 over the previous year (8,618 cases). 27.3% (2,244) of the total such cases reported from Uttar Pradesh alone followed by Bihar for 15.5% (1,275) cases. The highest rate of crime (2.7) was reported from Bihar as compared to the national average of 1.4.

Torture (Cruelty by husband or his relatives) (Sec. 498-A IPC): Torture cases in the country have increased by 7.5% during the year 2012 over the previous year (99,135 cases). 18.7% of these cases were reported from West Bengal (19,865) followed by Andhra Pradesh for 12.6% (13,389) and Rajasthan for 12.5% (13,312). The highest crime rate of 47.8 was reported from Tripura as compared to the national rate at 18.2.

Assault on Women with intent to Outrage her Modesty (Sec. 354 IPC): If on the one hand it is uninterrupted 'honour killing' against girls seeking to assert their independence in their personal lives, on the other it is the wanton outrage of modesty with no counter-action from the state or the society at large.7

Incidence of assault on women with intends to outrage her modesty in the country have increased by 5.5% during the year 2012 over the previous year (42,968). Madhya Pradesh has reported the highest incidence (6,655) amounting to 14.7% of total such incidences. Kerala has reported the highest crime rate (20.9) as compared to the National average of 7.7.

Insult to the Modesty of Women (Sec. 509 IPC): The number of such cases has increased by 7% during the year 2012 over the previous year (8,570). Andhra Pradesh has reported 40.5% (3,714) followed by Maharashtra 14.1% (1,294) of total incidents during the year 2012. Andhra Pradesh has reported the highest crime rate (8.7) as compared to the national average of 1.6.

Importation of Girl from Foreign Country (Sec. 366-B IPC): A decrease of 26.2% has been observed in crime head as 59 cases were reported during the year 2012 as compared to 80 cases in the previous year 2011. Karnataka stand for 32 cases heading top of the list, West Bengal for 12 cases have together contributed 93.2% of total such cases at the national level.

Immoral Traffic (Prevention Act, 1956): Cases under this Act have registered an increase of 5.2% during the year 2012 as compared to the previous year 2011 (2,435). The highest incidences of 19.5% (500) of such cases were reported from Tamil Nadu followed by Andhra Pradesh 18.4% (472). Goa has reported the highest crime rate of 4.6 as compared to the national average of 0.2.

Commission of Sati Prevention Act, 1987: No such case was registered under this crime head in across the country during the year 2012.

Indecent Representation of Women (Prohibition) Act, 1986: A decrease of 68.9% was noticed in this crime head during the year 2012 as compared to the previous year (453). Rajasthan with 62 cases has accounted for 44% of total such cases at the national level, which has also reported the highest crime rate of 0.2.5

Dowry Prohibition Act: The cases under this act have increased by 36.5% during the year 2012 as compared to the previous year (6,619). 27.8% of cases were reported from Andhra Pradesh (2,511) followed by Odisha (1,487) accounting for 16.5% of total cases at the national level. The highest crime rate of 7.3 was reported from Odisha as compared to 1.5 at the national level.5

Acid Throwing: Also called acid attack, or vitriolage.8 Women and girls are the victims in 75-80% of cases.9 Acid attacks are often connected to domestic disputes, including dowry disputes, and refusal of a proposition for marriage, or of sexual advances.

India passed a new law in February following the Delhi gang rape case which also criminalizes acid attacks. The law defines acid attack as a separate Indian Penal Code offence and proposes punishment of not less than 10 years to a maximum of life imprisonment for perpetrators and fine that could go up to Rs.10 lakhs. The Supreme Court on 18 July, 2013 passed the order to regulate the sale of acids across the country. The decision was taken in the light of a PIL which was filed in 2006 by Laxmi, an acid attack victim from Delhi.10

CONCLUSION

A steep decline in the quality of governance, proportionate rise in public inertia and self-centered attitude of the public has made matters worse for women, particularly from the Dalit segment which remains most vulnerable against muscle, money and
The cultural mindsets about women are to be changed amongst the common people of the society. Some rights-based law like “Protection of Women against Domestic Violence Act 2005”, the JAGORI’s vision, “Bringing feminist consciousness to a wider audience using creative media”, “men’s role in stopping discrimination against women at a personal level”, “increased involvement of men in parenting”, “increasing number of organizations of men against violence”, community-level initiatives to prevent violence: gender sensitization workshops with men and joint campaigns against violence against women are very much useful in combating those crimes.

Increase in women’s participation at all levels: social, economic and political; awareness of women’s rights by the State, civil society organizations, as well as the public at large is to be carried out to reduce the incident of these heinous crimes against women.

Acknowledgement: I am indebted to my wife Manmi Das Mahanta and to my kids Jacinth and Adriana for their help in various aspects.

Ethical Clearance: Taken

Source of Funding: Self

Conflict of Interest: Nil

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Case of Rupture of Gravid Uterus with Previous LSCS Scar

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ABSTRACT

Rupture of gravid uterus with its sequelae remains one of the most disastrous complications of pregnancy occurring invariably at or near term. Uterine rupture is an obstetric catastrophe that is associated with high rates of maternal and perinatal mortality1. In India it still accounts for 5-10% of all maternal deaths2. Besides the unscarred uterine rupture, the developing countries are now having increased incidence of scarred uterine rupture due to rising rate of caesarean section-a new problem to be addressed3. One such case of a pregnant woman was brought dead to casualty of Sri Aurobindo Medical College and PG Institute. Post Mortem Examination revealed that it was a case of rupture uterus with the history of previous LSCS 1 year back. Proper antenatal examination and care might have avoided the mishap.

Keywords: Rupture Uterus, Hemorrhage, LSCS

INTRODUCTION

The uterus is a hollow pyriform muscular organ situated in the pelvis between the bladder in front and the rectum from behind. Nongravid uterus measures about 8cm long, 5cm wide at the fundus and its walls are about 1.25cm thick. Its weight varies from 50-80gms. Rupture of gravid uterus is rare. It is obstetric emergency condition and carries high risk both to fetus and mother. Spontaneous rupture of uterus during pregnancy usually involves upper segment and generally occurs in later months of pregnancy. Rate of Caesarian delivery has increased from 4.5% in 1965 to 25% in 1998 & since then it has declined not only in USA but in several other countries4. 0.94% rupture uterus cases were found in cases following previous LSCS were found in a study by Devendra R. Chaudhari et.al. in Maharashtra5. Meta analysis of pooled data from 20 studies from 1976-2009 indicated an overall incidence of pregnancy related uterine rupture of 1 per 1,536 pregnancies (0.07%)6. Uterine rupture occurs in 1:200 to 1:3000 deliveries depending upon obstetric care and the population dealt with7.

CASE REPORT

A second gravida G2P2L1A0, 23 year female brought to SAIMS casualty with the history of labour pain on 28/11/13 and was declared brought dead and the dead body was shifted to mortuary for autopsy. Relatives gave the history of current pregnancy which was uncomplicated but previous delivery was one year back through LSCS.

External finding
1. Previous LSCS scar mark present over lower abdomen and Striae Gravidarum present over the abdomen.[Fig.1]
2. The whole body was pale which was suggestive of hemorrhage.[Fig.1]
3. Fetal parts were felt on palpation per abdomen.
4. Per vaginally fetal head was engaged.
5. Rigor Mortis was in developing phase and present over the face and the jaw.
6. PM lividity was present over back in patches and was not fixed.

Internal Findings on opening the body
1. All the organs were found pale.
2. Dead fetus was present outside the uterine cavity in abdomen and placenta was present in uterine cavity and was attached to its wall.
3. Uterus was ruptured and fetus was present in peritoneal cavity and the peritoneal cavity was filled with 2 liters of partly clotted blood. [Fig. 2]

4. Horizontal rupture was found on lower segment of uterus of length 12 cm, full thickness and margins were regular, going along old LSCS scar mark. [Fig. 3]

5. Fetus was full term male weighing 2200 gms.

   Cause of death was due to shock and hemorrhage as a result of uterine rupture.

DISCUSSION

There are so many causes of rupture of gravid uterus like blunt trauma on abdomen, penetrating wound on lower abdomen, previous damage due to Dilatation and Curettage or manual removal of placenta, grand multipara, congenital malformation of uterus, previous history of LSCS etc. Traumatic uterine rupture needs to be differentiated from non-traumatic rupture. Our case is a case of rupture of gravid uterus with previous LSCS scar. The deceased has conceived within one year of previous pregnancy which is a potential risk factor for uterine rupture. Sinha and Roy reported an incidence of 24.4% scar rupture, while Kulkarni and Kendre reported 56.12% scar rupture in their series on ruptured uterus in rural India. There are increasing number of cases of scar rupture due to an increasing trend of use of caesarean section in place of difficult vaginal delivery. As LSCS leaves a scar on the uterus, it is important to avoid pregnancy for at least one year by barrier or hormonal contraceptives. All patients with previous caesarean scars require proper monitoring, early hospitalization and elective caesarean section at term. As to the choice of surgery, conservation of uterus by re-suturing the rent should be attempted. However, in cases with severe hemorrhage and shock the emergency hysterectomy is advisable more specified, quick subtotal hysterectomy should be resorted.
CONCLUSION

Most cases of uterine rupture are preventable with good ante-natal and intra partum care and proper identification of high risk cases. High risk cases should have mandatory hospital delivery. Fatal outcomes in all the cases are either due to mishandling the cases or improper/incomplete treatment provided to the deceased.

Conflict of Interest: None to declare.

Source of Funding: No source of financial assistance was obtained from any individual or agency.

Acknowledgement: Nil.

Ethical Clearance: Identity of the deceased not revealed. (doesn’t require ethical clearance)

REFERENCES

An Evaluation and Modification of Known Method of Clinical Age Estimation Based on the Eruption Sequence of Teeth: Kusri's Triangle Revisited

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ABSTRACT

Background: Age estimation forms an integral part of the identification of missing people, be it among the living or the dead. The lack of accurate clinical methods of age estimation based on tooth eruption is an extensively documented fact.

Aim: The purpose of the study was to evaluate the accuracy of 1 such method, Kusri's Triangle method of dental age estimation in children and to adapt the scoring system if proven inaccurate.

Design: 50 children between the age group of 6-14 years were selected for the assessment of permanent tooth emergence respectively. Newer methods of age estimation (Triangle and Regression equations) were derived for use in an Indian population.

Results: The data was analyzed using Receiver Operating Characteristics (ROC) Curve and Intra Class Correlation Coefficient (ICCC). The results conducted in a validation sample of 30 children suggested greater accuracy using the new methods (0.897, 0.912 and 0.928) as compared to Kusri's Triangle method (0.761).

Conclusion: Such clinical methods of age estimation will be of paramount importance in a rural setup where the facility of panoramic radiography is unavailable.

Keywords: Age Estimation, Clinical Method, Eruption, Permanent Teeth, Regression Equations

INTRODUCTION

Forensic Odontology has grown considerably since its origin in the year 1898, and today, encompasses various fields of research ranging from the simple identification of rugae patterns to the complicated analysis of salivary DNA in bite mark evidence. In India however, the growth of Forensic Odontology has failed to keep pace with the global trend.

Age estimation is an important activity, commonly carried out in areas of medico legal research. In a developing country like India, a considerably large proportion of people are illiterate and lack knowledge or records of their date of birth which is required by law enforcing agencies in matters like, criminal responsibilities, identification, judicial punishment, consent, rape, criminal abortion, employment, attainment of majority, kidnapping and prostitution.

There are fundamentally two methods of dental age assessment, radiographic methods and clinical methods based on the emergence of teeth in the oral cavity. It is possible to follow the formation of crowns and roots of teeth and their calcification, using radiographic methods. However, obtaining a suitable panoramic radiograph in a mentally compromised or an emotionally immature child can be an ordeal in itself. Also there is the added demerit of increased radiation exposure to a young child.
In a developing country like India, approximately 68% of the population still lives in a rural setup, where basic amenities are hard to come by, and dental radiographs are a luxury. Hence the presence of an accurate age estimation method based on clinical observation of erupted teeth would play a pivotal role in forensic dentistry today. The clinical method is more suitable since it does not require any special equipment, expertise and is more economical. In India, there is a severe lack of clinical methods of age estimation which can be used in the absence of radiographs. These methods will be of utmost importance in a rural setup where the facility of panoramic radiography is unavailable.

Kusri’s Triangle is an established method of clinical age estimation based on the eruption sequence of teeth. This method has been used over a considerable period of time by forensic medicine experts for the purpose of dental age estimation.4-6 (Figure 1)

However various drawbacks have been established with this method including the failure to differentiate between both sets of jaws and genders. Hence the present study was undertaken to estimate the accuracy of Kusri’s Triangle method of age estimation in an Indian population and to devise new methods based on the eruption status of permanent teeth, to be used in an Indian population.

MATERIALS AND METHOD

Aim of the study: To estimate the accuracy of a known clinical method of age estimation (Kusri’s Triangle) and to derive revised methods of age estimation based on the eruption status of permanent teeth.

Sample selection: A preliminary sample consisted of 50 children reporting to the Department of Pedodontics and Preventive Dentistry, A.B Shetty memorial institute of dental sciences, Nitte University Mangalore. Children between the ages of 6-14 years with at least 1 erupted permanent tooth were included in the study. Dental examination of the individual was conducted using a dental mouth mirror and dental probe under all the aseptic precautionary measures. The dental examination data of the individuals was then recorded in a detailed Performa. The tooth was considered to have erupted if at least some part of it had pierced the gingival (gingival eruption/emergence). Children with any underlying systemic disease or debilitating condition were excluded from the study. The accuracy of the Kusri’s Triangle method of age estimation was assessed in the children included in the study.

RESULTS

Formulation of new triangle based on eruption status of permanent teeth

The data collected was subjected to analysis using a ROC curve to obtain the sensitivity and specificity values for each variable to be used in the formulation of the modified triangle. High values of sensitivity and specificity were observed for all the variables to be included in the study, with the exception of upper Lateral incisors (ULI) and Upper 1st Premolars (UPM1) displaying low specificity values of 53.846 and 48.275 respectively. (Table 1)

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Sensitivity</th>
<th>Specificity</th>
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Table 2: ROC curve analysis depicting sensitivity and specificity values for each variable to be used in the formulation of the modified triangle to be used in males

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Table 3: ROC curve analysis depicting sensitivity and specificity values for each variable to be used in the formulation of the modified triangle to be used in females

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<th>Specificity</th>
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Table 4: Table depicting values and their interpretation using the Intra class correlation (ICC) method

<table>
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<tr>
<th>Value</th>
<th>Interpretation</th>
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<tbody>
<tr>
<td>0 - 0.2</td>
<td>Poor</td>
</tr>
<tr>
<td>0.3 - 0.4</td>
<td>Fair</td>
</tr>
<tr>
<td>0.5 - 0.6</td>
<td>Moderate</td>
</tr>
<tr>
<td>0.7 - 0.8</td>
<td>Strong</td>
</tr>
<tr>
<td>&gt;0.8</td>
<td>Almost Perfect</td>
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</table>

Table 5: Table depicting the correlation values obtained using the Intra class correlation method based on the eruption of permanent teeth

<table>
<thead>
<tr>
<th>Intraclass Correlation</th>
<th>Kusri's Triangle</th>
<th>New Triangle</th>
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</thead>
<tbody>
<tr>
<td>0.761</td>
<td>0.912</td>
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</table>
Fig. 1. Kusri's Triangle method of age estimation

**MALES**

<table>
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<th>UMI</th>
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</thead>
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<td>7</td>
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**FEMALES**

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<tr>
<td>12.85</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Fig. 2. Schematic representation of method of age estimation for use in males

Fig. 3. Schematic representation of method of age estimation for use in females
Also the Area under curve value demonstrates the accuracy of the variable to be used. Based on the traditional academic point system scale it suggests that the accuracy of the variables ranges from good to excellent. Hence a new triangle was formulated based on the above data using eruption status of permanent teeth.

Also as various studies have established the difference in eruption timings of permanent teeth in males and females, we decided to develop 2 individual triangles for age estimation in males and females separately. (Table number 2 and 3, Figure 2 and 3)

**Comparative evaluation of the accuracy of kusri’s triangle with new methods of age estimation**

The accuracy of Kusri’s method of age estimation was compared with the new method in a validation sample of 30 children. The data was analyzed using the Intra Class Correlation Coefficient (ICC) method and the accuracy of the old and new methods were comparatively evaluated. Table 4 depicts the criteria used to determine the standard levels of accuracy to be used.

**Methods Based on Eruption Status of Permanent Teeth**

The results obtained suggests greater accuracy of age estimation using the new Triangle as compared to Kusri’s Triangle of Age estimation. (Table 5) Results suggest “Strong” agreement using Kusri’s Triangle method of Age estimation whereas “Almost Perfect” degree of agreement using the new formula.

**DISCUSSION**

Age estimation plays an integral role in the dental identification of missing person cases, in instances of mass disaster and also in medico-legal matters. In a dental perspective, the importance of age determination pertains to many fields including treatment planning in orthodontics and pediatric dentistry.

**Age estimation methods can be broadly divided into 3 categories**

- Clinical methods
- Radiographic methods
- Skeletal methods

Various studies have established the superior accuracy of radiographic methods over methods based on eruption status of teeth (Clinical methods). In children, the reference method of age estimation remains Demirjan’s method using four or seven teeth. However several limitations are well documented:

1) It is based on radiographic interpretation and hence inter observer variations exist
2) Cannot be used in uncooperative, mentally compromised or extremely young children
3) It showed significant overestimation in different population groups and
4) Since panoramic radiography is required, it significantly increases the radiation exposure to the patient.

Kusri’s Triangle is a clinical method of age estimation based on the emergence of permanent teeth. It is a method used by forensic medicine experts for a considerable period of time. However it has several limitations:

1) No differentiation between males and females despite it being an established fact that eruption of teeth is generally earlier in females than their male counterparts.
2) The values suggested are very arbitrary values with a wide span of accuracy of age. The lack of similar studies in an Indian population, coupled with the numerous drawbacks of this method encouraged us to develop new methods of age estimation.

The study was generally based on recording each type of erupted tooth and was carried out on independent samples: a preliminary (n=50), and later on, a validation sample (n= 30). The data collected was subjected to statistical analysis using the ROC curve and the Intra Class Correlation Coefficient (ICCC) methods.

The analysis of the ROC curve (Table 2, 3) revealed that the accuracy of the variables ranged from “good” to “excellent” while also displaying high values of sensitivity and specificity. All the variables except the Upper Lateral Incisors (ULI) and the Upper 1st Premolars (UPM1) displayed high levels of specificity. (53.846 And 48.275 respectively)
Using the values obtained from the ROC curve analysis, 2 new triangles were developed based on permanent tooth emergence to be used in males and females respectively. (Figure 2, 3)

The accuracy of the new methods of age estimation was comparatively evaluated with Kusri’s Triangle method in a validation sample of 30 children. The results suggest greater accuracy using the New Triangle (0.917) as compared to Kusri’s Triangle method (0.761). Kusri’s Triangle method of age estimation displays “strong” whereas the new Triangle displays “Almost perfect” correlation between actual and estimated age (Table 5).

Choosing the right method of age estimation for an individual can be an arduous task. With the wide array of clinical, radiographic and skeletal methods available, the onus is on the dentist to utilize the necessary literature and arrive at an informed decision on which method to choose. There is a severe lack of clinical methods of age estimation which can be used in the absence of radiographs. These methods will be of significant relevance in a rural setup where the facility of panoramic radiography is unavailable.

Acknowledgement: We would like to sincerely thank Dr. Ashith Acharya (S.D.M, Dharwad) and Prof. Dr. GopaKumar Nair (Bilaspur) for all the timely help rendered in the completion of the study.

Ethical Clearance: Taken from Nitte University Ethical committee

Source of Funding: Self

Conflict of Interest: Nil

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Incidence of Congenital Club Foot in and around Tumkur

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ABSTRACT
Congenital club foot is found in approximately 1 per 1000 live births & has even higher prevalence in still births. Males are twice as likely to be affected as females. Incidence of bilaterality is as high as 40-50 %. 37 children with clubfoot were examined, diagnosed & treated by Ponseti method at Sri Siddhartha Medical College, Tumkur. This study aims at valuating the effectiveness of correction of clubfoot by Ponseti method.

Keywords: Congenital Talipus Equinovarus, CTEV, Rocker Bottom Foot, Rocker Bottom Deformity, Foot Deformity, Clubfeet, Ponseti Method, Clubfoot Surgery

INTRODUCTION
Tallipus equinovarus is the term most commonly used for club foot. Tallipus is the generic term for any foot deformity that centre’s around the tallus. Equinus implies that the foot is flexed in the plantar direction. Club foot is a complex foot deformity that is readily apparent at birth. All clubfeet are not of the same severity, although all have the basic components of adduction and inversion of the forefoot and midfoot, heel varus and fixed equinus. Soft tissue changes vary from mild to severe. The incidence of idiopathic clubfoot is estimated to be 1-2 per 1000 live births. It has a male predominance of 2:1 and an incidence of bilateralness estimated to be about 50%.1

The Ponseti technique was described in the early 1960’s, but it is only in the last decade that its benefits in the early treatment of clubfoot deformity have been highlighted.2

MATERIALS & METHOD
40 children age group ranging 1 day to 2 years with clubfoot were selected from Sri Siddhartha Medical College, Tumkur. Of which 32 male children with clubfoot [10 bilateral, 13 right & 9 left] and 8 female children with clubfoot [5 bilateral, 1 right & 2 left] were used as study material. None of the parents suffered from clubfoot.

Clinical features

<table>
<thead>
<tr>
<th>Primary deformities</th>
<th>Equinus Varus Cavus Forefoot adduction Internal tibial torsion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary deformities</td>
<td>Foot size is decreased to 50%. Medial border is concave, lateral border is convex. Forefoot is plantar-flexed upon hindfoot. Skin is stretched over the dorsum of the foot. Callosities are present over the dorsum of the foot. Stumbling gait. Hypotrophic anterior tibial artery. Atrophy of muscles in anterior or posterior compartments of the leg</td>
</tr>
<tr>
<td>Late changes</td>
<td>Degeneration of joints. Fusion of joints.</td>
</tr>
</tbody>
</table>

Clinical Examination

Dorsiflexion Test: This is not possible in CTEV and this can be used as a screening test.3

Plumb line test: This helps to detect the tibial torsion. A line drawn from the centre of the patella to the tibial tubercle when extended down should cut the foot normally at the first or second inter-metatarsal space. In CTEV with medial rotation of the tibia it cuts the fourth of fifth inter-metatarsal space & vice versa in lateral rotation of the tibia.3
Scratch test: This test is performed to detect muscle imbalance in an infant who cannot obey commands.

- Medial scratch test: In a normal child, when the medial sole is scratched the foot everts. This tests the peroneals.
- Lateral scratch test: When the lateral sole is scratched, the child inverts the foot. This tests the invertors.3

Classification of CTEV

A. Pirani’s classification3 is most accepted and is based on 10 different physical examination findings with each score 0 for no abnormality, 0.5 for moderate and 1 for severe abnormality. The points are scored and the maximum is 10, higher the score more severe is the deformity and vice-versa. This classification requires no radiographic parameters.

B. Dimeglio’s classification3 is another equally effective classification. Four parameters are assessed on the basis of their reducibility with gentle manipulation and measurement with a goniometer:

- In the sagittal plane: Equinus deviation.
- In the frontal plane: Varus deviation.
- Horizontal plane: De-rotation.
- Adduction of the forefoot in relative to hindfoot.

Description of deformity

1. The foot is plantar flexed at ankle.
2. The hind foot is inverted at subtalar joints.
3. Mid & fore foot are adducted, inverted and in equinus position.

Investigation: -X-ray: - Radiography of the foot including the AP and plantar-flexed lateral views help to make a reasonable accurate diagnosis in CTEV

<table>
<thead>
<tr>
<th>Antero-posterior</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talocalcaneal angle: is reduced (normal is 30-35°)</td>
<td>Talocalcaneal angle is reduced (normal is 25-50°)</td>
</tr>
<tr>
<td>Talometatarsal angle: This indicates extent of forefoot adduction. (Normal is 5-15°. In CTEV it is 0° to negative.</td>
<td>Tibiocalcaneal angle: This angle indicates extent of equinus (normal is 5-15°. It is negative in CTEV.</td>
</tr>
</tbody>
</table>

The navicular, cuboid & metatarsals are also deformed & mal-articulated and articulate improperly. The tendo-Achilles is shortened. Muscular atrophy is generalised & inherent. Upon examination the surgeon will note atrophy of the lower leg, an empty heel pad as the calcaneus is high pronounced creases on the medial posterior aspect of the heel and ankle and no skin crease on the dorsolateral aspect of the foot. The incidence of idiopathic clubfoot is estimated to be 1-2 per 1000 live births. It has a male predominance of 2:1 and an incidence of bilateralness estimated to be about 50%.1

Etiology is multifactorial, although many factors are speculative. These factors include abnormal intrauterine forces, arrested foetal development, abnormal muscle & tendon insertions, imbalance between fast-twitch & slow-twitch muscle fibre groups & germ plasm defects. The morphologic features of the limb in patients with club foot usually include a dimple over the anterior lateral aspect of the talus; the heel is in equinus & varus & the forefoot is in adduction.4,5,6 A three-dimensional computer analysis of one club foot revealed the talus to be external rotated; other clinical studies have identified internal rotation.

A. Idiopathic club foot: When deformity is not associated with any other abnormalities in the body. This is the most common type.


2. Primary Germplasm defect: - Irani & Sherman (JBJS 45 A 1963) have suggested that the deformity probably results from a primary germ plasm defect affecting the neck of talus. Moreover completer normal shaped head & neck of talus fails to develop even after correction of the deformity, supporting this theory.

4. Heredity: Palmer (JBJS 46 A 1964) & Wynne Davies (1964) have shown that club foot deformity occurs more frequently in those families that already have a member with a club foot (polygenic multifactorial trait).

5. Heredity & environmental combined.


7. Teratogenic theory: (Warkany et al 1948) Deficiencies of Vit A, D, & Riboflavin in pregnant rats. Doraismwamy in 1950, 1952 & 1956 reported abnormalities including defects in more than 70% of chick embryos after injection of substance such as insulin, lead & thallium into the yolk sack of fertilised hen eggs.

8. Bone anomalies

9. Failure of muscle development

10. Congenital dislocation of navicular on talus

11. Circulatory- temporary & permanent breakdown of circulation leading to fibrosis of tissue.

B. Non-Idiopathic club foot: - Where the deformity is a local manifestation of systemic musculo-skeletal disorder.

This type of clubfoot is secondary to other musculoskeletal abnormalities. A child may be born but the presence of other stigmata of skeletal disorder readily distinguishes the non-idiopathic deformity. Clubfoot of non-idiopathic verity is associated with innumerable skeletal syndromes. It is usually associated with other abnormalities like supernumerary digits, eye abnormalities, cleft palate & mirognathia, delayed motor & mental development. Various syndromes such as Arthrogryposis multiplex congenital; Nail patella syndrome; muscular dystrophies; Lead poisoning; Gordon syndrome, Mobius syndrome, Larsen’s syndrome, Smith & Leimilptiz syndrome; Pierre Robin syndrome.

Treatment

Medical therapy: - Aims of medical therapy are to correct the deformity early & fully & to maintain the correction until growth stops.

Traditionally 2 categories of clubfeet are identified as follows

1. Flexible: - Easy or correctable clubfeet correct with manipulation, casting & splintage alone.

2. Rigid: - These feet that require surgery are those that respond poorly to splintage & relapse quickly following seemingly successful manipulative treatment. These club feet require early operative management. These feet are said to be associated with a thin calf & small high heel.

Traditional non-operative treatment: Splintage begins 2-3 days after birth. The order of correction is as follows

1. Forefoot adduction

2. Forefoot supination

3. Equinus

Manipulation for first 1½ months. Serial casting for next 2 years (changing every 15 days). Followed by tendoachilles lengthening.

Ponseti Technique: Ponseti2,8 in the year 1950 described a very effective conservative method of treating a clubfoot with very few recurrence rates. There is an extremely high success rate for correcting clubfoot using this method for non-surgical cast correction of clubfoot. Here the success of the reduction is 90-98% and is better than Keite’s regime. It can be used in older children of 2 years age and also thus has wider application.

Treatment phase: Ideally it is begun as soon as possible after birth. The treatment involves weekly stretching of the foot deformity followed by the application of long leg plaster casts. The cast is changed every 2 weeks. A new-born with congenital clubfoot should expect the deformity corrected in about 5-6 weeks.

Surgical technique: Percutaneous Achilles tenotomy was done before application of the final cast. Achilles tendon lengthening is done using non-invasive surgery. The incision is so small that no stitching is required. The child wears a final cast for three weeks to allow the tendon to heal.
**Maintenance phase:** The child wears a corrective foot orthosis (Dennis Brown splint) full time (23 hours a day) for three months, followed by night & nap-time wear for up to four years to prevent the deformity from recurring.

**RESULTS**

In the present series 40 children with idiopathic clubfoot by Ponseti method of correction of serial manipulation and casting.

Out of 40 patients, 28 children presented between 0-6 months, 6 between 6-12 months & 6 between 1-2 years.

Among 40 children, 25 had unilateral & 15 had bilateral involvement. Among 40 children, 32 were male & 8 were females.

By using a 10 point Pirani scoring system, the average Pirani score for the age group 0-6 months is 4.46, 6 months to 1 year is 5.36 and 1-2 years is 5.75. As the Pirani score increased, and the number of casts required for correction increased (5.1 – 7.4).

Percutaneous tenotomy was required in 85% of cases to correct equinus. One child required transfer of Tibialis anterior tendon to medial cuneiform. The results were excellent in 88.3% and good in 11.7% by using Ponseti method.

**DISCUSSION**

Congenital talipes equinovarus) is the commonest of all the foot deformities forming about 80% of the cases. Its incidence is about 1 in every 1000 live births being commoner in India, when compared to western countries. The condition is bilateral in about 66% of cases being commoner in males. Idiopathic being the commonest type.

In 1948, Ponseti proposed reducing the deformity with successive casts. Although treatment with casts is a very old method, Ponseti’s method is based on strict rules established from anatomic evidence. The goal is not to correct the apparent deformation but on the contrary to impose a simultaneous supination and abduction of the foot. Once the calcaneo-pedal block has been derotated, percutaneous tenotomy of Achilles is performed. Extensive open surgery like posteromedial release is commonly associated with long-term stiffness and weakness, which is avoided by the Ponseti technique.

Ponseti reported that open surgery is avoided in 89% of cases by this technique of manipulation, casting and limited surgery. Correction of heel varus and increased declination angle of neck of the talus are better in a clubfoot treated by Ponseti method of management as compared to traditional casting methods. Percutaneous tenotomy was required in 85% of cases to correct equinus. Tenotomy of the Achilles tendon is an integral part of Ponseti’s technique for treatment of clubfoot.

In our series, we have excellent results in 45 (88.3%) and good in 6 (11.7%) children using Ponseti method. One child required transfer of Tibialis anterior tendon to medial cuneiform.

The average initial Pirani score was 5.10 and the final total Pirani score was 0.54. The average initial Pirani score for ages 0-6 months (4.46), 6 months to 1 year (5.36) and 1 year to 2 years (5.75) respectively. The most striking finding is a strong link between the initial Pirani score and the duration of treatment shown, this is the best evidence yet that a more deformed foot requires greater intervention.

Conclusion: Congenital talipes equinovarus (CTEV) is the commonest of all the foot deformities forming about 80% of the cases. Idiopathic type being the commonest of all the deformities forming about 80% of the cases. The treatment of severe deformities has been a challenge over the years with poor results. The Ponseti method of treatment has changed the face of Orthopaedics and assessment of this method in the treatment of idiopathic clubfoot was the objective of this study. Many complications can be anticipated and prevented or treated with the same method.

Acknowledgement: Nil.

Conflict of Interest: Nil

Source of Funding: Self.

Ethical Clearance: Taken from Institutional ethical committee.
REFERENCES


A Study of Fractures of Hyoid Bone and Thyroid Cartilage in Hanging and Ligature Strangulation

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1Assistant Professor, Department of Forensic Medicine, Krishna Institute of Medical Sciences, Karad, Maharashtra, 2Associate Professor, 3Professor and Head, Department of Forensic Medicine, Bangalore Medical College and Research Institute, Bangalore

ABSTRACT

Introduction: Hanging and ligature strangulation are common causes of asphyxial deaths due to compression of neck by ligature material. Damage of osteo-cartilaginous structures of neck in form of fractures of hyoid bone and thyroid cartilage is the important finding indicative of compression on neck by external force in form of ligature. The present study was carried out to know the incidence of fractures of hyoid bone and thyroid cartilage in hanging and ligature strangulation.

Materials and method: A cross sectional study of a total of 105 cases of hanging and ligature strangulation was conducted in the Department of Forensic Medicine, Victoria Hospital over a period of 20 months from November 2009 to June 2011.

Results: Of the 109 cases studied, hanging constitutes 105 cases (96%) and ligature strangulation constitutes 04 cases (4%). Among 105 cases of deaths due to hanging, 61 (58.09%) were male and 44 (41.90%) were female with a mean age at death of 30.3 + 11.23. Hyoid bone was fractured in 4 cases (3.8%) and thyroid cartilage was fractured in 3 cases (2.85%) in cases of hanging. All the cases of fracture of hyoid bone (3.8%) and fracture of thyroid cartilage (2.85%) in death due to hanging were male.

Conclusion: Increase in age is the most important factor that contributes to fracture of hyoid bone in hanging.

Keywords: Hanging, Ligature Strangulation, Hyoid Bone, Thyroid Cartilage, Fracture

INTRODUCTION

Hanging and strangulation are common causes of asphyxial deaths due to compression of neck by ligature material. In these cases, there will be damage of neck structures from skin to spinal cord including hyoid bone and thyroid cartilage due compression. Damage of osteo-cartilaginous structures of neck in form of fractures of hyoid bone and thyroid cartilage is the important finding indicative of compression on neck by external force in form of ligature. Age, force of compression, location of knot, point of suspension and width of ligature are important factors responsible for damage of osteocartilagenous structures of neck in asphyxial deaths.

Observation of hyoid bone fracture is one of the most integral parts of internal examination during autopsy of hanging, ligature strangulation or throttling case. It is also very important to check whether it is ante-mortem or post-mortem in nature. For this difficulty some have even advised preautopsy X-ray of the neck structures to detect ante-mortem hyoid bone fracture.

The hyoid bone is almost U-shaped structure and is composed of the central horizontal portion (body) to which are attached ‘greater horn’ through a natural joint with the body. The greater horns in early are connected to body by cartilage but after middle life these are usually connected to the bone. There are two lesser horns situated close to junction of the greater
horn with the body that carries no forensic significance. The hyoid bone may get fractured or fracture – dislocated in handing. The fractures usually involve the greater horns, which are likely to break at about the junction of their outer third and inner two thirds. There is lack of unanimity of opinion regarding the frequency of hyoid bone fracture in hanging.

Various studies conducted on fractures of hyoid bone and thyroid cartilage in asphyxial deaths in different countries over the time, have shown considerable differences in incidences of fractures ranging from as low as nil to as high as 67%. The present study was carried out to know the incidence of fractures of hyoid bone and thyroid cartilage in hanging and ligature strangulation.

MATERIALS AND METHOD

A cross sectional study of a total of 109 cases of hanging and ligature strangulation was conducted in the Department of Forensic Medicine, Victoria Hospital over a period of 20 months from November 2009 to June 2011. The data was collected from the information furnished by deceased relatives and police and post mortem examination. The hyoid bone and thyroid cartilage were dissected out for their fractures and ante-mortem characteristics maintaining all the precaution not create to any post-mortem fracture. Evidence of ante-mortem fractures was obtained by demonstrating macroscopic haemorrhage at fracture site. The data was analysed using descriptive statistics.

RESULTS

Of the 109 cases studied, hanging constitutes 105 cases (96%) and ligature strangulation constitutes 04 cases (4%).

Table 1. Age and sex wise distribution of cases.

| Age(years) | Hanging | | | Ligature Strangulation |
|-----------|---------|---|---|---|---|---|
|           | Male | Female | Total | Male | Female | Total |
| 11-19     | 05   | 05    | 10(9.52%) | 0    | 0      | 0 |
| 20-29     | 28   | 28    | 56(53.33%) | 0    | 3      | 3(75%) |
| 30-39     | 14   | 08    | 22(20.95%) | 0    | 0      | 0 |
| 40-49     | 08   | 02    | 10(9.52%) | 0    | 0      | 0 |
| 50-59     | 03   | 0     | 03(02.85%) | 1    | 0      | 1(25%) |
| 60-69     | 03   | 01    | 04(03.80%) | 0    | 0      | 0 |
| Total     | 61(58.09%) | 44(41.90%) | 105 | 1(25%) | 3(75%) | 4 |

Among 105 cases of deaths due to hanging, 61(58.09%) were male and 44(41.90%) were female with a mean age at death of 30.3 ± 11.23. Among 4 cases of deaths due to ligature strangulation, 3(75%) were female and 1(25%) was male.

Table 2. Fracture of hyoid bone and thyroid cartilage.

<table>
<thead>
<tr>
<th></th>
<th>Fracture of hyoid bone</th>
<th>Fracture of thyroid cartilage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>Hanging(n=105)</td>
<td>04</td>
<td>3.8</td>
</tr>
<tr>
<td>Strangulation(n=4)</td>
<td>00</td>
<td>00</td>
</tr>
</tbody>
</table>

The table shows that in cases of hanging, hyoid bone was fractured in 4 cases (3.8%) and thyroid cartilage was fractured in 3 cases (2.85%). On the other hand, fractures of hyoid bone and thyroid cartilage were nil in cases of strangulation.
Table 3. Fracture of hyoid bone and thyroid cartilage in hanging in detail

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right greater horn</td>
<td>2</td>
</tr>
<tr>
<td>Left greater horn</td>
<td>1</td>
</tr>
<tr>
<td>Both greater horns</td>
<td>1</td>
</tr>
<tr>
<td>Fracture of thyroid cartilage (n=3)</td>
<td></td>
</tr>
<tr>
<td>Right superior horn</td>
<td>1</td>
</tr>
<tr>
<td>Left superior horn</td>
<td>1</td>
</tr>
<tr>
<td>Both superior horns</td>
<td>1</td>
</tr>
</tbody>
</table>

DISCUSSION

Of the 109 cases of death studied, hanging constitutes 105 cases (96%) and ligature strangulation constitutes 04 cases (4%). Among 105 cases of deaths due to hanging, 61 (58.09%) were male and 44 (41.90%) were female with a mean age at death of 30.3 ± 11.23. The males to female ratio were 1.4:1. The predominance of the males was in accordance with studies of Yadav et al (62.9%), Sharma et al (68%), Ingale et al (58.39%), Jeannette et al (90%), Azmak et al (83.9%), Uzün et al (70.56%). On the other hand, predominance of the females was observed in studies by Naik et al (37.74%).

Of the 109 total cases studied, the largest group was found to be 20-29 years (53.33%), followed by 30-39 years (20.95%). The previous studies have also reported similar results, with 21-30 years age group being the most commonly involved by different other authors (3,4,6,8,9,10). The above findings can easily be explained by the fact that 20-29 years of age group is most susceptible to frustration in life because of many factors like marriage, financial issues, failure of love affairs, failure in exams, pressure of making a good career after completion of studies and unemployment etc.

Hanging can be associated with either isolated fractures of hyoid bone or thyroid cartilage or fracture of the combined thyro-hyoid complex. In the present study, out of 105 cases of death due to hanging, fracture of hyoid bone was present in 4 cases (3.8%). The incidence of fractures of hyoid bone has been reported as Naik et al (0%), Jeannette et al (0%), Ingale et al (0%), Jayaprakash et al (1.08%), Yadav et al (1.6%), Charoonnate et al (2.7%), Simonsen (3.7%), Momonchand et al (4.9%), Sarangi (9.4%), Morild (10%), Dixit et al (14%), Sharma et al (21%), Uzün et al (23.25%), Luke et al (26%), Davison et al (26.7%), Kurtulus A et al (42.15%), Derya (46.4%) and Tirupude et al (64.51%).

In the present study, among fractures of hyoid bone (n=4), right greater horn was involved in 2 cases (50%), left greater horn in 1 case (25%) and both greater horns in 1 case (25%). In contrast to present study findings, among fractures of hyoid bone (n=43), right greater horn was fractured in 14 cases (32.55%), left greater horn in 20 cases (46.5%), both greater horns in 8 cases (18.60%) and body in 1 case (2.32%) in study conducted by Kurtulus A et al. Right greater horn of hyoid bone was found to be the most common fracture site (50%) in cases of hanging in present study.

In the present study, out of 105 cases of death due to hanging, fracture of thyroid cartilage was observed in 3 cases (2.85%). The incidence of fractures of hyoid bone has been reported in Momonchand et al (0%), Morild (9%), Luke et al (15%), Dixit et al (15%), Sharma et al (17%), Derya (17.8%), Davison et al (34.3%) and Kurtulus A et al (47.05%).

In the present study, among fractures of thyroid cartilage (n=3/105), right superior horn was involved in 1 case (33.33%), left horn in 1 case (33.33%) and both horns in 1 case (33.33%). A study by Kurtulus A et al showed that among fractures of thyroid cartilage (n=48/102), right superior horn was fractured in 13 cases (27.08%), left horn in 20 cases (41.66%) and both horns in 15 cases (31.25%).

Table 4. Fracture of hyoid bone and thyroid cartilage in hanging according to age.

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Hyoid bone</th>
<th>Thyroid cartilage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fracture present</td>
<td>Fracture absent</td>
<td>Fracture present</td>
</tr>
<tr>
<td>&lt;40</td>
<td>1 (0.95%)</td>
<td>87 (82.85%)</td>
<td>1 (0.95%)</td>
</tr>
<tr>
<td>&gt;40</td>
<td>3 (2.85%)</td>
<td>14 (13.33%)</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td>Total</td>
<td>4 (3.8%)</td>
<td>101 (96.2%)</td>
<td>3 (2.85%)</td>
</tr>
</tbody>
</table>

(P=0.01) Chi square  (P=0.06) Chi square
The incidence of fracture of hyoid bone in hanging below 40 years was 0.95% as compared to 2.85% in cases above 40 years which is significant (p=0.001) as mentioned in table 4. Similar significant correlation between fracture of neck structures and age was found in study by Kurtulus A et al21 which reported the incidence of fractures of neck 63.2% in age below 60 years and 93% in age above 60 years. But there was no significant correlation between fracture of thyroid cartilage and age (p=0.06) as mentioned in table 4. In present study, we found that incidence of the fracture of hyoid bone increased with age similar to various studies in literature9, 10, 21. Fusion of greater horn to the body of hyoid bone and thyroid cartilage increase with age21. Increase in the incidence of hyoid bone fracture with age might be due to calcification and ossification and age related changes in the bone21.

In the present study, all the cases of fracture of hyoid bone (3.8%) as well as cases of fracture of thyroid cartilage (2.85%) in deaths due to hanging were male similar to the study conducted by Yadav at al3 which reported that 1.6% cases of fracture of hyoid bone in hanging were of all males with their Mean age being 47 years.

Fractures of hyoid bone and thyroid cartilage were nil in cases of strangulation as sample size was small.

CONCLUSION

The incidence of fractures of hyoid bone was found to be 3.8% and fractures of thyroid cartilage 2.85% in deaths due to hanging. All the cases of fracture of hyoid bone (3.8%) as well as cases of fracture of thyroid cartilage (2.85%) in deaths due to hanging were male. Right greater horn of hyoid bone was the most common fracture site (50%) in cases of hanging. Increase in age is the most important factor that contributes to fracture of hyoid bone in hanging.

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Conflict of Interest: No.

Source of Funding: Self

Ethical Clearance: The study was approved by Bangalore Medical College and Research Institute Ethical Committee.

REFERENCES


A Retrospective Study of Pattern of Un-Natural Deaths: an Autopsy Study at Victoria Hospital Mortuary, Bangalore

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ABSTRACT

Death due to un-natural causes is a major burden to the society, especially in a developing country like India, wherein if a working youth or a bread earner to the family dies. An effort to highlight the major deaths due to un-natural causes is made in this piece of literature. This study is a retrospective study based on facts and details available at Department of Forensic Medicine, Victoria Hospital, Bangalore Medical College and Research Institute, Bangalore.

Keywords: Un-Natural Deaths, Bangalore, Forensic Medicine, pattern

INTRODUCTION

Victoria Hospital, a tertiary care hospital situated at Bangalore’s heart is one amongst the hospital which serves the people of the lower and middle strata of life and said to be the best of its kind. The hospital has a history of 110 years started by the British Rulers of India and funded by the then queen of Mysore Her Highness Smt Kempanajamma. The hospital has an in-patient bed strength of 964 patients and outpatient average of 30,000 a month. The morgue at Victoria hospital has a cold storage capacity for 48 bodies. It is one of the oldest hospital conducting autopsy. Records available reveals autopsy being conducted since 1948. The hospital has a state of art mortuary which conducts autopsy of an average of 10 autopsies a day, an average of 300-350 cases a month. The study done shows the pattern of deaths in the urban and sub urban Bangalore and to some extent rural part surrounding Bangalore.

Death due to unnatural cause is on the rise, especially in the urban cities, like Bangalore. The increase in motorization, the road designs, and the neglect on safety measures like wearing helmets adds to the contribution. The usage of fuel like Kerosene for cooking by the people belonging to low socio economic status contributes to the majority of accidental death due to burns. The stress factors, the life style changes, the urbanization of life and other social factors accounts to the majority of suicidal deaths. Cases of poisoning, electrocution, drowning, fall from heights are amidst the urbanization risk.

MATERIALS AND METHOD

This study is a retrospective study undertaken at the Mortuary at Victoria Hospital, Bangalore for a period of one year i.e. January 2013 to December 2013. The autopsies are conducted on dead bodies of the deaths at hospital which are registered as Medico-legal cases, dead bodies brought directly to mortuary declared to be unnatural deaths where the cause of death is at doubt/unknown/ brought dead, directly from the police of some urban police stations of Bangalore and some Sub-urban places. It also includes dead bodies of hospital deaths referred from some rural places for treatment at Victoria Hospital. Un-natural deaths include accidents, suicides and homicides based on manner of deaths. Some sudden Natural deaths are also included.

The various modes of death are burns, road traffic accidents, hanging, poisoning, fall, railway cases, assault, electrocution, drowning, snakebite, abandoned newborns and miscellaneous cases like bull gore, elephant stomp, operative deaths, rabies, insect bites and blood transfusion death. Deaths due to
natural cause brought by police as unnatural deaths were also studied here.

RESULT

Table 1: Shows total cases and their percentage.

<table>
<thead>
<tr>
<th>Modes of death</th>
<th>No of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural death</td>
<td>856</td>
<td>22.60</td>
</tr>
<tr>
<td>Burns</td>
<td>788</td>
<td>20.80</td>
</tr>
<tr>
<td>RTA</td>
<td>636</td>
<td>16.79</td>
</tr>
<tr>
<td>Hanging</td>
<td>575</td>
<td>15.18</td>
</tr>
<tr>
<td>Poisoning</td>
<td>426</td>
<td>11.24</td>
</tr>
<tr>
<td>Fall</td>
<td>166</td>
<td>4.3</td>
</tr>
<tr>
<td>Railway</td>
<td>126</td>
<td>3.3</td>
</tr>
<tr>
<td>Assault</td>
<td>93</td>
<td>2.4</td>
</tr>
<tr>
<td>Electrocution</td>
<td>38</td>
<td>1.0</td>
</tr>
<tr>
<td>Drowning</td>
<td>32</td>
<td>0.84</td>
</tr>
<tr>
<td>Snakebite</td>
<td>15</td>
<td>0.39</td>
</tr>
<tr>
<td>Abandoned Newborns</td>
<td>14</td>
<td>0.36</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>22</td>
<td>0.58</td>
</tr>
<tr>
<td>Total</td>
<td>3787</td>
<td>100</td>
</tr>
<tr>
<td>Decomposed*</td>
<td></td>
<td>57</td>
</tr>
<tr>
<td>Grand total</td>
<td>3844</td>
<td></td>
</tr>
</tbody>
</table>

*Decomposed cases are mentioned separately as they are not included in the study.

Graph 1. Pie Chart showing different modes of death.

Graph 2. Month-wise distribution of cases and Male: Female: children ratio

Male deaths are more in the month of May and Female deaths are more in the month of February as seen in this chart.

Graph 3. Pie chart showing male, female and children ratio

Sex profile: Among 3787 cases, 2498(65.92%) were males, 1105(29.18%) were females, and 184(4.8%) were children.

DISCUSSION

Death due to Burns: In a study conducted at Govt. Medical College & Hospital, Chandigarh during the period between January 1996 to December 2005a total of 3178 medico legal autopsies were conducted by the department, of which 617 (19%) were deaths due to burn injuries1 which is nearer to this study i.e. 20.80%.

Death due to Road traffic accidents (RTA): The Asia-pacific region accounts for about 60% of global road deaths despite having only 16% of the world’s vehicles. India accounts for about 10% of RTA worldwide. It contributed 30.2 percent to all kind of natural and unnatural accidental deaths during 20052. In a study conducted at Transkei region of South Africa, RTA deaths have come down from 39% of all trauma-related deaths in 1993 to 29% in 19993. In our study RTA accounts to 16.79%, the reason behind this being more awareness and safety measures implemented in the city like wearing helmets, seat belts, etc and also because of slow moving traffic in the city.

Death due to suicidal Hanging and Poisoning: Suicide is one of the ten leading causes of death in the
world, accounting for more than a million deaths annually. Hanging and poisoning constituted the two major modes of suicides (63%)\textsuperscript{4}, which mostly implies in the present study.

Death due to fall from height: Fall from height is the most common cause of fatal injuries and single biggest cause of work place deaths. The highest incidence of fall from height occurred at construction site followed by fall from public buildings. A study conducted at Department of Forensic Medicine, M.S. Ramaiah medical college and hospital, Bangalore during the period October 2005 to May 2007 showed that out of 1319 cases of Post mortem, fall from height constituted 52 cases amounting to 3.94 %\textsuperscript{5} which is very close to the study (4.3%), Bangalore being a hub for high rise buildings.

Deaths due to Railway injuries: A two year retrospective study of railway related fatal cases conducted at Department of Forensic Medicine & Toxicology, Indira Gandhi Government Medical Medical College, Nagpur, showed railway fatality cases of 5.99% (173out of 2888 autopsies) conducted during the period of January 2001 to December 2002. A similar result of 3.3% is seen in this study\textsuperscript{6}.

Deaths due to assault: In a study undertaken at the mortuary of KLES’s Hospital & MRC, Belgaum, during the period from Oct 2004 to Oct. 2005 homicides amounted to 2.5% (3 of 120 cases studied)\textsuperscript{7} and 2.4% in our study.

Deaths due to electrocution: In a study conducted at the All India Institute of Medical Sciences, New Delhi (India), 1.98% of all autopsy cases received from South Delhi were reported, as compared to 1.0%\textsuperscript{8}.

Deaths due to Drowning: Drowning in India commonly occurs in rivers, ponds, lakes and wells and can be accidental, suicidal or sometimes homicidal in nature. Drowning as a suicidal method is also responsible for a significant number of deaths. The Survey of Causes of Death (SCD) report (1998b) reveals that 1.1% of total deaths and 18% of total injury deaths were due to drowning\textsuperscript{9}.

Death due to Snake bite and miscellaneous deaths amounts to around 1% of total deaths. Most snake bite cases are referred to Victoria Hospital from neighboring rural Primary Health centre. India is estimated to have the highest snakebite mortality in the world. World Health Organization (WHO) estimates place the number of bites to be 83,000 per annum with 11,000 deaths\textsuperscript{10}.

**CONCLUSION**

In the past decade the number of deaths due to unnatural causes has steadily increased. Though Road Traffic Accidents related deaths in and around Bangalore shows slight decline, but suicide due to stress related (work pressure, marital disharmony) has increased. Even cases of suicidal hanging show a increase considerably. Deaths due to burns (Kerosene dowsing) have shown a dramatic increase. Homicidal deaths have shown a decrease.

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**Conflict of Interest:** Nil

**Source of Funding:** Nil

**Ethical Clearance:** Not applicable.

**REFERENCES**


Homicidal and Suicidal Hanging in Dyadic Death

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ABSTRACT

Though a relatively rare occurrence, dyadic death episodes have a devastating impact on the families, and communities who had experienced these tragedies. Homicidal hanging in dyadic death is extremely rare occurrence. In the present case report, we discussed a dyadic death (murder-suicide) of a newly married couple in which the method used by the perpetrator for killing his wife & committing suicide was hanging.

Keywords: Homicidal Hanging, Perpetrator, Dyadic Death

INTRODUCTION

Dyadic death, murder-suicide and homicide-suicide all refer to an incident where a homicide is committed followed by the perpetrator’s suicide almost immediately or soon after the homicide. Murder-suicides though rare, have got important social impact. The striking common feature in all such deaths is a family relationship or close bond between the perpetrator and victim/s¹.

Apart from the now rare ‘lynching’, hanging is almost always suicidal or accidental, former being by far the most common². Occasional cases of homicidal hanging have been reported in the literature. Examples have also occurred of people killed in some other way being suspended to simulate hanging³. Any dead body of hanging with other multiple injuries brought in mortuary will definitely raise suspicion of foul play in mind of autopsy surgeon and in such cases the autopsy surgeon has to face sophisticated questions like “what is the cause of death”, “is it a suicidal or a homicidal manner”, “was the victim hanged after strangling him or her”, “could the neck compression be accidental”.

Here we present a case report of homicidal & suicidal hanging in dyadic death where the perpetrator was the husband of young female victim. We also discussed circumstances, psycho-social characteristics & legal issues related to dyadic death (murder-suicide).

CASE REPORT

Case History: The dead bodies of newly married couple were brought for medico-legal autopsy to Department of Forensic Medicine at Shri Vasantrao Naik Government Medical College, Yavatmal on a day in January 2009.

The couple was found in their rented house on same day in morning. The door was locked from inside and both the bodies were hanged to ceiling support by a nylon rope with lower limbs almost touching ground. Multiple bloodstains were present over floor, bed & wooden stool and broken bangle pieces found at places over the floor. A sickle having bloodstains was there by the side of husband. Neighbors told history of frequent quarrels between husband and wife since few days and on previous night. As per information given by relatives, friends & neighbors, the husband had suspicion of wife’s character due to her premarital affair. The couple was married since few months and they were living in Yavatmal city away from their family members because of the husband’s job.

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Post Mortem Findings of Perpetrator: On examination of husband, clothes were intact and bloodstains were present over his hands. Cyanosis was present and glove & stocking type of postmortem lividity with petechial hemorrhages were noted over legs and thighs. Ligature mark was of typical hanging and there were no other external injuries over body. Internal findings were suggestive of asphyxia as a mode of death. Cause of death was given as “Asphyxia due to hanging”.

Post Mortem Findings of Victim: On examination of victim wife, bloodstains were present over clothes & body at places. Multiple incised wounds were present over scalp (bone deep) and a stab wound was found over left lateral aspect of neck which was muscle deep without involving any vital neck structure. Bite mark was found over right cheek & contusions seen over inner aspect of lips. Multiple incisions over both upper limbs & a chop wound over right forearm near elbow with cut fracture of ulna were noted suggestive of defense wounds. Lower limbs also showed multiple incisions and lacerations were present over all limbs. Abrasions were seen over face, neck, trunk & limbs. The ligature mark over neck was showing characteristics of ante-mortem hanging. Cyanosis was present and glove & stocking type of postmortem lividity with petechial hemorrhages were noted over lower limbs. Internal findings were suggestive of asphyxia as a mode of death. Cause of death was given as “Asphyxia due to hanging with evidence of multiple injuries over body.”

DISCUSSION

Dyadic death is one of the most tragic forms of inter-family violence wherein an individual kills another member/s and commits suicide immediately or within short period. In the present case report of dyadic death (murder-suicide), the perpetrator was 30 years old male who killed his wife. Dyadic death episodes involving male as a perpetrator were reported in Indian literature. Eliason S noted in his study that most murder-suicides are spousal /consortial, involving a man killing his wife, girlfriend, ex-wife, or ex-girlfriend. Barnes J reported that, in cases of murder-suicide, 50.4% victims were or had been in intimate relationship with offenders.

In developed countries most common method used for killing by perpetrator of a murder-suicide is firearm. The use of firearm in dyadic deaths was rare in developing countries like India. Stabbing, strangulation, smothering, drowning and burning are commonly used methods for killing victim by the perpetrators in India. In present case of dyadic death the perpetrator used hanging as method for killing and also for suicide. du Plessis et al reported a similar case of dyadic death where the method of killing and suicide was hanging, and the victim was a young woman. A dyadic death in which a young man stabbed his wife, hanged his son, and then hanged himself was reported by Leo EO. In his study Dhwane et al observed a dyadic death case resulted from homicidal hanging of wife, strangulation of 2 year daughter and suicide of perpetrator husband by shooting with duty rifle.

Hanging is considered always suicidal in nature until proved otherwise and partial hanging is taken to be diagnostic of being suicidal in nature. In present case report, the findings of struggle between victim & perpetrator at crime scene, multiple injuries over victim’s body, ante-mortem nature of ligature mark of hanging and signs of asphyxial mode of death denote that the victim was beaten unconscious and then hanged with a rope by the husband. It is virtually impossible for one of two healthy adults, equally matched physically, to hang the other unless the victim was beaten unconscious or rendered helpless by alcohol or drugs.

The dyadic death episodes reported from various parts of India were mostly in low socio-economic, less educated or illiterate families due to financial stress and worry about future. The present episode of dyadic death occurred in educated middle class family and the spousal killing in this case occurred as a result of suspicion of sexual infidelity by husband due to wife’s premarital love affair. Dhwane et al reported spousal killing in murder-suicide as a result of the conflict over extramarital, sexual and love affairs. According to Milroy CM the major reason for homicide-suicide was breakdown in a relationship (46%), the victim usually being the spouse. Possessiveness /jealousy appear to be leading homicide motive and it is the departing threat or action which triggers the sequence of events in murder-suicide.

There was no any history of mental illness and/or addiction in the perpetrator of present dyadic death case. The association of mental illness in perpetrator and dyadic death episodes was reported in many studies. In present case of dyadic death, as the perpetrator /offender was dead, recording details of
the case & making appropriate investigations were the
only actions taken by the investigating police officer
to close the case file.

The dyadic death is complex phenomenon, but due
to death of the victim & perpetrator both, it is
impossible to know the exact circumstances and
psychology of perpetrator /offender. Some experts
consider the homicides to be simply a side effect of
the suicide in dyadic death, wherein the specific
decision to kill oneself precipitates a perceived
necessity to kill others. Other experts say that murder-
suicide cannot be categorized with either homicides
or suicides but is actually a distinct behavior6. Though
these dyadic death episodes are infrequent in
occurrence, they not only disturb the family involved,
but also have psychological impact on society.

Conflict of Interest:

There are no any conflicts of interest and the work
described has not been published previously & it is
not under consideration for publication elsewhere.

Source of Funding: self

Ethical Clearance: Not applicable

Acknowledgement: Nil

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Spectrum of Accidental Paediatric Poisoning at a Tertiary Care Centre in South India

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ABSTRACT

Objective: To see the clinical spectrum and outcome of accidental childhood poisoning cases admitted to Kamineni Hospital, a tertiary care Teaching Institute in Telangana region of south India, including the incidence, types of substances ingested, the age of the children involved, and the clinical outcomes.

Design and Methods: A retrospective review of the charts of all admitted patients, less than 18 years old presented at Paediatric emergency room for acute accidental poisoning between January 2010 to December 2013.

Results: 69 patients presented to the paediatric emergency room with definite history of poisoning during the study period. The majority of our patients (34.78%) were in the <5 year age group. Males (68.12%) outnumbered females (31.88%). Kerosene (46.38%), insecticides (24.64%) and Plant Poison (8.70%) were the agents most frequently implicated. All cases were accidental in nature. Nineteen patients (27.54%) were asymptomatic after 6 hr of observation in the emergency paediatric room; 29 patients (42.03%) developed symptoms related to toxic ingestion. The common serious symptoms included altered sensorium, respiratory distress, seizures, ataxia, hypotension, cyanosis and burns.

Conclusion: Poisoning is most common in 0-5 year’s age group as far as accidental paediatric poisoning is concerned; also it is more frequent in males. Kerosene poisoning is the most frequently reported household poisoning. There is a need to establish regional toxicological centers and poison information centers which can help guide hospitals in the quick identification of poisons and provide guidelines for treatment. There is also a need to initiate public awareness campaigns to attempt to decrease morbidity and mortality from this eminently preventable problem.

Keywords: Paediatric, Poisoning, Insecticide, Profile

INTRODUCTION

Acute Poisoning, a common paediatric emergency is one of the important cause of morbidity and mortality in children especially in developing countries. Thousands of innocent children under the age of five years are poisoned accidentally every year throughout the world, mainly due to their innovative and exploratory nature and mouthing tendencies1, 2. Furthermore, the introduction of a whole range of new and complex chemicals in the form of pesticides, household cleaners, medicines etc. has widened the spectrum of toxic products to which children may get exposed. Most exposures among children are unintentional2.

The developed world has accurate information on incidence and changing trends of causative agents as a result of rigorous population census, mortality data and development of poisons control centre’s (PCC)3, 4. In contrast, pediatric poisoning incidence in developing countries is poorly documented5, 6, 7. Decrease in cases of pediatric poisoning related to drugs and pharmaceuticals in developed countries is due to introduction of child proof packs and bottles2,
measures which are yet to be implemented in many of the developing countries.

Likewise in India limited data are available on morbidity and mortality related to poisoning in children. Studies from India that describe the profile of poisoned pediatric patients from various regions, most of them are at least a decade old with increasing urbanization and rapid socioeconomic development in India during the last decade, change in pediatric poisoning profile and outcome are to be expected. We carried out this study in the pediatric emergency room of a tertiary care centre located in rural south India with the aim to see clinical spectrum and outcome of acute accidental childhood poisoning.

AIM & OBJECTIVES

This descriptive study was designed to see the clinical spectrum and outcome of accidental childhood poisoning cases admitted to our Hospital during the last four year.

MATERIAL AND METHOD

The data for the present study is retrospective, was carried out for the last four years (January 2010 to December 2013) hospital records of pediatric emergency room was used to profile all cases of pediatric poisoning and noted their outcome at Kamineni Institute of Medical Sciences, Narketpally District Nalgonda which is a tertiary care teaching hospital situated in Telangana region of south India.

Inclusion Criterion: Age group: 1 – 18 years age group

Exclusion Criterion: Food poisoning and venomous bite cases were excluded from the study.

All poisoning cases at our centre are registered as medico-legal cases, and case sheet records are scrupulously stored in the medical records section of our hospital. All cases age < 18 years with definite history of poisoning were included. Relevant data regarding age, sex, type and quantity of substance consumed, time of ingestion, nature of ingestion, time of symptom onset, symptoms and signs, diagnostic and therapeutic interventions, outcome was obtained from the clinical case sheet from Medical record Department of KIMS Narketpally and was recorded on a predesigned questionnaire. All the data from the duly filled questionnaires was transferred to a micro soft excel spread sheet. Data was tabulated and analyzed using SPSS (Statistical Package for Social Services) Version 18 software.

OBSERVATION

A total of 69 cases of poisoning in the pediatric age group were admitted at the Kamineni Hospital in Pediatric emergency room, during the period of 04 years from January 2010 to December 2013, as depicted in the table no. 1.

Table No 1: Year wise distribution of cases of Poisoning in Pediatric age group (n=69)

<table>
<thead>
<tr>
<th>Year</th>
<th>No of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>14</td>
</tr>
<tr>
<td>2011</td>
<td>20</td>
</tr>
<tr>
<td>2012</td>
<td>16</td>
</tr>
<tr>
<td>2013</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
</tr>
</tbody>
</table>

Study showed that, the maximum numbers of pediatric poisoning cases were found to be in the age group of less than 5 years, followed by the age group of 11 to 15 years, 16 to 18 years, and 6 to 10 years respectively, as depicted in the Table No. 2.

Table No 2: Age incidence (n=69)

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Number of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 Years</td>
<td>24</td>
<td>34.78</td>
</tr>
<tr>
<td>6-10</td>
<td>09</td>
<td>13.04</td>
</tr>
<tr>
<td>11-15</td>
<td>19</td>
<td>27.54</td>
</tr>
<tr>
<td>16-18</td>
<td>17</td>
<td>24.64</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>100.0</td>
</tr>
</tbody>
</table>

In the present study, we observed that the boys 47(68.12%) outnumbered the girls 22 (31.88%). Most of the poisoning cases occurred at home in both the genders, boys being 61.70% and girls 63.64%.

Table No 3: Gender wise distribution of poisoning cases according to place of Poisoning (n=69)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Poisoning</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indoor</td>
<td>Outdoor</td>
</tr>
<tr>
<td>Boys</td>
<td>29(61.70%)</td>
<td>18(38.30%)</td>
</tr>
<tr>
<td>Girls</td>
<td>14(63.64%)</td>
<td>8(36.36%)</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>26</td>
</tr>
</tbody>
</table>

In our study the most common substances frequently implicated in pediatric poisoning cases were Kerosene (46.38%), insecticides (24.64%) and Plant Poison (8.70%). Poisoning by organophosphate compound (Insecticides) was seen in 17 (24.64%) children, 11 were exposed and 6 took by mouth. All these children presented with vomiting, headache, salivation, sweating, fits, constricted pupils and
unconsciousness. The exact nature of consumed substance could not be determined in 5.80% of our patients (Table 4). Plant poisons such as Datura seeds consumed by 2(3.22%) children.

Table No 4: Agents responsible for accidental Poisoning (n=69)

<table>
<thead>
<tr>
<th>Poison</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerosene</td>
<td>32</td>
<td>46.38</td>
</tr>
<tr>
<td>Insecticides</td>
<td>17</td>
<td>24.64</td>
</tr>
<tr>
<td>Turpentine oil</td>
<td>1</td>
<td>1.45</td>
</tr>
<tr>
<td>Drugs</td>
<td>2</td>
<td>2.90</td>
</tr>
<tr>
<td>5% Phenol</td>
<td>2</td>
<td>2.90</td>
</tr>
<tr>
<td>Corrosives</td>
<td>3</td>
<td>4.35</td>
</tr>
<tr>
<td>Heavy metals</td>
<td>1</td>
<td>1.45</td>
</tr>
<tr>
<td>Camphor</td>
<td>1</td>
<td>1.45</td>
</tr>
<tr>
<td>Plant Poison</td>
<td>6</td>
<td>8.70</td>
</tr>
<tr>
<td>Unknown Poison</td>
<td>4</td>
<td>5.80</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Majority of patients developed symptoms like Pain in abdomen, altered sensorium, respiratory distress, seizures, ataxia, hypotension, vomiting, headache and burns due to corrosives (Table 5). Nineteen patients (27.54%) were asymptomatic after 6 hr of observation in the emergency pediatric room; 29 patients (42.03%) developed symptoms related to toxic ingestion. Majority of the patients who developed respiratory distress and those who had altered sensorium had ingested kerosene.

Table No 5: Common Symptoms in Patients with Poisoning

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain abdomen</td>
<td>14</td>
</tr>
<tr>
<td>Altered sensorium</td>
<td>09</td>
</tr>
<tr>
<td>Skin Rash</td>
<td>4</td>
</tr>
<tr>
<td>Seizures</td>
<td>2</td>
</tr>
<tr>
<td>Burns</td>
<td>3</td>
</tr>
<tr>
<td>Abdominal Distension</td>
<td>4</td>
</tr>
<tr>
<td>Vomiting</td>
<td>19</td>
</tr>
<tr>
<td>Headache</td>
<td>8</td>
</tr>
<tr>
<td>Hematemesis</td>
<td>1</td>
</tr>
<tr>
<td>Hypotension</td>
<td>1</td>
</tr>
<tr>
<td>Facial Flushing</td>
<td>1</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>1</td>
</tr>
<tr>
<td>Watering eyes and nose</td>
<td>1</td>
</tr>
<tr>
<td>Psychosis</td>
<td>3</td>
</tr>
<tr>
<td>Respiratory Distress</td>
<td>16</td>
</tr>
<tr>
<td>Ataxia</td>
<td>1</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>18</td>
</tr>
</tbody>
</table>

In our study the outcome of accidental pediatric poisoning; majority of cases were discharged home within 48 hours after receiving appropriate treatment, the maximum duration of stay was up to 4 days (Table 6) (76.81%) Patients were discharged (17.39%) were referred to Higher center at Kamineni Hospital LB Nagar Hyderabad (KHL), around 4 cases (5.80%) were lost in follow-up.

Table No 6: Outcome of Accidental Pediatric Poisoning cases (n=69)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharged</td>
<td>53</td>
<td>76.81</td>
</tr>
<tr>
<td>Referred to Higher centre</td>
<td>12</td>
<td>17.39</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>4</td>
<td>5.80</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>100.0</td>
</tr>
</tbody>
</table>

DISCUSSION

Accidental poisoning is a significant cause of morbidity and mortality in pediatric patients in our country. It is responsible for 0.33% to 7.6% of total admissions in pediatric wards at various hospitals across India. It is very likely that this reporting is an underestimate of the actual magnitude of this problem as many cases go unreported. Globally approximately 3 million acute poisoning and 220,000 deaths from pesticide exposure have been reported annually. In developing countries like Pakistan, India and Bangladesh household products and pesticides are the common causes of poisoning.

The commonest age group involved in acute poisoning in our study was 1–5 years (34.78%) this finding is consistent with other studies. Child at this age is not able to differentiate between safe or dangerous things and have higher tendency to search and put everything in their mouth. Majority of children were male (68.12%) as boys tend to be more energetic which increased the liability. This male predominance is also reported in another Pakistani study. In a report from poison control centers in the United States, 1-year-old children were the ones most often involved in accidental poisoning, accounting for 28% of the poisonings in children less than 12 years old. They were followed by 2-year-old children (27%) and 3-year-old children (12%); infants made up 11%.

Plant poisoning constituted (8.70%) of cases in our study, of which cases were due to datura and opium because of its use as traditional medicine in some families to sedate the children by their mothers. These
patients presented with CNS and GIT symptoms and signs. Buch et al reported plant poisoning in 13.4% cases while Khurshed reported more than 15% plant poisoning in their study with more than 50% of cases due to datura\textsuperscript{18,19}.

In the present study household products constitute the major cause of accidental poisoning in children, similar findings reported in a study by Kumar\textsuperscript{20}. Among house hold products kerosene (46.38%) was the leading poison. Previous studies from India and adjoining regions have also shown that kerosene is the major culprit in majority of childhood poisonings\textsuperscript{21,10,22,23}. Kerosene is mostly used in our country as a cooking fuel by low income families, and is frequently stored in empty soft drink bottles that are kept on the floor, within easy reach of the children. All the cases of kerosene ingestion developed respiratory distress requiring hospitalization, CNS symptoms were noted in 4 and gastro-intestinal symptoms in 9 patient. Kerosene has been reported as important and leading house hold product taken accidentally by children in other studies with occurrence of 50.93% and 30%\textsuperscript{24,15}. Singh et al studied pattern of pediatric poisoning in a large north Indian tertiary care centre and observed a significant decline in kerosene poisoning in the decade 1980-89 compared to 1970-79. Their data showed a mortality rate of 12.5%. While kerosene still remains the single most important cause of poisoning in our patients, no deaths were reported\textsuperscript{9}.

Due to easy availability of organophosphate compounds, its poisoning was seen in 17 (24.64%) cases in the present study. Similarly our data also showed insecticides and pesticides to be important contributors. Common symptoms noted in decreasing order of frequency were vomiting, diarrhea, Respiratory distress, pain abdomen, altered sensorium and headache. While none of our patients died, one required intubation for altered sensorium and severe respiratory distress.

Accidental poisoning in pediatric age group is a common occurrence. Although the clinical outcome of such cases is usually favorable, deaths do occur but in our study no mortality was reported. Similarly no deaths were reported in the studies conducted at Pakistan\textsuperscript{25} and United Arab Emirates\textsuperscript{26}. The retrospective nature of the present study is a limitation. This may be responsible for non-availability of data on some of the aspects. In spite of this limitation, our results suggest that accidental poisoning in children remains a significant clinical problem. The age groups most at risk (1 to 5 years old) are relatively constant.

**CONCLUSION**

Poisoning is most common in 0-5 year’s age group as far as accidental pediatric poisoning is concerned; also it is more frequent in males. Kerosene poisoning is the most frequently reported household poisoning. Although adequate evidence regarding effectiveness of community-based childhood poisoning prevention programs is lacking at present, simple measures like parental education, storage of poisonous substances out of reach of children, safe storage under lock and key, proper disposal of poisonous substance and their containers after use and use of child proof packing and containers for drugs and basic health education during schooling could be effective in preventing a large proportion of morbidity and mortality related to accidental childhood poisoning. There is a need to establish regional toxicological centers and poison information centers which can help guide hospitals in the quick identification of poisons and provide guidelines for treatment. There is also a need to initiate public awareness campaigns to attempt to decrease morbidity and mortality from this eminently preventable problem.

**Acknowledgement:** I would like to thank the doctors, nurses, and support staff in the Emergency Medicine Department at Kamineni Hospital, Kamineni Institute of Medical Sciences, Narketpally, for their diligence and expertise. I am extremely thankful to staff of Medical Records Department, Kamineni Hospital, KIMS Narketpally, for their kind help and assistance in collecting data.

**Ethical Approval:** Ethical approval taken from the Institutional ethics committee.

**Source of Funding:** Nil

**Conflicts of Interest:** Nil.

**REFERENCES**


INTRODUCTION

Pattern of poisoning in a region depends upon variety of factors, ranging from availability and access of poison to the socio-economic status of the individual; also not to forget of the cultural and religious influences. Poisoning forms a major problem all over the world, though the type of poison, the associated morbidity and mortality varies from place to place and changes over a period of time.

Poisonings claim substantial numbers of lives throughout the world, in the form of Suicide, Accident or Homicide. Suicides by poisoning are increasing recently, possibly due to the stress and strain of modern life style. This is in turn could be from the changes occurring due to globalization and urbanization. Extensive usage of chemicals in industries, agricultural sector and domestic front is causing increased accidental poisoning.

The traditional methods of suicide by drowning, hanging etc. are being replaced by poisoning. The poisons and their compounds are cheap and easily available with out any questions or documentation, especially in developing countries like India.

In our area of study the irrigation projects have definitely contributed for the greenery of the region, but also given way for indiscriminate usage of pesticides and weed killers by the farmers who are looking for big yields. Thus these poisonous substances are available in their backyards round the clock. With this back drop of factors prompted us to study the profile or trend of poisoning cases which were admitted or autopsied at District and Khaja Banda Nawaz institute of Medical Sciences, Gulbarga [North Karnataka]. The aim was to collect authenticated data of the poisoning cases and analyze them in all respects. These kinds of data are in turn helpful for the concerned authorities to look for solutions to the problem and evolve necessary policies to reduce or prevent them.

ABSTRACT

Morbidity and mortality due to poisoning is a world wide problem. The pattern poisoning varies from Country to country, place to place and changes over a period of time due to various reasons.

The present study is a prospective study conducted at Khaja Banda Nawaz institute of medical science of Gulbarga, (North-Karnataka) during 2011-2013. Total 229 poisoning cases were studied from OPD to IPD, followed from admission to recovery or death in a systematic manner. All these cases were analyzed with an objective of knowing age & sex distribution of victims, commonest type of poison, the manner of poisoning, occupation, and also the rural & urban trends.

Among 229 cases, male (51.15%) predominated females (42.85%) with majority (42.25%) belonging to 21-30 yrs age group. The commonest poison encountered was the Organophosphorous compounds (73.14%). Suicide (77.33%) was the commonest manner than accidental poisoning.

Agricultural farmers with rural background, belonging to lower socioeconomic strata were the commonest victims (78.29%) compared to others.

Keywords: Poisoning Cases, Organophosphorous Compounds, Suicide, Accident
MATERIALS AND METHOD

Study design: Descriptive

Study period: 01-11-2011 to 31-10-2013

Study Method- A total of 229 poisoning cases admitted and autopsied at District hospital & Khaja Banda Nawaz Institute of Medical Sciences, Gulbarga (North Karnataka) were analyzed during 2011-2013.

The victims were studied from the time of OPD admission to wards and followed up till recovery or death. Data were collected in a Performa, from the history given by the patient, hospital records, police inquest reports, post mortem reports, FSL reports and also personal interview with the concerned relatives. The emphasis was on the age, sex, rural / urban, type of poison and manner of poisoning. All data was documented and statistically analyzed.

RESULTS

Among 229 cases of poisoning studied during 2011 - 2013, majority of the victims were males (57.15%) (Table No.1) and male and female ratio was 1.3:1. 21-30 yrs (42.29%) (Table No.2) was the commonest age group involved and were residents of (in and around) Gulbarga.

The commonest type of poison encountered was the compounds of Organophosphorus (73.14%) (Table No.3) and last was the Phenol with single case (0.57%).

The commonest manner (Table No.4) of poisoning was suicide both in male (78%) and female (77.33%) followed by accidental poisoning accounting for 21% and 22.67% in male and female respectively. Not a single case of homicidal poisoning was observed in our study. Occupation wise (Table No 5) agricultural farmers topped the list (36%) followed by laborers (23.43%). Most of the victims belonged to rural area i.e. 133 (76%) compared to urban area (Table No.6).

Persons of low socio-economic strata are the commonest victims (72.57%) followed by middle class (25.71%) and least involved were the upper class (1.14%) (Table No.7).

---

Table No.(1) Sex wise Distribution of victims

<table>
<thead>
<tr>
<th>Age</th>
<th>Males No</th>
<th>%</th>
<th>Females No</th>
<th>%</th>
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<tbody>
<tr>
<td>0-10</td>
<td>1</td>
<td>1.00</td>
<td>3</td>
<td>4.00</td>
</tr>
<tr>
<td>11-20</td>
<td>11</td>
<td>11.00</td>
<td>28</td>
<td>37.33</td>
</tr>
<tr>
<td>21-30</td>
<td>44</td>
<td>44.00</td>
<td>30</td>
<td>40.00</td>
</tr>
<tr>
<td>31-40</td>
<td>28</td>
<td>28.00</td>
<td>9</td>
<td>12.00</td>
</tr>
<tr>
<td>41-50</td>
<td>10</td>
<td>10.00</td>
<td>5</td>
<td>6.67</td>
</tr>
<tr>
<td>51-60</td>
<td>4</td>
<td>4.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>61 and Above</td>
<td>2</td>
<td>2.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100.00</td>
<td>75</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table No.(2) Age wise distribution of victims

<table>
<thead>
<tr>
<th>Age</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>4</td>
<td>2.29</td>
</tr>
<tr>
<td>11-20</td>
<td>40</td>
<td>22.86</td>
</tr>
<tr>
<td>21-30</td>
<td>74</td>
<td>42.29</td>
</tr>
<tr>
<td>31-40</td>
<td>37</td>
<td>21.14</td>
</tr>
<tr>
<td>41-50</td>
<td>14</td>
<td>8.00</td>
</tr>
<tr>
<td>51-60</td>
<td>4</td>
<td>2.29</td>
</tr>
<tr>
<td>61 and Above</td>
<td>2</td>
<td>1.14</td>
</tr>
<tr>
<td>Total</td>
<td>175</td>
<td>100</td>
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</tbody>
</table>

Table No (3) Commonest type of poison

<table>
<thead>
<tr>
<th>Poison</th>
<th>No of Cases</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Organophosphorus compounds</td>
<td>128</td>
<td>73.14</td>
</tr>
<tr>
<td>Diazepam</td>
<td>16</td>
<td>9.14</td>
</tr>
<tr>
<td>Rat poison</td>
<td>12</td>
<td>6.86</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>6</td>
<td>3.43</td>
</tr>
<tr>
<td>Kerosene</td>
<td>2</td>
<td>1.14</td>
</tr>
<tr>
<td>Alcohol</td>
<td>2</td>
<td>1.14</td>
</tr>
<tr>
<td>Datura</td>
<td>5</td>
<td>2.86</td>
</tr>
<tr>
<td>Endrin</td>
<td>2</td>
<td>1.14</td>
</tr>
<tr>
<td>Bhang</td>
<td>1</td>
<td>0.57</td>
</tr>
<tr>
<td>Phenol</td>
<td>1</td>
<td>0.57</td>
</tr>
<tr>
<td>Total</td>
<td>175</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table No.(4) Manner of poisoning

<table>
<thead>
<tr>
<th>Manner</th>
<th>Males No</th>
<th>%</th>
<th>Females No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental</td>
<td>21</td>
<td>21.00</td>
<td>17</td>
<td>22.67</td>
</tr>
<tr>
<td>Suicidal</td>
<td>78</td>
<td>78.00</td>
<td>58</td>
<td>77.33</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>1.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Homicidal</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100.00</td>
<td>75</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Table.No (5) Occupation of Victims

<table>
<thead>
<tr>
<th>Occupation</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>63</td>
<td>36.00</td>
</tr>
<tr>
<td>House wife/ Labourer</td>
<td>33</td>
<td>18.86</td>
</tr>
<tr>
<td>Labourer</td>
<td>41</td>
<td>23.43</td>
</tr>
<tr>
<td>Student</td>
<td>19</td>
<td>10.86</td>
</tr>
<tr>
<td>Driver</td>
<td>7</td>
<td>4.00</td>
</tr>
<tr>
<td>Clerk</td>
<td>5</td>
<td>2.86</td>
</tr>
<tr>
<td>Others</td>
<td>7</td>
<td>4.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>175</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table. No.(6) Rural / Urban distribution of victims

<table>
<thead>
<tr>
<th>Areas</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>133</td>
<td>76.00</td>
</tr>
<tr>
<td>Urban</td>
<td>42</td>
<td>24.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>175</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Table.No.(7) Socio-economic status of victims.

<table>
<thead>
<tr>
<th>Status</th>
<th>No of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower class</td>
<td>127</td>
<td>72.57</td>
</tr>
<tr>
<td>Middle class</td>
<td>45</td>
<td>25.71</td>
</tr>
<tr>
<td>Upper class</td>
<td>2</td>
<td>1.14</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>175</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

DISCUSSION

The present scenario of globalization, urbanization and industrialization is creating lot of stress on individuals in particular as well as on the society in common. Persons who are not able to sustain these stressful situations are the major victims of either suicidal or accidental poisonings.

Males out numbered the females and majority were in the age group of 21-30 yrs (42.25%). This particular age group is the most active phase of life for men who are involved mentally, physically and socially. They are exposed to day to day stresses of life than females. This observation is consistent with previous studies.2,3,4

The commonest poison observed was the Organophosphorus compounds and least encountered was the Phenol. This is consistent with the observations made by earlier studies.5,6,7 Suicide being the commonest manner of poisoning (77.33%) with agricultural farmers being the major victims (78.29%) residing in rural setup (76%) belonging to lower socio economic strata (72.5%).These observations are similar to the other earlier workers.2,3,8 This is possibly due to illiteracy and poverty of the agricultural farmers residing in rural parts. They solely depend on the agricultural income for their living. Due to some reason (i.e. either lack of water or flood) if they are not able to generate the required income for their day to day living and commitments, they may get frustrated and resort to suicide by these agricultural insecticides, pesticides or weed killers which are available in their backyard.

Even though the government and other agencies are trying their best to prevent these unfortunate events by various projects and programmes, but still the trend continues. Knowing the pattern of poisoning in an area, not only helps in early management of poisoning cases but also suggests taking earliest preventive measures.

CONCLUSION

The study clearly highlights the pattern of poisoning in North Karnataka area, showing that the males of 21-30 yrs age group are the major victims. It also point towards the commonest poison used i.e. Organophosphorous compounds to commit suicide by agricultural farmers of rural area belonging to lower socio-economic strata.

The incidence, trends of poisoning, the morbidity & mortality due to poisoning can be possibly curtailed by following means:

- Strict vigilance over the sale and distribution of insecticides.
- Educating the users regarding the safety measures.
- Good treatment facilities (i.e. antidotes etc) at rural areas like P H C’s & P H U’s.
- Establishing Poison Information Centers.
- Proper & correct implementation of social & economic projects aimed for upliftment of the Rural poor & downtrodden.

Acknowledgement: The authors are thankful to Principal, Dr Imtiazul haq, Khaja Banda Nawaz institute of Medical Sciences, Gulbarga for kindly providing laboratory and necessary facilities to carry out this research work.

Conflict of Interest: The findings in this research work found to be similar to most of the research work conducted in India.

Source of Funding: Self Funding

Ethical Clearance: Not Applicable.
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2. Escoffery T Carlos, Shirley E Suzane. Fatal poisoning in Jamaica. A Coroner’s autopsy study from the University hospital of West Indies; 2004; 44(2), 116 – 120.


Sport Death: a Case Report

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1Associate Professor and Head of Department, 2Assistant Professor, Department of Forensic Medicine, Bangalore Medical College and Research Institute, Bangalore

ABSTRACT

Death while sporting could be due to many reasons, of which sudden death due to cardiac cause has a major share. Injuries involving the Central Nervous system and spine have a high morbidity and mortality. Injuries may vary from a very minimal scratch to an injury that can cause death. Most injuries in sports are non fatal, but injuries to vital organs can be fatal. The dynamics involved in the sport plays a major role in the injury and related mortality. One such case of field hockey death of a young individual is discussed here.

Keywords: Sport, Injury, Hockey, Death, Head and Neck

**Serious sport has nothing to do with fair play. It is bound up with hatred, jealousy, boastfulness, disregard for all rules, and sadistic pleasure in witnessing violence. In other words, it is war minus the shooting… Most of the games we now play are of ancient origin, but sport does not seem to have been taken very seriously between Roman times and the nineteenth century… Then, chiefly in England and the United States, games were built up into a heavily-financed activity, capable of attracting vast crowds and rousing savage passions, and the infection spread from country to country. It is the most violently combative sports, football and boxing, that have spread the widest**

- Eric Arthur Blair

British author and journalist, Commonly known by his pen name, George Orwell (1945)

INTRODUCTION

A wide range of head and neck injury risks are present in sport, including catastrophic injury. The literature since 1980 on prevention of head and neck injury in sport was reviewed, focusing on catastrophic and brain injury and identifying the range of injury prevention methods in use. Neurological injuries of either the peripheral or central nervous system (CNS) are varied and numerous depending on the nature of the sporting activity, age of the participants and intensity of play. The associated with specific sporting activities. The type of sport may vary from recreational games such as lawn darts, individual sports such as skiing or snowboarding and team sports such as professional football. The physician may be confronted with symptoms and signs reflecting injury to the brain and spinal cord. Recognition of specific injuries and their relationship to specific sporting activities may assist physicians with the rapidity of diagnosis and possible therapy. The number of minor traumatic brain injury (mTBI), cerebral concussions, is increasing and cannot be eliminated by any kind of equipment. A new internet database system, the International Sports Injury System (ISIS) should improve epidemiological analysis of head, face, and spinal injuries worldwide. ISIS should provide an internationally compatible system for continuous monitoring of risk factors, protective effects of equipment, and effects of changes in rules through the years.

Case: A young 18 year old army recruit said to have sustained injury while playing field hockey match at around 5.20 pm and was shifted to an Army hospital and was declared dead at 6.30 pm. The body was kept in the cooler. Post-mortem examination was conducted on the next day at 3pm.

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Post-mortem findings: Dead body was that of an adult male, measuring 172 cms in length, moderately built and nourished. Post-mortem staining was present over the back and Rigor mortis was present all over the body. Defibrillator mark present over front of chest.

External injuries: Abrasions 1.5cm x 1 cm and 1.5cm x 1cm were present over right forearm back and front of left knee respectively.

Internal injuries: On reflection, the scalp was intact, skull and membrane were intact. The whole of brain showed subdural and subarachnoid hemorrhages. Thick clots were present overmid brain region, cerebellum and medulla oblongata. Fracture dislocation at C4- C5 vertebrae with surrounding blood extravasation. Heart was found to be normal. All other organs were found to be intact and congested.

Cause of death: Opined as “death was due to coma as a result of intra cranial hemorrhage and injury to the cervical spine”.

DISCUSSION

A wide range of Traumatic brain injury and cervical spine injury patterns are related to sports activities. Although hemorrhage and hypovolemia are rare in thesetting of a sports-related spinal injury, patients with severecerebral spine injuries are at risk for neurogenic shock, which is characterized by disruption of the sympathetic outflow with resulting hypotension and associated bradycardia. In an autopsy based study conducted by Maron BJ et al, between 1992 to 2002 of 370 cases of sport injury 6 cases of neck non penetrating injury were selected of which death was attributed to dissection and rupture of the vertebral in 4 cases or internal carotid artery in 1 case and the precise location was unresolved in 1 case, leading to massive subarachnoid hemorrhage with rapid accumulation of blood within basilar cistern, Sylvian fissures and ventricles, and brainstem herniation. In no individual was a cerebral aneurysm identified. The precise mechanism by which death occurs is uncertain. Although it is possible that a blow to the neck may directly cause arterial rupture, it is also possible that it can result from reflex hyperextension and rotation of the head (triggered by an unexpected blow). In the present case cervical injury could be attributed to sudden hyperextension of neck trying to avoid the ball.

CONCLUSION

Autopsy based studies on death due to sports injuries provides more data to International Sports Injury System (ISIS). It also contributes to the challenges faced by health-care professionals in making accurate diagnoses and developing treatment plans for sports injuries. More research is required in the field of field hockey which is the national game of India. Awareness among youth regarding such sports injuries is important in developing protective and preventive strategies during sporting activities.

Acknowledgement: To all the staff members Department of Forensic Medicine, Bangalore Medical College and Research Institute, Bangalore.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Not applicable.

REFERENCES

Estimation of the Stature from a Fairly Reliable Body Parameter: Arm Span

Sweta Patel¹, Binaya Kumar Bastia², Lavlesh Kumar³, Senthil Kumaran M⁴
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ABSTRACT

Background: Stature is an important parameter in establishing the identity of a person. It has always been a challenge to assess the stature from incomplete human remains.

Aim: To evolve a regression equation to determine the height of an individual by using arm span length in Gujarati population.

Material and Method: A cross-sectional study was conducted in a teaching hospital of Vadodara, Gujarat comprising 100 participants (50 males and 50 females) in the age group of 20-40 years. Height was measured using Stadiometer while arm span was measured with a flexible steel tape from the tip of the middle finger of one hand to the tip of the middle finger of the other hand, the individual standing with their back to the wall and both arms abducted.

Results: A regression equation was obtained. The regression equation serves to estimate stature using arm span in both males and females with optimum accuracy. Analysis reveals a highly significant correlation (p< 0.05) between height and arm-span.

Conclusion: Arm span can be considered as a fairly reliable body parameter for the estimation of stature when height cannot be measure directly. It will extend a great help to forensic experts, anthropologists, anatomists in solving inter-related medico-legal issues especially in mass disasters.

Keywords: Anthropometry, Stature, Arm Span

INTRODUCTION

Establishment of an individuality of a person carries an immense importance in medico legal investigation in living as well as in dead. Stature or human height is an important factor in establishing the identity of a person especially in the skeletonized remains. It becomes a challenge when incomplete human remains or only the upper half of the body are available. Before estimating stature, one must determine the race, sex, and age of the individual as stature varies with the variables. Krogman and Iscan have mentioned that regression formula for stature should be population specific. In Latin, the word ‘Scapula’ means the shoulder blade, the bone that connects the humerus (upper arm bone) with the clavicle (collar bone). The cartilaginous scapula is ossified from eight or more centres: one in the body, two each in the coracoid process and the acromion, one each in the medial border, inferior angle and lower part of the rim of the glenoid cavity. The centre for the body appears in the 8th intrauterine week. Ossification begins in the middle of the coracoid process in the first year or in a small proportion of individuals before birth and the process joins the rest of the bone about the 15th year. At or soon after puberty centres of ossification appear in the rest of the coracoid process (subcoracoid centre), in the rim of
the lower part of the glenoid cavity, frequently at the
tip of the coracoid process, in the acromion, in the
inferior angle and contiguous part of the medial
border, and in the medial border. The base of the
acromion is formed by an extension from the spine;
the rest of the acromion is ossified from two centres
which unite and then fuse with the extension from the
spine. The various epiphyses of the scapula all join
the body of the bone by about the 20th year.4

The aim of this present study is to measure the
stature of an individual using arm-span to determine
whether there is any correlation between the stature
and the arm-span in Gujarati population. This will help
to derive a regression equation for estimation of stature
from arm span, when incomplete human remains are
available consisting of only the upper half of the body
and to analyze the differences between the two genders
in estimating height.

MATERIAL AND METHOD

A cross sectional study was conducted on 100
apparently healthy Gujarati individuals (50 males and
50 females) in the age group of 20–40 years. This age
group was selected because by this age the growth of
the individual ceases.

Inclusion criteria: Apparently healthy individuals
who are above the age of 20 years and below the age
of 40 years.

Exclusion criteria: Individuals who are unable to
stand erect for measurement of standing height due
to history of fracture of limb bones or due to the
presence of any spinal and/or other skeletal
abnormality of the limbs.

The standing height and arm span were measured
for all individuals. The height was measured with the
individual standing barefoot on the platform of the
stadiometer with the buttocks and heels pressed
against the upright position of the instrument.

Arm span was measured with a flexible steel tape
from the tip of the middle finger of one hand to the tip
of the middle finger of the other hand with the
individual standing with her back to the wall with both
arms abducted, the elbows and wrists extended and
the palms facing directly forward. Readings were taken
to the nearest 0.1 cm. The measurements were recorded
twice on the different occasions to avoid intra-
observational biases.

Statistical Analysis

The data obtained was tabulated in MS Excel and
software SPSS Version 20 was used to formulate a
regression equation. The correlation between height
and arm span were determined using simple
correlation coefficient and their 95% confidence
interval. A p-value less than 0.05 were considered as
significant.

RESULTS AND OBSERVATION

<table>
<thead>
<tr>
<th>Gender</th>
<th>Regression equation</th>
<th>Percentage Explained (r²)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>51.627 + 0.672 x Arm span</td>
<td>0.557</td>
<td>0.002</td>
</tr>
<tr>
<td>Females</td>
<td>123.856 + 0.215 x Arm span</td>
<td>0.364</td>
<td>0.000</td>
</tr>
</tbody>
</table>

DISCUSSION

Several studies have reported the effectiveness of
using various body parameters in predicting body
height and the arm span was found to be the most
reliable.5,6,7 Chumlea8 estimated stature from knee
height, while Mitchel6 correlated arm length with
height. The one variable that proved to be consistently
reliable in estimating height was the arm span.

Steele and Chenier, in a study on black and white
women in the age group 35–89, reported correlations
of arm span and height of 0.852 and 0.903 for black
and white women respectively.9 In a similar study of
blacks of both sexes in the age group 22–49, a
correlation of 0.87 was observed between arm span
and height. In Steel and Chenier’s study, arm span was
nearly 8.3 cm more than height for blacks, whereas
for whites, this difference was only 3.3 cm.9

SP Mohanty et al.10 carried out a similar study on
South Indian women and noted that the arm span was
nearly 2.5 cm more than height, which was similar to
that noted in the white population.

We found that estimating height of an individual
using arm span is both statistically significant (p value
< 0.05) and with high degree of correlation (r & r² values
higher in males than in females). The estimation
equations which we obtained are clearly different from
those of other populations. This emphasizes the need
for developing separate models for each population
on account of racial and ethnic differences in
anthropometric measurements.
CONCLUSION

From the present study, we found arm span to be a fairly reliable body parameter for the estimation of height when it is difficult or not possible to measure height directly. Comparisons made with other population could contribute to the understanding of the relative status of Gujarati population in the context of the anthropometric variations around the world. This may also be helpful for those who work in this area especially in the various medical disciplines, anthropologists, and in certain civil cases.

RECOMMENDATION

This is a preliminary study and it is therefore recommended that further studies aimed to assess the level of accuracy of this formula and other observations to be carried out using large population group.

Acknowledgement: Nil

Ethical Clearance: Taken from ethical committee.

Source of Funding: Nil

Previous Presentation: Nil

Conflict of Interest: Nil

REFERENCES


A Case Report Homicide under Disguise of Fall from Height

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ABSTRACT
Battering of women has been a major problem in the community since years and irrespective of caste and socio economic status it has been persistent in our society. Most of the women in India experience some of the other form of physical violence from their partners during their married life. Battering of women is one of the most common recognised crimes in India, and most of them are settled within home and rarely they reach to the police station or court. Among these cases the history is misleading which makes detection of such crimes difficult. One such case was brought to mortuary of Sri Aurobindo Medical College and PG Institute, Indore in which history was given by her husband of fall from height. On Post Mortem Examination it emerged out to be the case of wife battering. This raises a big question, as to where else a woman can feel safe if they are not safe in their own home.

Keywords: Wife Battering, Incised Looking Lacerated Wounds, Rail Pattern Contusion

INTRODUCTION

Battering and the effects of battering are complex phenomenon. In addition to physical injury, individuals who have experienced battering often confront an array of psychological issues that differ in both type and intensity. The effects of domestic violence vary according to the social and cultural contexts of individuals’ lives and include differences in the pattern, onset, duration, and severity of abuse. The term 'battered woman syndrome' was coined by psychologist and prominent feminist academic, Lenove E. Walker, to denote a set of distinct psychological and behavioural symptoms that result from prolonged exposure to situations of intimate partner violence¹. Despite the international recognition, women in most societies in the world are still subject to various kinds of violence, particularly violence inflicted by husbands within the domestic sphere. The traditional tendency to consider women as subordinate to men has led to a perception of justification of traditional violent practices and gender-based violence such as wife battering, as a form of control or “protection” of women. In many jurisdictions, particularly Asia, wife battering is seen as a private matter and considerations of family and culture or religion tend to prevail over women’s interests.

CASE REPORT

A 25 years old woman was brought to the casualty by her husband with history of fall from height on 31º December 2011. On examination patient was gasping, her peripheral pulse was not palpable, and her BP was not recordable. Both the pupils were dilated and fixed not reacting to the light and temperature was subnormal with cold extremities. Patient could not be resuscitated and was declared dead. The dead body was shifted to mortuary for Post Mortem Examination.

Autopsy examination

On examination the dead body was moderately built female wearing red saree, black blouse and maroon colored paticoat and clothes which were soaked with blood on posterior aspect. Eyes and mouth found closed.

Injuries
1) Upper lip showing tear at frenulum with contused margins and gums. (Fig. 1)
2) Multiple semi circular abraded contusions present all over anterior aspect of the neck.
3) Lacerated wound 2.5cm x 1cm x Bone deep with contused margins present over forehead just above
the lateral end of right eyebrow horizontally. Another lacerated wound with contused margin present over the midline of forehead 8 cm above the glabella vertically measuring 2 cm x 1 cm x Bone deep. (Fig. 2)

4) Bluish contusion 6 cm x 4 cm present over right side of cheek. (Fig. 2)

5) Bluish black color Rail pattern contusion 7 cm x 2.5 cm with 0.5 cm healthy area in between the contusions present over postero lateral aspect of mid of left thigh and bluish black contusion present over both the buttocks all over. (Fig. 3)

6) Bluish black color Rail pattern contusion 5 cm x 2.5 cm with 0.5 cm healthy area in between the contusions present over anterior aspect of left thigh.

7) Three incised looking lacerated wounds measuring 2 cm x 1 cm x Bone deep each, were present over the occipital region, around the occipital protubrence obliquely and parallel to each other. On reflection, the scalp showing echymosis all over. (Fig. 4)
Internal findings: Organs were pale. Heart was practically empty.

DISCUSSION

Thus the postmortem examination findings were inconsistent with the history given i.e. fall from height. The abrasions were covered with bright red scab which indicates these injuries were 12-24 hours old. Contusions were bluish black in color which indicates that the injuries were 3-4 days old. Difference in the duration of age of injuries indicates that woman was continuously harassed since few days. Tearing of upper lip frenulum with contused gums and nail marks which were present as semi circular abraded contusions over neck are suggestive of attempted assault more likely throttling. However on internal examination of the neck showed no significant injuries as the neck muscles appeared without any injury and the hyoid bone was intact. There was no skull fracture and no brain injury seen. All the injuries were ante mortem in nature and were caused by hard and blunt object. Injuries appeared to occur as a result of assault. Cause of death was due to shock and hemorrhage as a result of multiple injuries present over body. Further the weapon was seized from the crime scene and was sent for examination which was an axe and was sent in two parts separately, the metallic part and the handle which was bamboo (Fig.5). After examining the weapon it was found that the bamboo handle was loosely fit and might have separated during the struggle. Later on the incised looking lacerated wound could have been caused by the separated metallic, heavy not so sharp blade. Other injuries (Rail patterned contusions) present over the body appears to be caused by wooden handle separated from axe. Opinion was given that the injuries mentioned in the post mortem report could have been caused by this kind of object.

In India the rate of domestic violence is around 45% which appears to be the tip of iceberg, actually statistics is far more since most of the cases remain unreported or unexpressed. Every 6 hours, a young married woman is burnt alive, beaten to death or forced to commit suicide in India.

Government is also trying to protect the women from all such violence and for that the “Domestic Violence Act 2005” was brought into force by Indian Government from October 26, 2006. Domestic violence under this act includes actual abuse or the threat of abuse whether physical, sexual, verbal, emotional or economical.

Studies in different countries found that rates of abuse were higher among women whose husband had either themselves been beaten as children or had witnessed their mothers been beaten. Another risk marker for partner violence that appears especially consistent across different settings is alcohol use by men.

The basic reason behind the domestic violence is socio-cultural and economic, illiteracy and ignorance, about rights and remedies. The other reasons for not reporting of domestic violence are, fear of being socially isolated and fear of more violence, lack of alternative means of economic support i.e. victim is economically dependent on the abuser, concern for the children, emotional dependence, lack of support from family and friends, an abiding hope that the man will change and not knowing to whom and where to go.

CONCLUSION

The consequences of abuse are profound, extending beyond the health and happiness of individuals to affect the wellbeing of entire community. Living in a violent relationship affects a woman’s sense of self esteem and her ability to participate in the world. Such women are often unable to properly look after themselves and their children or to pursue jobs and carriers.

Conflict of Interest: None to declare.

Source of Funding: No source of financial assistance was obtained from any individual or agency.

Acknowledgement: Nil.

Ethical Clearance: Identity of the deceased not revealed. (doesn’t require ethical clearance)

REFERENCES


Profile of Medicolegal Cases Admitted at a Newly Established Rural Medical College Hospital of Central India

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ABSTRACT

Profiling of the medicolegal cases is important to know the quality and quantity of caseload to be expected by the medicolegal workforce serving the area. A retrospective study was conducted at Index Medical College Hospital and Research Center Indore M.P. covering the first five years of its establishment as a teaching hospital in the rural area of central India.

The study revealed that road traffic accidents (60.7%) constituted the majority of medicolegal cases out of the total 596 cases, followed by poisoning (14.3%) and assault (10.6%). Accidents were the major cause of injury; male preponderance was at 2.6:1, most affected age group was 21-30 years (36.2%). The peak time of incidence was during 1601-2000 hours (36.4%) and the maximum cases were recorded in the month of April (11.1%). Out of the 596 cases 408 (68.5%) were discharged and 12 (2%) died due to their injuries.

Keywords: Medicolegal case, Profile, Injury, Indore

INTRODUCTION

Medicolegal cases are an integral part of medical practice especially in the casualty department of all health institutions.¹ As the scope of medicolegal problems differ by regions so the profiling of the medicolegal cases is important to know the quality and quantity of caseload to be expected by the local medicolegal workforce and it’s also important for the proper allocation of funds and for the formulation of preventive strategies to efficiently address the medicolegal needs of a particular area.²

The present study was undertaken to understand the magnitude and pattern of medicolegal cases at a newly established rural medical college hospital.

MATERIALS AND METHODOLOGY

The study was a retrospective analysis of all medicolegal cases admitted to the emergency department of Index Medical College Hospital and Research Center Indore M.P. during the five year study period extending from 1st January 2008 to 31st December 2012. After taking the history and circumstances of the incident and examination of the admitted patients those who had been declared as a Medico-legal Case (MLC) were included in the study. Information regarding age, gender, demography, mode of injury, time of occurrence, length of stay in hospital and final outcome of these MLC cases was recorded. The collected data was analyzed observations discussed and compared with other studies.

OBJECTIVES

1. To document the profile of medicolegal cases at Index Medical College Hospital and Research Center Indore M.P.
2. To highlight the vulnerable gender and age of the victims, the most common mode and manner of such injuries, the time and seasonal frequency of medicolegal caseload at Index Medical College Hospital and Research Center Indore M.P.

3. To suggest preventive measures that can reduce the incidence of such cases.

OBSERVATIONS

During the five year study period 596 hospital admissions were identified as medicolegal cases and were included in the study. In respect to gender distribution, 431 were male as compared to 165 female and male to female ratio was 2.6:1 in this study. (Table 1). Maximum numbers of cases 216 (36.2%) were reported in the age group of 21-30 years followed by 31-40 years, which showed 125 (20.9%) cases. (Table 2)

The majority cases 489 (82.0%) were from rural areas and 383 (64.3%) were married. Maximum cases reported were of Road traffic accidents 362 (60.7%) followed by poisoning 85 (14.3%) and thereafter 63 (10.6%) cases of assault and 35 (5.9%) of falls. (Figure 1). For 484 (81.2%) cases manner of injury was accidental, followed by assault/homicidal in 64 (10.7%) and suicidal intent in 48 (8.1%). (Figure 2)

The month of April recorded the maximum caseload at 66 (11.1%) of total which was closely followed by December with 62 (10.4%). (Figure 3) With respect to the time of occurrence of the injury, 217 (36.4%) cases were in the 1601 hrs – 2000 hrs slot followed by 145 (24.3%) in 1201 hrs-1600 hrs and 96 (16.1%) between 2001 hrs-2400 hrs. (Figure 4)

Hospital stay of under 24 hours was seen with 117 (20%) cases and between 24-48 hours in 125 (20%). One hundred and forty-one (23%) patients had a stay of more than 1 week but less than 4 weeks and only 5 (0.8%) cases had a hospital stay beyond 4 weeks. (Figure 5)

Overall, 408 (68%) cases were discharged after treatment, 128 (21%) left against medical advice, 19 (3.2%) were discharged on request and 13 (2.2%) had to be referred to higher centers in the Indore city. Sixteen cases (2.7%) were reported absconding as per the hospital records. There were 6 male and 6 female fatalities, these 12 deaths constituted 2.0% of total MLC caseload. (Figure 6)

<table>
<thead>
<tr>
<th>Column1</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>TOTAL</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>MALE</td>
<td>10</td>
<td>39</td>
<td>103</td>
<td>66</td>
<td>213</td>
<td>431</td>
<td>72.3</td>
</tr>
<tr>
<td>FEMALE</td>
<td>1</td>
<td>21</td>
<td>50</td>
<td>27</td>
<td>66</td>
<td>165</td>
<td>27.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>11</td>
<td>60</td>
<td>153</td>
<td>93</td>
<td>279</td>
<td>596</td>
<td>100</td>
</tr>
<tr>
<td>%</td>
<td>1.8</td>
<td>10.1</td>
<td>25.7</td>
<td>15.6</td>
<td>46.8</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Age and Gender wise distribution of cases

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male (n=431)</th>
<th>Female (n=165)</th>
<th>Total (n=596)</th>
<th>Male : Female Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 yrs</td>
<td>13 (3.0%)</td>
<td>10 (6.1%)</td>
<td>23 (3.9%)</td>
<td>1.3:1</td>
</tr>
<tr>
<td>11-20 yrs</td>
<td>80 (18.6%)</td>
<td>30 (18.2%)</td>
<td>110 (18.5%)</td>
<td>2.7:1</td>
</tr>
<tr>
<td>21-30 yrs</td>
<td>163 (37.8%)</td>
<td>53 (32.2%)</td>
<td>216 (36.2%)</td>
<td>3.1:1</td>
</tr>
<tr>
<td>31-40 yrs</td>
<td>90 (20.9%)</td>
<td>35 (21.2%)</td>
<td>125 (20.9%)</td>
<td>2.6:1</td>
</tr>
<tr>
<td>41-50 yrs</td>
<td>51 (11.8%)</td>
<td>18 (10.9%)</td>
<td>69 (11.6%)</td>
<td>2.8:1</td>
</tr>
<tr>
<td>51-60 yrs</td>
<td>21 (4.9%)</td>
<td>10 (6.1%)</td>
<td>31 (5.2%)</td>
<td>2.1:1</td>
</tr>
<tr>
<td>&gt;60 yrs</td>
<td>13 (3.0%)</td>
<td>9 (5.6%)</td>
<td>22 (3.7%)</td>
<td>1.4:1</td>
</tr>
<tr>
<td>Total</td>
<td>431 (100%)</td>
<td>165 (100%)</td>
<td>596 (100%)</td>
<td>2.6:1</td>
</tr>
</tbody>
</table>
DISCUSSION

In the study, a total of 596 cases were studied, which had reported to the emergency department between Jan, 2008 and December, 2012. There was a substantial increase in the quantum of case recorded every successive year- only 1.8%(11) in 2008 to 46.8%(279) in 2012. The predominance of male victims, 431 (72.3%), was observed with a male to female ratio of 2.6:1, which is consistent with others studies. This is probably due to the fact in rural areas males are more actively involved in outdoor activities whether job or agriculture work, and females are mostly involved in household activities.

Most common age group with 36.2% medico-legal cases was 21-30 years. Moreover the young and productive age between 11-30 years recorded 326 cases which were 54.7% of the total caseload. These findings are consistent with other studies. Our Medical College is situated in rural area of Indore district, so 489(82%) cases were with rural background.

The most common manner of injury was accidental with 484(81.2%) cases (leading to 6 deaths), this finding is consistent with studies available from other parts of India. There were 48(8.1%) cases with suicidal intent out of which 42 were with poison use and 6 with burns. Out of the 64(10.7%) cases of assaults 1 homicidal death recorded.
Majority of the caseload 362(60.7%) was RTA; this is consistent with other studies from urban areas\(^3\) but not with some studies from rural India wherein poisoning is most common in rural setup.\(^2,7\) Index Medical College is situated in a rural area but it’s close to the industrial rich part of Indore so more travel is done by people to reach their factories, school, colleges, educational institutes, moreover, the conditions of the roads is not good in the areas which make the travellers susceptible to accidents contributing to the higher number of RTA cases recorded. Poisoning was the second most common cause with 85(14.3%) cases; out of these 41 were accidental exposures (leading to 2 accidental poisoning deaths), 42 suicidal attempts (leading to 5 suicidal poisoning deaths) and 2 cases with homicidal intent. As our hospital is in agricultural rural area, people have relatively easy access and exposure to agricultural poisons. The similar findings were reported by Malik et al.\(^2\)

Seasonal trends showed 36% cases each in rainy (June-Sep) and winter (Oct-Jan) seasons as compared to 29% in summer (Feb-May), this can be due to the slippery roads and poorer visibility conditions associated with these seasons. Moreover evening time recorded 217(36%) cases and half of the cases load (52.5%) was between 4:00 pm to midnight, as has been reported by Reddy et al.\(^3\)

With regards to the patient outcome, 409(68%) were discharged after satisfactory management at our hospital with just 13(2.2%) requiring referral to higher centers. As 128(22%) cases left against medical advice and another 16(2.7%) absconded as per hospital records, the hospital management needs to better its patient counseling and hospital security.

**Conclusions and Recommendations**

1. Males of young age group are most commonly involved in Medico-legal cases suffering morbidity and mortality. This results in loss of valuable manpower and hampers potential economic growth.

2. Road traffic accidents and poisoning cases account for the maximum medicolegal incidents. Improvement of the road conditions in this area can prevent majority of road traffic accidents and thus can reduce the medicolegal caseload coming to the casualty department.

3. Rash and negligent driving should be identified and the offenders be rigorously punished. Local people should be educated and trained to follow safety measures at home, workplace, on road and community programs should attempt to modify people’s behaviour to prevent all forms of violence, as human life is precious.

4. Accidental and Suicidal poisoning cases have a high incidence in rural population; therefore the casualty of all centres should be well equipped with antidotes and other life saving drugs required for the treatment of common poisons especially agricultural ones.

5. There should be authorized centres to arrange spraying of pesticides over crops and to train farmers how to do it safely, so as to prevent accidental poisonings. All hazardous materials should be kept under direct supervision of head of the family or an elderly member, who is physically and mentally healthy, so as to prevent suicidal attempts.

6. A toxicological lab should be established in the department of Forensic Medicine or in hospital itself so as to ensure early detection of the poison and timely institution of appropriate treatment to save precious lives. This facility should also be available in all community health centres.

We are sure that if above recommendations are implemented and brought in practice with sincerity and responsibility, it will be easier to maintain health of any community.

**Ethical Clearance:** Taken from Institutional Ethical Committee Index Medical College Hospital and Research Centre, Indore

**Conflict of Interest:** Nil

**Source of Funding:** Nil

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7. Agarwal KK, Kumar R, Sharma M. A retrospective study of medico legal cases presenting in the emergency of Rajindra Hospital Patiala in the year 2009. JPAMAT. 2011;11(2):77-80
Recent Amendments to Laws Related to Sexual Offences

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ABSTRACT

In April 2013 the Indian Parliament introduced amendments to the Indian Penal Code making various changes to the anti-rape laws in India.

Background: On 16 December 2012 a female physiotherapy intern was beaten and gang raped in Delhi. The incident generated international coverage and was condemned by the United Nations Entity for Gender Equality and the Empowerment of Women, who called on the Government of India and the Government of Delhi "to do everything in their power to take up radical reforms, ensure justice and reach out with robust public services to make women's lives more safe and secure".

Result: A judicial committee headed by J. S. Verma, report included the maximum punishment for rape as life imprisonment.

Keywords: Rape, Sexual Assault, Indian Evidence Act; CrPc; IPC

INTRODUCTION

Rape is the most gruesome and barbaric act of violating bodily integrity and honor of a woman. It destroys the entire physical and mental composure and pushes the victim into a deep emotional crisis and reduces her to a living corpse. (1) It is a crime against basic human rights one is entitled to and a clear violation of the Right to Life enshrined in Article 21 of our Constitution. (2,3)

Rape in India has been described by Radha Kumar as one of India’s most common crimes against women (4) and by the UN’s human-rights chief as a “national problem”. (5) Marital rape is not a criminal offence. (6)

Sources show that rape cases in India have doubled between 1990 and 2008. (7) According to the National Crime Records Bureau, in 2012, 25,000 rape cases were reported across India. Out of these, 24,470 were committed by relative or neighbor. The latest estimates suggest that a new case of rape is reported every 22 minutes in India. (8)

More than 7,200 children are raped each year in India. Underage victims who do report the assaults are often subjected to mistreatment and humiliation from the police. (9) A landmark government survey in 2007 revealed that a lot of children in India are physically abused and that such occurrences are 3 disturbingly common. (6,10)

Young girls are trafficked into prostitution in India, often by women who have been trafficked themselves. As adults they use personal relationships and trust in their villages of origin to recruit additional girls. (11) India is categorized as one of the ‘extreme risk’ countries for trafficking children by Maplecroft. (11)

In this article the changes that are brought to the existing laws against sexual assault are discussed along with the problem of rape cases in India. The material was searched in the Google search using key words : rape, amendments to criminal laws, IPC 375, 376, 370, 326, and 354'.

Etymology and definitions: The term rape originates in the Latin rapere from rapus, “to snatch,
to grab, to carry off. The term has come to mean, since approximately the 14th century, “to seize and take away by force.” In Roman law in the carrying off of a woman by force, with or without intercourse, constituted “raptus.” In Medieval English law the same term could refer to either kidnapping or rape in the modern sense of “sexual violation.”

The term is most often defined in criminal law. Rape is a type of sexual assault usually involving sexual intercourse, which is initiated by one or more people against another person without that person’s consent. The act may be carried out by physical force, coercion, abuse of authority or against a person who is incapable of valid consent, such as one who is unconscious, incapacitated, or below the legal age of consent.

There are several types of rape, generally categorized by reference to the situation in which it occurs, the sex or characteristics of the victim, and/or the sex or characteristics of the perpetrator. Different types of rape include date rape, gang rape, marital rape, incestual rape, child sexual abuse, prison rape, acquaintance rape, war rape and statutory rape.

The definition of rape varies both in different parts of the world and at different times in history. It is defined in many jurisdictions as sexual intercourse, or other forms of sexual penetration, of one person by another person without the consent of the victim.

The United Nations Office on Drugs and Crime defines it as “sexual intercourse without valid consent,” and the World Health Organization defined it in 2002 as “physically forced or otherwise coerced penetration – even if slight – of the vulva or anus, using a penis, other body parts or an object.”

When part of a widespread and systematic practice during international conflict, rape and sexual slavery are recognized as crimes against humanity and war crimes. Rape is also recognized as an element of the crime of genocide when committed with the intent to destroy, in whole or in part, a targeted ethnic group.

People who have been raped can be severely traumatized and may suffer from posttraumatic stress disorder; in addition to psychological harm resulting from the act, rape may cause physical injury, or have additional effects on the victim, such as acquiring of a sexually transmitted infection or becoming pregnant. Furthermore, following a rape, a victim may face violence or threats thereof from the rapist, and, in some cultures, from the victim’s own family and relatives.

**Current legal position in India: Criminal Law (Amendment) Act, 2013**

The Criminal Law (Amendment) Act, 2013 is an Indian legislation passed by the Lok Sabha on 19 March 2013, and by the Rajya Sabha on 21 March 2013, which provides for amendment of Indian Penal Code, Indian Evidence Act, and Code of Criminal Procedure, 1973 on laws related to sexual offences.

**BACKGROUND**

On 16 December 2012 a female physiotherapy intern was beaten and gang raped in Delhi. She died from her injuries thirteen days later, despite receiving treatment in India and Singapore. The incident generated international coverage and was condemned by the United Nations Entity for Gender Equality and the Empowerment of Women, who called on the Government of India and the Government of Delhi “to do everything in their power to take up radical reforms, ensure justice and reach out with robust public services to make women’s lives more safe and secure.” Public protests took place in Delhi, where thousands of protesters clashed with security forces. Similar protests took place in major cities throughout the country.

On 22 December 2012, a judicial committee headed by J. S. Verma, a former Chief Justice of India, was appointed by the Central government to submit a report, within 30 days, to suggest amendments to criminal law to sternly deal with sexual assault cases. The Committee submitted its report after 29 days on 23 January 2013, after considering 80,000 suggestions received by them during the period from public in general and particularly eminent jurists, legal professionals, NGOs, women’s groups and civil society. The report indicated that failures on the part of the Government and Police were the root cause behind crimes against women. Major suggestions of the report included the need to review AFSPA in conflict areas, maximum punishment for rape as life imprisonment and not death penalty, clear ambiguity over control of Delhi Police etc.

**Changes in law**

Section 370 of Indian Penal Code (IPC) has been substituted with new sections, 370 and 370A which...
deals with trafficking of person for exploitation. If a person (a) recruits, (b) transports, (c) harbors, (d) transfers, or (e) receives, a person, by using threats, or force, or coercion, or abduction, or fraud, or deception, or by abuse of power, or inducement for exploitation including prostitution, slavery, forced organ removal, etc. will be punished with imprisonment ranging from at least 7 years to imprisonment for the remainder of that person’s natural life depending on the number or category of persons trafficked. Employment of a trafficked person will attract penal provision as well. (38)

Section 375 of IPC: The most important change that has been made is the change in definition of rape under IPC. Although the Ordinance sought to change the word rape to sexual assault, in the Act the word ‘rape’ has been retained in Section 375, and was extended to include acts in addition to vaginal penetration. The definition is broadly worded with acts like penetration of penis, or any object or any part of body to any extent, into the vagina, mouth, urethra or anus of another person or making another person do so, apply of mouth or touching private parts constitutes the offence of sexual assault. The section has also clarified that penetration means “penetration to any extent”, and lack of physical resistance is immaterial for constituting an offence. Except in certain aggravated situation the punishment will be imprisonment not less than seven years but which may extend to imprisonment for life, and shall also be liable to fine. In aggravated situations, punishment will be rigorous imprisonment for a term which shall not be less than ten years but which may extend to imprisonment for life, and shall also be liable to fine.

A new section, 376A has been added which states that if a person committing the offence of sexual assault, “inflicts an injury which causes the death of the person or causes the person to be in a persistent vegetative state, shall be punished with rigorous imprisonment for a term which shall not be less than twenty years, but which may extend to imprisonment for life, and shall also be liable to fine. In aggravated situations, punishment will be rigorous imprisonment for a term which shall not be less than ten years but which may extend to imprisonment for life, and shall also be liable to fine.

Section 326A: Offence is acid attack; the punishment is imprisonment not less than 10 years but which may extend to imprisonment for life and with fine which shall be just and reasonable to meet the medical expenses and it shall be paid to the victim; Gender neutral

Section 326B: Offence is attempt to acid attack; imprisonment not less than 5 years but which may extend to 7 years, and shall also be liable to fine.; Gender neutral.

354A: Offence is sexual harassment; punishment is rigorous imprisonment upto 5 years, or with fine, or with both in clauses (i) & (ii) imprisonment upto one year, or with fine, or with both in other cases.

i) Physical contact and advances involving unwelcome and explicit sexual overtures; or

ii) A demand or request for sexual favors; or

iii) Making sexually colored remarks; or

iv) Forcibly showing pornography; or

v) Any other unwelcome physical, verbal or non-verbal conduct of sexual nature.

354B: Act with intent to disrobe a woman: Imprisonment not less than three years but which may extend to seven years and with fine; assaults or uses criminal force to any woman or abets such act with the intention of disrobing or compelling her to be naked.

354C: Voyeurism: In case of first conviction, imprisonment not less than one year, but which may
extend to three years, and shall also be liable to fine, and be punished on a second or subsequent conviction, with imprisonment of either description for a term which shall not be less than three years, but which may extend to seven years, and shall also be liable to fine.

**Definition:** Watching or capturing a woman in "private act", which includes an act of watching carried out in a place which, in the circumstances, would reasonably be expected to provide privacy, and where the victim's genitals, buttocks or breasts are exposed or covered only in underwear; or the victim is using a lavatory; or the person is doing sexual act that is not of a kind ordinarily done in public.

**354D: Stalking:** Imprisonment not less than one year but which may extend to three years, and shall also be liable to fine.

**Definition:** Only for woman. To follow a woman and contact, or attempt to contact such woman to foster personal interaction repeatedly despite a clear indication of disinterest by such woman; or monitor the use by a woman of the internet, email or any other form of electronic communication. There are exceptions to this section which include such act being in course of preventing or detecting a crime authorized by State or in compliance of certain law or was reasonable and justified.

**CONCLUSION**

Definition of rape is broadened to include the accused under the ambit of rape. Consenting age for sexual intercourse has been increased from 16 to 18 years. That means any sexual activity irrespective of presence of consent with a woman below the age of 18 will constitute statutory rape. Changes has been introduced in the CrPC and Evidence Act, like the process of recording the statement of the victim has been made more victim friendly and easy but the two critical changes are: 1. the 'character of the victim' is now rendered totally irrelevant, and 2. there is now a presumption of 'no consent' in a case where sexual intercourse is proved and the victim states in the court that she did not consent. Section IPC 354 has been amended with definitions for sexual harassment, voyeurism, stalking, disrobing the woman and prescriptions of punishments.

Though strict laws are being introduced still the crimes are increasing.

**Acknowledgement:** None

**Funding:** None

**Conflict of Interest:** None

**Ethical Clearance:** Not required

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39. Section 8, Criminal Law (Amendment) Ordinance, 2013
Torus Palatinus as a Criterion for Sex Determination - a Study in 60 Adult Human Skulls

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ABSTRACT
Torus palatinus is a bony protuberance which occurs in the midline of the hard palate. The prevalence of torus palatinus in dental patients and skulls of different races has been studied by many researchers because of its clinical significance. In addition, the correlation of torus palatinus with various factors like age, sex, torus mandibularis has also been studied. Most of the previous researchers have found sex differences in its prevalence. Few studies have been conducted with regard to torus palatinus in Indian population. Thus, in the present study, 60 adult human skulls of North Indian individuals have been studied to assess the reliability of the palatine torus development in sex determination. The palatine torus development has been graded on the basis of visual inspection. The data has been statistically analyzed by Logistic and Probit regression models. Subsequent to analysis, it has been found that the palatine torus development correctly classified 48.3% of the sample. The correlation between the palatine torus development and maxillo-alveolar index has also been studied. The factors which affect the palatine torus development and ultimately the reliability of palatine torus development in sex determination have also been highlighted in the present study.

Keywords: Palatine Torus, Sex Determination, Skulls, Logistic Regression, Probit Regression, Maxillo-Alveolar Index

INTRODUCTION
Torus palatinus (meaning “to stand out” or “lump” in Latin) is the bony elevation in the median palatine suture of the hard palate. It is a normal anatomical variation and occurs in both youth and age, in both sexes and in all races, though not in the same frequency1. It may affect many members of a family2. It was first described in 1814 by Fox and is the most common torus of the human jaw skeleton3. It consists of compact and cancellous bone and is formed by the hypertrophy of the spongy and oral compact layers4. The palatine torus casual factors and its correlation with factors like age, sex, form of palate and torus mandibularis has been studied by many authors as it is clinically significant especially for dental surgeons. When excessively developed it may interfere with speech, deglutition, mastication and the fitting of maxillary dentures. It may obscure radiographic details of lower premolars and the maxillary sinus5 and has significant relation with temporomandibular joint dysfunction syndrome6. Many researchers have stated subsequent to their studies on the prevalence of palatine torus in dental patients or skulls of different races1-4,6-26.

Sex determination is vital for the identification of an individual, since many skeletal features vary by gender27. Forensic identification often involves fragmentary remains. Bony and dental structure of the palate are preserved even in the face of serious bodily damage28.

The main aim of the present study is to know the reliability of palatine torus development in sex determination and also to highlight the factors which
should be pre-considered before undertaking sex determination studies of palatine torus. The data has been analyzed by Logistic and Probit regression models. Logistic and Probit regression models are commonly used statistical tools for the analysis of ordinal categorical data. In anthropological studies, visual indicators of sex are traditionally scored on an ordinal categorical scale.

Till date few studies have been conducted on the palatine torus in the Indian population. Thus, the present study will provide the baseline data for the palatine torus development in North Indian skulls and will also highlight important facts about it.

MATERIALS AND METHOD

60 adult human skulls (30 of either sex) of North Indian individuals have been studied to assess the reliability of palatine torus development in sex determination. The samples for the study have been drawn from the Department of Anatomy and Forensic Medicine, Government Medical College, Patiala.

The skulls of only known sex have been included in the study. The skulls with physical damage, apparent deformity, defect or disease have been excluded from the study. Juvenile (sphenoid-occipital junction not synostosed) and senile skulls (wasted alveolar processes) have also been excluded from the study.

For the study of palatine torus development Larnach and Macintosh sexing and population affinities system has been followed. The palatine torus development has been graded into Absent, Trace and Distinct on the basis of visual inspection only. The data has been statistically analyzed by Logistic and Probit regression models using SPSS (PC+) software.

The correlation between the palatine torus development with the maxillo-alveolar index has also been studied in the present study. For the calculation of the maxillo-alveolar index, maxillo-alveolar length and maxillo-alveolar breadth have been measured with the sliding caliper to the nearest millimeter as per standard anthropological conventions. The detailed methodology for the measurements of maxillo-alveolar length, maxillo-alveolar breadth and calculation of maxillo-alveolar index is described in Sumati et al.

RESULT

Table 1: Statistical analysis of palatine torus development by Logistic regression

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>Standard error</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp.(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palatine torus development</td>
<td>-0.164</td>
<td>0.407</td>
<td>0.163</td>
<td>1</td>
<td>0.686</td>
<td>0.848</td>
</tr>
<tr>
<td>Constant</td>
<td>0.428</td>
<td>1.090</td>
<td>0.154</td>
<td>1</td>
<td>0.695</td>
<td>1.534</td>
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</table>

Table 2: Classification results

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
<th>Percentage correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Female</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>Overall percentage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 showed that palatine torus development correctly classified 48.3% of the sample. The classification result subsequent to Probit regression was similar to as obtained by Logistic regression, that is, 48.3% (table not shown).

The analysis of variance (ANOVA) revealed that the association between palatine torus development and maxillo-alveolar index was not statistically significant (p=0.64). Similar results were observed for males and females individually and for maxillo-alveolar length and maxillo-alveolar breadth (data not shown).

DISCUSSION

In the present study, 60 adult human skulls of North Indian individuals have been studied to know the reliability of the palatine torus development in sex determination, so that the sex can be determined from
a fragmentary crania. Subsequent to Logistic and Probit regression, it has been found that the palatine torus development correctly classified 48.3% of the sample.

Torus palatinus is a sessile nodular mass present along the median palatine suture. Its prevalence and its correlation with factors especially age, sex and torus mandibularis has been studied by many authors in dental patients or in skulls of different races. The prevalence of torus palatinus in different races varies from 9 to 66% as it is influenced by genetic and environmental factors including functional, nutritional, behavioral and possibly climatologic factors. The prevalence of palatine torus varies among similar ethnic groups living in different areas or different ethnic groups living in same areas because of exposure to different environmental conditions and consumption of different types of foods (thus, exposed to differential masticatory stress).

The results of the authors vary with respect to sexual differences in the prevalence of the palatine torus. Most of the authors subsequent to their studies in human skulls or dental patients of different races favors the higher prevalence of the palatine torus in females. But, some suggest higher prevalence in males or no statistical significant sexual difference. In the present study, no statistical significant difference has been found in the prevalence of palatine torus between skulls of male and female individuals.

While comparing data with the previous studies, one should be aware of the facts highlighted by Woo and Haugen. Haugen suggested that inadequate representation of the data contribute to loss of valuable information like when findings reported from skull materials are matched with others obtained by investigations in living material. Woo inferred that the sexual difference of torus on dry skulls is much less than that in living as reported by Lachmann and Miller. The reason for this difference is that the torus is covered with mucosa and its lateral borders obscured by vessels, nerves and mucous glands, thus, smaller tori in the living may escape observation, where as the larger ones certainly could not be missed. Moreover, the small tori constitutes more than half of the total percentage. Thus, the percentage of the torus observed in the living is much less than that on dry skulls. Thus, combined results exaggerate the sexual differences.

Most of the previous studies highlight that their exists sexual difference in the prevalence of palatine torus, thus in the present study, reliability of palatine torus development in sex determination has been studied by Logistic and Probit regression. But, in the present study no statistical significant sex difference has been found in the prevalence of palatine torus in North Indian skulls and also the present study highlights only 48.3% reliability of palatine torus development in sex determination by Logistic and Probit regression.

The important variable that has not been considered in the present study while carrying out sex determination studies is age. The results of some of the previous researchers suggest that there exists correlation between palatine torus and age. Miller and Roth concluded that palatine torus grows with age. As per, Haugen; Eggen et al; Jainkittivong et al palatine torus is a dynamic character capable of growth and subject to resorption and remodeling. Palatine tori are frequently observed during the middle phase of life than at a younger and older age. It tapers off in older age group.

In the present study as age has not been considered as variable and so differences in frequency of palatine torus with age cannot be ascertained. Though, in the present study reliability of palatine torus in sex determination has been found to be 48.3% but the efficacy can vary if age is taken into consideration. Thus, before conducting sex determination studies of palatine torus, age grouping should be done in prior race determined samples.

The present study suggests that there exists no association between palatine torus development and maxillo-alveolar index but Woo inferred from his studies that the large type of torus has smallest palatal index and the small type has largest palatal index.

**CONCLUSION**

1) The reliability of the palatine torus development in sex determination in skulls of North Indian individuals by Logistic and Probit regression is 48.3%

2) Age should be taken into consideration prior to sex determination studies of palatine torus

3) No correlation has been found between palatine torus development and maxillo-alveolar index
Acknowledgement: The authors are thankful to Dr. P Raghvan, Senior Research Associate Scientist, Australian National University, for giving us training in studying the cranial morphological traits and biometric methods.

Conflict of Interest: There is no conflict of interest in the present research paper

Source of Funding: No funds were required as the research was conducted in the Department of Anatomy and Forensic Medicine, Government Medical College, Patiala on dry skulls which were available in Departments only.

Ethical Clearance: This work is a part of the thesis which has been submitted to the Baba Farid University of Health Sciences for the degree of MS(Anatomy). The permission for conducting this research work was given by the university.

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A Case Report a Playful Push in Swimming Pool Turned Into an Unintentional Act of Murder

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ABSTRACT

Drowning is a form of asphyxia due to aspiration of fluid into air passages caused by submersion in water or other fluid and is mostly accidental. Drowning suffocation causes a lack of oxygen, resulting death in only a few minutes. An exception to this rule appears in victims who have been suddenly and rapidly submerged into ice-cold water. Mostly the death due to drowning is unintentional or accidental. 12 year old male child a good swimmer having history of drowning was brought dead to casualty by a security guard of the swimming pool which raised suspicions on the circumstances of death.

Keywords: Ante mortem drowning, Haematoma, Kidneys, Manner of Death

INTRODUCTION

According to the WHO statistics, in 2011, an estimated 359 000 people died from drowning, making drowning a major public health problem worldwide. Injuries account for nearly 10% of total global mortality. Drowning is the 3rd leading cause of unintentional injury death, accounting for 7% of all injury-related deaths¹. In US, drowning claims nearly 3,600 lives annually and is the third leading cause of accidental death in the United States. For children, it is the second leading cause of accidental death in school going children and the number one cause for preschoolers². The medico-legal investigation of bodies found in water focuses on victim identification, evaluation of post mortem submersion time, and determination of the cause and manner of death. In any given case the circumstances surrounding death, environmental factors, victim’s pre-existing diseases, and autopsy findings must be appropriately considered in reaching a diagnosis of the cause and manner of death. In addition to drowning, injuries, intoxications, or natural conditions are all among the potential causes of death in bodies found in water or the factor that may have contributed to the fatal outcome. Attention is drawn to those features which are of most diagnostic value. Emphasis is placed on certain pitfalls for the unwary, which if not taken cognizance of, may lead to a miscarriage of justice.

CASE REPORT

On 6th October 2012, an unidentified body of a boy of around 12 years of age was discovered floating on the surface of the water by a security guard of the swimming pool. He was immediately brought to Sri Aurobindo Medical College and PG Institute where he was declared dead and the dead body was shifted to mortuary for an autopsy. Before conducting autopsy, the identity was established by his parents who gave the history that the boy was a good swimmer and took 150 Rs for purchasing books, but went to the swimming pool of a hotel along with his friends where this mishap took place.

Autopsy findings

External findings

Dead body of 12 year old average built boy, wheatish in complexion and was naked with only blue colored underwear. Eyes were semi open, pupils dilated and fixed, mouth semi open and dried yellow
colored mucoid vomitus present around mouth and both the nostrils. Lips, nails, palms and soles showed bluish discoloration. Post Mortem lividity had present over back but was not fixed. Rigor Mortis was present over eyes and jaw. No external injuries were present over the body.

**Internal Findings**

On opening, the trachea was full of froth which was fine, non collapsible, lathery, tenacious and white in color (Fig. 1). Both the lungs were voluminous, distended, showing impression of ribs anteriorly. On cut section blood mixed froth oozed out (Fig. 2) and on squeezing crepitus was present. Both the kidneys showing severe diffuse haematoma on its surface in sub-capsular space (Fig. 3) and surrounding muscles were ecchymosed on both sides along with retroperitoneal space containing partly clotted blood. Stomach containing about 500cc of light yellow watery semi digested food material. Rest all organs were found congested. Cause of death was given as asphyxia as a result of ante-mortem drowning and duration of death was within 6 hrs since postmortem examination.

**DISCUSSION**

A fine, white, lathery froth or foam is seen in trachea and nostrils, which is one of the most characteristic external signs of drowning. So looking into the findings there is no confusion about cause of death. Three major factors influencing the human reactions to the drowning process include: pre-existing state of the body of the victim, chemical components of the water and amount of solution inhaled.

Now the questions were

What was the cause of severe hematoma over and around both the kidneys and why did the boy drown, if he was a good swimmer?

The CCTV footage shows the incident as an act of playful beating and pushing the deceased in swimming pool by his friends unintentionally which might be the cause of peri nephric haematoma and might be because of severe pain and agony, the boy was not able to swim up and finally drowned in the swimming pool.

What is the manner of death (homicidal or accidental) and who is to be blamed for this incident (his friends, hotel management or the deceased himself) and why?

In this case the point of discussion is whether this case will fall under

1. Culpable homicide Sec 299 IPC.
2. Culpable homicide amounting to murder Sec 300 IPC (Punishment- sec 302 IPC).
3. Culpable homicide not amounting to murder Sec 304 IPC or Sec 304-A.

4. Accidental.

In view of getting a blunt trauma over the abdomen, this raises a suspicion that this person was unintentionally injured before being thrown in to swimming pool.

Looking into the injury and cause of death how can we differentiate whether this is
1. Culpable homicide amounting to murder.
2. Culpable homicide not amounting to murder.

**Homicide:** It is the killing of a human being by a human being. It is either
A) Lawful. (judicial, excusable etc.)
B) Unlawful. It includes –
1. Culpable homicide amounting to murder Sec 299.
2. Culpable homicide not amounting to murder. Sec 304
3. Murder. Sec 300
4. Rash or negligent homicide. Sec 304- A

**Culpable homicide, Sec. 299 IPC:** It states that “Whoever causes death by doing an act with the intention of causing death, or with the intention of causing such bodily injury as is likely to cause death, or with the knowledge that he is likely by such act to cause death, commits the offence of culpable homicide”. In the scheme of the penal code culpable homicide is genus and murder its species. All murder is culpable homicide but not vice versa.

**Murder, Sec. 300 IPC:** Culpable homicide is murder if the act by which the death caused is done with the intention of causing death or likely to cause death, offender knows injury is likely to cause the death, injury is sufficient in the ordinary course of nature to cause death and if the injury is imminently dangerous to cause death. Exceptions: Culpable does not amount to murder, if the act by which death is caused is done: 1) Under grave and sudden provocations. 2) In good faith of the right of private defense of person or property. 3) For the advancement of public justice. 4) Without premeditation. 5) When a person above the age of 18 years takes the risk of death with his own consent.

**Punishment for murder sec 302 IPC:** Whoever commits murder will be punished with death, or imprisonment for life, and shall also be liable to fine.

**Punishment for culpable homicide not amounting to murder sec 304 IPC:** Whoever commits culpable homicide not amounting to murder, shall be punished with imprisonment for life, or imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine, if the act by which the death is caused is done with the intention of causing death, or causing such bodily injury as is likely to cause death, Or with imprisonment of either description for a term which may extend to ten years, or with fine, or both, if the act is done with the knowledge that it is likely to cause death, but without any intention to cause death, or to cause such bodily injury as is likely to cause death.

**Causing death by negligence Sec 304 A -** Whoever causes the death of any person by doing any rash or negligent act not amounting to culpable homicide, shall be punished with imprisonment of either description for a term which may extend to two years, or with fine, or with both.

In this case there was no intention of causing death and no knowledge that this injury can cause death. With the help of the CCTV footage, police found that there was no proper security arrangement in the hotel premises. Police arrested the hotel manager and the coach. A case under Section 304-A of the Indian Penal Code was registered against them.

**CONCLUSION**

This type of incidence is unfortunate where 45 people were present in the swimming pool with CCTV camera monitoring. We feel these types of cases are preventable if proper care and precaution are taken-on the part of victim, colleagues and on the part of potential dangers should be predominantly displayed in writing in such places.

**Conflict of Interest:** None to declare.

**Source of Funding:** No source of financial assistance was obtained from any individual or agency.

**Acknowledgement:** Nil.

**Ethical clearance:** Taken
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INTRODUCTION

According to World Health Organization Sexual violence is defined as, “any sexual act, attempt to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic women’s sexuality, using coercion, threats of harm or physical force, by any person regardless of relationship to the victim, in any setting, including but not limited to home and work”. Virtually all societies in the industrialized and developing worlds are characterized by male dominance and systemic and individualized practices of gender inequality. The resulting power imbalance sets the conditions for violence against women.

In this context, the widespread experiences of, and problematic institutional responses to, sexual assault have been generated and fuelled by a ubiquitous rape discourse. Among all the crimes, sex related crimes are most barbarous and humiliating. Women and children remain the most vulnerable group to this crime. The alarming rise in the rate of sexual assault worldwide represents a major health problem. The incidence of rape in South Africa is approximately 300 per 100,000 women, with a conviction rate of approximately 10% of cases. Poor medical evidence is responsible in part for the low conviction rate.

The year 2008, reported more than 20,000 rapes and estimates say only about one in 69 cases is reported in India. The absence of uniform guidelines in gathering medical evidence for rape cases is one of the main reasons why conviction rate is so low. Only 26.4% of the 24,206 cases of rape were registered in 2011 had convictions, according to National Crime Records Bureau. Some cases of rape are falsely alleged. False rape charges have probably been in existence as long as the concept of rape. However, in the 20th century, medical jurisprudence saw a new development that enabled false allegations to be viewed as a singular instance of gender-related lying, something quite different in nature from the false accusations of robbery.
or burglary that were made by men. In short, false rape accusations became a reflection of a unique condition of women, not unlike that of kleptomania.

Section 363 IPC: Punishment for Kidnapping.— Whoever kidnaps any person from [India] or from lawful guardianship, shall be punished with imprisonment of either description for a term which may extend to seven years, and shall also be liable to fine.

Section 363A IPC: Kidnapping or maiming a minor for purpose begging shall be punishable with imprisonment of either description for a term which may extend to ten years, and shall also be liable fine.

The Criminal Law (Amendment) Ordinance, 2013

Promulgated by the President in the Sixty-fourth Year of the Republic of India.

Substitution of new/sections for sections 375, 376, 376A, 376B, 376C and 376D.

For sections 375, 376, 376A, 376B, 376C and 376D of the Penal Code, the following sections shall be substituted, namely:

Sexual assault. ‘375. A person is said to commit “sexual assault” if that person-

(a) Penetrates his penis, to any extent, into the vagina, mouth urethra or anus of another person or makes the person to do so with him or any other person; or

(b) Inserts, to any extent, any object or a part of the body, not being the penis, into the vagina, the urethra or anus of another person or makes the person to do so with him or any other person; or

(c) Manipulates any part of the body of another person so as to cause penetration into the vagina, urethra, anus or any part of body of such person or makes the person to do so with him or any other person; or

(d) Applies his mouth to the penis, vagina, anus, urethra of another person or makes such person to do so with him or any other person;

(e) Touches the vagina, penis, anus or breast of the person or makes the person touch the vagina, penis, anus or breast of that person or any other person, except where such penetration or touching is carried out for proper hygienic or medical purposes under the circumstances falling under any of the following seven descriptions

First. — Against the other person’s will.

Secondly. — Without the other person’s consent.

Thirdly. — With the other person’s consent when such consent has been obtained by putting such other person or any person in whom such other person is interested, in fear of death or of hurt.

Fourthly. — When the person assaulted is a female, with her consent, when the man knows that he is not her husband and that her consent is given because she believes that he is another man to whom she is or believes to be lawfully married.

Fifthly. — With the consent of the other person when, at the time of giving such consent, by reason of unsoundness of mind or intoxication or the administration by that person personally or through another of any stupefying or unwholesome substance, the other person is unable to understand the nature and consequences of that action to which such other person gives consent.

Sixthly. — With or without the other person’s consent, when such other person is under eighteen years of age.

Seventhly. — When the person is unable to communicate Consent.

OBJECTIVES

Status of the accused and the role of medical evidence in examination of the accused.

MATERIALS AND METHOD

The material in this study are the documents available related to the accused in cases of sexual offences at the Department of Forensic Medicine, Victoria Hospital, Bangalore Medical College & Research Institute, Bangalore for a period of one year i.e. from 1st January 2013 to 31st December 2013.

Information regarding case details including informed consent, detailed history by the accused, examination of clothes, age, address, socio-economic status, relationship with the victim, general physical examination, systemic examination and genital examination were collected. They were supplemented by laboratory investigation reports from Regional Forensic science laboratory, Bangalore. Interview with
police officers, visit to the scene of incidence and analysis of photographs in cases where visit was not possible were also considered for the study.

RESULTS & DISCUSSION

Rape in India is the fourth most common crime against women in India, according to the National Crime Records Bureau 2013 annual report. During this study period, 82 males who were accused of sexual offences were examined. The number of cases were 52 in the year 2012, which indicates 67% increase in case reporting which further indicates that the people are coming out of their social farness and conscious ignorance and reporting the cases which is a welcome news to the government and the society.

Most of the cases are in the group of 21-30 years 59(72%), followed by age group of 15-20 years 11(13%) (Fig.1). The minimal age of accused being 17 years and the maximum age being 51 years. This indicates that the sexual active adolescent and young adult age group are commonly involved in this sexual assault act. This result coincides with study of Shinge SS et al where 24(58.5%) cases belonged to age group 21-30 years followed by 8(19.5%) cases from age group 31to 40 years. The minimum age of accused was 17 years and maximum age was 54 years.10

Considering the relation with the victim, in most of the cases the victims/survivors were known to the accused either in the form of a friend or as a neighbour 73(89%)cases, followed by unknown to the victim in 5(2.44%)cases, in our study 4 accused were one among the family member where 3 of them were father among them 2 were step father and one case close relative to the family (Fig.2). Most of the cases the sexual offender were alone 78(95.1%) and in 4(4.9%) cases the offenders were more than 2. The results are similar to the study done by Shinge SS et.al which states that the accused were friends of the victim in 23 (56.09%) cases, 12 (29.2%) were known to the victim and 04(9.7%) were strangers, two cases where in the accused was a family member of the victim, father-in-law in one case and grandfather in the other.10 This indicates that most of the time the accused will be well known to the victim as a friend, neighbour or as a family member who can easily get hold of the victim taking advantage of knowing them earlier which would ease the act. In our study most cases were that of eloping and later parents complaining the police as kidnap, rape or both.

The age of the victim ranged from 3 years old girl to a 30 year old married women. Most of the victim are in age group between 16 to 20 years 63.41%(52 cases) followed by 11 to 15 years age group15.85% (13 cases), then by age group below 10 years 8.54%(07 cases) (Table 1). One victim amongst these cases was a 3 year old female child, in two cases the victims were boys and the offender were fathers. In a study by DuMont et al majority of the victim were between 16 to 20 years of age11, Malhotra et al reported the majority (79.9%) of victims to be adolescents12. This concludes assailant usually pick comparatively younger age groupwho are innocent and are physically weak to resist and defend themselves.

Table 1: Distribution of study group based on victim age

<table>
<thead>
<tr>
<th>Sl no</th>
<th>Victim age group</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0-10yr</td>
<td>07</td>
<td>8.54</td>
</tr>
<tr>
<td>2.</td>
<td>11-15yr</td>
<td>13</td>
<td>15.85</td>
</tr>
<tr>
<td>3.</td>
<td>16-20yr</td>
<td>52</td>
<td>63.41</td>
</tr>
<tr>
<td>4.</td>
<td>21-30yr</td>
<td>10</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Table 2: Distribution of study group based of time interval between incidence of sexual assault and date of examination.

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Time interval</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>&lt; 24hrs</td>
<td>07</td>
<td>8.54</td>
</tr>
<tr>
<td>2.</td>
<td>24hr – 48hr</td>
<td>07</td>
<td>8.54</td>
</tr>
<tr>
<td>3.</td>
<td>3days- a week</td>
<td>12</td>
<td>14.63</td>
</tr>
<tr>
<td>4.</td>
<td>A week – a month</td>
<td>08</td>
<td>9.76</td>
</tr>
<tr>
<td>5.</td>
<td>A month- 6 month</td>
<td>21</td>
<td>25.61</td>
</tr>
<tr>
<td>6.</td>
<td>6 months- One year</td>
<td>16</td>
<td>19.51</td>
</tr>
<tr>
<td>7.</td>
<td>After One year</td>
<td>11</td>
<td>13.44</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>82</td>
<td>100</td>
</tr>
</tbody>
</table>
Among 82 cases of sexual accused 07 cases (8.54%) were brought for examination within 24 hours of the incidence, 07 cases (14.63%) were brought between 24 to 48 hrs, 12 cases (14.63%) were brought between 3 days to 6 days and 56 cases (68.29%) were examined after 6 days (Table 2). This implies that most of the cases examined were reported late, which leads to loss of significant and important evidence which may further lead to reduction in the conviction rate. Though 07 cases were examined before 24 hrs of incidence no stains were found either on body or clothes of the accused. Even the Forensic science laboratory could not detect any stains on the clothes which were sent to them. In the study conducted by Sarkar S et al10% of the accused were examined on the first day and 61.11% were examined after 6 days, where the findings are similar to our study.

CONCLUSIONS

Medico-legal examination of accused has less significance as compared to that of a victim in case of sexual assault. The importance of collection of medical evidence and the consequences of delay has to be educated to the law enforcing agencies. Every effort has to be made to differentiate true allegation from false allegation so that no innocent is punished. The biggest threat lies from known people and friends. Medical faculty should follow proper protocol for examination and collection of evidence. Further research in the field of sexual offences related to the psychological behavior, socio-economic status of the accused and an universal guidelines for examination are the need of the hour.

Acknowledgement: To all the staff members Department of Forensic Medicine, Bangalore Medical College and Research Institute, Bangalore.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Not applicable.

REFERENCES

Military Suicide by Service Rifle: a Case Report

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ABSTRACT
Suicide is one of the leading causes of death in the world, and suicide amongst the military is not uncommon. In this paper, suicide by a military man using his service rifle is presented. The paper emphasizes the importance of regular check up for these people who are working under stressful circumstances for their mental health besides the routine physical check up.

Keywords: Military, Firearm, Depression, Suicide

INTRODUCTION
Every year, more than 800,000 people die from suicide; this roughly corresponds to one death every 40 seconds. Suicide is among the three leading causes of death among those aged 15-44 years in some countries, and the second leading cause of death in the 10-24 years age group (WHO).[1] On the other hand, according to Ministry of Defence, every third day a soldier is killing himself, at a rate higher than the toll taken by the militants.[2] Suicide among military members is thought to be an impulsive act triggered by one or multiple stressors such as relationship breakups, legal/disciplinary problems, financial difficulties or physical health problems.[3,4] In this paper, suicide by a military man using his service rifle is presented.

CASE REPORT
The body of a 41-year old male was brought for medicolegal autopsy to a tertiary care hospital at Shillong. As per the inquest report of the police, the victim was a military man and on the unfortunate day, at about 5:30 AM, the victim shot himself while on sentry duty using his service rifle. The incident was witnessed by another army man on sentry duty, posted at a distance of about 50 metres away from the victim, who saw the victim falling to the ground following the shot.

On post mortem examination, rigor mortis was developing and post mortem staining was present on the back and not fixed. Dried blood stains were present on the face and the following external injuries were observed: - (1) Entrance wound behind the chin in the midline 4.5 cm x 1.5 cm, situated 163 cm above heel with an almost flower-like pattern of soot and seared skin in the surrounding area, and deposition of soot along the track of the wound (Fig 1). The direction of the track was upwards, and the exit wound was observed on the cranial vault, measuring 19 cm x 17 cm, 177 cm above the heel, with red everted margins and brain matter protruding out (Fig 2). (2) Another entrance wound on the front of neck, measuring 3 cm x 0.5 cm, situated just left to midline, 6 cm above sternal notch and 160 cm above the heel, having red inverted margins with an almost flower-like pattern of soot and seared skin in the surrounding area, and deposition of soot along the track of the wound (Fig 1). The direction of the track was upwards, backward and laterally towards the left involving the skin, muscle only. The exit wound was on the back of neck, measuring 2 cm x 1 cm, situated 2.5 cm left to the midline and 165 cm above heel (Fig 3). There was no other external injury seen on the body.

On internal examination, there was bursting fracture of base of the skull and the cranial vault, and the brain and meninges were lacerated into pieces. The stomach was empty and devoid of any suspicious smell.
because they have a weapon with them. The discrimination between the suicidal gunshot wound and homicidal wound is important in forensic practice. The usual sites of election in a case of suicide by firearm are:- (1) temple (about 60%), (2) centre of forehead (3) roof of mouth (4) midline behind the chin (5) Left side or front of the chest. In the present case, the site of entry was at a common site i.e. midline behind the chin. A person intending suicide may discharge his gun into himself more than once. In the present case, the victim sustained two gunshot injuries, out of which one was fatal. The wounds had almost flower-like pattern of soot and seared skin in the surrounding area of the entrance wounds which could have been produced by the flash suppressor of his service rifle when it was held in contact with the body. Considering the range of fire (contact range) and direction of the shot, it was in favour of a suicide which was well supported by the eye witness’s account of the incident.

During the course of investigation, it had come to light that the victim was under extreme depression related to some problems at home before he took the drastic step. Several unpredictable factors such as battle fatigue, unseen threats, extended field tenures, absence of adequate recreational avenues, domestic feuds, problems related to denial of leave at the time of requirement, inability to ensure quality education to children and inability to meet aspirations of spouse and children increase the level of frustration, leading to stress. A regular mental health check up of these personnel besides the regular health check up is indeed a need of the hour. There is compelling evidence indicating that adequate prevention and treatment of depression and alcohol and substance abuse can reduce suicide rates, as well as follow-up contact with those who have attempted suicide.

CONCLUSION

Studies have shown a parallel between increased numbers of mental disorders and suicide rates. The paper emphasizes the importance of regular check up for the military men who are working under stressful circumstances for their mental health besides the routine physical check up.

Acknowledgement: Nil.

Ethical Clearance: NA.

Source of Funding: Self.

Conflict of Interest: Nil.
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Munchausen Syndrome in a New Perspective - a Case Report

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ABSTRACT

A 17 year old, adolescent male was treated at Jawahar Lal Nehru Medical College, Aligarh, for reason of drug ingestion. It was discovered that he took 35 tablets of alprazolam 0.25mg. Past history revealed that he had demonstrated such behaviour on several other occasions (4-5 times). This case merited attention simply for the reason that there is a variance between motive-induced self-harm and pure desire to commit suicide. This case qualifies to be called “Munchausen Syndrome” as the events unfolded in the paper.

Keywords: Munchausen Syndrome, Alprazolam, Self-Harm, Compassion Seeking Behaviour, Parasuicide

INTRODUCTION

The present case report is a factual entity of self-harm and not that of parasuicide. The finer distinction can be made on the basis of manner of committing suicide and in the former case the desire to achieve the end whether it may be perceived to be illegal or against the norms of the society as perceived by others.

Self-harm (SH) is defined as the “intentional, directly injuring of body tissue most often done without suicidal intentions”. Behaviours associated with substance abuse and eating disorders are usually not considered self-harm because the resulting tissue damage is ordinarily an unintentional side effect.¹ However, the boundaries are not always clear-cut and in some cases behaviours that usually fall outside the boundaries of self-harm may indeed represent self-harm if performed with explicit intent to cause tissue damage.²

Munchausen syndrome is a mixture of two elements; one, there is always an element bordering on self-harm of various degrees and two, the urge to gain out of the demonstrable harm. Literature has described Munchausen syndrome to be a psychiatric factitious disorder wherein those affected feign disease, illness, or psychological trauma to draw attention or sympathy to themselves. In some extreme cases, people suffering from Munchausen’s syndrome are highly knowledgeable about the practice of medicine.

CASE REPORT

Mr. X, a 17 years old adolescent male, precocious, and a student of local senior secondary school was brought to the Jawahar Lal Nehru Medical College and hospital, AMU, Aligarh, in February 2008, late in the evening. The past and immediate history of the patient was offered by the mother and it seems striking that the mother was disconcerting and not as consolable as the situation demanded.

Present history

For the last many days that Mr. X was visibly perturbed and adamant in behaviour. The family members tried to console the boy but to no avail. The mother revealed an unusual streak of behaviour in the boy in the sense that the boy was not very close to any of the family members. On the contrary he used to derive satisfaction in the company of others, notably professionals. His stubbornness had no basis in the
eyes of his immediate family members and acquaintances. His siblings reconciled to this fact and created distance among themselves.

Past history

Three years earlier to 2008, he tried to seek attention by faking suicide. Initially, he was brought to the JNMCH with history and symptoms of poisoning but the examination contradicted his claim and it was found that he was faking just to gain attention. After 2-3 episodes, doctors stopped giving him attention that he was after. So he started taking alprazolam tablet – used to treat anxiety disorders and panic disorder- 8-10 tablets and then presenting with signs and symptoms of drug overdose. After each episode (3-4 times) he was admitted to the hospital, stayed for varying duration and subsequently discharged without any remarkable event. However, the glow on his face and rejuvenation in the boy’s activity later were significant reminders to the family members that the hospital stay has infused a new life in him each time.

In his last and final attempt, (he ceased to present himself later) on duty doctor recognised him. So after treating him and before discharging, they took him in the ICU and in presence of whole team of doctors including anaesthesiologist, a Boas tube was inserted and the tip of vocal cord was touched by the tube. This resulted in the gag reflex and it was told to the patient that it was a part of the treatment and that it had to be done each time. This frightened the patient. Later on the patient was discharged without any complication. Regular psychiatrist follow up was suggested.

No history of previous major diseases, drug addiction or alcoholism was obtained.

Examination

Patient’s vital data on admission were as follows: Pulse-110/minute feeble; BP - 88/70mm of Hg (both arms lying down); Respiratory rate - about 32 per minute irregular; Body temperature - Afebrile. On general examination mild cyanosis was observed. No. smell of alcohol was noted. On Central Nervous System (CNS) examination patient was comatose and responding to painful stimuli, bilateral constricted pupils that reacted sluggishly to light, bilateral extensor planter response, diminished tendon reflexes and retention of urine. On Cardio Vascular System (CVS) examination tachycardia was the positive finding ECG was showing sinus tachycardia.

Treatment

Gastric lavage and foley’s catheterization was done and parenteral fluids were started. Urgent intubation was performed. Ceftriaxone injection was used along with pantaprazole and ondsetsron injection.

Prognosis

The patient showed signs of improvement after 18 hrs. Patient completely regained consciousness after 36 hrs. There was no neurological deficit observed during this entire episode. After regaining full consciousness patient was asked about the event and he revealed that he took alprazolam for his suicidal attempt. Coma due to over dosage of alprazolam is reversible.

Regular psychiatrist follow up was suggested. And he was asked to come back to hospital after 15 days.

DISCUSSION

Munchausen syndrome was discovered by Richard Asher in February, 1951. Initially there was a wave of disbelief among other researchers because this disease has no physical entity, prevalence was highly disorganized and even focused psychiatrist was unable to compartmentalize the disease into any syndrome. However with a passage of time the disease gained a firm rooting and now the incidence in the western society is quite high. In under developed and developed countries the diagnosis of this disease has fared abysmally low simply because there are overriding concerns like malnutrition, accidents and maternal deaths that masks diagnosis of Munchausen syndrome.

The above case qualifies to be brought under Munchausen syndrome because of following indicators

1. The boy was school going and had palpable inclination to the use of computers.
2. He had significant knowledge about certain medicines and this came through his close association with medical and paramedical professionals.
3. The boy was not addicted to any therapeutic drugs or drugs of abuse.
4. Due to his stubbornness and aloofness, his family members were no more than strangers.
5. His weak temperament compelled him to seek warmth and solace elsewhere.

6. Though the victim has not revealed still it can be surmised that he knew about the basic functioning of alprazolam and its side effects.

7. A determined suicide would take full measures to bring life to a close and hence would ensure that his effort to commit suicide should not leave any window of opportunity to regain life. In this case all the attempts-recent as well as in the past-show that he did not have malafide intent to commit suicide.

8. At each episode he was admitted to the hospital where he gained attention and sympathy from doctors, nurses and other paramedical staff. Significantly his relationship with the family did not improve but others have noticed that his behaviour change for certain duration and this may be attributed to the injection of sympathy and compassion he received from the hospital staff.

9. In one of the informal meeting with the boy the author (cited at number-1) the boy confided that he was afraid to go the hospital. He vividly remembered the painful experience of gastric tube impacting the vocal cord. He vowed internally that would stay aloof from the hospital and has refashioned his life. Now, he believes in good behaviour, studies and mixes with boys of his own age.

SUMMARY

This case has attracted attention because it is unique in threefold measure:

(a) The boy is of tender age, stubborn and had no kinship with the family members.

(b) The boy had relationship with medical professional and indirectly gained elementary knowledge about certain drugs.

(c) Stubbornness mixed with extrovert behaviour added to the desire of seeking gratification outside the confines of homemade. This moulded his personality feeble and fictitious.

(d) The fact that a single painful experience at the hospital jolted him speaks of his poorly constructed temperament. Perhaps, his case can be considered to “Munchausen syndrome in the making” and which was abruptly halted by an insalubrious experience. The “gag reflex” proved to be a shocker to him that propelled him from revelry to reality.

Inference

This case can safely be considered to be Munchausen’s syndrome because it fulfils all the criteria attributed to this disease. The authors realised that there is a great potential in the case report and that this should be thrown open for wide readership.

Acknowledgement: The authors wish to acknowledge the assistance rendered by staff nurses and paramedical staff who were associated with patient in the ward. Their timely information was crucial in observing the behaviour of the patient which many a times was at odd hours.

Funding: None from any source

Conflict of Interest: None to declare

Ethical Clearance: Not required; all details pertaining to names and place have been changed

REFERENCES


2. Ibid.


INTRODUCTION

Due to anatomical position and dimension, the thoraco-abdominal region is a major site of impact in any type of trauma. Thoraco-abdominal injuries provide a major contribution to death because associated cavities to these body regions contain numerous important vital organs and injuries to these organs are significant as individually or cumulatively sufficient for morbidity and mortality.

It is frequently seen that subsequent to blunt force trauma to the thoracic wall may or may not show any injuries but abdominal walls usually escape gross injury by transmitting the force of violence to the more resistant organs inside the abdominal cavity which get injured without any visible external injury in the region. Hence, there is always a possibility of fatal thoraco-abdominal injuries to go unnoticed, and leading to their late detection and fatal outcome and also a source of professional embarrassment and possible litigation.

This post-mortem study of pattern of blunt thoraco-abdominal injuries, its type-pattern and nature of external and internal injuries involved may all together helps in the determination of actual or probable anatomical site of primary impact which may be useful in reconstruction of the events and broaden the horizon of the knowledge of clinicians for treatment of trauma victims and medico-legalists to deposit evidence in the court of law.

MATERIAL AND METHOD

The study was Hospital based Descriptive Observational Study conducted during October 2011 to September 2012 in the Department of Forensic Medicine, S. M. S. Medical College, Jaipur, Rajasthan
and includes 200 cases of blunt thoraco-abdominal traumatic deaths.

A detailed victimiologic profile was made which contain data related to bed head treatment record during hospitalization and police inquest documents to analyzed the fatal blunt thoraco-abdominal injuries.

RESULTS

Males outnumbered females in the ratio of 4:1. The age group of 20-29 years (30%) was most commonly involved age group. Vehicular accident was the leading cause of blunt thoraco-abdominal trauma (74.50%) followed by assault by fall from height (11.50%). There were 34 (22.81%) pedestrians, 82 (55.02%) two-wheelers and 32 (21.47%) four-wheelers and in 1 case the position of victim remained unknown. Among the two wheeler riders, 57 (69.51%) were riders and 25 (30.49%) were pillion riders. Also, there were 29 light motor vehicles with 10 drivers and 19 occupants. Maximum (87%) fatalities occurred as a result of hemorrhagic shock, 11% deaths resulted due to head injury.

Out of 200 cases, thoracic injuries were seen in 157 cases; out of which there were 149 cases of external injuries having 110 associated internal injuries. There were 8 cases of internal thoracic injuries without associated external injuries. In 95 cases of external as well as internal thoracic trauma, thoracic trauma remained uninvestigated. Out of 157 cases of thoracic injury, there was fracture of thoracic cage bones in 130 cases, with multiple type of bony involvement in 40 of those cases. The fracture of ribs was the commonest injury in the thoracic region and ribs remained the most common bone of thorax to be fractured. Internal injury to thoracic viscera was seen in a total of 118 cases out of the 157 cases of thoracic trauma. Out of these, isolated injury to lungs was seen in 91 cases. The heart was traumatized in 15 cases and in rest of the 12 cases both lungs and heart were injured.

Out of 200 cases, 160 of all cases suffering external as well as internal abdominal injuries, out of which 115 cases were remained undiagnosed. Abrasions remained the most common type of external injury over the abdominal region as in the thoracic region. Amongst the 98 cases of Hepatic trauma, right lobe was most commonly injured in a maximum of three-quarter cases. Most of these injuries were lacerations (83.70%). In 65 cases of splenic injury, laceration (55.39%) was the commonest pattern of splenic injury followed by rupture (41.53%). Kidneys remained the third most common organ to be injured in cases of abdominal trauma. Contusion (64%) was the commonest pattern of renal injury followed by lacerations (28%). Among hollow viscous, intestinal perforation was commonest (17.5%) followed by injuries to the urinary bladder (3.75%) and stomach (3.13%)

In this study 15% (n=30) cases were spot death or during transportation or death within 1 hour of incident and the maximum number of deaths 45.50% (n=91) occurred within 6 hours of the incidence. The next majority of cases 12.50% cases death occurred after more than 7 days of the incidence.

It was observed that victims with low ISS (1-10 and 11-20 ISS score range) survival was more as compared to the victims with high ISS.

<table>
<thead>
<tr>
<th>Age group(Years)</th>
<th>Sex</th>
<th>Total no. of</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>male &amp; female</td>
</tr>
<tr>
<td>0-9</td>
<td>2 (1.00%)</td>
<td>4 (2.00%)</td>
<td>6</td>
</tr>
<tr>
<td>10-19</td>
<td>17 (8.50%)</td>
<td>4 (2.00%)</td>
<td>21</td>
</tr>
<tr>
<td>20-29</td>
<td>58 (29.00%)</td>
<td>2 (1.00%)</td>
<td>60</td>
</tr>
<tr>
<td>30-39</td>
<td>32 (16.00%)</td>
<td>9 (4.50%)</td>
<td>41</td>
</tr>
<tr>
<td>40-49</td>
<td>21 (10.50%)</td>
<td>8 (4.00%)</td>
<td>29</td>
</tr>
<tr>
<td>50-59</td>
<td>19 (9.50%)</td>
<td>3 (1.50%)</td>
<td>22</td>
</tr>
<tr>
<td>60 +</td>
<td>13 (6.50%)</td>
<td>8 (4.00%)</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>162 (81.00%)</td>
<td>38 (19.00%)</td>
<td>200</td>
</tr>
</tbody>
</table>
### Table 2: Distribution of 200 cases according to Mode of Injury & Cause of death

<table>
<thead>
<tr>
<th>Mode of Injury</th>
<th>Shock</th>
<th>Coma</th>
<th>Peritonitis Traumatic</th>
<th>Asphyxia</th>
<th>Decapitation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road accidents</td>
<td>132(88.59)</td>
<td>16(10.81)</td>
<td>00(0.00)</td>
<td>01(0.68)</td>
<td>00(0.00)</td>
<td>149(100.00)</td>
</tr>
<tr>
<td>Fall</td>
<td>19(82.61)</td>
<td>04(17.39)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>23(100.00)</td>
</tr>
<tr>
<td>Train accident</td>
<td>16(84.21)</td>
<td>01(5.26)</td>
<td>01(5.26)</td>
<td>00(0.00)</td>
<td>01(5.26)</td>
<td>19(100.00)</td>
</tr>
<tr>
<td>Assault</td>
<td>03(60.00)</td>
<td>01(20.00)</td>
<td>01(20.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>05(100.00)</td>
</tr>
<tr>
<td>Land slide</td>
<td>03(100.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>03(100.00)</td>
</tr>
<tr>
<td>Machine Injury</td>
<td>01(100.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>00(0.00)</td>
<td>01(100.00)</td>
</tr>
<tr>
<td>Total</td>
<td>174(87.00)</td>
<td>22(11.00)</td>
<td>02(1.00)</td>
<td>01(0.50)</td>
<td>01(0.50)</td>
<td>200(100.00)</td>
</tr>
</tbody>
</table>

### Table 3: Distribution of 149 Cases of Road Traffic Fatalities according to Type of Vehicle and position of the victim in the Vehicle

<table>
<thead>
<tr>
<th>Type of Vehicle &amp; Position of Victim</th>
<th>No. of victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>34</td>
<td>22.81 %</td>
</tr>
<tr>
<td>2W Driver</td>
<td>57</td>
<td>38.25 %</td>
</tr>
<tr>
<td>2W Pillion</td>
<td>25</td>
<td>16.77 %</td>
</tr>
<tr>
<td>LMV Driver.</td>
<td>10</td>
<td>6.71 %</td>
</tr>
<tr>
<td>LMV Occupant</td>
<td>19</td>
<td>12.75 %</td>
</tr>
<tr>
<td>HMV Driver</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>HMV Occupant</td>
<td>3</td>
<td>2.01 %</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>0.67 %</td>
</tr>
<tr>
<td>Total</td>
<td>149</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

### Table 4: Distribution of 200 Cases according to External and Visceral Thoracic injuries and the Investigation Status

<table>
<thead>
<tr>
<th>Investigation</th>
<th>External Injury Present</th>
<th>External Injury Absent</th>
<th>Visceral injury to chest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present</td>
<td>Absent</td>
<td>Total</td>
</tr>
<tr>
<td>Not Performed</td>
<td>91(82.73)</td>
<td>26(66.67)</td>
<td>117(78.52)</td>
</tr>
<tr>
<td>Performed</td>
<td>19(17.27)</td>
<td>13(33.33)</td>
<td>32(21.48)</td>
</tr>
<tr>
<td>Total</td>
<td>110(100.00)</td>
<td>39(100.00)</td>
<td>149(100.00)</td>
</tr>
</tbody>
</table>

### Table 5: Distribution of 200 cases according to external Injury & visceral injury to abdomen and their Investigation Status

<table>
<thead>
<tr>
<th>Investigation</th>
<th>External Injury Present</th>
<th>External Injury Absent</th>
<th>Visceral injury to abdomen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present</td>
<td>Absent</td>
<td>Total</td>
</tr>
<tr>
<td>Not Performed</td>
<td>68(80.00)</td>
<td>7(46.67)</td>
<td>75(75.00)</td>
</tr>
<tr>
<td>Performed</td>
<td>17(20.00)</td>
<td>8(53.33)</td>
<td>25(25.00)</td>
</tr>
<tr>
<td>Total</td>
<td>85(100.00)</td>
<td>15(100.00)</td>
<td>100(100.00)</td>
</tr>
</tbody>
</table>

### Table 6: Survival period

<table>
<thead>
<tr>
<th>Survival Time</th>
<th>No. of victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brought Dead / &lt; 1 hrs</td>
<td>30</td>
<td>15.00 %</td>
</tr>
<tr>
<td>1 - 6 hrs</td>
<td>91</td>
<td>45.50 %</td>
</tr>
<tr>
<td>6 - 12 hrs</td>
<td>15</td>
<td>7.50 %</td>
</tr>
<tr>
<td>12 – 24 hrs</td>
<td>10</td>
<td>5.00 %</td>
</tr>
<tr>
<td>1-3 days</td>
<td>15</td>
<td>7.50 %</td>
</tr>
<tr>
<td>3-7 days</td>
<td>14</td>
<td>7.00 %</td>
</tr>
<tr>
<td>&gt; 7 days</td>
<td>25</td>
<td>12.50 %</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>
DISCUSSION

Males (81%) outnumbered the females (19%) in the ratio of 4:1 which is explainable by the fact that males are usually the earning members of the families making them vulnerable to accidents and industrial mishaps as compared to females who are mostly indulged in house hold works. These findings are similar to those of Chandra J et al (1978)2, Gosh PK (1992)6, Meera Th et al (2005)13, Seger S et al (2005)8. A slightly lower male-female ratio of 3:1 have reported by Jha et al (2004)10 and Kaul et al (2005)12 while a higher male-female ratio of 6:1 has been reported by Wong et al (2004)16 and Husaini N et al (2009)15.


The commonest cause of death was hemorrhagic shock as a result of intra-thoracic and abdominal bleeding in 87% cases followed by deaths as a result of head injury in 11% cases. Our findings are similar to those of Segers P et al (2001)8, Meera Th et al (2005)13, Husaini N et al (2009)15.

In the present study, majority of the blunt thoraco-abdominal fatalities occurred as a result of road traffic accidents accounting for about three-quarter (74.50 %) of the total cases. This finding is in agreement with those observed by numerous workers Chandra J et al (1979)2,23, Sinha SN et al(1981)4, Sharma AK (1986)5, Banerjee KK (1998)7, Sharma BR et al (2004)11, Meera Th et al (2005)13, Shetty BSK et al (2012)17. The commonest cause amongst accidental deaths were vehicular accidents (74.50%) as already elaborated upon, followed by fall from height (11.5%), train accident (9.5%) and land slide (1.5%). Among vehicular accidents, two wheeler riders were the major victims (55.02%) out of which 69.51% were two-wheeler riders and rest 30.49% were pillion riders of two-wheeler vehicles. Pedestrians were the next major victim population of vehicular accidents deaths, accounting for 22.81% cases among road accident deaths. Our results are in accordance with of Jha N et al (2004)10, Kaul A et al (2005)14 and Shetty BSK et al (2012)17.

In the thoracic region, injuries were seen in 157 (78.5%) cases out of 200 cases either individually or in association with abdominal injuries. External thoracic injuries were seen in 74.5% cases (n=149). Out of these, 75.16% cases had associated visceral injuries and rest 24.84% had no visceral injuries. Thus, sub grouping thoracic injuries to external and internal thoracic injuries revealed that external thoracic injuries were more common than the internal injuries. In this study, abrasions were the most common external thoracic injury in 59.1% cases (n=88). This study correlates with the observations made by Biswas G et al (2003)8 and Shetty BSK et al (2012)17.

Out of 157 cases of thoracic injury, there were associated fractures of the thoracic cage in 130 cases. Among these, fracture of ribs was observed in 66 cases. Similar findings have been reported by Pathak MK et al (2006)14, Husaini N et al (2009)15 and Shetty BSK et al (2012)17.

Among internal injuries of thorax, lungs and pleurae were the most commonly involved organ (n=91), followed by the heart in 15 cases. In 12 cases both lungs and the heart suffered fatal injuries. Our findings are similar to those of Banerjee KK et al (1998)7, Husaini N et al (2009)15 and Shetty BSK et al (2012)17.

External injury to the abdomen was seen in 100 cases (50%) of all studied cases. However, the total number of cases suffering abdominal injuries, external as well as internal were 160 (80%) of all cases. Abrasions were the commonest external injury, observed in 63% cases followed by bruise in 21% cases.

Internal injuries of abdomen were observed in 72.5% (n=145) of total fatalities (n=200) which was 90% of all abdominal injuries (n=160). The most commonly involved organ was liver, being involved in 61.25% cases (n=98), out of total 160 cases of abdominal trauma followed by spleen in 40.6% cases and kidneys in 15.6% cases. Similar findings were reported by Chandulal R (1971)1, Chandra J et al (1978 and 1979)2,3, Sharma AK (1986)5, Kaul A et al (2005)12, Meera Th et al (2005)13 and Husaini N et al (2009)15.

Among hepatic injuries, majority of the cases had involvement of the right lobe of liver (74.5%) with predominant involvement of its convex surface. This has been confirmed by similar findings described by Sharma AK (1986)5, Meera Th et al (2005)13. Laceration was the commonest form of injury seen in spleen followed by rupture of spleen. In the present series, majority of the cases of splenic injuries were due to vehicular accidents. Similar findings have also been reported by Chandulal R (1971)1, Sharma AK (1986)5.
Kidneys remained the third most commonly offended organ in abdominal trauma. Similar results have been reported by Chandulal R (1971)\textsuperscript{1}. Among hollow viscous, intestinal perforation was commonest (17.5%, n=28) followed by injuries to the urinary bladder (3.75%) and stomach (3.13%) cases. This is in accordance to the findings of Husaini N et al (2009)\textsuperscript{15}.

In this study 15% (n=30) cases were spot death or death within 1 hour and the maximum number of deaths 45.50% (n=91) occurred within 6 hours of the incidence. The next majority of cases 12.5% cases death occurred after more than 7 days of the incidence. In 7.5% cases death occurred in 6-12 hours, in 5% cases death occurred in 12-24 hours and in 7.50% cases death occurred in 1-3 days. Thus, in all 60.50% victims died within 6 hours, which is quite similar to the study of Sharma BR et al (2005)\textsuperscript{11}. The higher figures for early mortality may be due to the severity of injuries or to inadequate infrastructure for early transport and management of trauma patient and higher involvement of road accident fatalities.

Initial investigation reports of each trauma patient should be reviewed meticulously. Diagnostic study that is not clear must be repeated. Continue serial examinations of each patient must be pursued for the entire clinical course. Clinicians should give the attention over remote body areas and never. Surgeon/clinician should keep in mind that any deviation from expected course of recovery in a trauma patient should promptly need a diligent search for a missed injury. Prompt transportation with facilities for adequate pre-hospital care should be routinely provided at various places for immediate care, stabilization and timely shifting of trauma victims to a well equipped trauma care centre. These are some of the factors apart from injury severity scoring which affect the period of survival.

REFERENCES

Estimation of Stature by Factorizing Sternal Measurements On X-Ray Examination

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1Senior Resident, 2Professor & Chairman, 3Professor, Department of Forensic Medicine, J N Medical College, AMU, Aligarh, India

ABSTRACT

The study was conducted to create general formula for stature estimation of adult male and female population respectively, upon measurements of length of sternum associated moieties, i.e. manubrium, mesosternum and xiphoid process alone or in combination using radiographic method. A number of 150 subjects were involved in this study. The subjects were males (100) and females (50) ranging from 18-70 years in age. The standing height of the subject was recorded before the sternum was scanned by a digital x-ray machine. The bone length was measured on the x-ray film of size 8x10 cm taken on console without magnification in centimeters (cm) and analyzed using Statistical Package for Social Sciences (SPSS) version 19.0 for Windows. The results showed a significant relationship (p < 0.001) between stature and measurements of length of parameters of sternum. Simple Linear Regression Analysis was used to derive regression equation for sternum parameters alone or in combinations. Seven formulae for stature estimation of adult male and female population were derived respectively. This preliminary study concludes that the length of the sternum parameters alone or in combinations can be used as a tool for stature estimation in adult males and females.

Keywords: Sternum Measurement, X-Ray Screening, Body Stature, Body Fragment, Anthropometry

INTRODUCTION

Forensic anthropology is a field that analyzes human skeletal remains of unexplained death. Sometimes, skeletal remains can be the only source of information that can be used to identify the victim in forensic case. The most important data that can be deduced from the analysis are age, ancestry, sex and stature of the victims. This study was conducted to estimate the stature using radiographic measurements of sternal moieties i.e. manubrium, mesosternum and xiphoid process by radiographically scanning these parts. This technique has earlier been used by other researchers 1, 2, 3 to create formulae using long bones.

Sundry attempts have been made by researchers to construct height from sternum measurements 4, 5, 6. None has been able to get close to accuracy because of constraints. Our study has been successful as we have used x-ray of the parts as tool for measuring the sternum instead of measuring the cadaver bone length.

MATERIAL AND METHOD

The study was conducted on males (100) and females (50), (n=150) the age of subjects ranging from 18-70 years. Volunteers who had physical deformity were excluded from the study, including females during pregnancy. Socio-economic status, nutritional status, climatic influences and ethnic differences with other cultural influences were not taken into account. The subjects were those people who came to JNMCH for minor illness or age determination and the x rays were advised by the physician.
MEASUREMENT OF HEIGHT

Standing height of subject was recorded in centimeters (cm) using a stadiometer in an anatomical position. The subject was to make breathe in and hold it until the sliding horizontal rod touched subject’s head.

Precautions taken

i. In the measurements of height unshod volunteer was made to stand on the flat surface with head in Frankfort plane.

ii. All the readings were taken before noon as stature varies during different times of the day by 1.5 to 2 cm being less in the evening.

iii. All the readings were taken by the same individual to exclude the observational error.

iv. Subjects with the congenital or acquired deformities were excluded.

v. The measurements of height in female subjects were made with untied hair.

vi. All the readings were taken up to 0.1 cm accuracy.

RADIOGRAPHIC METHOD

In radiography method, the x-ray was measured in kilovolt peak (kvp) and milliampere per second (mA/s). The x-ray chests (Lateral view) were taken on the console without magnification, where measurement of parts of sternum was employed. To establish uniformity in imaging the sternum was visualized in lateral view.

Manubrium length (cm): At the level of sternoclavicular joint, from upper border of manubrium to the junction of manubrium and body of sternum.

Sternal body length (cm): From the junction of manubrium and body of sternum to the junction of body of sternum and xiphoid process (in cm).

Xiphoid length (cm): From the junction of body of sternum and xiphoid process to the tip of xiphoid process.

The statistical analysis was conducted by using Statistical Package for Social Sciences (SPSS) version 19.0 for Windows.
Derivation of Formulae

The formulae were derived from Simple Linear Regression Analysis using standard equation below (all values in cm):

\[ \text{Stature} = \text{constant} + (\text{coefficient} \times \text{length of bone}) \]

**OBSERVATION**

The average stature of males was 166.50 ± 5.91 cm and that of females was 158.22 ± 3.84. The mean of all the sternal lengths as well as of stature was found to be significantly (p < 0.001) greater in males than females. A significant and positive correlation was observed between stature and all the sternal parameters lengths in males (p < 0.001) and with all the female sternal parameters lengths, but the correlation coefficient was found to be low when xiphoid length was added to other sternal parameters, in both sexes. A highly significant correlation (p < 0.001) was found between stature and the combined length of manubrium and mesosternum and the total sternal length in both the sexes.

**Linear regression analysis**

Table 1: Shows bivariate regression analysis for estimating stature on the basis of sternal parameters. The linear regression analysis between stature and the sternum length in both the sexes was found significant.

<table>
<thead>
<tr>
<th></th>
<th>MALE</th>
<th></th>
<th>FEMALE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± S.D.</td>
<td>Correlations coefficient with body length</td>
<td>Mean ± S.D.</td>
<td>Correlation coefficient with body length</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>166.50±5.91</td>
<td>1.00</td>
<td>158.22±3.84</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>ML</strong></td>
<td>5.21±0.52</td>
<td>+0.496</td>
<td>4.94±0.27</td>
<td>+0.836</td>
</tr>
<tr>
<td><strong>BL</strong></td>
<td>10.10±0.87</td>
<td>+0.593</td>
<td>8.93±0.79</td>
<td>+0.852</td>
</tr>
<tr>
<td><strong>XL</strong></td>
<td>4.08±0.66</td>
<td>+0.164</td>
<td>3.43±0.42</td>
<td>+0.214</td>
</tr>
<tr>
<td><strong>ML+BL</strong></td>
<td>15.32±1.15</td>
<td>+0.678</td>
<td>13.88±1.02</td>
<td>+0.849</td>
</tr>
<tr>
<td><strong>ML+XL</strong></td>
<td>9.30±0.93</td>
<td>+0.397</td>
<td>8.37±0.55</td>
<td>+0.578</td>
</tr>
<tr>
<td><strong>BL+XL</strong></td>
<td>14.19±1.16</td>
<td>+0.541</td>
<td>12.36±0.95</td>
<td>+0.803</td>
</tr>
<tr>
<td><strong>ML+BL+XL</strong></td>
<td>19.41±1.43</td>
<td>+0.620</td>
<td>17.31±1.17</td>
<td>+0.853</td>
</tr>
</tbody>
</table>

S = Stature, ML = Manubrium Length, BL = Body Length, XL = Xiphoid Length, \( \bar{x} \) = Mean SD= Standard deviation

Table 2: Shows Simple Regression Equation to Estimate Stature (S) in (cm) from sternum parameters \( x_i-x_8 \) in adult males and females with their \( R^2 \):

<table>
<thead>
<tr>
<th>Males</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ML :</strong> S = 5.582 (x2) + 137.4</td>
<td>0.247</td>
</tr>
<tr>
<td><strong>BL :</strong> S = 4.007 (x3) + 126.0</td>
<td>0.352</td>
</tr>
<tr>
<td><strong>XL :</strong> S = 1.458 (x4) + 160.5</td>
<td>0.027</td>
</tr>
<tr>
<td><strong>ML+BL :</strong> S = 3.489 (x5) + 113.0</td>
<td>0.461</td>
</tr>
<tr>
<td><strong>ML+XL :</strong> S = 2.516 (x6) + 143.1</td>
<td>0.158</td>
</tr>
<tr>
<td><strong>BL+XL :</strong> S = 2.754 (x7) + 127.4</td>
<td>0.293</td>
</tr>
<tr>
<td><strong>ML+BL+XL :</strong> S = 2.557 (x8) + 116.8</td>
<td>0.385</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Females</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ML :</strong> S = 11.68 (x9) + 100.4</td>
<td>0.699</td>
</tr>
<tr>
<td><strong>BL :</strong> S = 4.117 (x10) + 121.4</td>
<td>0.726</td>
</tr>
<tr>
<td><strong>XL :</strong> S = 1.966 (x11) + 1501.4</td>
<td>0.046</td>
</tr>
<tr>
<td><strong>ML+BL :</strong> S = 3.387 (x12) + 111.2</td>
<td>0.800</td>
</tr>
<tr>
<td><strong>ML+XL :</strong> S = 4.011 (x13) + 124.6</td>
<td>0.335</td>
</tr>
<tr>
<td><strong>BL+XL :</strong> S = 3.222 (x14) + 118.3</td>
<td>0.645</td>
</tr>
<tr>
<td><strong>ML+BL+XL :</strong> S = 2.805 (x15) + 109.6</td>
<td>0.729</td>
</tr>
</tbody>
</table>

Where, S= Stature or height and \( x_i-x_8 \) are sternum parameters.
DISCUSSION

The role of forensic expert to find out stature assumes difficult and challenging task when long bones like femur, humerus, tibia, radius, ulna, etc are not present at that sites. Therefore, to find out stature search is made for those bones which are generally present within the body and sternum is one of them. This technique is quick, time-saving and non-invasive.

Complete stature

The values of mean and standard deviation of stature of male in present study were 166.50 ± 5.91 cm while it were 168.1 ± 7.19 cm in North Indian males (Singh et al in 2010) , 166.47 ± 7.22 cm in South Indian males (Menezes et al in 2009) and 167.9 ± 6.90 cm in Portuguese male (Marinho et al in 2012). Thus the height in our series was 1.6 cm less in North Indian males (Singh et al in 2010) while 0.3 cm more as compared from South Indian male (Menezes et al in 2009) and 1.4 cm less as compare from Portuguese males (Marinho et al in 2012) but the standard deviation of males height in our study was less than Singh’s, Menezes’s and Marinho’s study. In our study we measured stature of a living subject while other three used cadaver bone length instead of living subject.

The values of mean and standard deviation of stature in females in our study were 158.22 ± 3.84 cm while it was 156.3 ± 6.98 cm in North Indian females reported by Singh et al 2010. Here the height in our study was 1.92 cm more than Singh’s study but the standard deviation is ± 3.14 cm less in our study.

Manubrium length

Mean manubrium length of male and its standard deviation in our study was equal to that of Singh’s study i.e 5.21 ± 0.52 cm.

The values of mean manubrium length in our study of female subjects was 4.94 ± 0.27 cm while it was 4.74 ± 0.52 cm in Singh’s study, thus our mean is 0.20 cm more and standard deviation was ± 0.25 cm less as compared to Singh’s study.

Sternal body length

Mean body (mesosternum) length of male in our study was 10.10 ± 0.87 cm however as estimated in Singh’s study it was 9.41 ± 1.0 cm. The body length is 0.69 cm more than Singh’s study while standard deviation was ± 0.13 more than our study.

Mean body length of female in our study was 8.93 ± 0.79 cm, when we compared with Singh’s study which was 7.85 ± 1.02 cm, the length was 1.08 cm more in our study while standard deviation is ± 0.23 cm less while comparing Singh’s study.

Xiphoid length

The mean xiphoid length and standard deviation of male and female in our study was 4.08 ± 0.66 cm and 3.43 ± 0.42 cm respectively. There was no study done for xiphoid measurement for estimation of stature.

When manubrium is combined with body length in male, the mean length of their combination is 15.32 ± 1.15 cm in our study. When compared to Singh’s study it was 14.57 ± 1.14 cm so it was 0.75 ± .01 cm more in our study but when compared with Menezes study the combined length of manubrium and body was 14.20 ± 1.34 cm. Here the combined length was ± 1.12 cm more while standard deviation is 0.19 cm less in our study.

When manubrium is combined with body length in female, their mean length was 13.88 ± 1.02 cm in our study. When compared to Singh’s study it was 12.49 ± 1.01 cm. From the above observation it was 1.39 ± 0.01 cm more from our study. The larger length of sternal parts in our study was because we measured manubrium length and body length separately, whereas Singh’s et al and Menezes et al measured the combined sternal length as a whole in a straight line i.e., from suprasternal notch to mesoxiphoid junction in mid–sagittal plane.

When Xiphoid length is combined with manubrium length and xiphoid length is combined with body length in male their length was 9.30 ± 0.93 cm and 14.19 ± 1.16 cm respectively.

But when we combined xiphoid length with manubrium length and xiphoid length with body length in females, their combined length were 8.37 ± 0.55 cm and 12.36 ± 0.95 cm respectively.

No work has been done on the above combinations, so we do not have any data for their comparison, as in most of the studies xiphoid was not taken into consideration due to its variability in length and also showing its weak correlation with stature.

When combined length of manubrium, body and xiphoid (total sternal length) of male is taken into consideration we find their total length was 19.41 ±
1.43 cm. When it was compared with Marinho study mean sternal length was 20.39 ± 1.42 cm, so here our value is 0.98 cm less while our standard deviation is ± 0.01 cm more. But when compared with Singh’s study which was 16.88 ± 1.64 cm, here our mean sternal length is 2.5 cm more while our mean standard deviation is 0.21 cm less.

When combined mean length of manubrium, body and xiphoid of females was taken into consideration we find total length was 17.31 ± 1.17 cm, as compared to Singh’s study, it was 14.31 ± 1.24 cm, and the difference between both studies is 3 ± 0.07 cm. This means total sternal length in our study is more and standard deviation is less.

The reason for increase in values in our study is that we measured each fragment of the sternum bone separately in chest X-ray whereas in Singh’s study sternum was measured as a whole from suprasternal notch up to the tip of xiphoid process in single linear dimension. They omitted taking curvature of sternum into consideration.

The variations in sternal parameters in our study and that done by others 4,5,6 were due to different approach in methodology. We used chest X-ray (lateral view) for measurement of sternal parameters while Singh’s et al, Menezes’s et al, and Marinho et al measured sternum after dissecting out of the cadaver.

The correlation coefficient of stature and sternum in present study and Singh’s study are as follows (for male)

<table>
<thead>
<tr>
<th>Sternal parameters</th>
<th>Present study</th>
<th>Singh’s study</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML</td>
<td>0.496</td>
<td>0.191</td>
</tr>
<tr>
<td>BL</td>
<td>0.593</td>
<td>0.255</td>
</tr>
<tr>
<td>XL</td>
<td>0.164</td>
<td>Not done</td>
</tr>
<tr>
<td>ML+BL</td>
<td>0.678</td>
<td>0.318</td>
</tr>
<tr>
<td>ML+XL</td>
<td>0.397</td>
<td>Not done</td>
</tr>
<tr>
<td>BL+XL</td>
<td>0.541</td>
<td>Not done</td>
</tr>
<tr>
<td>ML+BL+XL</td>
<td>0.620</td>
<td>0.277</td>
</tr>
</tbody>
</table>

Correlation of sternum parameter single or in combination

Our study:  ML+BL > ML+BL+XL > BL > BL+XL > ML > ML+XL > XL.
0.678 > 0.620 > 0.593 > 0.541 > 0.496 > 0.397 > 0.164.

Singh’s study: ML+BL > ML+BL+XL > BL > ML > not done > not done > not done.
0.318 > 0.277 > 0.255 > 0.191 > not done > not done > not done.

So from above observations we can say that manubrium and body in combination shows higher correlation coefficient and body alone showed higher correlation with stature but when we add xiphoid into other sternum parameter the correlation coefficient decreases as xiphoid process alone showed least correlation with stature.

The correlation coefficient of stature and sternal parameters in females are

<table>
<thead>
<tr>
<th>Sternal parameters</th>
<th>Present study</th>
<th>Singh’s study</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML</td>
<td>0.836</td>
<td>0.237</td>
</tr>
<tr>
<td>BL</td>
<td>0.852</td>
<td>0.229</td>
</tr>
<tr>
<td>XL</td>
<td>0.214</td>
<td>Not done</td>
</tr>
<tr>
<td>ML+BL</td>
<td>0.894</td>
<td>0.318</td>
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<td>ML+XL</td>
<td>0.578</td>
<td>Not done</td>
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<td>BL+XL</td>
<td>0.803</td>
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<tr>
<td>ML+BL+XL</td>
<td>0.853</td>
<td>0.317</td>
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Correlations of single sternal parameter in female with stature in decreasing order are as follows

Our study: - Body (0.852) > manubrium (0.836) > xiphoid (0.214).

Singh’s study: - Manubrium (0.237) > body (0.229) > not done.

Correlation of sternal parameter single or in combination as follows

Our study: - ML+BL (0.894) > ML+BL+XL (0.853) > BL (0.852) > ML (0.836) > BL+XL (0.578) > XL (0.214).

Singh’s study: - ML+BL (0.318) > ML+BL+XL (0.317) > ML (0.237) > BL (0.229) > not done > not done > not done.

So from both these studies the correlation coefficient of summation of manubrium and body and manubrium and body alone is so high that when we taken xiphoid into consideration it would not affect the other correlation with height. So in this case manubrium, body and their combination, and manubrium , body and xiphoid combination both are highly correlated with the stature.

In our study simple regression equation of stature and sternum parameters in male and female had
positive correlation corresponding to the study done by Singh et al. In our study, female regression equation and correlation are more positive than male subjects.

CONCLUSION

Stature is an important parameter in determining the partial identity of mutilated bodies and skeletal remains. In our study, the length of the sternal parameters was found to be well correlated to stature in the adult male and female population. The present study concludes that the sternum can be a useful tool in the estimation of stature. Our study indicates that stature can be predicted from the length of sternal parameters by linear regression analysis.

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REFERENCES


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