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From the Desk of Editor-in-Chief

It is my pleasure to present the second issue of the year 2014 of the esteemed journal of Punjab Academy of Forensic Medicine & Toxicology before the members and all other readers.

I am thankful to the authors and contributors of the scientific articles and research papers being published in this issue. I am also thankful to the editorial team for supporting me in its publication and the members of the Academy for giving me the opportunity to serve for the second term.

The journal has entered in the 14th year of its publication and it is now covered by Elsevier products (Scopus), Med-Ind and DOAJ and cited with Index Copernicus and many other citing bodies namely Safetylit, Worldcat library, J-Gate & WHO Hinary.

My special thanks to **Dr Anil Garg, Joint-Editor** for his support and sincere efforts for timely publication and release of this issue.

Any suggestions and advice for further improving the standards and quality of the journal is highly appreciated.

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*Editorial*

**Child Sexual Abuse & Medical Professionals**

The UN Convention on the Rights of the Child urges states to ensure the right of children to protection from abuse, violence, neglect and exploitation. Available data on child sexual abuse is often not reflecting the real magnitude of the phenomenon due to the taboo and culture of silence around it and the difficulties to research the subject.

India is home to the largest child population in the world, with almost 41 per cent of the total population under eighteen years of age. (1) Needless to say, health and security of the country's children is integral to any vision for its progress and development. However, there has been a steady increase in sexual crimes against children, and according to a study conducted by the Ministry of Women and Child Development in 2007; over half of the children surveyed reported having faced some form of sexual abuse.(2) and hence an alarming reality.

Sexual abuse is an extremely traumatic experience that can affect the body as well as mind and the reaction of the body and the mind to such an occurrence could leave a lasting impact on the health conditions for any person at any age. Studies have consistently demonstrated that sexual abuse and physical problems that persist into adulthood; these include anxiety, depression, Post- Traumatic Stress Disorder ( PTSD), self-destructive behavior, dissociation, substance abuse, sexual maladjustment, and a tendency towards revictimization in subsequent relationships. (3) Adult survivors of childhood physical, emotional or sexual abuse are not only at increased risk for depression and other mental health disorders, but new evidence suggests they are increasingly more likely to suffer from heart disease, obesity, and other potentially fatal physical conditions.

Thus, it is imperative that that the right kind of intervention and opportunity for recovery be provided at the right time. This is why the role of health sector is such an important one. Doctors, nurses and other health sector professionals are important stakeholders in the prevention and response to sexual violence against children. According to the Adverse Childhood Experiences (ACE) Study, a major American research project examining the effects of adverse childhood experiences on adult life and well-being, a powerful relationship has been established between emotional experiences during childhood and physical and mental health during adulthood. (4)

What are sexual offences against children?

Child Sexual Abuse (CSA) refers to the involvement of a child in any sexual activity (5) that:

- The child does not understand;
- The child is unable to give informed consent to;
- The child is not developmentally prepared for and cannot give consent to; and,
- Violates the laws or norms of society

Under the Protection of Children from Sexual Offences (POCSO) Act 2012, any sexual activity with a child below 18 years, whether boy or girl is a crime. As defined in the Act, sexual offences which include penetrative sexual assault (Section 3), sexual assault (i.e. non-penetrative – Section 7), sexual harassment (Section 11) and use of a child for pornography (Section 13). Sexual offences under the Act include:

- Actual or attempted penetrative sexual intercourse with a child;
- non-penetrative sexual activity, e.g. rubbing the penis between the child's thighs or genitals;
- fondling a child's sexual parts, i.e. genitals, breasts or buttocks;
- oral sex with a child, i.e. mouth to sexual parts;
- forcing a child to masturbate another person;
- masturbating a child;
- the adult showing his or her private parts to the child;
- inappropriate watching a child undress or using the bathroom;
- photographing a child in sexual poses;
- the exploitive use of a child in prostitution or any other unlawful sexual practice;
- the exploitive use of children in pornography;
- showing pornography or any pictures of a sexual nature to the child that he or she does not want to see; and
- letting the child watch or hear an act of sexual intercourse.

**Prevalence:**

The data on child sexual abuse in India is scare and the according to the first published report on CSA reveals that over 53 % children reported having faced some form of CSA, over 57% of these were boys, 72% said they did not report the abuse to anyone and only 3% reported CSA to police.

### **Where does CSA take place?**

Child sexual abuse can occur in a variety of settings, including home, school or workplace in places like India where child labour is common.

### **The Perpetrators:**

Child sexual abuse can take place in the family – by a parent, step-parent, sibling or other relative. It is almost always by someone the child knows: friend, neighbor, childcare giver, teacher etc. offenders come from all walks of life and cannot be picked out or identified by appearance.

### **Grooming:**

It is a method of building trust with a child and adults around the child in an effort to gain access to the child and increase the chances that the child will not consider the sexual advances of the perpetrator untoward or improper. However, in extreme cases, offenders may use threats and physical force to sexually assault or abuse a child.

### **Consequences:**

Child sexual abuse leads to a range of physical as well as emotional / mental health consequences. These depend on a number of factors, such as the duration of abuse, age of the child, type and availability of support. Some of the symptoms and indicators that should raise an alarm if detected by a medical professional include:

- a. Physical Symptoms: Sexually transmitted diseases, pregnancy, complaints of pain or itching in the genital area, difficulty in walking or sitting, repeated unusual injuries, pain during urination and / or defecation and frequent yeast infections.
- b. Behavioral indicators: it is important to pay attention to changes in a child's behavior as children communicate how they are feeling through their behavior.
- c. Emotional consequences: Children who have been sexually abused often continue to suffer even after the abuse has ended. Some of the psychological harms will be obvious to the family members, others may remain hidden. The effects of abuse may take the forms as confusion, guilt, shame, fear, grief, anger, helplessness or depression.

### **Preventing Child Sexual Abuse:**

The law on Child Sexual Abuse "The Protection of Children from Sexual Offences Act, 2012" came into force in November 2012 to provide for the protection of children from the offences of sexual assault, sexual harassment and pornography. It defines a child as any person below eighteen years of age. It includes children friendly mechanisms for reporting, recording of evidence, investigation and speedy trial of offences through designated Special Courts. It defines different forms of sexual abuse, including penetrative or non-penetrative assault, as well as sexual harassment and pornography.

The Act provides for mandatory reporting of sexual offences, so that any adult, including a doctor or other health care professional, who knows that a child has been sexually abused, is obliged to report the offence failing which he may be punished with six months' imprisonment and / or fine.

### **Role of health professionals under the Act:**

Doctors have a dual role to play in cases of child sexual abuse. They are in a position to detect that a child has been or is being abused; they are also often the first point of reference in confirming that a child has indeed been the victim of sexual abuse.

- Under Section 27 of the POCSO Act, the doctor must conduct a medical examination as per the provisions of Section 164 A of Criminal Penal Code.
- When the victim is a girl, the medical examination is to be conducted by a woman doctor.
- It is to be conducted in the presence of the parent of the child or any person in whom the child reposes trust or confidence.
- If such person cannot be present, the examination is to be conducted in the presence of a woman nominated by the head of the medical institute.
- Under Rule 5 of the Act, emergency medical care is to be provided by any medical facility, private or public; and no magisterial requisition or other document is to be demanded as a precondition to providing emergency medical care.
- The role of the doctor may include:
  - a. Obtaining a medical history of the child's experience in a facilitating, non-judgmental and empathetic manner.
  - b. Meticulously documenting historical details.
  - c. Conducting a detailed examination to diagnose acute and chronic residual trauma and STDs, and to collect forensic evidence.
  - d. Considering a differential diagnosis of behavioral complaints and physical signs that may mimic sexual abuse.
  - e. Documenting all diagnostic findings that appear to be residual to abuse;

- f. Assessing the child's emotional and physical well-being and making appropriate referrals.
- g. Formulating a complete and thorough medical report with diagnosis and recommendations for treatment.
- h. Testing in court when required.
- i. Informed consent to be taken for examination, sample collection for clinical and forensic examination, treatment and police intimation. According to the Indian Penal Code, where the child is over twelve years old, consent for the medical examination should be sought from the child himself or herself. Where he or she is below the age of twelve, a parent or the guardian may be asked for such consent.
- j. Diagnosis and management.
- k. Forensic evidence includes blood, semen, sperm, hair or skin fragments that could link the assault to an individual person, as well as debris that could link the assault to a location.
- l. Mental health professionals play a key role throughout the process in assisting the child and his / her family by more than one ways.

Who else is involved?

The POCSO Act (6) envisages a multi-sectoral approach that will be conducive to the justice deliver process, minimize the risks of health problems, enhance the recovery of the child and prevent further trauma. This is to be achieved through coordination and convergence between all the key players. It would therefore be very useful for hospitals and medical professionals to maintain links with their local police station, Special Juvenile Police Unit, Child Welfare Committees and District Child Protection Units. The Model Guidelines under the POCSO Act, published by the Ministry of Women and Child Development, contain descriptions of the functions of each of these professionals under the Act, and also lays down guidelines for how these duties are to be discharged.

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6. The Protection of Children from Sexual Offences Act, 2012

**Source:**

Information booklet for doctors and health professionals on Child Sexual Abuse Prevention & Response

**Dr DS Bhullar, MD**  
Editor-in-Chief

**STERNUM AS AN INDICATOR OF SEX IN HARYANVI POPULATION OF INDIA:  
A MORPHOMETRIC ANALYSIS**

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<p><b>Article history</b> Received Feb 12, 2014. Recd. in revised form Accepted on. Available online Jan 01, 2015.</p>	<p><b>Abstract</b> The estimation of sex is an important first step in developing a biological profile for human skeletal remains as methods of establishing stature and age-at-death are frequently sex dependent. Current study was an attempt to know the potential of sternum in the differentiation of sex in the population of Haryana of Northern India. A total of 100 adult sterna (comprising of 50 male and 50 female sterna) of confirmed sex were studied for parameters including length of manubrium, length of mesosternum and combined length of manubrium and mesosternum. The values were subjected to univariate and discriminant function analysis and a comparative analysis was made. The study confirmed sternum to be a potential indicator of sex in Haryanvi population of Northern India with length of mesosternum being the most useful parameter.</p>
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<p><b>Keywords:</b> Discriminant Function Analysis, Identification, Limiting Point, Osteometric, Overlapping Zone, Sternum.</p>	<p>©2014 JPAFMAT. All rights reserved</p>

**Introduction**

Identification of sex from human skeletal remains an indispensable element of medico-legal investigation, forensic science and physical anthropology [1-4]. The sternum, also known as breastbone, is an elongated, flattened bone, forming the middle portion of the anterior wall of the thorax. Its upper end supports the clavicles and its margins articulate with the cartilage of first seven pairs of ribs. It consists of three parts, named from above downwards: - manubrium sterna, body of sternum or mesosternum and the xiphoid process or xiphisternum.

Sexual dimorphism in human sternum was first noted by Wenzel as early as in 1788 who observed that manubrium of the two sexes is of almost equal length whereas the mesosternum is proportionately longer in males than in females [5]. This was followed by Fiegel, Hyrtl and Dwight during the 19th century [6-8]. This led to pronouncement of Hyrtl's law that "the manubrium of the female sternum exceeds half the length of the body, while the body in male sternum is, at least, twice as long as manubrium" [7]. Ashley, by

"Trial and Error" method, formulated "the 149 rule" and "the 136 rule" by considering combined length of manubrium and mesosternum as sexually dimorphic parameter, for European and East African population respectively [9]. The male sternum exceeded 149 mm and 136 mm while female sternum measured less than 149 mm and 136 mm in these population groups. Similarly Lee et al formulated "rule of 141" for Korean population [10]. Bongiovanni and Spradley, Maculoso et al and Rother et al applied discriminant function analysis on various sternal parameters for sex determination successfully [11-13].

In the Indian context, Jit et al successfully applied "the 136 rule", given by Ashley (for East African population), on North Indian sterna [14]. Similarly, Dahiphale et al gave "rule of 129" and Hunnargi et al proposed "rule of 131" for Gujarati and Maharashtra population respectively [15,16]. Singh et al applied Fisher's multivariate stepwise discriminant analysis to the various sternal parameters and found that out of all

independent variables, length of the manubrium and combined length of manubrium and mesosternum were the best selected parameters for the study [17].

The present study is an attempt to sex the manubrium, mesosternum, and combined length of manubrium and mesosternum, on the basis of morphometric analysis in the Haryana region of Northern India.

### Materials and Methods

The material for the present study consisted of a total number of 100 sterna of both sexes (Males=50; Females=50) collected from autopsy subjects brought to the mortuary of the Department of Forensic Medicine and Toxicology, Pt. Bhagwat Dayal Sharma Post-Graduate Institute of Medical Sciences, Rohtak (Haryana). The study was done in the unidentified or unknown adult subjects of confirmed sex with fused mesosternum. Bones showing any fracture or gross pathology or unfused mesosternum (after maceration) were excluded from the study. The measurements were taken in millimeters according to the technique described by Ashley with the help of Vernier calipers to the nearest millimeter. The morphometric parameters of the sternum studied were as follows:-

1. Length of manubrium (M): - is the distance measured on the anterior surface of the sternum from the centre of suprasternal notch (jugular notch) to the centre of manubrio-mesosternal junction (sternal synchondrosis) in mid-sagittal plane. [17]
2. Length of mesosternum (B): - It is the distance measured from the manubrio-mesosternal junction to the xiphi-sternal junction of the sternum in the mid-sagittal plane. [17]
3. Combined length of manubrium and mesosternum (M+B): The respective measurements M and B were added.
4. Statistics:

The data obtained was statistically analysed by using basic statistics-univariate analysis, identification point, demarking point, limiting point and discriminant function analysis. Statistical Package for Social Sciences version 16.0 (SPSS) which analyze the values like range, mean, standard deviation and discriminant function as proposed by Armitage was used. [18]

The male identification point is the maximal value of a particular dimension in female bones and for the female bone identification point is the minimum value of a particular dimension in male bones. The area lying between these points was called overlapping zone. The values of bones lying in this zone were said to have overlapped values. A variable having more overlapping area was not thought to be a good estimator.

Demarking points are obtained by calculating the maximum and minimum limits i.e. the range of a particular dimension. Addition of 3 standard deviations to the mean gives the maximum value and subtraction of 3 standard deviations from the mean gives the minimum value. Thus demarking points were obtained above which no female bone could be found and this was the upper calculated range of female bone. Any bone having values more than this was bound to be male. Similarly from the calculated range of male bones, a demarking point was obtained below which no male bone could be found. Thus, any bone having value less than this was bound to be female. The number of sterna beyond "demarking point" i.e. having value more than the demarking points for males was obtained and the number of bones less than "demarking points" for females was obtained and their percentage was calculated.

Although identification and demarking points can identify sex accurately, but only a small proportion of sterna can be sexed based on these methods as most of the remaining sterna show the measurements in the overlapping zone. Therefore, a limiting point was chosen in the study, calculated from the average of male and female identification points. Limiting point so calculated was such that the vast number of male sterna showed value greater than it and the bulk of female sterna showed values lesser than this limiting point.

In univariate analysis, the mean measurements were compared using unpaired t-test and p values less than or equal to 0.05 were considered to be statistically significant while those less than or equal to 0.001 were highly statistically significant.

### Results and Discussion

The various statistical descriptive calculated out for the studied parameters using SPSS 16.0 version software package are shown in

Table 1 whereas Table 2 shows the range, identification points, demarking points, limiting points, sectioning points, the number and percentage of sterna correctly classified using these parameters and the percentage of cases falling in the overlapping zone. Table 3 shows results of Fisher's linear discriminant function analysis.

### Univariate Analysis

#### 1. Length of Manubrium:

The range of male sterna was found to be 41.0-62.0 mm with a mean of 48.94 mm  $\pm$  4.7SD while for female sterna it was ranging from 36.6-62.0 mm with a mean length of 45.42 mm  $\pm$  5.0 SD. The mean difference was found to be statistically highly significant ( $p < 0.001$ ) with a value of 3.51. On the basis of identification points 0% (none) of the male sterna and 14% of female sterna were correctly classified with 100% of the male and 86% of the female sterna falling in the overlapping zone. On the basis of demarking points only 2% of the male and none of the female sterna could be classified correctly. By considering the limiting point of 51.5, 22% of the male and 90% of the female sterna could be classified correctly. In the similar way, sectioning point of 47.18 was able to classify 66% and 72% of the male and female sterna respectively. Most of the values of sternal measurements of both the genders were found to lie in the overlapping zone or zone of values of the other gender.

#### 2. Length of mesosternum:

The range of male sterna was found to be 65.1-126.7 mm with a mean of 93.07 mm  $\pm$  13.4 SD while for female sterna it was ranging from 60.1-100.8 mm with a mean length of 74.71mm  $\pm$  9.0 SD. The mean difference was found to be statistically highly significant ( $p < 0.001$ ) with a value of 18.36. On the basis of identification points 24% of the male and 12% of female sterna were correctly classified with 76% of the male and 88% of the female sterna falling in the overlapping zone. On the basis of demarking points 18% of the male and 0% of the female sterna were classified. With the limiting point of 83.0, 78% of the male and 84% of the female sterna were classified. A dividing line between the two genders (rule) was arrived at by "trial and error" based on limiting point. Thus, a "rule of 85" was arrived at for the length of mesosternum in the present study and by

considering the same, 78% males and 88% females were sexed accurately (Fig. 1) The sectioning point of 83.89 was able to classify 78% and 86% of the male and female sterna respectively. Most of the values of sterna measurements of both the sexes were found to lie in the overlapping zone or zone of values of other sex.

#### 3. Combined length of manubrium and mesosternum:

The range of male sterna was found to be 110.2-216.1 mm with a mean of 143.0 mm  $\pm$  17.3SD while for female sterna it was ranging from 104.1-144.8 mm with a mean length of 120.13mm  $\pm$  10.7 SD. The mean difference was found to be statistically highly significant ( $p < 0.001$ ) with a value of 22.87. On the basis of identification points 36% of the male sterna and 20% of female sterna were correctly classified with 64% of the male and 80% of the female sterna falling in the overlapping zone. On the basis of demarking points 16% of the male and 0% of the female sterna were classified. With the limiting point of 127.5, 86% of the male and 76% of the female sterna were classified. By "trial and error" method, a "rule of 128" was derived in the present study which was able to classify 86% of males and 76% of females correctly (Fig. 2). The results were found to be similar to the earlier study.<sup>14-15</sup> With the sectioning point of 131.56, 78% male and 84% female sterna were classified. Overall most of the sterna were falling in the overlapping zone of opposite sex. Thus, the values of all the parameters was found to be more in males as compare to females with combined length of manubrium and mesosternum showing highest mean difference of 22.87.

### Discriminant Function Analysis

The univariate analysis is helpful in determination of sex from the mentioned parameters individually or when parts of sternum are available for examination. For correct discrimination of the bones and to differentiate between sexes in the sterna, Fisher's discriminant function analysis was applied to all the parameters in combination. The Wilk's lambda and F ratio criteria were made the basis for the classification with Wilk's lambda at the priority. A parameter with lower Wilk's lambda and a higher F value was assigned to be most sexual dimorphic. By applying Fisher's linear discriminant function analysis,

length of manubrium distinguished 68% of total sterna (68% males and 68% females) thus showing least sex discriminating capacity. The length of mesosternum was found to be having maximum sex determining potential. A total of 83% of total sterna (78% male and 88% female) were correctly classified. From the results, it is also evident that although combined length of manubrium and mesosternum has provided similar yield as that of length of mesosternum, but on the basis of lower Wilk's lambda value of 0.61 and higher F value of 64.25 as compared to that of combined length of manubrium and mesosternum with Wilk's lambda value of 0.61 and F value of 62.68, the length of mesosternum proved to be having greater potential in sex determination. Thus length of mesosternum was found to be having maximum sex discriminating potential.

### Conclusion

The results and comparative observations show that the length of mesosternum is the most significant, reliable and useful estimator of sex amongst the three sternal variables considered in the study. Furthermore, among the univariate and discriminant function analysis, the results of basic univariate analysis were found to be dissatisfying as greater number of sterna were falling in the overlapping zone with very few sterna correctly classified using identification and demarking points. Limiting point and sectioning point analysis though are able to classify the sterna individually, failed to classify in combination with other variables. Among all the methods, discriminant function analysis was found to be the best for correct classification and misclassification of bones with length of the mesosternum to be the best sex discriminating parameter. To conclude, there are definite osteometric differences between sterna of males and females in the population of Haryana; on the basis of which the sex can be accurately determined in up to 83% of the cases.

### Conflict of interest

None Declared

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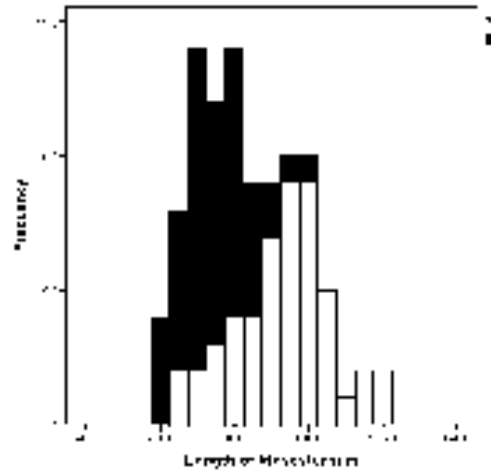
**Table 1 showing Statistical Descriptives of Various Sternal Measurements (mm)**

Parameter	M (n=50)			F (n=50)			t-test value	Mean Diff.	P value
	Mean	SD	S.E. of Mean	Mean	SD	S.E of mean			
Length of manubrium (M)	48.94	4.7	0.07	45.42	5.0	0.07	3.59	3.51	<0.001
Length of mesosternum (B)	93.07	13.4	0.19	74.71	9.0	0.13	8.06	18.36	<0.001
Combined length of manubrium and mesosternum (M+B)	143.0	17.3	0.25	120.13	10.7	0.15	7.91	22.87	<0.001

**Table 2: Results of Detailed Statistical Descriptive Analysis (mm)**

Parameter	Length of Manubrium		Length of Mesosternum		Combined length of manubrium and mesosternum	
	M	F	M	F	M	F
StatisticS						
Original	41.0-62.0	36.6-62.0	65.1-126.7	60.1-100.8	110.2-216.1	104.1-144.8
Range						
M±3SD	34.8-63.0	30.4-60.1	52.9-133.3	47.7-101.7	91.1-194.9	87.7-152.5
Identification point	62.0	41.0	100.8	65.1	144.8	110.2
Percentage classified	-	14	24	12	36	20
Overlapping (%)	100	86	76	88	64	80
Demarking point	60.1	34.8	101.7	52.9	152.5	91.1
Percentage classified	2	-	18	-	16	-
Overlapping (%)	98	100	82	100	84	100
Limiting point		51.5		83		127.5
Classified (%)	22	90	78	84	86	76
Sectioning point		47.18		83.89		131.56
Classified (%)	66	72	78	86	78	84

Figure 1 showing length of mesosternum (in mm): Distribution of cases.



**Table 3: Results of Fisher’s Linear Discriminant Function Analysis**

Parameter	Wilk’s lambda	F-ratio	P-value	Fisher’s Classification Coefficients		Fisher’s Constants		Sterna Correctly Classified (%)
				M	F	M	F	
Length of Manubrium	0.88	12.88	<0.001	20.38	18.91	-50.56	-	68
Length of Mesosternum	0.60	64.25	<0.001	7.09	5.69	-33.70	-	83
Combined length of Manubrium and Mesosternum	0.61	62.68	<0.001	6.85	5.75	-49.70	21.96	(M-39,F-44)
							35.28	(M-39,F-44)

**A STUDY OF PATTERN OF NON FATAL INJURIES DUE TO ASSAULT**

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<p><b>Article history</b>                  Received Jan 21, 2014.                  Recd. in revised form Jun 14, 2014.                  Accepted on Jun 18, 2014.                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  The present study was carried out over a period of 2 years and 8 Months, of which 2 years was retrospective and 8 months Prospective study. A total of 360 cases were studied during this period. Males were 78.3% more affected. The extremes of age were least affected and individual between 21-30yrs were the most affected. The face and Right upper limb (19.3%) were vulnerable parts of the body and Abdomen was least vulnerable. Contusions and Abrasions formed the majority of the injuries. Stabs, Chops and Firearm wounds did not exist in surviving patients. The major type of weapons used was stick followed by feet and fist. Majority of Assaults (53.8%) were between 7pm-6am and least number of cases reported during the period 6 AM-12 Noon (3.8%). In 98.89% of Assaults the Assailants were unknown. The Study also highlights the regional influence in Injuries.</p>
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<p><b>Keywords:</b> Assault, Weapon, Injuries, Nature, Pattern, Assailant, Force, Medico legal.</p>	
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**Introduction**

Assault is a crime of violence against another person. As per 351 IPC an assault is defined as “An offer or threat or attempt to apply bodily force to the body in a hostile manner may be a common assault with an intention of murder.

In our country we come across innumerable cases of assault. Not just our country but every country reports cases of Assault in different proportion. May be this is the reason that a study on the characteristic of injuries in assault cases is available from almost every part of the world.

The pattern and characteristics of injuries depends on a variety of factors like mechanical force, nature and shape of weapon, amount of energy moving/fixed body and the type of tissue on which it is applied [1]. A study on the pattern of injuries helps us to decipher a lot of valuable data which may help the legal procedure to progress smoothly and deliver justice. Comprehensive data pertaining to injury diagnose medico-legal injuries in the right perspective and medico-legal parameters help to diagnose the nature and mode of injury. This in turn helps the law officials to deliver justice [1].

In the medico-legal point of view a doctor is an expert witness and needs to record every injury so that justice may be delivered in the right

perspective [2]. In order to perform the duties of an efficient expert witness, the doctor must have the required qualification, training and experience in order to detect any problem with professional skill observe carefully and accurately and interpret the results properly and logically so as to form a scientific conclusion and to furnish an opinion on his findings[3]. Assault being a crime of violence has a lot of medico-legal implications at the national and local levels. It may be a common assault or an assault with an intention to murder.

Studies of assault related injuries have clearly established relationship between unemployment, poverty, illiteracy, male sex and alcohol [4, 5]. The need to define the characteristics and pattern of injuries lies in the fact that it helps to deliver justice in the right direction and also alert the healthcare providers with what to expect and to tighten up the health force during those periods when the incidence of assault peaks. Hence the present study is one such attempt to discuss the characteristics of injuries in assault cases with references to its variability in the parameters like age, sex, time, fatalities, frequency and rate.

**Aims and Objectives**

- a. To Study the Nature and Pattern of distribution of Injury in Assault Cases.
- b. To study the sex and Age relation to Assault.
- c. To study the Circumstances surrounding the Assault.
- d. To study the type of Force involved in Assault.
- e. To analyze the Time of occurrence, Fatalities if any and The Wound certificates issued in the Assault cases under study

**Materials and Methods**

The present study has been carried out for 2year retrospectively and 8 months prospectively. During this period of study 360 cases of assaults were analysed from the mediological register and the injury certificate issued at the casualty of SIMS & RC. The cases were analysed only from the data recorded in the medicolegal register and no attempt was made to examine the assaulted victim personally. The analysed cases were checked for the following parameters listed below. There was no attempt made to find out the name of the certifying doctor and the identity of the victim has not been revealed.

**Parameters checked**

1. Sex predilection in assault cases.
2. Age group preponderance
3. Nature of injury in the cases
4. Sites affected in assaults
5. Types of weapons used
6. Time of occurrence of incidence
7. Fatalities in relation to the assaults

The above parameters were analysed and Chi-Square of significance was applied to find out the significantly high value of respective parameters.

**Observations**

**Table No 1 showing sex wise distribution of cases**

Sex	Total	Percentage
Men	282	78.33%
Women	78	21.77%

**Table No 2 showing age group affected**

Age group(years)	Total	Percentage
0-10	02	0.55
11-20	40	11.11
21-30	112	31.11
31-40	88	24.44
41-50	58	16.11
51-60	50	13.88
61-70	10	2.77

**Discussion**

In the present study 360 cases of assault were analysed from the medico-legal register and

were also cross checked with the available injury certificates as well. The general observation was that a complete note of all injuries inflicted on the body was made and a more or less correctly filled injury certificate was issued.

**Table No 3 showing site of distribution of injuries**

Site of distribution	Total	Percentage
Head	50	13.88
Face	70	19.44
Chest	24	6.66
Abdomen	06	1.66
Back	62	17.22
Right upper limb	70	19.44
Left upper limb	66	18.33
Right lower limb	24	6.66
Left lower limb	32	8.88

**Table No 4 showing type of injuries**

Type of injuries	Total	Percentage
Abrasion	88	24.44
Contusion	154	42.77
Laceration	00	0.00
Incised wound	20	5.55
Chop wound	00	0.00
Stab wound	00	0.00
Firearm injuries	00	0.00
Burns	00	0.00
Contused lacerated wound	94	26.11
Fractures	38	10.55

**Table No 5 showing kind of weapon used**

Kind of weapon	Total	Percentage
Blunt weapon	348	96.66
Sharp weapon	12	3.33

**Table No 6 showing types of blunt weapon**

Blunt weapon type	Total no.
Stick	242
Stone	12
Iron rod	14
Glass bottle	22
Club	04
Fist	26
Feet	32
Human bite	08

**Table No 7 showing time of occurrence of assault.**

Time of incident	Total no	Percentage
06 AM-12 Noon	14	3.88
12 Noon-07PM	92	25.55
07 PM-06 AM	194	53.88

**Table 08 showing Assailant**

<b>Unknown Assailant</b>	<b>98.88%</b>
Known Assailant	1.22%

The study indicated Males were more affected as compared to Females consisting of 78.33% of the Victims (282cases of total 360 cases) this is similar to the study conducted in

Witbank General Hospital [6] who concluded in his observation that Males constituted 71.8% of Victims However the Study conducted in India [1] did conclude that Males dominated with victims constituting 92% of total number of cases. All this clearly highlights the fact that the male gender is more prone for Assaults as compared to the Females. This may be due to their more aggressive nature and a predilection to get involved into interpersonal violence.

The age wise distribution of the cases of assaults helps us to conclude the age group that is more prone or most commonly affected. In the present study it was observed that 258 cases (71.66%) were in the age group of 21-50 years. It indicates that mainly the young adults were likely to get involved into violence. Similar were the observation made in study in Witbank General Hospital, Mpumalanga [6] where a significant percentage of 86.9% victims were in the age group of 17-45 years. The percentage of individuals affected among the age group 21-40 years were 55.55% which is in consistent with the observations made by similar study in India [1] where 58% victims belonged to the similar age group. The other important observations made in our study is that the very younger (0-10 years) and Older group. It was interesting to find the very young age and Old age group (61-70 years) were least to be affected comprising 0.55% and 2.77% of the total number of Victims respectively, which is highly insignificant when compared with the middle age group.

The region most affected in the body were the Upper limbs constituting 37.77%(n-136) which is possibly due to the defensive and instinctive reaction of the victim toward of the external attack by extending his upper limbs, further observations in the Upper limbs indicated that both Right and Left Limbs were nearly equally affected consisting of 19.44%(n-70) and 18.33%(n-66) respectively. This is contrary to the observations made in Witbank General Hospital Mpumalanga. [6] wherein his victims upper limbs involvement was only 12.3%, However the Head and Face was the second most common region affected contributing to 33.32% of the body involved whereas in study conducted in Witbank General Hospital Mpumalanga [6] it indicated that head region were commonly involved i.e. 65.5% which is again contrary to our findings possibly due to number and region of study.

The majority of the nature of wounds were Contusions (42.7%) in the present study and majority were non fatal injuries. This observation corresponds with similar observation made by Hutchison et al [7] where bruises contributed to 59% of the injuries sustained. Similar views were the shared by of Researchers [8, 9]. Similar view

point was shared by others International Researchers in regarding to the non fatality of injuries sustained in Assaults [8, 10]. The Injuries least observed were incised wounds 05.5 % (n-20), the other nature of injuries unreported were Chops, Stabs, Burns and Firearms.

About 38 cases (10.5%) had fractures, amounting to grievous injuries also signifies the amount of intending force used to cause the injury. An interesting observation made was that in about 8 cases (2.22%) human bite was the weapon of injury. It would be a point of debate whether the person causing the injury by biting the victim actually wanted to assault the victim or whether it was inflicted in self defence or is it that the person causing the bite injury is mentally subnormal or was it done accidentally.

The present study indicated that Blunt force contributed to the majority of the Assaults 96.66 % (n-348) which further contributing to the predominant nature of injury i.e. Contusion and Contused Lacerated wounds. The common source of Blunt Force was Stick (70%) which is due to the easy Availability. The Human Feet, Fist and Bite constituted to 09.19%, 07.47% and 02.22 % for the Assaults, which all reflects the instinctual and Rage factor. These observations are in contrast to the Findings made by study conducted in Nigeria [11] wherein they observed Stick related injuries in 15.4% only and other injuries due to Matchete, Arrow Shot, Stab and Gunshot contributed to the rest of Non-Fatal Assault injuries. This observation clearly indicates the Regional, Cultural and geographical influence associated with Pattern of Non fatal injuries due to Assaults. In the present study it is interesting to find that the place of assault was not mentioned in the medico legal register neither was it present in the injury certificate.

In the present study the majority (53.55%) of the Assaults took place between 07PM-06 AM, indicating that the advantage of Dark (Night) was utilized by the assailants as a cover for their Crime. Similar were the observation made in study conducted in Witbank General Hospital Mpumalanga [6] the least number (03.88%) of cases were reported during Forenoon hour's i.e. 06 AM-12 noon.

It was interesting to observe that none of the injuries in the 360 cases were fatal even though many grievous injuries did exist. Similar were the views expressed by International researchers [10, 7], who observed that majority of the Assaults are of less severity and nonfatal in nature. The present study also observed that in majority (98.88%) of cases the assailants have not been named, the reasons behind this is probably that the Victims taken by surprise, unknown assailant, cover of

Darkness and Fear to reveal the Identity cannot be ruled out.

**Conflict of Interest**

None Declared

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**PATTERN OF SUICIDAL DEATHS BROUGHT FOR MEDICO LEGAL AUTOPSY AT GAUHATI MEDICAL COLLEGE: A RETROSPECTIVE STUDY**

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<p><b>Article history</b>                  Received Nov 11, 2014.                  Recd. in revised form Dec 27, 2014                  Accepted on. Dec 24, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  Suicide is a major cause of death in today's world. The pattern of suicidal deaths in a particular area points not only to the quality of living but also the social and mental makeup of the population. The present study includes the cases which have been identified as suicidal deaths being brought for medico legal autopsy. Out of 862 cases of suicidal deaths majority of the cases were males belonging to the age group between 21-30 followed by 31-40. Hanging and self-burn were the most common methods employed. Most of the victims were of lower socio economic class belonging to rural background. Economic instability and family conflict were the most common cause that led to suicides. Suicidal deaths are preventable by the combined effort of the Government agencies, adaption of healthy lifestyle, counseling facilities and change in the mindset of the people to adapt to all the difficult situations in life.</p>
<p><b>Corresponding author</b>   <b>Dr. Aditya Madhab Baruah</b>                  Phone: +91- 7399028709                   Email: baruaditya@gmail.com</p>	
<p><b>Keywords:</b> Suicide, Hanging, Economic instability, Counselling   ©2014 JPAFMAT. All rights reserved</p>	

**Introduction**

**Suicide** (Latin *suicidium*, from *sui caedere*, "to kill oneself") is the act of intentionally causing one's own death. According to Durham, the French biologist, suicide is death resulting directly or indirectly from a positive or negative act of the victim himself, which he knows will produce this result [1]. Around 800,000 to a million people die by suicide every year, making it the 10th leading cause of death worldwide [2, 3]. More than one lakh persons (1,35,445) in the country lost their lives by committing suicide during the year 2012 [4]. Suicide and attempted suicide, while previously criminally punishable, is no longer in most Western countries. It remains a criminal offence in our country. With the advent of cut throat competition and mechanized upbringing with less emotional quotient the rate of suicides is on the way up which stands at 11.2 per 100000[4].

Thus suicide which is very much a by-product of the advancements of society needs a careful and refined approach so as to study the factors related to it, the causes and if possible to find ways to prevent such a tragedy.

**Aims and Objectives**

The aim of our study was to ascertain suicidal death patterns in and around Guwahati city and to analyse the data with respect to epidemiological and demographics presentation, methods used for committing suicide and to find out the underlying factors that led to it.

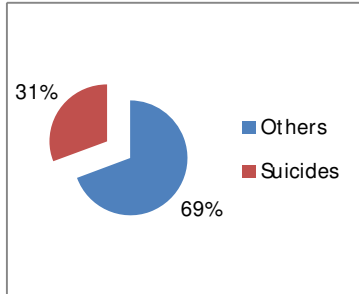
**Materials and Methods**

A retrospective study was conducted on 2814 victims subjected to medico-legal autopsy at mortuary of Department of Forensic Medicine, Gauhati Medical College, Guwahati over a period of one year from January 2013 to December 2013. The study design comprised of thoroughly scrutinized information gathered from autopsy related documents, proforma, history of relatives of the deceased, hospital records, concerned investigating agencies and laboratory report of viscera and their contents, fluids, diseased tissues and organs and other relevant suspicious samples, available in our department. Suicide notes if any were also included.

**Observation and Results**

A total of 2814 autopsies were carried out during the study period out of which 862 cases were opined to be that of suicides which constituted 30.63% of the total cases.

Chart No 1 showing suicides in relation to total autopsies



**Month wise distribution**

The month of October recorded the maximum number of cases with 98 cases followed by January with 86 cases and minimum recorded in February with 54 cases, with an average of 71.83 cases per month.

**Age and sex**

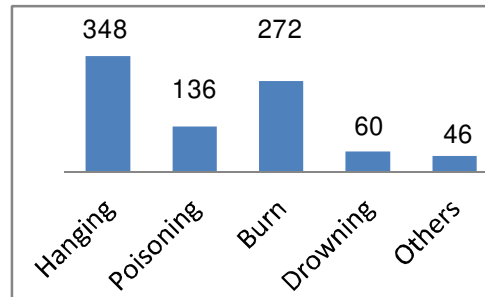
The age group 21-30 years recorded the highest number of cases followed by 31-40 years with males numbering 504 and females 358 with a male female ratio of 1.4:1.

In the age group 21-30 males constituted 38.10% of cases and females 37.43% while in the age group between 31-40 males consisted of 30.56% cases and females 34.08%. Least number of cases was observed in the age group above 60 years in both males and females.

**Method of committing suicide**

Hanging was the method which accounted for the highest number of cases 348 followed by burn 272 cases and poisoning with 136 cases. Drowning accounted for 60 deaths while others methods such as suicidal cut throat, electrocution, and railway run over etc. constituted the other cases.

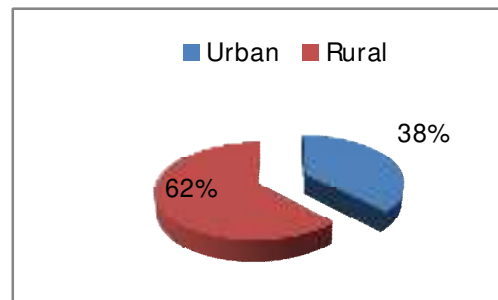
Chart No 2 showing methods adopted for suicide



**Location**

The majority of the victims belonged to rural background with 535 cases (38%) and 327 cases (62%) belonged to those of urban background.

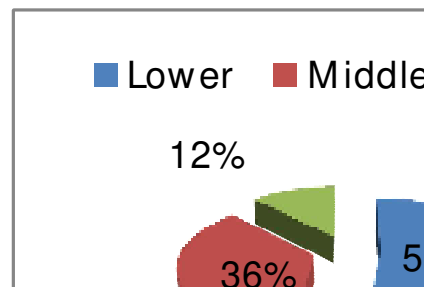
Chart No 3 showing location of victims



**Economic status**

The lower class people were the majority of affected victims with 448 cases followed by the middle class 308 cases and last by the upper class people 106 cases.

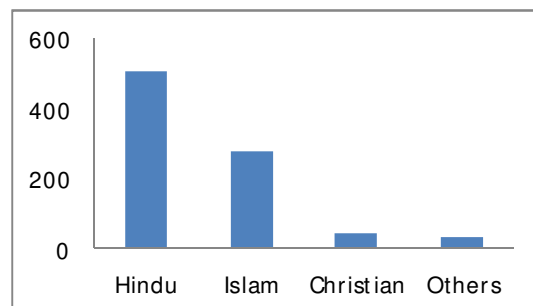
Chart No 4 showing economic status of victims



**Religion**

The highest number of victims belonged to Hindu religion (508), followed by Islam (276), Christian (42) and other religions comprising 42 cases.

Chart No 5 showing religion of victims

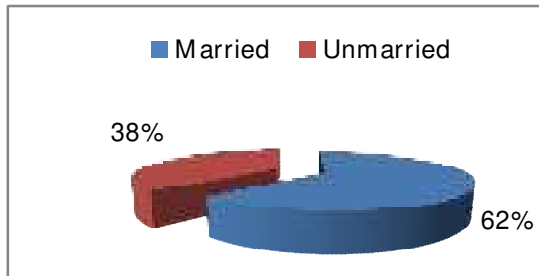




**Marital status**

Of the 862 cases 536 cases (62%) were married while 326 cases (38%) were unmarried.

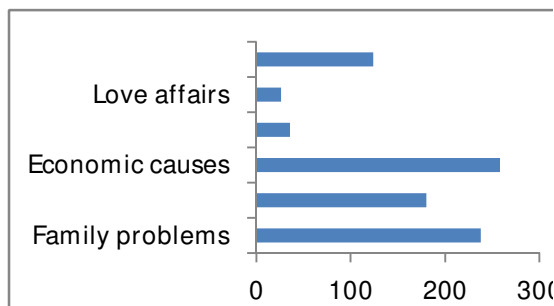
Chart No 6 showing marital status of victims



**Causes of suicide**

Economic crisis/poverty was the most common cause involved with 258 cases reporting the same followed by family related conflicts or problems with 238 cases. Illness, both mental and physical was another common cause with 180 cases. Love affairs and educational setbacks were the other causes. In Nearly 124 cases sufficient information regarding the cause could not be elicited.

Chart No 7 showing causes of suicide



**DISCUSSION**

Suicide cases account for nearly 31% of cases undergoing autopsy. This is slightly less to the findings of Santosh CS et al [9] who found suicides in nearly 44% of cases autopsied. However the relative large numbers of cases brings fore to the fact that suicide is now an inseparable part of medicolegal autopsy.

Most of the victims belong to the age group between 21-30 and 31-40 years which is similar to the studies by Behera A et al [1], Singh H et al [5], Meera T et al [6], Sharija S et al [7] and Vijaykumari N [8]. This can be explained by the fact this age group is the most active and are entrusted with the responsibilities of the family leading to conflicts and economic distress which forces one to end his or her life.

As in the most studies the highest number of cases were observed in the males but the male to female ratio was comparatively high in the studies conducted by Singh H et al [5], Meera T et al [6]. The higher incidence of males can be attributed to the demographic distribution in the area and also the financial responsibility heaped solely on the male in our society.

Hanging and self-immolation were the most common methods employed for suicide. This is similar to the studies of Meera T et al [6], Sharija S et al [7], Vijaykumari N [8], Arun M et al [10] and Vij K [11]. However Behera A et al [1], Singh H et al [5] singled out poisoning as the most common method used. This distribution can be explained by the geographical location of the study area which is not agriculture based and hence comes with less number of agriculture poison use. Hanging is easily managed with use of garments and kerosene being commonly used kitchen oil is also used.

Majority of the cases being of the rural background brings to fore the fact that the study area consists of a lot of migrant population who venture out of their home for better prospects. The failure of such endeavours leads to suicide. This is similar to the findings of Santosh CS et al [9].

Majority of the victims belonged to lower socioeconomic class. This is similar to the study of Behera A et al [1]. This is due to the fact that economic crisis leads to poor quality of life leading to suicide. Also Hindus being the most common religion involved is consistent with the demographic profile of the region. This is similar to the findings of Santosh CS et al [9].

Majority of the cases were married which is consistent with the age profile in the study. This finding is similar to the studies of Behera A et al [1], Singh H et al [5], Meera T et al [6], Sharija S et al [7], Vijaykumari N [8] and Santosh CS et al [9]. This is due to more responsibility and increases familial conflict among married people.

Economic causes, poverty and familial conflicts are the leading causes in the studies of Behera A et al [1], Singh H et al [5], Meera T et al [6], Sharija S et al [7] and Vijaykumari N[8]. This is also similar to the NRCB [4] data. This finding is relevant as economic instability and indebtedness leads to the person being termed an outcast in the society which leads to suicide. Also Meera T et al [6] mentions illness as another important factor which is also true in our study. The rising

economic costs associated with treatment and insufferable misery leads the person to commit such a step.

### Conclusion

Suicide is an escapist measure taken by a person whose cognitive abilities are completely masked and clouded by confusion and in whom death may appear to be the only immediate certainty upon which he can lay hands on. With the growing menace of this event the challenges lie ahead not only on the individual but also the society as a whole to tackle this problem. A few suggestions are made:-

1. Creation of more employment opportunities for the weaker sections of the society
2. Easy availability of credit services for the poor so that they do not have to depend upon moneylenders for credit.
3. Cooperation between Government and Non-Government agencies in implementation and awareness of welfare programmes for the poor.
4. To understand the need for psychiatric help and proper counselling for people showing signs of self-harm
5. To reform the education system this puts a heavy price on marks and not on skill of a person.
6. Stringent dowry laws which prevents familial conflict regarding the same.
7. Better and vigilant policy of the Government on the sale and storage of pesticides and agriculture poisons.
8. Though it is not possible to bring back those lives which are often lost in such a tragic manner but identifying the underlying factors in the social system which promote suicidal tendencies and improving the mental health of the community can certainly prevent such incidence further. As such a multidisciplinary approach is required to prevent the loss of many valuable lives and the recognition of suicide not as an unfortunate event but as a 'social epidemic'

### Conflict of Interest

None Declared

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Table No 1 showing month wise distribution of cases.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Cases	86	54	71	82	76	58	81	61	62	98	61	72

Table No 2 showing age and sex distribution of cases

Age	Male	Percentage	Female	Percentage
1-10	0	0	0	0
11-20	76	15.08	47	13.13
21-30	192	38.10	134	37.43
31-40	154	30.56	122	34.08
41-50	31	6.15	27	7.54
51-60	27	5.36	17	4.75
Above 60 years	24	4.75	11	3.07
<b>Total</b>	<b>504</b>	<b>100</b>	<b>358</b>	<b>100</b>

**PATTERNS OF FATAL POISONING DEATHS: A RETROSPECTIVE STUDY**

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<p><b>Article history</b>                  Received Apr 24, 2014.                  Recd. in revised form. Dec 26, 2014                  Accepted on Dec 27, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  Poisoning is an important public health problem causing significant morbidity and mortality throughout the world especially in developing countries. Acute poisoning with pesticide accounts for as many as 300,000 deaths worldwide every year. The majority of deaths occur due to exposure to organophosphates, organochlorines and aluminium phosphide. The present study was undertaken to evaluate the pattern of poisoning deaths in Ramanagar District of Karnataka. It is a retrospective study conducted during Jan 2010 - Dec 2013 in Rajarajeshwari medical college hospital, Bangalore, Karnataka. There were 153 cases of death due to acute poisoning. Among 153 cases, 133 cases were of intentional poisoning and 18 cases were of accidental poisoning. Males 114 cases (74.50%) outnumbered females 39 cases (25.50%). Peak occurrence was in the age group of 20-39 years (83 cases). Organophosphorus was the commonest agent (62%). More cases were reported during summer season (32%) followed by spring season (29.5%). The incidence of poisoning and its morbidity and mortality can be reduced by developing and implementation of effective prevention strategies.</p>
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<p><b>Keywords:</b> Pesticide, Intentional poisoning, Organo-phosphorus, Phosphide.</p>	<p>©2014 JPAFMAT. All rights reserved</p>

**Introduction**

In developing countries, acute poisoning from pesticides is the most worrisome type of poisoning. [1] Self-poisoning with agricultural pesticides represents a major hidden public health problem accounting for approximately one-third of all suicides worldwide. [2] It is one of the most common forms of self-injury in the Global South. Poisoning with pesticides is frequent in India and carries a high mortality and morbidity.

The increase in pesticide use for agriculture has paralleled the increase in quality and quantity of food products over the years. At the same time, there has been an increase in the use of these products for suicidal purposes and is termed as deliberate self-harm (DSH), and it results in a higher mortality than accidental. [3]

The commonest cause of poisoning in India and other developing countries is pesticides, the reasons being agriculture based economics, poverty, unsafe practices, illiteracy, ignorance and lack of protective clothing and easy availability of highly toxic pesticides and among pesticides. Majority of the victims of poisoning are from lower socio economic status.

Pattern of poisoning in a region depends on various factors which include availability and access to the poison, socioeconomic status of an individual, cultural and religious influences, etc. Even though the advanced medical treatment and awareness, the poisoning cases are increasing day by day. Very few studies have been done in region this regarding the epidemiology of poisoning. So this study has been aimed to determine the various parameters of poisoning such as mode of poisoning, outcome of poison, the most vulnerable age group and above all to find out the most common type of poison used in this region.

## Material and Methods

This present study was undertaken in the department of Forensic medicine and Toxicology, at Rajarajeshwari medical college hospital, Bangalore, Karnataka. A total of 153 cases of death due to poisoning were selected for this retrospective study, which were brought to us for postmortem examination during the span of three years (From Jan 1st, 2010 to Dec 31st, 2013). Data regarding the particulars of the deceased, history, circumstantial evidence, post-mortem findings were collected from the hospital records and documented in the pre-structured proforma. Confirmation of the nature of the poison was obtained from the viscera analysis in the postmortem cases and outcome of poisoning were recorded and analysed by descriptive method.

## Results

All cases of deaths due to poisoning who were autopsied in the Rajarajeshwari Medical College Hospital Mortuary, Bangalore irrespective of Sex, Age groups treated and untreated and duration of survival for a period of three years from Jan 2010 to Dec 2013.

Out of a total number of 1917 autopsies conducted at the department during the period under study, 153 cases (8.2%) of deaths were due to poisoning. While the number of poisoning deaths, in general showed a slight increase from 6.26% to 9%. **(Table 1)**

In the present study of 153 cases of poisoning, the cases are seen more in the male victims 114 (74.50%) as compared to females 39 (25.50%) with a male to female ratio of 3:1. **(Table 2)**

Our study showed that the deaths are more in the third (50 cases) and fourth decades (33 cases) constituting 32.7% and 21.6% of total 153 victims and the male victims are highest in the age group 20 - 39 years (39.90 %) but for female age group 20-39 years (16.33%) reports the highest number of deaths. **(Table 3)**

The commonest manner of poisoning was suicidal 133 cases and there were 18 accidental poison cases. Two cases of homicidal poisoning death were reported during the study period. Higher suicidal rate was found among males compared to females. **(Table 4)**

Considering the place of death of the victims we have observed that 52 cases (34%) died at the place of consumption of poison and while shifting to the hospital. A total of 101 cases (66%) have died in the hospital after undergoing the treatment. The majority of the cases stayed for 1 to 3 days in the hospital (55.5%).

In the present study, the commonest poisoning agent was organophosphorus compounds 95cases (62%) followed by phosphide poison (15 cases, 9.8%), next common includes other pesticides like organochlorines, pyrethroids and herbicides accounting for 13 cases. Drugs used were phenobarbitone and diazepam. **(Table 5)** In all the cases of intentional poisoning route of administration was oral.

Seasonal variation also alters poisoning statistics. More number of cases were reported during summer season (49 cases, 32%) followed by spring season (45 cases, 29.5%). **(Table 6)**

## Discussion

Out of 1917 Post mortem examination done during the study period 153 cases were of poisoning. In Karnataka, there were 1619 accidental deaths and 3975 suicidal deaths due to poisoning [4] in the year 2007. The city of Bengaluru, reported 584 deaths due to poisoning with suicidal and accidental deaths in the ratio of 3: 1 [4]. Data from BISP revealed that there were nearly 300 (9%) deaths due to poisoning in 2007. In the same one-year, there were 5,470 (10%) persons with injuries brought to 21 partner institutions. In our study only 8.2% of cases brought for autopsy were in relation to poisoning. [5]

The males were more involved 114 (74.50%) as compared to females 39 (25.50%). These findings are similar to findings of study conducted by KSN Reddy, Gannar OG at Gulbarga shows that 65.65% of cases were male. [6]

In this study the most common age group involved were between 20-49. A pattern similar to this has been reported elsewhere in India and abroad [7]. This age group was the most active one, physically, mentally and socially and so, it was more prone to stress during life.

The commonest manner of poisoning was suicidal (133 cases, 86.9%) and there were 18 cases of accidental poisoning. Higher suicidal rate was found among males compared to females. The reasons for the suicide in males include lack of employment, poverty, high degree of stress in academic, financial and social sectors. Higher suicidal rate among males than females were similar with other studies done by Sharma et.al (2002) [8] and others (Dash et al. 2005) [9] but contradict the study done by Pokhrel et.al (2008) [10] in which incidence was high among females. The commonest route of poisoning was oral in the suicidal cases. Various national and international studies have projected an increase in the incidence of intentional poisoning. The findings are similar to the study done by Das et al 2007 [11].

A wide range of products were used for poisoning acts. Cases of suicidal poisoning by various chemical compounds are being reported by very frequently from all parts of India and other countries. Organophosphates are the commonest class of pesticides which have been implicated for the intentional poisoning in the present study (95cases, 62%), as the organophosphorus pesticides are easily available at a cheap rate. According to various studies organophosphates forms the commonest poisoning agent. [12, 13]. Various agents such as pesticides, drugs have been used for intentional and accidental poisoning in different countries [14] However, pesticides are the commonly used poisoning agents for intentional poisoning in India [15]. Majority of these products were either available at home or purchased from nearby shops. Our findings are strengthens the view that easy availability of insecticides is responsible for the choice of poisoning as a preferred means of suicide in different regions of [16, 17] India.

The OP poisoning almost evenly distributed in all the seasons, with the highest number of cases occurring in summer (49 cases, 32%) followed by spring season (45 cases, 29.5%). This was similar to the study done by Jesslin et al [12]. Water scarcity during summer leads to crop failure and financial loses which indirectly increases the incidence of suicide. And also grains are preserved during summer season for which pesticides are procured, that increases the availability of poison and indirectly it leads to rise in the incidence during summer. The most common agent responsible for fatal poisonings in this study are pesticides with organophosphates alone being responsible for the majority of the fatalities, an observation similar to that reported in the earlier studies from different parts of India [18, 19] except for the Northern regions of India where Aluminium Phosphide is reported as the most common cause of poisoning in sub-urban and rural parts [20, 21].

### Conclusion

Most of the deaths in this study were due to Self-poisoning. Self-poisoning is one of the oldest methods tried for committing or attempting suicide, only the substances is used for poisoning change from time to time and place to place. However, OP poisoning still most common type of poison used for intentional poisoning. Higher incidence of OPCs and aluminium phosphide can be restricted by having a control on their sale and distribution. The high incidence of suicide by poisoning among young adults can be checked by psychological counselling and by tackling their problems sympathetically. Reducing deaths from self-poisoning require prevention strategies include treating the problems leading to suicidal behaviours involving pesticides.

### Acknowledgement

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### Conflict of Interest

None declared

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**Table 1 showing total deaths due to Poisoning**

YEARS	2010	2011	2012	2013	TOTAL(%)
NO.OF AUTOPSIES	383	482	539	513	N=1917
POISONING DEATHS	24(6.3%)	39(8%)	44(8.2%)	46(9%)	153(8.2%)

**Table 2 showing total deaths due to Poisoning sex wise**

	2010	2011	2012	2013	TOTAL (%)
Males	19	27	32	36	114(74.5)
Females	05	12	12	10	39(25.5)
<b>TOTAL</b>	<b>24</b>	<b>39</b>	<b>44</b>	<b>46</b>	<b>153</b>

**Table 3 showing total deaths due to Poisoning Agewise**

Age (Yrs)	2010	2011	2012	2013	TOTAL(%)
0 – 9	00	00	00	01	01(0.6)
10 – 19	03	04	03	02	12(7.9)
20 – 29	11	10	15	14	50(32.7)
30 – 39	04	09	07	13	33(21.6)
40 – 49	01	08	07	05	21(13.7)
50 – 59	04	07	08	07	26(17)
60 and Above	01	01	04	04	10(6.5)
<b>TOTAL</b>	<b>24</b>	<b>39</b>	<b>44</b>	<b>46</b>	<b>153</b>

**Table 4 showing Manner of death of poisoning cases**

	2010	2011	2012	2013	TOTAL(%)
Suicidal	21	34	39	39	133(86.9)
Accidental	03	04	05	06	18(11.7)
Homicidal	00	01	00	01	02(1.4)

**Table 5 showing type of poison involved in poisoning deaths**

Type of poison	2010	2011	2012	2013	TOTAL(%)
Organo-phosphorus	14	27	28	26	95(62)
Organo-chlorines	02	03	00	00	05(3.3)
Pyrethroids	01	01	00	02	04(2.5)
Herbicides	00	00	02	01	03(2.0)
Phosphides	01	04	04	06	15(9.8)
Corrosives	01	00	04	01	06(4.0)
Alcohol	02	01	02	02	07(4.6)
Phenobarbitone/Benzodiazepine	01	00	02	02	05(3.3)
Kerosene	00	00	00	01	01(0.6)
Snakebite	00	01	00	02	03(2.0)
Carbon monoxide	00	00	01	01	02(1.3)
Unknown	02	02	01	02	07(4.6)
	<b>24</b>	<b>39</b>	<b>44</b>	<b>46</b>	<b>153</b>

**Table 6 Season wise**

SEASONS	TOTAL%
Summer (Mar, Apr, May)	49(32)
Rainy (Jun, Jul, Aug)	36(23.5)
Spring (Sep, Oct, Nov)	45(29.5)
Winter (Dec, Jan, Feb)	23(15)



**PROFILE OF FATAL ORGANOPHOSPHORUS PESTICIDE POISONING CASES NEAR DAVANGERE**

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<p><b>Article history</b>                  Received Jan 22, 2014.                  Recd. in revised form. Dec 28, 2014                  Accepted on Dec 28, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  The present study was conducted in the department of JJM Medical College, Davangere to assess the incidence, pattern and risk factors in organophosphate poisoning cases. This study included 100 cases of fatal organophosphate poisoning. In our study, male to female ratio was found to be 2.23:1. The most frequently affected age group was 31-40 years old (37%). Incidence of poisoning was seen higher among the married people (72%), who had a lower level of education, belonged to rural areas (77%) with agriculture (80%) as their primary occupation and low socio-economic group (58%). Manner of poisoning were suicidal in 89 (89%) of cases and prolonged illness (28%) was the commonest cause. Males (62.9%) were found more prone to the suicidal poisoning. Ingestion (100 %) was the commonest route of exposure. Most of the deaths occurred within 24 hours (55%) after the occurrence of poisoning.</p>
<p><b>Corresponding author</b>   <b>Dr. Ashok Gupta</b>                   Phone: +91- 7795123727                   Email: dr.ashokgupta007@gmail.com</p>	<p><b>Keywords:</b> Organophosphorus poisoning, Pesticides, Suicidal, Pattern, Incidence, India.</p>
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**Introduction**

Pesticides comprise a wide range of compounds including insecticides, herbicides, fungicides and others, which are widely used for agriculture, vector control and some of the domestic purposes. And because of their high toxicity & easy availability, pesticide poisonings remain a serious public health problem worldwide. According to the World Health Organization's estimate, 3 million cases of pesticide poisoning occur every year, resulting in more than 220,000 deaths, most of which are intentional. [1] Among the numerous pesticides that can result in death, organophosphate (OP) insecticides are the most common culprit agents because of their high toxicity & easy availability.

Most of these pesticide poisoning and subsequent deaths occur in developing countries particularly in rural areas where the mortality from intentional self-poisoning is 10 to 50 times higher than the developed countries because of common use of these highly toxic insecticides.[2,3] The WHO reports that pesticides are now the most common method of suicide worldwide.[4] In India too, organophosphorus use is widespread as most

of the population is mainly rural with agriculture as a major occupation.

It is therefore important to identify the most commonly used methods of suicide to design appropriate strategies for restricting access to such methods and to improve the ability of health care systems to effectively treat individuals who use these methods. This study was aimed to assess the incidence, pattern and risk factors in OP poisoning cases in department of forensic medicine and toxicology, JJM Medical College, Davangere.

**Materials and Methods**

This is a prospective study of 100 cases of organophosphate poisoning who were brought for autopsy in the mortuary of JJM Medical College, Davangere over the period of 2 years from January 2012 to December 2013. Data regarding the age, sex, marital status, education, occupation, socio-economic status, reasons for the poisoning, route of poisoning, period of survival were obtained from the hospital records, police inquest reports, interviews of family members & relatives of deceased, post-mortem examination reports and

the reports of the forensic science laboratory, Davangere.

**Results**

In our study, 69 (69%) of the cases were of male sex and 31 (31%) of female sex with male to female ratio of 2.23:1. This shows males are more prone than female. According to the age distribution, the most frequently affected age group was 31-40 years old (37%) followed by 41-50 years (21%), 21-30 years (14%), 10-20 years (13%), 50-60 years (13%) and below 10 years (2%) in both sexes. The distribution of the cases with regards to their ages clearly shows that majority of the cases fall under the productive age group. Regarding marital status 72 (72%) cases were married and 28 (28%) cases unmarried which mean married subjects are more prone to the incidence than unmarried. Incidence of poisoning was seen higher among the people who had a lower level of education. 77 (77%) cases reported from rural areas whereas 23 (23%) cases were from urban areas. A majority (80%) of the total cases were involved in agriculture as their primary occupation. It was found that most of the people were from low socio-economic group, the number of people died in that group are 58 (58%), followed by middle socio-economic group whose number is 30 (30%). The rest of them are from high socio-economic group whose number is 12 (12%). (Table.1)

**Table 1: Socio-demographic profile of the OP poisoning cases (n=100)**

Sex	Number (%)
Male (M)	69 (69%)
Female (F)	31 (31%)
M:F Ratio	2.23:1
<b>Age (in years)</b>	
< 10	2 (2%)
10-20	13 (13%)
21-30	14 (14%)
31-40	37 (37%)
41-50	21 (21%)
50-60	13 (13%)
<b>Marital status</b>	
Married	72 (72%)
Unmarried	28 (28%)
<b>Education</b>	
Illiterate	13 (13%)
Up to 12th class	61 (61%)
Graduate and above	26 (26%)
<b>Area</b>	
Rural	77 (77%)
Urban	23 (23%)
<b>Occupation</b>	
Agriculture	80 (80%)
Non-agriculture	20 (20%)
<b>Socio-economic status</b>	
Low	58 (58%)
Middle	30 (30%)
High	12 (12%)

Manner of poisoning were suicidal in 89 (89%) of cases and accidental in 9 (9%), while only 2 (2%) cases of homicidal manner were found.

This indicates that the intentional poisoning (suicide) is the most common manner. (Table.2)

**Table 2: Manner of OP poisoning (n=100)**

Manner of poisoning	Number (%)
Suicidal	89 (89%)
Accidental	9 (9%)
Homicidal	2 (2%)

Of all 89 suicidal cases, majority of the cases were due to prolonged illness (28%), which is followed by financial crisis (15.7%), other domestic problems (14.6%), and marital disharmony (10.1%). The rest were because of variety of reasons like dowry problem (4.4%), psychiatric illness (4.4%), and failure in exam (3.3%), unemployment/loss of job (2.2%) and failure in love (1.1%). Cause of the suicidal ingestion was not known in 14 cases (15.7%). The most frequent age group prone to incidences of suicide is 31-40 years followed by 41-50 years, while the age group below 20 years was more frequent to accidental ingestion of poison, while both the cases below the age of 10 years were homicidal in nature. Males (62.9%) were found to be more prone to the suicidal poisoning than females (37%). (Table.3 at end)

As regard to the routes of exposure, ingestion (100 %) was the commonest mode in our study, we have not found any case with topical, inhalational and parenteral route of exposure. (Table.4)

**Table 4: Means of exposure (n=100)**

Means of exposure	Number (%)
Ingestion	100 (100%)
Inhalation	0 (0%)
Topical application	0 (0%)
Parenteral	0 (0%)

The victims of the OP poisoning succumbed at varying period after the poisoning. Among them most of the deaths occurred within 24 hours of occurrence of poisoning, with 55 (55%) deaths occurring in that time. The next vulnerable period appears to be between 1-5 days of occurrence of poisoning, wherein 27 (27%) cases succumbed, 11 (11%) persons died after 10 days, and 7 (7%) between 6 to 10 days. (Table.5)

**Table 5: Period of survival (n=100)**

Period of survival	Number (%)
< 24 hours	55 (55%)
1-5 days	27 (27%)
6-10 days	7 (7%)
>10 days	11 (11%)

**Discussion**

Organophosphates are used widely throughout the world as pesticides and for increasing the yield of agriculture products. This has resulted in increased incidence of occupational, accidental and intentional exposures

of organophosphates and posed a global health problem especially in developing countries. The scenario is equally grave in India where the extensive use of organophosphorus compounds in agriculture sector, its easy availability & uncontrolled sale, poor regulation of its use, and lack of medical services are responsible for millions of cases and thousands of deaths occurring each year. In the present time, because of these factors, organophosphorus compounds, have become most common method of suicide in India.

The present study was carried out to assess the incidence, pattern and risk factors of organophosphorus poisoning which is major public health problem in India.

Our study showed that males (69%) predominated over females (31%) with male to female ratio of 2.23:1. This might be due to fact that males are more often dealing with agricultural works, so they are more commonly exposed as well as have easy access to the pesticides. Similar findings were reported in the studies by Rao et al [5], Dhaval et al [6], Khajuria et al [7], Kar [8], Thunga et al [9], Nair et al[10], while female predominance was shown by Kafle et al[11], Rauniyar et al [12], Paudyal et al [13], Gupta Set al [14], Singh et al [15], Kar et al [16], Khadka et al [17], Karki et al [18], Pokhrel et al [19].

Majority of the cases were between the age group of 31-40 years (37%), followed by 41-50 years (21%), suggesting probability of higher risk of suicidal death in these age ranges. The high incidence in people of productive age group may be due to the fact that they are the ones with the main responsibilities of the family and may be under constant stress, frustration and also they are more commonly involved in agricultural works and so more commonly exposed to organophosphorus compounds. These findings were supported by Khajuria et al[7], Nilamadhab Kar [8], and Malik GM et al[20]. Whereas Srinivas Rao et al [5], Thunga G et al[9], Singh DP et al[15], and Karki P et al[18] report high risk among the age group of 21-30 years.

In the present study, incidence was more in rural than urban population comprising 77% of cases, and majority of the cases died due to organophosphorus poisoning were agriculturists (80%). This may be because of more prevalent agriculture profession and widespread use of pesticide in agriculture sector predominantly in rural area. This is in concurrence with reports of Dhaval JP et al[6] (82.29 % poisoning cases from rural area), Khajuria V et al[7] (62% from rural), Thunga G et al[9] (45.1% agricultural workers), Nair V et al[10] (73.33% from rural), and Gannur et al[21] (37.8% agricultural workers). Higher

incidence of suicide has been reported in farmers in rural India.[22]

Majority of the cases belonged to low socio-economic class (58%). High incidence amongst the lower class was also reported by the studies of Dhaval JP et al[6] (48.95%), and Nair V et al[10] (35.83%).

Majority of the victims were married (72%), which shows married subjects are more prone to the incidence. High incidence amongst the married victims was also reported by the studies of Khajuria V et al[7] (54.2%), Nilamadhab Kar[8] (90.6% women and 70.6% men were married), Nair et al[10] (35.83%), and Pokhrel D et al[19] (37.1%).

Most cases ( 89% ) in the present study were the result of intentional self-poisoning; this finding can be matched with the findings of studies done by Rao et al[5] from South Indian hospital (96%), Kar[8], Kar et al[16] (95%) and Karki et al[18] (89%), Chataut et al[23] (97%). Whereas in a study done by Khadka et al [17] suicidal poisoning was seen in just 58% of cases. Causes of suicidal poisoning were financial crisis, marital disharmony, dowry problems, other domestic problems, unemployment/loss of job, failure in love, prolonged illness, psychiatric illness, failure in exam. In both males and females prolonged illness (28%) was found to be the major cause of suicide, followed by financial crisis (15.7%), other domestic problems (14.6%). Dhaval JP et al[6] showed that the financial problem was commonest in married male - 71 cases (58.67%) and domestic problem was most frequent in married females - 51 cases (54.25 %). In the same study, unmarried category also showed both the reasons as commonest in male - 30 cases (69.76%) and in females - 17 cases (56.66%). In a study by Nair V et al[10] the major reason for committing suicide was financial crisis (42.50%) mostly in males but domestic problem was also another major reason (37.50%) especially in females. Chataut et al[23] found, majority of the cases (20%) were due to financial problems, which is followed by domestic troubles (17.3%), unsuccessful love affairs (16%), and marital disharmony (13%).

Oral ingestion (100%) was found to be the most common route of poisoning. Similar findings were observed by Khajuria V et al[7] (100%), Thunga G et al[9] (98%), and Malik GM et al[20] (85.4%).

In this study it also became evident that out of 100 cases which were autopsied, 10 received no treatment before coming to the hospital and brought dead. Majority of the cases in our study who received treatment succumbed within 24 hours followed by 1-5 days. Whereas Srinivas Rao et al [5] in his study found that half the deaths occurred in the first 6 hours of

admission. Causes for higher mortality observed in our study may be the lack of ICU facilities, late arrival, not receiving any treatment at periphery before arrival to the hospital, poverty and illiteracy.

### Conclusion

Now a days, pesticides are an integral part of agriculture in our country hence pesticide poisoning is very common in India and organophosphorus is one of the most common poisons consumed because of its wide and easy availability. The results of current study revealed that the organophosphorus poisoning was more common in males, young adults, with low education and socioeconomic status and from rural areas with agriculture as a major occupation. In majority of cases the ingestion was intentional for self-harm because of multiple reasons such as financial crisis, domestic problems, marital disharmony, unemployment/loss of job, failure in love, dowry problems, etc. Based on the findings of present study, we recommend that interventions are required to prevent the morbidity and mortality from organophosphorus poisoning in the future. Possible interventions could be good governance, strict laws regarding the sale of such compounds which will restrict their availability, banning more toxic ones, improved storage which will reduce the easy accessibility during times of stress, education of people which will help in improving their health, in coping with the problems and improving their socio-economic status, etc. Along with this, early hospitalization, diagnosis, management and improving the medical facilities at peripheral level are of paramount importance in improving the prognosis. And definitely setting up a poisoning control centre in the hospitals may bring revolution in strengthening the process of early diagnosis, management and consequent prognosis. We believe, this information may be useful in future for preventing the incidence of poisoning in developing countries like India.

### Conflict of Interest

None declared.

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**Table 3: Reasons for suicidal OP poisoning (n=89)**

Reasons for suicidal OP poisoning	Male	Female	Total
	[Number (%)]	[Number (%)]	[Number (%)]
Financial crisis	10 (17.8%)	4 (12.1%)	14 (15.7%)
Marital disharmony	2 (3.5%)	7 (21.2%)	9 (10.1%)
Dowry problems	0 (0%)	4 (12.1%)	4 (4.4%)
Other domestic problems	10 (17.8%)	3 (9%)	13 (14.6%)
Unemployment/Loss of job	2 (3.5%)	0 (0%)	2 (2.2%)
Failure in love	0 (0%)	1 (3%)	1 (1.1%)
Prolonged illness	16 (28.5%)	9 (27.2%)	25 (28%)
Psychiatric illness	3 (5.3%)	1 (3%)	4 (4.4%)
Failure in exam	3 (5.3%)	0 (0%)	3 (3.3%)
Unknown	10 (17.8%)	4 (12.1%)	14 (15.7%)
Total	56 (62.9%)	33 (37%)	89

**PATTERN OF NECK TISSUE INJURIES IN HANGING - A PROSPECTIVE STUDY**

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<p><b>Article history</b>                  Received Feb 10, 2014.                  Recd. in revised form Dec 31, 2014                  Accepted on. Dec 31, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  Deaths due to hanging are common in suicides .Many a time a ligature mark may be the only evidence available in cases of asphyxial deaths. A thorough examination of the ligature mark along with internal neck tissue injury is a must to arrive at the most probable cause of death. A prospective study consisting of 40 suicide cases of hanging during the period of January 2012 to September 2013 brought to the mortuary of Sri Ramachandra Medical College and Research Institute, Chennai was undertaken to assess the socio-demographic factors, examination findings, both external and internal including the histopathological investigation of relevant tissue samples. It was observed that deaths due to hanging constituted 15% of the total unnatural deaths subjected to medico-legal autopsy; young adults, of the age group 21 to 30 years accounted for the maximum cases, with a male: female ratio of 3:1. 70% of the victims preferred closed room, 77.5% of them used soft and broad ligature material. Complete atypical hanging constituted 57.5% of deaths. Subcutaneous tissue injury was seen in 35% cases, Focal tear of Sternocleidomastoid muscle was seen in 32.5% cases, carotid artery tear was present in 10% of cases and 2.5% of cases had hyoid fractures.</p>
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<p><b>Keywords:</b> Hanging, Ligature material, Ligature mark, Internal injuries</p>	<p>©2014 JPAFMAT. All rights reserved</p>

**Introduction**

Legally, death is defined under S-46 I.P.C as permanent disappearance of all evidence of life at any time after live birth has taken place. Death is inevitable to everyone once life starts. But premature ending of one’s own life has seen an alarming rise in the recent years. According to WHO [1] approximately one million people die from suicide, and 10 to 20 times more people attempt suicide worldwide every year. This represents one death every 40 seconds and one attempt every 3 seconds, on average. All over the world, suicide is now one of the three leading causes of death among people aged 15-34 years. Until recently, suicide was predominating among the elderly, but now suicide predominates in younger people in both absolute and relative terms, in all countries. On world suicide prevention day 2008, WHO claimed that Japan, China, India

might account for about half of the world suicide rate. [2]

In India, according to the National Crime Record Bureau (NCRB), 2012, 1.3 lakh people committed suicide every year. About 4 lakh people attempted suicide, and 15 suicides took place every 1 hour during 2012. There is always been a raise every year. Overall male victims are encountered more commonly in suicide. In females 1 suicide out of every 6 suicide was committed by a housewife. [2]

Hanging is a form of ligature strangulation that involves suspension by the neck. Hanging can be classified as either complete or incomplete. When the whole body hangs off the ground and entire weight of the victim is suspended at the neck, the hanging is said to be complete hanging. Incomplete hanging implies that some part of the

body is touching the ground and that the weight of the victim is not fully supported by the neck. [3]

### Material and methods:

Cases of hanging brought to the mortuary of Sri Ramachandra Medical College and Research Institute, Chennai for post-mortem examination during the period of January 2012 to September 2013, were studied in detail. In each case, detailed history was collected both from the police and the relatives. In case of hospital deaths, case sheets were perused.

Thorough examination of clothes and alleged ligature materials, if produced were done before autopsy. Detailed external and internal examination of dead body was conducted by the bloodless neck dissection technique. From the neck, abraded skin, bilateral Sternocleidomastoid muscles at their site of origin and bilateral carotid arteries were collected in each case and subjected for histopathological analysis. The neck skeleton i.e. hyoid bone, cricoid cartilage and thyroid cartilage were also studied to detect any fracture due to hanging.

### Results

The maximum number of death due to hanging in the study was seen in the age group between 21-30 years (50%). Least number of cases was seen in 51- 60 years (2.5%). It was observed that married victims were more 60% as compare to unmarried victims 40%. Males 75% were comparatively higher than females 25%, indicating a male: female ratio of 3:1.

In account to education status, under matriculation (55%) and higher education (25%) were relatively high. Victims who were self-employed (37.5%) and part time employers (22.5%) were found to be more. 35% of the victims were addicted to both alcohol and smoking and 5% were addicted to drugs. Among the various reasons for committing suicide by hanging, the most common reason was quarrel (30%) followed by economical problems (22.5%) and chronic physical pain or illness (17.5%).

Majority of the victims preferred closed rooms (70%), while some preferred open rooms and open place (30%) (Table no 1). A large proportion of the victims (57.5%) died on the spot, while the rest, on the way to hospital (37.5%). Only very few survived between 6-24hours (5%).

Ligature materials of choice were Sarees (47.5%), lungis (20%) and chunnis (15%) in which the consistency of the materials were soft and broad in nature (77.5%) (Table no 2). The present study revealed, the common type of hanging was complete atypical type of hanging (57.5%), followed by partial atypical hanging (37.5%). Complete typical and partial typical types were also seen (2.5%) (Table no 3).

Ligature mark was visible in 95% of cases, whereas it was absent in 5% of cases. In 87.5% of cases ligature mark was single and in 7.5% of cases multiple marks were present. The position of the mark around the neck was observed to be above the thyroid cartilage in 50% of cases and at the level of the thyroid cartilage in 20% of the cases, whereas mark below the thyroid cartilage was seen in only 5% of cases. The direction of the ligature mark was obliquely placed in 80% of cases, whereas oblique mark associated with transverse marks were seen in 15% of cases. In 55% of the cases, ligature marks were not patterned and in 40% of cases, it was patterned.

Knot mark was seen in 17.5% of cases and the victims were observed to have the mark in right lateral position more often (12.5%), than in left lateral position (5%). Knot mark was not identified in the rest of the cases (82.5%).

Out of 40 cases in the present study, internal injuries were observed in all cases, hemorrhage of the skin beneath the ligature mark was seen in 37.5%, whereas in 62.5% of cases it was absent. Skin fragmentation was seen in 12.5% of cases. Injured subcutaneous tissue was seen in 35% cases. Sternocleidomastoid muscle injury with focal tear was seen in 32.5% of cases (Table no 4). Carotid artery intimal tear was seen in 10% of cases (Table no 5). 2.5% of cases had hyoid bone fracture. No other fracture or injury was evident in other structures such as thyroid cartilage, cricoid cartilage, and cervical vertebrae and also there was no spinal cord injury observed in any of the victims.

### Discussion

In the present study the most common age group affected was between 21-30 years. The observation of this study was similar to the study done by Charoonsak Nualchaem [4] in which the common age groups of the victims were the same. Large numbers of cases were males, with a male:

female ratio of 3:1. This increase in number of male victims is mainly because of the stress and burden they face every day. Female deaths were seen in less number of cases, where predominant age group of females were between 11-20 years, and the incidence was found decreasing with advancing age (> 30 years) probably because, females could withstand pressures of life as age advances, by virtue of the social structure of the communities. Similar findings were observed by Charoonsak Nualchaem [4], where 65.7% were male victims who ended their lives by hanging. It is in contrast to the finding observed by Ahmad M and Hossain MZ [5] in which females were more (85 %) when compared to males (41.37%).

Ligature materials used were easily available ones which includes soft materials such as Sarees, lungis and chunnis (77.5%). Sharija S et al [6] in their study, have observed that soft ligature materials are preferred in majority of the cases. David G et al [7] in their study observed that the most commonly used ligature material were rope, belts, flexes.

Ligature mark, the external sign of hanging was present in 95% of the cases and absent in 5% of cases in the present study. The ligature mark was clear in 75 %, faint in 20 % and absent in 5% of the cases. The present study tallies with the findings as observed by Sarangi MP [8]. The reason behind this is, majority of the cases were complete suspension and the prominence of the marks were due to the hard material used and increased period of suspension.

In the present study, as we correlate the external findings with the internal injuries, it is observed as follows: The subcutaneous tissue showed infiltration of blood in 35% of cases and all these were cases of partial hanging. Sternocleidomastoid is the muscle frequently injured in hanging, such injuries were noted in 32.5% cases and all of them were present on the side of the knot. Glaister J and Rentoul E [9] had noted the rupture of lower attachment of sternocleidomastoid in 2% to 10% of hanging cases. Sivasuthan S [10] had attributed this rupture of lower attachment of sternocleidomastoid as a definite sign of ante mortem hanging.

In this study it was observed that, sternocleidomastoid muscle tear was seen in 35.4% of cases with clear ligature marks, 14.3 % of

cases with faint ligature marks and 50% of cases with no obvious ligature marks. In the present study, 10% of cases showed tear of the carotid artery and in those cases there were involvement of drop from point of suspension. In a study by Suárez-Peñaranda JM [11], vascular lesions are clearly more infrequent. Intimal injuries to carotid artery were seen in 9.1% of cases and rupture of the carotid adventitial layer was seen in 21.7%.

Fracture of the hyoid bone was noted in one case in this study and that was a 55 years aged elderly women. This may be due to calcification and fragility of bony structures in the later years of life, as stated by Spitz WU and Fischer RS [12] Fracture of hyoid bone was noted in 0% to 68% of cases of hanging in various studies.

### Conclusion

The present study re-affirms on the routine microscopic analysis of ligature mark in all cases of compression of neck by ligature. A thorough examination of the ligature mark along with internal neck tissue injury is a must to arrive at the most probable cause of death. The neck findings vary depending upon the composition, multiplicity and tightness of the ligature material used, the suspension time, type of hanging, etc. Hence, the possible findings in a suspected case of hanging must be always anticipated so as to avoid any erroneous opinion.

### Conflict of interest

None declared.

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**Table 1:- Place of occurrence**

Place	No. of victims	(%)
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Open	12	30
Closed	28	70

**Table 2:- Type of ligature material**

Material	No. of victims	( + %)
Soft and broad	31	77.5
Thin and tough	5	12.5
Rough and tough	4	10

**Table 3:- Type of hanging**

Type of hanging	Typical (%)	Atypical (%)	Total
Complete	1 (2.5)	23 (57.5)	24
Partial	1 (2.5)	15 (37.5)	16

**Table 4:- Sternocleidomastoid muscle tears**

SCM tear	No. of victims	(%)
Present	13	32.5
Absent	27	67.5

**Table 5:- Carotid tear**

Carotid artery tear	No. of victims	(%)
Present	4	10
Absent	36	90

**Pattern of Injuries Cases in the mortuary in the year 2011-2014  
in Rajindra Hospital Patiala**

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<p><b>Article history</b>                  Received Oct 4, 2014.                  Recd. in revised form Dec 25, 2014.                  Accepted on Dec 25, 2014.                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  The retrospective study was undertaken to focus light upon the pattern and injury severity score of fatal blunt thoraco-abdominal injuries in relation to various factors in the Patiala region. Atleast 100 cases were taken for this. The objective of the study was to find out the pattern of blunt thoraco-abdominal trauma in Patiala region as regards the sex ratio, the type of blunt trauma, and cause of death of victims.</p>
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<p><b>Keywords:</b> Postmortem cases, road traffic accidents, railway accidents, cause of death</p>	<p>©2014 JPAFMAT. All rights reserved</p>

**Introduction**

The accidents have always been a leading cause of blunt trauma throughout the world. At the same time, blunt weapons are some of the most easily available weapons during an unanticipated fight or assault. Blunt thoraco-abdominal injuries are one of the major causes of unnatural deaths[1]. The thorax and abdomen are two body cavities containing most of the vital organs and therefore, injury to these organs even by blunt trauma usually leads to a fatal outcome. Blunt trauma to the chest and abdomen can be produced in various situations such as road traffic accidents, railway accidents, fall from height and blunt weapons.

The thoraco-abdominal region, because of its dimension and anatomical position, is a major site of impact in any form of blunt trauma viz. road traffic accidents, the fall from heights, landslides, physical assaults, etc. Subsequent to blunt trauma, the thoracic and abdominal walls may show abrasions or bruises; but the abdominal wall usually escapes gross injury by transmitting the force of violence to more resistant organs inside the abdominal cavity, which get injured. Contusions or lacerations of the lungs and the heart may be produced by blows from a blunt weapon or by compression of the chest even without fracturing any bone of the thorax or showing marks of external injury. So, there is always a possibility of fatal thoracoabdominal injuries to be unnoticed leading to their late detection and fatal outcome.

Moreover, injuries to the chest and abdomen are commonly associated with injuries to other parts of the body, namely the head, spine, limbs. Hence, the presence of intra-thoracic and intra-abdominal injuries may be overlooked or discovered later. Early detection of the injury and prompt treatment are necessary in saving the lives of many of these victims.

Trauma deaths have taken an epidemic form the world-over. Vehicular accidents have emerged to be the major cause of trauma death among people below 50 years of age. Estimates suggest that in India rate of death per 1000 vehicles is 1.3. In India, the highest rate of accidents reported from D and N Haveli(92.9), Chattisgarh(63.3), Punjab(30.1) against the national average rate of 32.4. Road traffic accidents account for 37.2 %, Railway accidents 7.7% of total accidental deaths in India.[2]

**Material and Methods**

Material for the present study were cases of blunt thoracoabdominal trauma brought for medico legal autopsy to the Rajindra Hospital, Patiala mortuary. 100 cases were taken up for the study irrespective of age and sex of victims from year 2011-2014.

All the cases showing fatal blunt thoracic and/ or abdominal injuries with or without external injuries were included in the study.

### Observation

Detailed observations for 100 autopsies with evidence of fatal thoracoabdominal trauma were carried out and various statistical results were drawn from them. These are described in Table 1. and Figures 1-5.

### Conclusion

In the present study majority of the victims were male (91%). Elders in the age group of 31-40 years (28%) were most commonly involved in trauma cases. Vehicular accident was the most common cause of fatal thoracoabdominal trauma (85%). Most common category of victims involved in vehicular accidents was two wheeler occupants (41%). Trucks were found to be the main offending vehicles (31% of the cases).

Maximum number of victims had chest and abdominal injuries alone (34%) as in Table 1. Maximum cases died of haemorrhagic shock (69%).

### Suggestions:

- a) Encroachments on roads should be dealt with strictly.
- b) There should not be any stray animals walking on the roads.
- c) Trauma centers should be established in this part of Patiala region.
- d) Separate tracks should be made alongside the main roads for cyclists and pedestrians.
- e) Strategies that increase the use of seat belts or child restraints will result in fewer injuries.
- f) Stricter enforcement of speed limits will result in fewer injuries. The overall contribution of speed to accidents is not known but is widely quoted to be one third of all fatalities.
- g) Safer design of roads and roadside environments will result in fewer injuries as a result of trauma.
- h) Roadside crash barriers and crash cushions will reduce injury severity.
- i) Area wise traffic management schemes should be targeted at areas with high injury rates which will reduce pedestrian injury rates. The provision of crossing patrollers, measures to redistribute traffic and the design of roads to reduce speeds are effective in reducing pedestrian injuries.
- j) Permanently switched on lights on cars can reduce daytime road traffic accidents.
- k) Road safety education for children will reduce road traffic accidents.
- l) People should be encouraged to use railway over bridge rather than directly crossing the railway tracks.

### Conflict of Interest

None declared.

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Table 1: Distribution of cases according to regions of the body involved

Region of the body involved	No. of cases	Percentage
Chest and abdomen	34	34%
Head, Chest, Abdomen	15	15%
Chest and Others	14	14%
Head and Chest	7	7%
Chest, Abdomen, Others	6	6%
Chest, Pelvis	2	2%
Abdomen, Others	2	2%
Chest, Pelvis, Others	2	2%
Chest, Abdomen, Pelvis, others	1	1%
Abdomen, Chest and Pelvis	1	1%
Abdomen, Pelvis, Others	1	1%
Abdomen, Pelvis	1	1%
Head, Chest, Others	1	1%
Whole of body	13	13%
<b>Total</b>	<b>100</b>	<b>100%</b>

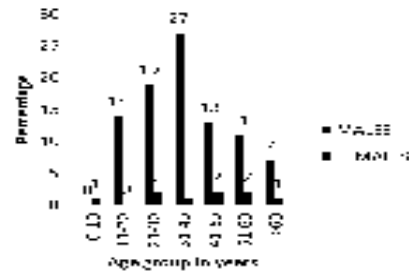


Figure1. Age wise distribution of cases

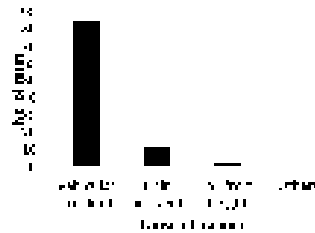


Figure2. Distribution according to cause of trauma

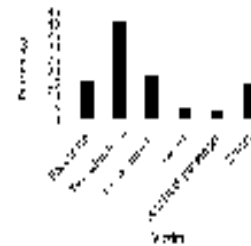


Figure3. Percentage distribution of victims

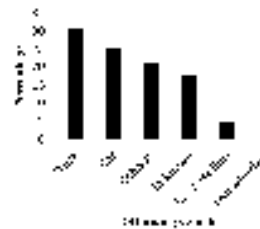


Figure4. Distribution of victims in relation to offending vehicle



Figure5. Cause of death

Case Report

**NON-VIABLE LIVE BIRTH MALE FOETUS: A CASE STUDY**

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<p><b>Article history</b>                  Received Nov 10, 2014.                  Recd. in revised form Dec 26, 2014                  Accepted on Dec 26, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  The incidences of male feticide and subsequent destruction of the aborted foetus although apparently are less compared to female feticide in India, the law of the land does not differentiate the two by gender and the perpetrators and facilitators for the crime including the woman are all liable for the offence. The reasons for male and female feticide may differ but the scientific and investigative approach in detection and dealing with the crime are the same and the forensic experts and medical practitioners are required to play a proactive role in the interest of justice and to check this heinous crime against humanity.</p>
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<p><b>Keywords:</b> MTP Act 1971, Male Foetus, Criminal Abortion, Foetal Viability, Concealment of Birth, Hydrostatic Test, Prima Facie, Rape, Incest.</p>	<p>©2014 JPAFMAT. All rights reserved</p>

**Introduction**

The Medical Termination of Pregnancy (MTP) Act of 1971 in India was enacted with several human considerations in the background of, health causes, eugenic causes, humanitarian causes, personal causes etc. especially with an eye to control illegal criminal abortions which are being carried out without any justification. However, the ethical issues surrounding the prevention of unwanted pregnancy have also been discussed and debated for many years. In the matter of pregnancy termination, some of the ethical and legal issues currently revolve around the competence and quality of medical services, the concept of foetal viability, the competitive interests between foetal rights and the rights of the women to terminate unwanted pregnancies and more recently the ethical question of termination of pregnancy centres around the increasing survival rates among very low birth weight infants and its implications for the revision of the definition of foetal viability. Some of these issues are being discussed in this paper in context of a case of post-mortem examination of an immature and non-viable male foetus dealt with by the author.

**Brief History**

An unknown unidentified male foetus allegedly aged 6 to 7 months was brought by police

in the department of Forensic Medicine & Toxicology of Government Medical College and Rajindra Hospital Patiala on 04.10.2014 for post-mortem examination with its alleged throwing by some unknown female near Railway Station Patiala.

**Post-mortem Examination findings**

Length and weight of the foetus respectively were 32 C.M. and 980 Grams with no apparent bodily deformity.

Rigor mortis was present on the dead body with post-mortem staining faintly visible on the back and fixed.

Nails were present and cyanosed. Head hairs were visible. Body skin was reddish in appearance. Creamish cheesy matter was present on scalp.

Centre of ossification was visible in the four sternum segments.

Both lungs were filling the thoracic cavity, voluminous, light red in appearance, with round edges, surface marbling present, and crepitus was present on pressure and the lungs as a whole and in pieces were floating in water. Diaphragm was present at the level of 6th ribs.

Umbilical cord was 5.5 C.M. in length, cut end with clotted blood and not dried up, flesh and glistening appearance of the cord and which was not tied.

Vernix caseosa was not visible. Scrotum was empty and without testicles. Meconium was present in large intestine. Penis was distinctly visible externally.

Both femur bones were kept for DNA examination.

### **Opinion:**

This foetus is immature and non-viable male foetus with 6 to 7 months of age of intrauterine life, born alive with probable duration of death within few hours and with asphyxial findings on post-mortem examination. The probable duration between death and post-mortem examination was within 36 hours.

### **Discussion**

Destruction of a male foetus is said to be a common feature among young unmarried women and by widows or may be resorted to by prostitutes. In such cases where a male foetus is found under suspicious circumstances at an abandoned place most likely with intent to concealment of birth, the medicolegal questions which can arise include:-

1. Whether it is an illegal abortion.
2. How did the nonviable foetus survive for some time after birth?
3. Who are the other accused along with the alleged mother.
4. Concealment of birth.
5. Circumstances supporting for making conclusions by the investigating authority.
6. Concept of the foetal viability.
7. Competitive interests between foetal rights and the rights of the women to terminate unwanted pregnancies.

#### **1. Whether it is an illegal abortion:**

By abortion is meant the expulsion of the products of conception at any period of gestation before full term. The distinction between abortion, miscarriage, and premature labour are not recognized in law and all are referred to as abortion. About 10% of all pregnancies end in spontaneous abortion and much more than that percentage, counts for induced abortion, greater number of which now are non-criminal, being induced under the provisions of the Medical Termination of Pregnancy Act of 1971. Those cases where termination of pregnancy is induced beyond the scope of MTP Act are criminal in nature and are punishable in law [1]. Keeping in view the provisions of the MTP Act of permitting lawful abortion only up to 20 weeks of pregnancy except

the therapeutic consideration for the mother, abandoning of the foetus and non-availability of the alleged mother and the doctor who performed and assisted the abortion including the relevant records of the case, criminal and negligent approach by the medical practitioner who performed the procedure evident from the findings of post-mortem examination and non-reporting of the case to the appropriate authorities is prima facie a case of illegal abortion.

#### **2. How did the nonviable foetus survive for some time after birth?**

Signs of establishment of respiration in the post-mortem examination by Hydrostatic Test indicate survival of the foetus for some time after birth. While some pathologists decry this test as useless, it has its own value in most cases provided its limitations are kept in mind. One of the fallacies of the Hydrostatic Test is the artificial respiration given to the new born wherein the unexpanded lung may float but the artificially inflated lungs are inflated only partially and do not exhibit the mottled or marbled appearance by the process. The possibility of inflating the lungs artificially should be kept remote because it is difficult to conceive why a person who desires the death of the child should endeavour to resuscitate the child [2]. During maturation of lungs, by the end of the seventh month of prenatal life, sufficient number of mature alveolar sacs and capillaries are present to guarantee adequate gas exchange, and the premature infant is able to survive. Foetal breathing movements begin before birth and cause aspiration of amniotic fluid. These movements are important for stimulating lung development and conditioning respiratory muscles. When respiration begins at birth, most of the lung fluid is rapidly resorbed by the blood and lymph capillaries, and a small amount is probably expelled via the trachea and bronchi during delivery. With the air entering alveoli during the first breath, the surfactant coat prevents development of an air-water (blood) interface with high surface tension [3].

#### **3. Who are the other accused along with the alleged mother.**

In India, the matter of termination of a pregnancy is often not based on the perceptions of the woman herself, rather religious, socioeconomic and societal pressures play a significant role in influencing her decision [4]. A study by a Nagpur based institute has found the sex ratio skewed in doctors' families too. It was indicative of deep-rooted malady that could pose a critical challenge

in correcting the sex ratio India, the study stated and strongly indicative of underlying sex selection practices in doctors' families [5]. But in illegal abortion beyond 20 weeks of the advanced state of pregnancy only a skilled abortionist can intervene to perform abortion by use of methods which ensure immediate and complete evacuation of the uterus and the method approximates to the therapeutic procedure.

#### **4. Concealment of Birth**

In such a case if feticide or illegal abortion is not proved, the alleged mother is usually charged with a lesser offence of concealment of birth. According to Section 318 of the Indian Penal Code, whoever, by secretly burying or otherwise disposing of the dead body of a child, whether such child dies before or after or during its birth intentionally conceals or endeavours to conceal the birth of such child, is punishable for this offence [6].

#### **5. Circumstances supporting for making conclusions by the investigating authority**

The law presumes that every new-born child found dead was born dead, until the contrary is proved. Therefore in criminal cases, the only evidence is the opinion of expert founded on post-mortem examination. In this case circumstantial evidence as availability of the foetus at an abandoned place near railway station with no clues of its identification and the untying of the umbilical cord with presence of clotted blood at the cut end are the strong indicators of illegal interference in pregnancy.

#### **6. Concept of Foetal Viability**

A newer and more recent ethical question in termination of pregnancy centres around the increasing survival rates among very low birth weight infants and its implications for the revision of the definition of foetal viability. Viability means the stage of maturity at which a foetus with normal intrauterine development is able to maintain a separate existence after birth. In India, a child is viable after 210 days or seven months of intrauterine life, and in some cases after 180 days or six months but in most of these cases the foetus is immature. The U.S. Supreme Court set viability as the limit for abortion. A survey of neonatal intensive care units in 1975, led to the conclusion that infants born before 24 weeks and weighing less than 600 gm. at birth were not viable [7]. However, the improvements in the neonatal care

has led to the survival of infants at 23 weeks and weighing more than 500 gm. [8]. Thus, the limits of viability acceptable in practice are likely to alter with medical advances.

Another parameter indirectly related with viability is foetal lung maturity which has always been a challenge to the obstetrician and paediatrician in cases of preterm labour and preterm premature rupture of membranes (PROM). With preterm babies, hyaline membrane disease has always been the main cause of neonatal death and solution to the immaturity of foetal lungs is a primary concern. The introduction of corticosteroids for foetal lung maturity by Liggins and Howie [9] in patients at risk of preterm labour was a major milestone in reducing neonatal morbidity and mortality from respiratory distress syndrome.

#### **7. Competitive interests between foetal rights and the rights of the women to terminate unwanted pregnancies**

A consistent majority of the public believes that abortion is immoral in most cases [10 & 11]. None the less, the overwhelming majority believes that abortion should be available in cases of rape, incest and severe genetic abnormality. However, a large majority of the people consistently say that although they believe abortion to be wrong or immoral, the ultimate decision should be made by the women and her physician rather than by legislatures. Physicians play a central role in counselling pregnant women about their health and the health of their foetuses, and hence a balanced mature view on the part of the physician can help the patient to resolve her conflicts and dilemmas.

#### **Conclusion**

Criminal abortions in violation of the Medical Termination of Pregnancy Act of 1971 are prevalent in India.

Both, the women undergoing illegal abortion and the medical practitioner facilitating the illegal act in violation of the MTP Act 1971, are liable for punishment under Section 312 of Indian Penal Code. (Explanation – A woman who causes herself to miscarry, is within the meaning of this Section) although the Act is seemingly liberal under various indications for termination of pregnancy.

Criminal Law in reference to the penal punishment for concealment of birth needs to be amended for deterrent punishment to the violators.

Keeping in view the improvements and advancements in the neonatal care and survival,

the term Foetal Viability in the Indian perspective needs to be redefined.

More scientific advancements are required in the field of foetal autopsy procedures and examination in the interest of justice.

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Fig. 1 showing Male Foetus



Fig. 2 showing Umbilical Cord Closer View



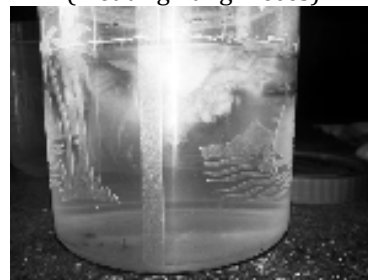
Fig. 3 showing Dissected Foetus



Fig. 4 showing Hydrostatic Test Top View



Fig. 5 showing Hydrostatic Test Side View (Floating Lung Pieces)





Case Report

**ELECTROCUTION BY LIGHTNING – AN UNUSUAL PRESENTATION**

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<p><b>Article history</b>                  Received Nov 11, 2014.                  Recd. in revised form Dec 17, 2014.                  Accepted on Dec 25, 2014.                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  Lightning is one of the rare causes of unnatural deaths. This case report describes an unfortunate event in which a 50 year old male was struck by a lightning while riding a bike. A complete autopsy and a thorough examination of the place of incidence were carried out. The present case is an example for contact strike mechanism of lightning injuries. Based on the injury pattern observed on the body it can be concluded that a high voltage current had passed through the victim. No specific kerauno-pathologic features were found on the victim. Since the event was witnessed, the manner of death could be easily established.</p>
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<p><b>Keywords:</b> Lightning, electrocution, Kerauno-pathology, bike   ©2014 JPAFMAT. All rights reserved</p>	

**Introduction**

Lightning is one of the most commonly occurring natural phenomena. During lightning there is a massive electrostatic discharge between electrically charged regions within the clouds or between the surface of earth and clouds. About 50,000 thunderstorms and 8 million lightning flashes occur worldwide every year[1,2].The lightning can be categorised into intra-cloud, inter-cloud and cloud to ground discharges, with the cloud-ground type possessing the most destructive effects [3].

Lightning has an enormous energy with 10,000 to 200,000 amperes of current and voltage that ranges from 20 million to 1 billion[4,5]. Amazingly, though a large amount of energy is involved, the mortality when a lightning strikes a person is only 30% [6,7]. More than 2000 lightning related deaths occur every year in India [8]. This case report describes a case in which a motorcycle rider was struck with lightning and ultimately lost his life.

**Case report:**

A 50 year old man was riding a bike near his village on a rainy evening and was struck by lightning. As a result, both the rider and the motorcycle sustained severe damages. This event was witnessed by another biker who immediately rescued the victim and took him to a local hospital.

From there he was referred to this institute where he succumbed to his injuries.

At autopsy, superficial to deep burns were present involving 80 % of the body surface area. These injuries mostly comprised of single and multiple confluent circular burns (Fig. 1). A circular raised charred injury with a small central ulceration was present over medial aspect of right knee (Fig. 2). Skin splits along with charring were noted over medial aspect of left thigh, right leg and right foot (Fig. 3). A laceration of dimension 4 cm x 1.5 cm x 0.5 cm was noted on left forehead. Multiple reddish grazed abrasions of different sizes and shapes were observed over the face and left upper limb. The cause of death was due to extensive burn injuries.



**Fig 1: Photograph showing crocodile skin pattern of injuries on the trunk**



**Fig 2: Burn injury on the antero medial aspect of right knee suggestive of contact with bike**



**Fig 3: Charred right foot with skin split Scene of incidence**

The place of incidence was thoroughly investigated. A partially burnt old bike with iron basket attached on either side was noticed at the scene of incidence. Front of seat, headlight and right side of handle, right brake handle and right rear view mirror were completely damaged. Right shock absorber, right side of fuel tank, frame, and engine were partially burnt. Other regions of the bike including the tyres were unaffected. (Fig. 4)



**Fig 4: Picture depicting the damages on the bike produced by lightning.**

#### Discussion

Lightning is discharge of static electric charge developed in the clouds. When the lightning

discharges, it tends to follow a path of least resistance [9]. The resistance offered by a metal is much lower when compared to atmosphere. Since most of the bike components are made of metal, it offers less resistance for the lightning to pass through. Usually a person riding a bike will be in contact with metallic brake handle and the lower limbs will be in close proximity to the fuel tank and engine. This can be evidenced by the distinctive pattern of injuries on the body of the victim.

In the present case, the victim was electrocuted when the lightning bolt struck the bike. Owing to very high voltage, characteristic skin burns were noted on the victim (Fig. 1). The crocodile skin pattern found on the victim was produced as a result of spark burns due to multiple current arcs [10]. The raised crater with central ulceration present over medial aspect of right knee might be produced due to contact with the fuel tank. If the current leaves the body by arcing, third-degree burns can occur [11,12]. The completely charred right foot with skin split (Fig. 3) might be either due to exit of the electric discharge as it was in contact with metallic brake. No specific kerauno-pathologic features were noted on the victim, since the victim was not directly struck by the lightning. Keraunopathology is the effect of lightning on living organism.

Lightning strikes are not always witnessed. In the absence of such reliable history, a meticulous search for evidence should be carried out. A thorough examination of incidence site and dead body are thus essential so that the investigation could be carried out in the right direction.

#### Prevention

1. It is better to avoid going outside in the presence of thunderstorm.
2. Seek shelter in a large permanent building if caught in thunderstorm. Avoid using wired electrical gadgets.
3. If no building is found in the vicinity, stay inside a hard top automobile like car. Avoid contact with the steel frame of the vehicle.
4. Seek shelter in dense areas of small trees or bushes if struck at a forest. Stay away from tall trees as they attract lightning.
5. If time does not permit evacuation to a safe place, immediately squat down with the head placed between the knees and hand closing the ears. In this position the path taken by the current may not involve the vital organs like brain and heart. Do not lie flat on the ground.

**Conflict of Interest**

None declared.

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Case Report

**A FATAL TRAUMATIC OUTCOME BY TRIVIAL INJURY IN A HAEMOPHILIA CASE:  
A RARE CASE REPORT**

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<p><b>Article history</b>                  Received April 26, 2014                  Recd. in revised form Dec 28, 2014                  Accepted on Dec 28, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  Haemophilia is a clinical syndrome affecting males usually and characterized by inherited tendency to bleed excessively following slight injury. Haemophilia is caused by a specific defect of coagulation factor VIII. The main concern associated with the disease is bleeding, especially after trauma and surgeries. The most serious site of bleeding for patients with haemophilia is the central nervous system. We reported a case of a 20 year-old person with a past medical history of haemophilia who came to the emergency department, SMS hospital, Jaipur with presenting complain of severe headache. Patient died after few days due to intracranial hemorrhage despite intensive treatment. Medico-legal autopsy was conducted on the same day. On autopsy brain was oedematous with tense duramater with underlying massive haemorrhagic blood clot. Intracranial hemorrhage (ICH) in patients with haemophilia can occur spontaneously or following mild head trauma however no guidelines exist for this approach. Most dramatic manifestation of Haemophilia is exsanguinating hemorrhage from a trivial traumatic injury. The most important aspect of ICH management is the early replacement therapy of deficient coagulation factors in haemophilic patients after every head trauma, even when considered minor. This prompt treatment will increase the chances of a better prognosis in haemophilic patients..</p>
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<p><b>Keywords:</b> Haemophilia, Intracranial Haemorrhage, Trivial Injury   ©2014 JPAFMAT. All rights reserved</p>	

**Introduction**

Bleeding disorders account for small but significant risk factor associated with intracranial haemorrhage. In conditions such as haemophilia, massive intracranial haemorrhage is often the cause of death. [1] Watchfulness in dealing with such patients and early therapy may be more necessary than often realized. Bleeding emergencies are common chief complaints in visits to the Emergency Department (ED) but haemophilia, a rare congenital bleeding disorder requires immediate treatment. As emergency medicine physicians we must be prepared to deal with such emergencies. One of the most feared complications in this population is the spontaneous or post-traumatic development of intracranial haemorrhage (ICH). [2]

Classic haemophilia is a congenital coagulation defect caused by an absence or low concentration of the plasma protein factor VIII [1,3] which results in impairment of the first phase of coagulation. [2,4] (Less common forms are caused by deficiencies in factor IX[5,6] and factor XI[7]. It is carried on X sex-linked recessive gene

which is transmitted to some male offspring by a carrier mother, and it can occasionally be seen in female offspring of a carrier mother and a haemophilic father. Intracranial haemorrhage is now the leading cause of death in all types of haemophiliacs. Milder deficiencies of factor VIII may only become apparent when a major hemodynamic stress supervenes such as trauma. [8]

In all symptomatic cases there is tendency towards easy bruising & massive haemorrhage after trauma or operative procedures. Petechiae are characteristically absent. [8]

Haemophilia A and haemophilia B are hereditary deficiencies of factor VIII and factor IX, respectively, two glycoproteins required for normal blood clotting. Among affected persons, spontaneous bleeding or bleeding at the site of an injury is common and, if uncorrected, can lead to severe disability or death. These complications can be prevented by appropriate clinical management and treatment with preparations of factor VIII or

factor IX concentrates therapeutic clotting agents that have been available since the late 1960s. [4]

Severity of haemophilia is directly related to levels of factor VIII. [9] Most dramatic manifestation of Haemophilia A is exsanguinating haemorrhage from a trivial traumatic injury. [10] Individual suffering from Haemophilia may present to forensic expert as a case of delayed traumatic apoplexy. If such death occurs in young adults then it raises speculation & apprehension. When haemophiliacs bleed, they do not bleed faster than normal, they bleed longer because the coagulation process does not function properly.

Haemophilia is the most common hereditary disease associated with bleeding. It is caused by a decrease in amount or activity of factor VIII. Haemophiliacs have a tendency to bruise easily, and have massive haemorrhage after trauma or surgical procedures.

#### **Case report:**

We report a case of a 20 year-old person with a past medical history of haemophilia who presented to the emergency department, SMS hospital, Jaipur with presenting complain of severe headache and a history of assault. On the same day he was discharged from the emergency treatment by giving the primary treatment. After three days, he again came to the emergency department with complaints of pain over scalp as a whole with history of seizures. Immediately the patient was admitted in the medicine department. At the time of medical examination, patient was conscious and oriented and had the minor external injuries.

An urgent Non contrast CT scan brain was advised. On evaluation of the CT scan there was large intra cerebral hematoma in frontal region and to the left frontal region with a thin layer of subdural blood on right side and in interhemispheric fissure in frontal region. Blood was also seen in subarachnoid space and over the tentorium on left side. After that the patient was immediately transferred to medical ICU and subsequent CT scan was done due to continuous deteriorating condition of the patient, which revealed similar findings with resolving haematoma seen in repeat scan after one week. However, there was an increase in the oedema and compression effect on the frontal bone with ischemic changes in the brain.

The patient's condition had deteriorated because of the brain injury and intracerebral hematoma. The hematoma which has occurred in the very beginning might have increased because of haemophilia from which this patient was suffering. Patient might have deteriorated further because of the seizure as per the history given by the relatives. Seizures were probably because of

the intracerebral hematoma caused by the initial brain injury.

The Patient's condition further deteriorated because of the progressive oedema and compression effect due to the intracerebral haemorrhage. This case report describes an unusual case of intracerebral haemorrhage following trivial injury in a patient with haemophilia.

Autopsy findings (Fig.1-4): A medico legal autopsy was conducted on the same day. There was oedema of brain with tense duramater with underlying haemorrhagic blood clot. A subdural hematoma that extended in the posterior fossa anteriorly from the clivus into the upper spinal subdural space was present.

#### **Discussion**

Reports of complete post-mortem examination of subjects with haemophilia have been sparse in number, have usually dealt with young peoples, and have emphasized the catastrophic results of uncontrolled haemorrhage consequent upon defective blood coagulation. Head trauma-related ICH in patients with bleeding disorders has been best described in patients with haemophilia (factor VIII and factor IX deficiency). ICH is the leading cause of mortality from bleeding in this population, and the reported prevalence of head trauma-related ICH in patients with haemophilia ranges from 2% to 16%. ICH is a life-threatening complication of haemophilia. A routine CT scan should be recommended to the patient of haemophilia even in minor head trauma, as it may be lifesaving. The correction of factor VIII to haemostatic level alone is inadequate in the majority of cases, and there is sudden deterioration in the patient's condition and death. Operation is strongly recommended when no improvement is noted within a few hours. [5] But in above reported case no surgery was done for the treatment of ICH.

We conclude that early diagnosis, prompt surgical intervention, and perfect normalization of haemostatic defect are essential in improving the outcome of these patients. The significant decrease in mortality rate from ICH (spontaneous and traumatic) in patients with haemophilia has been attributed to the wide availability of factor concentrates for replacement. [2]

#### **Conclusion**

When a child has an inherited coagulation disorder such as haemophilia, parents will be concerned about the possibility of trauma or injury that may lead to potentially dangerous bleeding episodes. The watchfulness of parents along with effective management of haemophilia by

physicians can help the child to lead a relatively normal life. Careful avoidance of injury is essential.

Haemophilia is not a disease of public health relevance in India. Like other developing countries, the focus of public health services in India is on the control of highly prevalent communicable diseases, health promotion and family welfare services. [11] In contrast, haemophilia is a rare condition, which is non-communicable, chronic and extremely expensive to treat. Thus, this condition is not a public health priority and does not attract any government resources. Under such circumstances, data collection for haemophilia acquires very low priority. Consequently there is very little information on the disorder and its trends in the population.

#### Medico-legal Aspect

Legally in India injuries are classified as simple and grievous in nature. Simple injury is defined as which is neither extensive nor serious and heals without leaving no permanent scar. [12] In this case report, the patient had suffered abrasions over the face and forehead which had been opined as simple in nature in the medico-legal examination report after radiological examination of head on the day of the episode of assault. Although the nature of injury was simple, despite this person died because he was suffering from haemophilia. After the death of the victim the post mortem examination concluded that the cause of death in this patient was due to head injury and the question rose about the opinion given in injury report. So it is a rare case in which simple injury becomes grievous and dangerous to life causing massive ICH leading to death. It is thus concluded that the clinical profile of a patient should be given due consideration while framing opinion regarding nature of injuries and one should avoid declaring the nature of injury on the spot in cases of head injury.

#### Conflict of Interest

None declared

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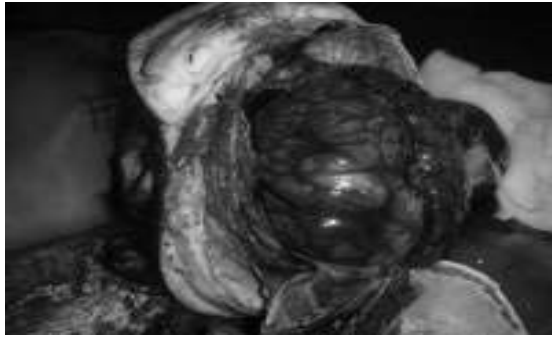


Fig 1: Shows oedema of brain with tense duramater with underlying haemorrhagic blood clot. Autopsy finding of haemophilic patient died due to assault.

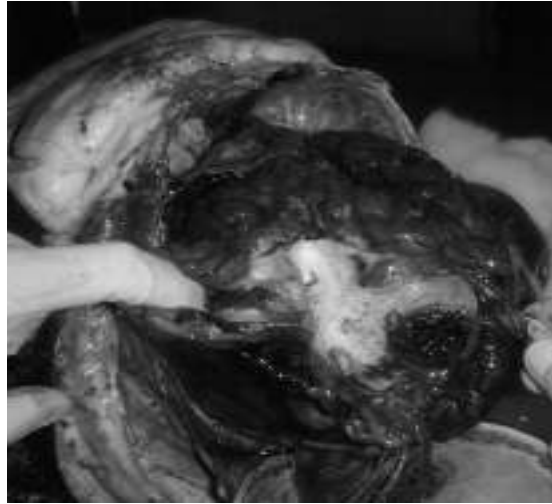


Fig 3: shows intracerebral haemorrhage following trivial injury; autopsy finding of haemophilic patient.



Fig 2: Shows massive blood clot due to intracerebral haemorrhage following trivial injury: Autopsy finding of haemophilic patient.



Fig.4 - Close up view of haemophilic patient with massive haemorrhagic clot on left side of brain

Case Report

**ACUTE AORTIC DISSECTION - A RARE CAUSE OF SUDDEN DEATH**

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<p><b>Article history</b>                  Received Nov 10, 2014.                  Recd. in revised form Dec 26, 2014                  Accepted on Dec 26, 2014                  Available online Jan 01, 2015.</p>	<p><b>Abstract</b>                  Aortic dissection is a rare and potentially life threatening disorder where death can be really quick. An autopsy case of aortic dissection is reported in a middle aged male, who was declared dead within 2 hours after complaining of chest pain.</p>
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**Introduction**

Aortic dissection refers to a condition of dynamic bleeding into the aorta resulting in separation and peeling apart of the vascular layers [1]. It is a rare and potentially life threatening condition where death can be really quick. Acute aortic dissection is considered as the most common cause of death among the different causes of deaths related to aortic pathology [2]. Autopsy is mandatory in all cases of sudden unexplained deaths, and in cases where the death cannot be certified by the attending doctor [3].

We here in report an autopsy case of aortic dissection in a middle aged male, who was declared dead within 2 hours after complaining of chest pain.

**Case Report**

The deceased, a 49 year old averagely built and nourished male was suffering from paralysis since past few years. On the fateful day, in the early morning hours he complained of severe chest pain and died on the way to hospital. Medicolegal autopsy was performed to ascertain the cause of death. At autopsy, no external injuries were present on the body. On internal examination brain and lungs were congested and oedematous. Surface of the lung showed few emphysematous bullae. All coronaries showed atheromatous changes with 20-30% occlusion of the lumen. An intimal tear measuring 2 x 2 cm with surrounding haemorrhages was present at the base of the aorta (Figure 1 A). Examination of the aorta showed atheromatous changes and layers of aortic wall were separated throughout its length,

demonstrating the classical double barrel aorta with scattered blood clots (Figure 1B). Other internal organs were congested. Toxicological analysis was negative for poisons analysed. Histopathology showed intimal tear in the proximal part of descending aorta and separation of medial layer by a well demarcated space, suggestive of acute aortic dissection, Death was attributed to acute aortic dissection, a natural cause of death.

**Discussion**

Forensic pathologists are involved in ascertaining the cause of death in cases of sudden unexplained deaths [3]. Recent studies from the region report cardiovascular diseases as the most common cause of sudden unexpected deaths [4]. Aortic wall diseases are characterized by the weakening of the aortic wall due to different mechanisms that leads to increased wall stress. The higher wall stress may result in aortic dilatation and formation of aneurysm, ultimately leading to aortic dissection or aortic rupture [5]. Rare cases of vascular causes of death such as the rupture of aortic aneurysm are reported from the region as well [6].

Aortic dissection is a medical emergency associated with high mortality. It is an uncommon cause of sudden death with the reported age- and sex-adjusted incidence of 3.5 per 100,000 (95% confidence interval, 2.4-4.6) persons annually [7]. Aortic dissection is more commonly reported in elderly males but no age is spared in particular and the disorder may affect any age group. In the majority of the cases the condition is characterized



by a sharp pain of abrupt onset followed by a rapid death. Common presenting symptoms in aortic dissection include; pain with or without syncope or signs of congestive heart failure (CHF) or cerebrovascular accident (CVA), CHF without pain, CVA without pain etc. The pain is characteristically appreciated as a retrosternal pain in proximal dissections, and as interscapular or back pain in the distal dissections [5]. Risk factors for aortic dissection include atherosclerosis, hypertension, connective tissue disorders, Marfan's syndrome, congenital cardiovascular malformations, cystic medial necrosis, and pregnancy etc. Thoracic aortic dissection however, has also been reported in young woman without any risk factors. [8]. Besides, medical conditions, there are reported cases in literature where the aortic dissections have occurred as a consequence of blunt trauma to the chest and abdomen [9,10].

In present case, the patient presented with a history of prolonged paralysis and sudden chest pain in the morning hours. History of sudden chest pain raised a suspicion of myocardial infraction. The victim however, did not have any history of cardiovascular illnesses. The deceased did not show any marfanoid features and based on the limited history available was not apparently suffering from any connective tissue disorders. Atherosclerosis was perceived as the possible risk factor for aortic dissection in the reported case. Acute aortic dissection was ascertained as the cause of death based on autopsy observations that itself is a rare cause of sudden death and thus, worth reporting.

**Conflict of interest**

Nil

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Figure 1 showing **A-** Dissection of aorta near the aortic arch that was extending up to its base, **B-** Double-barreled aorta with scattered blood clots

