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Autopsy Findings in Head Injuries from Road Traffic Accident

Ashok Kumar Rajaput[1], Faisal Nasim Gilani[2], Ramesh C Patil[3], ES Goudar[4], Anand Mugadlimath[5]

Abstract

Introduction: Head injury is a leading public health problem causing loss of life and limb particularly among young population throughout the world and our country is not an exception to this. Now-a-days, the term "head injury" has been replaced by the new term "traumatic brain injury (TBI)." The incidence of head injury is rising day by day worldwide because of inadequate traffic education, increased mechanization, and less implementation of road safety rules. *Materials and Methods:* The present study was undertaken on fatal head injury cases of road traffic accidents autopsied at Al-Ameen Medical College and District Hospital, Bijapur. The aim of this study was to describe in detail all the autopsy findings in head injury due to RTA. *Results:* Two-wheelers was the most commonly involved vehicle 114 (63.4%) cases. Next in the order was Pedestrians 47 (26.2%). In 54.9% victims facial injury was seen. Abrasion was seen in 61 (33.9%) victims (Isolated or in combination with other injures). In majority of the victims, contusion of the scalp was seen -137 (76.1%) (Isolated or in combination with other injures). Laceration was seen in 24 (13.3%) victims. In this study 166 (92.2%) had skull fracture. Fracture of vault and base together was seen in 121 (67.2%) Fracture of base alone was seen in 31 (17.2%) and in combination with vault constitute 152 (84.4%). In majority of victim comminuted fracture was seen 112 (70.0%). *Conclusion:* From this study it is definite that head is one of the most accessible, vital and vulnerable part of the body in road traffic accidents and so good things to avoid accident or to protect from accident, wear helmet and avoid alcohol during driving. Following road safety rules is atmost important to avoid accidents and head injury related to accident.

Keywords: Head Injury; Road Traffic Accident; PM Examination; Fracture of Skull.

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Introduction

Head injury is a leading public health problem causing loss of life and limb particularly among young population throughout the world and our country is not an exception to this. Now-a-days, the term "Head Injury" has been replaced by the new term "Traumatic Brain Injury (TBI)." TBI is defined as "Cerebral insult not degenerative or congenital nature, due to external mechanical force that possibly leads to permanent or temporary disabilities of cognitive, physical, and psychosocial functions with or without altered level of consciousness".[1] The incidence of head injury is rising day by day worldwide because of inadequate traffic education, increased mechanization, and less implementation of road safety rules. According to a study in India, most of the deaths due to road traffic accidents (RTAs) occur within 24 hours of injury, before reaching the hospital. This is said to be due to delay in shifting

to a healthcare facility.[2] Lack of first aid, delay in same transfer of patients, longer transit time, lack of knowledge about triage, and lack of facilities in hospitals are some major problems of casualty centers in India.[2–4] Postmortem examination is carried out for finding the exact cause of death. In cases of head injuries, confirmatory diagnosis only by the clinical and radiological tools (CT, MRI) may not reveal the full extent of injuries. In fatal RTA cases, autopsy may detect the lacunae in clinical diagnosis and investigation. This is a unique and time tested method to identify the exact cause of death.[5] This study is an attempt to know the possible causes and mechanisms of the trauma to the head in fatal RTA cases.

Materials and Methods

This descriptive study was conducted in a tertiary care hospital in South India from July 2015 to December 2016. All patients with suspected head injuries who were admitted to our Emergency dept, died and underwent autopsy were included in the study. The aim of this study was to describe in detail all the autopsy findings in head injury due to RTA. A pretested structured proforma was used for collecting data. History and socio-demographic characters such as age, gender, cause of head injury, first aid details, time lag, severity of head injury, and pattern of head injury were collected from the patients' case records. This study was approved by Institutional Ethics Committee of our institute. This study included 180 fatal head injury cases of RTA cases subjected to autopsy at of Al-Ameen Medical College and District Hospital. Bijapur for medico-legal autopsy between Oct 2003–Sep 2005.

Results

Table 1: Showing the distribution of the vehicles involved in fatal road traffic accidents.

Decreased Vehicle	No. of Victims	Percentage (%)
4 Wheelers	05	2.7
3 Wheelers	03	1.7
2 Wheelers	114	63.4
Cyclist	04	2.2
Pedestrians	47	26.2
Pedestrians	05	2.7
Unknown	02	1.1
Total	180	100

In this study, two-wheelers was the most commonly involved vehicle 114 (63.4%) cases. Next in the order was Pedestrians 47 (26.2%) in two cases (1.1%) the vehicle was not known (Table 1).

Table 2: Showing the distribution of the facial injuries in fatal road traffic accidents.

Type of Injuries	No. of Victims	Percentage (%)
No. Injuries	83	46.1
Abrasion	43	23.9
Contusion	09	05.0
Laceration	24	13.3
Abrasion + Contusion	04	2.2
Abrasion + Laceration	11	6.1
Contusion + Laceration	03	1.7
Abrasion + Contusion + Laceration	03	1.7
Total	180	100

In 54.9% Victims facial injury was seen. Abrasion was seen in 61 (33.9%) victims (Isolated or in combination with other injures). No injury to face was seen in 83 (46.1%) victims. Out of 54.9% cases of facial injuries 33.9% had facial bone fracture (Table 2).

Table 3: Showing the distribution of scalp injuries in fatal read traffic accidents.

Type of Injuries	No. of Victims	Percentage (%)
No. Injuries	31	17.2
Contusion	121	67.2
Laceration	12	6.7
Contusion + Laceration	12	6.7
Abrasion + Contusion	04	2.2
Total	180	100

In majority of the victims, contusion of the scalp was seen -137 (76.1%) (Isolated or in combination with other injures). Laceration was seen in 24 (13.3%) victims (Table 3).

Table 4: Showing the distribution of skull bone fracture in fatal road traffic accidents.

Site of Fracture	No. of Victims	Percentage (%)
Vault	14	7.8
Base	31	17.2
Vault + Base	121	67.2
No Fracture	14	7.8
Total	180	100

In this study 166 (92.2%) had skull fracture. Fracture of vault and base together was seen in 121 (67.2%) Fracture of base alone was seen in

31 (17.2%) and in combination with vault constitute 152 (84.4%). In 14 (7.8%) victims fracture of vault only was seen (Table 4).

Table 5: Showing types of skull bone fracture in road traffic accidents.

Type of Fracture	No. of Fracture	Percentage (%)
Fissured Fracture	34	21.2
Comminuted Fracture	112	70.0
Depressed Fracture	04	2.5
Diastatic Fracture	06	3.7
Ring Fracture	02	1.3
Comminuted + Diastatic Fracture	02	1.3
Total	160	100

In majority of victim comminuted fracture was seen 112 (70.0%). In two cases 2 (1.3%) ring fracture was observed (Table 5).

Discussion

This study included 180 fatal head injury cases of RTA cases subjected to autopsy at of Al-Ameen Medical College and District Hospital, Bijapur for medico-legal autopsy between Oct. 2003–Sep 2005.

Victims

In this study it was observed that most of the victims 44 (63.4%) were two wheeler riders and in this group no one was wearing the helmet at the time of accident. Pedestrian 47 (26.2%) were the second commonest victims.

Similar findings are reported by lee *et al.*[6] who reported that motorcyclist (53.6%) were the commonest victim followed by pedestrian (29.5%). Present is not in accordance with the study conducted by Patel[7] Agarwal & Agarwal[8], Shrivastava *et al.* [9] and Chandra *et al.*[10], according to whom the pedestrians were most commonly involved that the moter cyclist.

The reasons for above findings probably due to the students and office commuters preferring two wheelers for easy movements due to inconvenience of time and comfort and the credit facilities are directed towards the middle class people. This is responsible for increased number of two wheelers on the road in more number of deaths.

Facial Injuries

In this study 54.9% of showed facial injuries like abrasion, contusion and laceration. In 83 victims (46%) no injuries is seen at all. Commonest injury seen out study is abrasion 43 (23.9%) seen along face region as seen in 24 (13.3%) is alone of 97 cases of facial injuries 61 (33.9%) cases had facial bone fracture.

Abrasion is commonly seen in the above study since in road traffic accidents face is usually involved where the body hits the hard, rough, flat surface of the ground. These findings are consistent with observations by Shrivastava *et al.*[9] and Chandra *et al.*[10].

Scalp Injuries

In the present study scalp injury was seen in 82.8% of cases in the form of abrasion, contusion and laceration. Contusion was seen in 76.1% of cases either isolated or in association with other type of injuries. Laceration was seen in 13.3% of cases either alone or in combination with other type of injuries. According to Tonge *et al.*[11] injury to scalp and ear was seen in 25.8% and this is not in agreement with findings of the present study.

Contusion may be more common because extravasations of blood occur in the loose connective tissue of the scalp due to blunt. Abrasion is least common because of a protection provided by hairs. Laceration is less common than contusion because the scalp is less elastic and presence of galea aponeurotica.

Types of Skull Fracture

In present study, skull fracture was seen in 92% of cases, of which 28 had crush injury. The combination of calveria and base of skull fracture was the commonest (67%) and skull base fracture alone is seen in 17% and vault alone in 15% victims.

In basal skull fracture, commonest (21%) was seen in middle cranial fossa, where as other sites (Anterior and posterior) was seen in 5% cases. Fracture of squamous temporal bone was seen in 3%, occipital in one case and no fracture is seen other sites of skull (Parietal and Frontal bones).

Commonest fracture (70%) seen our study was comminuted type followed by fissure type in 21% of cases. Hence we can conclude comminuted fracture was the most common type of skull fracture seen our study followed by fissure fracture. Reasons for this may be due to heavy vehicles causing the accidents with greater force and compact leading to comminuted fracture. This finding is consistent with the finding of Fregtag[12], Solheim[13], Sevitt[14] and Chandra *et al.*[10]

Conclusion

Most of the victims were two wheeler riders in this most victim were drivers while very few pillion riders. Majority of victims showed facial injuries, abrasion being the commonest type of facial injury seen (alone or in combination). Scalp injury was seen in 82% of cases with contusion as most common injury (alone or in combination). In 92% of cases Skull fracture was seen, commonest being combination of both vault and skull base. Commonest type of fracture was the commonest skull fracture seen (70.0%). From this study it is definite that head is one of the most accessible, vital and vulnerable part of the body in road traffic accidents and so good things to avoid accident or to protect from accident, wear helmet and avoid alcohol during driving.

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Concentration of Neurotransmitter Metabolite 5-hydroxyindoleacetic Acid (5-HIAA) in Cerebrospinal Fluid of Individuals with Suicidal Tendencies: A Meta-Analysis

Ravi Prakash M[1], Sharma R[2], Bhute AR[3], Bastia BK[4]

Abstract

Review of 28 research articles on the cerebrospinal fluid levels of neurotransmitter metabolites involving 1942 psychiatric patients found a strong evidence of involvement of serotonin system in suicidal behavior. All the individuals who attempted suicide, especially those using violent methods, had lower levels of CSF 5-hydroxyindoleacetic acid (5-HIAA) as compared to those in the controls. The Meta-analysis attempts to draw more reliable conclusion than did each individual study alone.

Keywords: Cerebrospinal fluid; Neurotransmitter metabolites; 5-HIAA.

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Introduction

In year 2016, there were estimated 7,93,000 suicidal deaths worldwide. This indicates an annual global age-standardized suicide rate of 10.5 per 100000 populations.[1] Suicide is one of the most significant public health issue−globally. Individuals having clinical depression are at higher risk of completed suicide. However, the number of completed suicide is much smaller than that of attempted suicide in individuals with depression. An indicator that can point to a high suicidal risk can be an aid for the prevention of completed suicide. Such an indicator would benefit the community to categorize persons with higher risk. The more knowledge we have about our cognitive and neurological processes that lead to suicidal behavior, the better equipped we would be to search for the right treatment and proper medication that can match up to the disease. Currently, suicidal tendency is being searched for in sociological and psychological realm, that offers vague prediction for clinical utility.

Recently, there has been a renewed interest in role of neurotransmitters like serotonin, dopamine and norepinephrine inetiology of suicidal behavior, with special focus on neurotransmitters in cerebrospinal fluid (CSF), serum and urine. This biochemical realm seems to be a more promising approach to identify high-risk group that may complete suicide. 5-HT is the main principal metabolite associated with depression. Hypothesis for CSF studies is that levels of the breakdown products in CSF reflect neurotransmitter turnover in brain rather than that in spinal cord[2]. This hypothesis was reinforced from association between levels of 5-HIAA in CSF and in cerebral cortex in post-mortem studies.[3] Analyses of

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CSF are much simpler to conduct, than that on brain tissue. However, various Research point out that the CSF levels of metabolites such as 5-HIAA are affected by gender (lower in males), age and height (lower in taller individuals).[4] Other factors include diet, medication, physical movement, position of subject during lumbar puncture, amount of CSF drawn and analytical method used.[5] Many studies pertaining to this literature has been published in past and one researcher attempted a comprehensive meta-analysis of individual studies.[6,7] Purpose of this article is to review the studies for variations in concentration of 5-HIAA in CSF amongst suicidal and non-suicidal individuals and further in those with violent and non-violent methods of suicidal attempt.

Materials and Methods

An extensive literature search for eligible studies published before 08th June 2018 was done in the PubMed, EMBASE and Google Scholar databases. Following combinations of main keywords and MeSH term were used alone or in combinations: '5-HIAA', 'suicide', 'suicide attempters and Suicid'. We then reviewed reference lists of published studies for additional reports not identified by electronic search.

Only studies that reported sample size, mean scores and standard deviations (or standard errors of mean) for each group were included in our systematic review.

Results of each study thus located were then examined for relevant data: sample size, mean concentrations of the metabolite of interest (5-HIAA). All the data was converted to a standard form: mean, standard deviation instead of standard error, and *nmol/l* against *ng/mL*. Our study also included a control group (psychiatric patients) that roughly matched the study sample. Studies which compared suicidal individuals with healthy controls were not included since these studies failed to account for presence of psychiatric disorders.

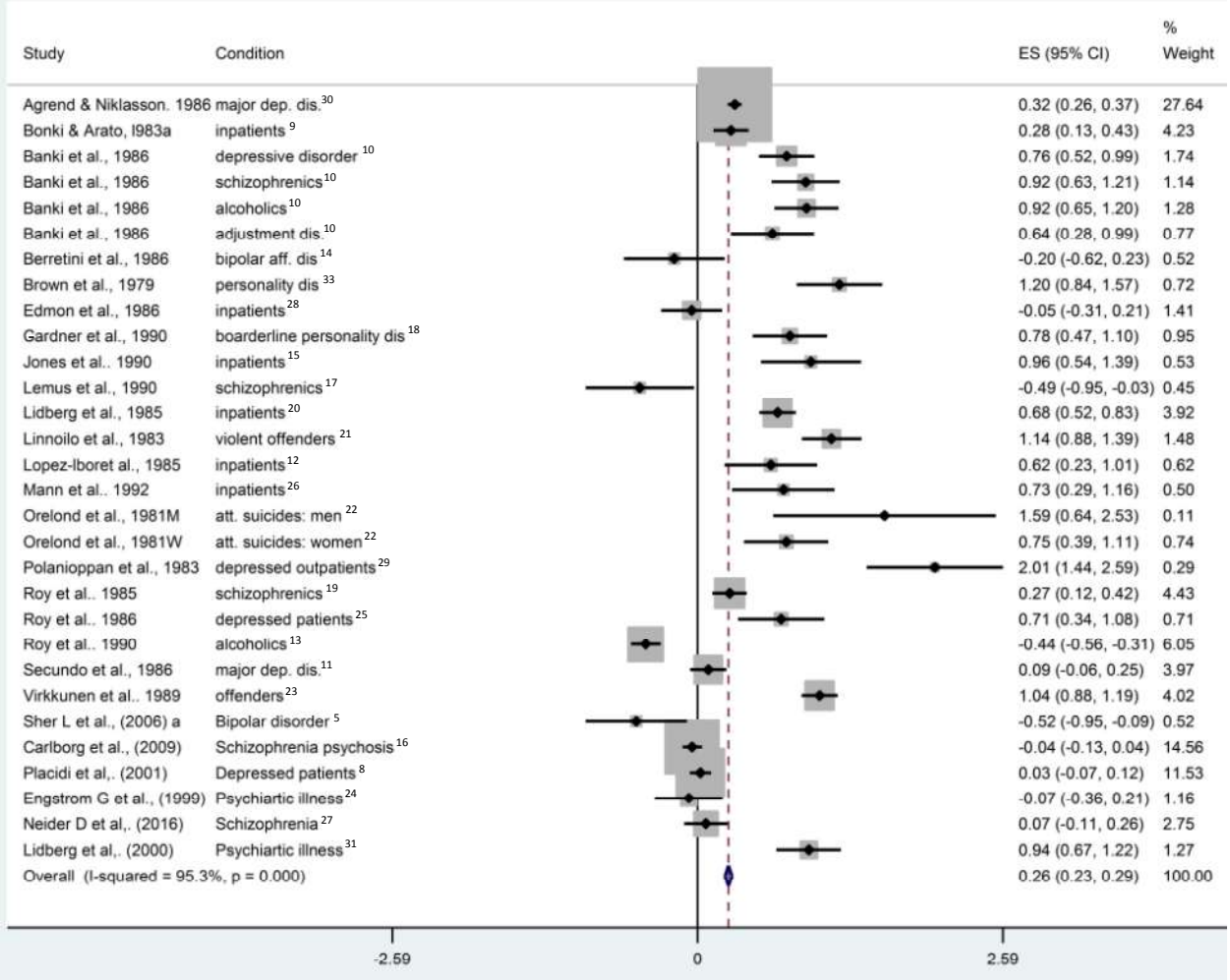

Fig. 1: Forest Plot of attempted suicide v/s Psychiatric control

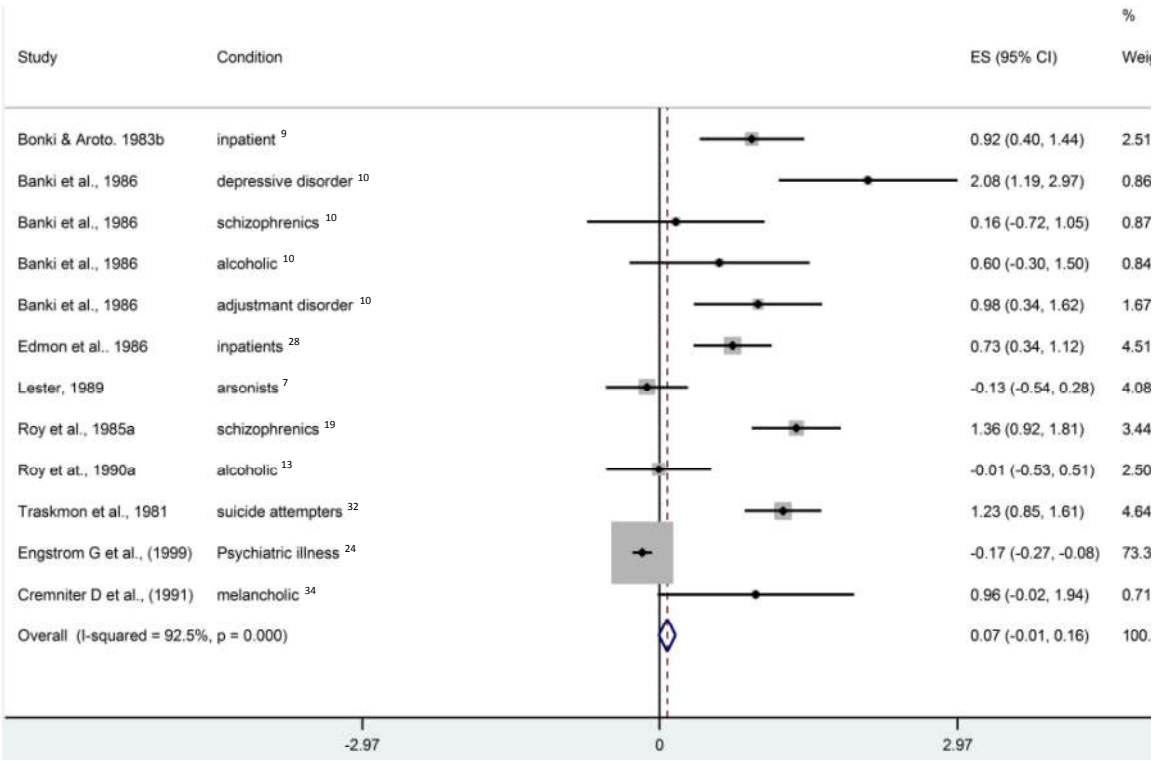

Fig. 2: Forest Plot of Violent v/s Non-Violent Suicide attempters

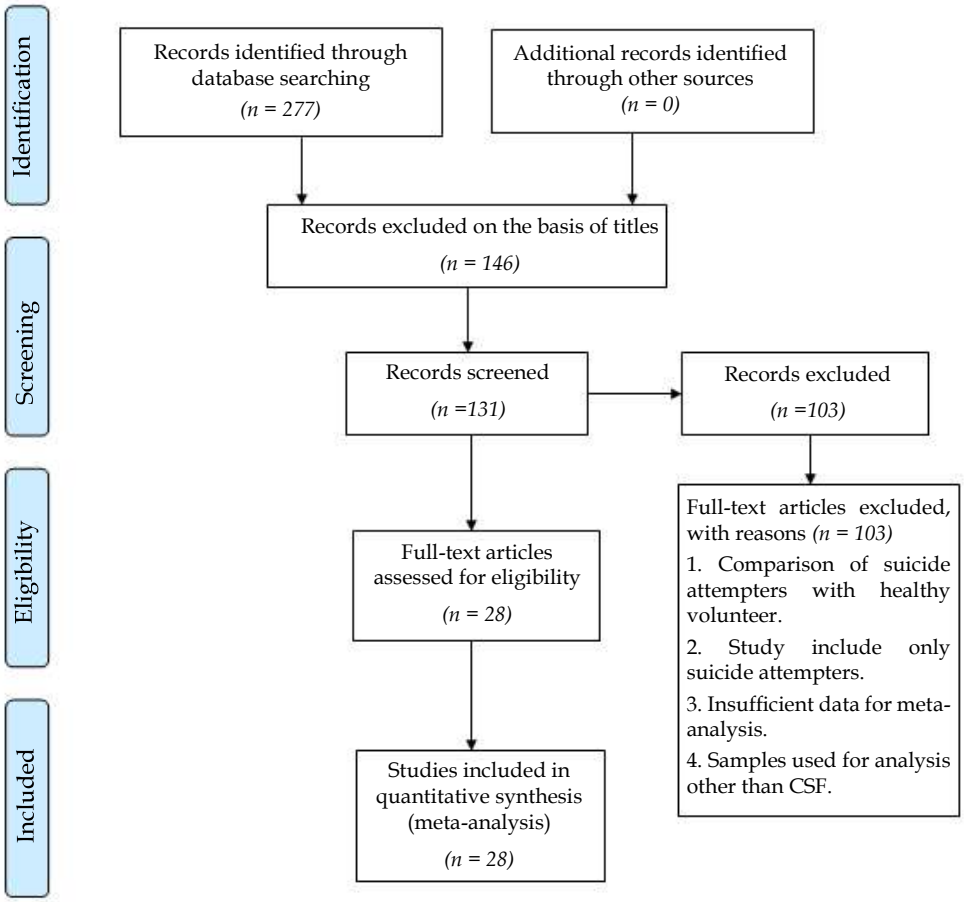

Fig. 3: Prisma flowchart for CSF 5-HIAA describing the process of study selection and exclusion.

All these studies used parametric statistical tests to analyze data in their published reports. Raw data was not available to us and it was also not possible to check whether the data met the criteria for parametric statistical tests. Since only means and standard deviations were available to us, we used parametric statistical tests for analysis. Standardized mean difference (SMD) was calculated for each study.

Effect size for psychiatric control and suicidal patient was calculated as difference of mean level of CSF 5-HIAA divided by combined standard deviation. Effect size for non-violent and violent patient was calculated as difference of mean level of CSF 5-HIAA divided by combined standard deviation.

Results

In figure-1, 32 studies were pooled together. Thirteen studies out of 32 (41%) had a very small confidence interval depicting larger sample size. Small-pooled effect size of 0.26 was found and is significant.

In figure-2, 12 studies were pooled together for analysis. In all the studies except one, the result was not precise with a larger confidence Interval depicting either a smaller sample size or a bias. Final pooled effect size is 0.07 and not significant**.** I square is 95%, so the studies are highly heterogeneous in nature and so the pooling of result may be biased.

Discussion

This review of CSF studies of 5-HIAA has clarified the findings of various researches. First, there is strong evidence that those who have attempted suicide have lower levels of CSF 5-HIAA than the psychiatric controls. Second, the serotonin system seems to be most clearly implicated in attempted suicides.

Analysis of violent and non-violent suicide attempters revealed no association between levels of CSF 5-HIAA in violent attempters compared to that in non-violent attempters.

All two sets of analyses point towards evidence for the involvement of serotonin system in those making suicide attempts, especially violent attempters, and in those engaging in subsequent completed suicide. Although there has been some speculation that lower levels of 5-HIAA in CSF of individuals with suicidal tendency might be found only in some psychiatric patients. Individual studies observed lower levels of 5-HIAA in attempted suicide with diagnoses of alcoholism, depressive disorders, personality disorders and schizophrenia and in offenders. Thus, psychiatric diagnosis does not appear to play a major role in the association.

It should be noted that, since majority of subjects in the studies reviewed were psychiatric patients, some may have been on medication. Therefore, data from these reports were not sufficiently detailed to take this factor into account. Furthermore, different investigators may have had differences in the techniques utilized for estimating the concentration of CSF neurotransmitter metabolites. In spite of these limitations, consistency in the findings of levels of CSF 5-HIAA are more note worthy.

Furthermore, although researches so far has been conducted on samples of patients with a variety of psychiatric diagnoses and the results do not at present appear to depend upon diagnosis, future researches should focus in a more systematic manner for possible mediating impact of psychiatric diagnosis on level of CSF 5-HIAA.

The studies reviewed in this paper typically employed small sample sizes, and only by examining the data from all of the studies, atrend could be identified. It is suggested that future investigators should involve large number of samples, so that not only will their results be more reliable, but also they can investigate the role of factors other than suicidal status *viz*, gender, age, height, diet, medication etc., that affect the CSF levels of these metabolites.

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Original Article

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Histomorphological Evaluation of Myocardial Ifarction: An Autopsy Study

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Abstract

Background: Myocardial Infarction is the irreversible necrosis of the heart muscle secondary to prolonged ischemia. The incidence of coronary heart disease has markedly increased in India over the past few years. Objective was to study the histopathological spectrum of myocardial infarction in autopsy specimens that play a major role as cause of death. *Aims:* To study histomorphological changes in myocardial infarction, to determine its age-sex distribution, etiology & complications. *Materials and Methods:* This work is a retrospective study of ovarian germ cell tumors carried out in department of pathology at tertiary healthcare center. All cases of germ cell tumors during the period from August 2017 to July 2018 were retrieved from the record files and analyzed. The tissues were routinely fixed with 10% formal in, and the slides were stained with hematoxylin and eosin stain and also with special stains whenever required. *Results:* Commonest age group was 40–49 years with significant number of cases below 30 years of age. Males are more commonly affected than females. Coronary atherosclerosis was most common etiology. Left anterior descending artery causing anterior wall MI was most common morphological finding. Ventricular aneurysm is the most common complication. *Conclusion:* Myocardial infarction due to atherosclerosis is the commonest finding in death cases subjected to medico legal autopsies.

Keywords: Myocardial Infarction; Coronary Atherosclerosis; Autopsy.

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Introduction

Myocardial infarction is common diagnoses in hospitalized patients in industrialized countries. The mortality rate with acute infarction is approximately 30%. More than half of these deaths occurring before the individual reach the hospital. Although the mortality rate after admission has declined over last two decades, approximately 1 of every 25 patients *i.e.* 4% who survives dies in the *1 year* after myocardial infarction.[1] Ischemic heart disease is by far most frequent cause of sudden death, being responsible for more than 90% of cases in which death occurs within.

One *hour* of onset of symptoms. However, death due to ischemic heart disease reduced due to maintenance of normal blood glucose level in diabetic, lipid lowering antioxidant therapy aspirin prophylaxis. But death rates from cardiovascular disease is presently increasing world-wide.[2] The study of correlation of coronary artery stenosis with site of infarction and recognition of early ischemic changes in the myocardium could well lead to the development of improved methods for the prevention and control of ischemic heart diseases.[3]

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Materials and Methods

This autopsy study was conducted on 100 cases of myocardial infarction over a period of *2 years* in autopsy section of pathology department at tertiary healthcare centre. In this autopsy study heart of patient with a history of chest pain/abnormal ECG known ischemic heart disease and showing early microscopic evidence of MI were evaluated. These were received in an autopsy section as medico legal post-mortem and clinical post-mortem cases.

Heart was examined grossly to identify suspected areas of early MI like subepicardial hemorrhages and fibrosis. Epicardial coronary arteries were dissected by transverse sectioning at interval of *5 mm* and lumen occlusion, severity and extent of severity of atherosclerotic narrowing of lumen. Heart was cut into transverse slice. *1 cm* thick starting at the apex of heart up to origin of left anterior descending artery and examined for variation in coronary thickening, block, color and consistency of myocardium. Multiple sections from apex, Anterior wall, posterior wall, lateral wall interventricular septum and coronary arteries were taken. All the sections were processed and stained with hematoxylin and eosin stain and examined under microscope. Triphenyl Tetrazolium Chloride Macro Test and Acridine Orange Fluorescence were performed whenever required.

Results

Total 100 cases of myocardial infarction were evaluated from medico-legal cases and clinical post-mortems in an autopsy section of tertiary healthcare centre over a period of *2 years*. The most common age group affected by ischemic heart disease was *40–49 years*, followed by *50–59 years* with maximum number of cases occurring in age group *40–70 years*. Male were more commonly affected than females 3.5:1 (**Table 1**). Chest pain was the most common presenting symptoms in this study followed by giddiness, sweating and breathlessness. More than 1 symptom was frequently present at the time of presentation. We found diabetes in 4 cases, hypertension in 5 cases, obesity in 15 cases and history of smoking in 10 cases as major risk factor. As many patients were brought dead we could not get their detailed history and investigation reports (**Table 2**). Atherosclerosis was the commonest etiological factor. Four cases were of Rheumatic heart diseases, three cases were aortic stenosis and one was aortic stenosis with mitral stenosis. Left anterior descending artery 65 cases (70.65%) was most common predominantly involved artery by atherosclerotic narrowing *i.e.* more than 75% of the lumen. This follows right coronary artery. 35 cases (38.40%) and left circumflex artery 14 cases (15.21%) (**Table 3**).

In this series majority of the cases having one vessel disease *i.e.* only one vessel was significantly narrowed >75 of cross-sectional luminal area (**Table 4**). Anterior wall of left ventricle was most commonly affected by infarct. Anterior, antero-septal, antero-lateral were considered in anterior wall group while posterior, postero-septal, postero-lateral in posterior wall group. Lateral wall alone constitutes lateral wall (**Table 5**). Maximum numbers of cases were of less than 12 hours duration. Total exceeded 100 cases since multiple infarcts were present in many cases **(Table 6).**

In H and E stained sections ischemic myocardium stained as brilliant crimson red color in contrast with light brown normal fibers. Infracted myocardium less than 12 hours duration was stained strongly. The number and intensity of staining the individual fibers was decreased slightly within *12–24 hours* and further decreased and disappeared when myocardium became frankly necrotic and polymorphonuclear infiltrates reached its peak. The fibroblastic granulation tissue of healing infarct does not stain with this stain (**Figs. 1-5**).

Table 1: Age and sex wise distribution of cases in present study

Age (Yrs)	Male (n = 78)	Female (n = 22)	Total (%)
< 30	5	-	5 (5%)
30–39	6	2	8 (8%)
40–49	27	2	29 (29%)
50–59	19	7	26 (26%)
60–69	13	9	22 (22%)
70–79	6	2	8 (8%)
>/= 80	2	0	2 (2%)

Table 2: History of presenting symptoms of MI in all cases studied

Symptoms	No. of cases (n = 100)	%
Chest pain	60	60
Breathlessness	13	13
Sweating	13	13
Giddiness	17	17
Vomiting	4	4
Epigastric pain	3	3
Brought dead/no history	13	13

Table 3: Aetiological factors for myocardial Infarction

Aetiology	No. of cases (n = 100)	%
Atherosclerosis	92	92
Emboli	3	3
Rheumatic heart diseases	4	4
Aortic dissection	1	1

Table 4: Distribution of cases as per number of vessels involved

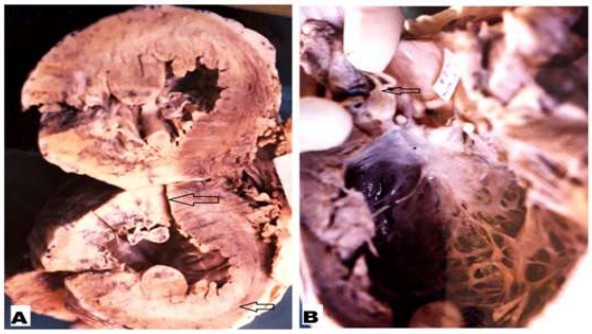
No. of vessels involved	No. of cases (n = 92)	%
One vessel disease	44	47.82
Two vessel disease	28	30.43
Three vessel disease	20	21.73

Table 5: Area wise distribution of recent infarct

Area involved	No. of cases (n = 48)	%
Anterior wall	23	47.91
Posterior wall	14	29.16
Lateral wall	7	14.58
Septal	1	2.08
Circumferential	3	6.25

Table 6: Distribution of cases according to age of infarct[2,4,5,6].

Age of infarct	No. of cases (n = 100)	%
< 12 hours	48	48
12–24 hours	18	18
1–3 days	20	20
3–7 days	6	6
1–2 weeks	4	4
2–8 weeks	22	22



Figs. 1A: Showing myocardial infarction on postero-lateral wall of left ventricle. **B:** Showing aortic stenosis.

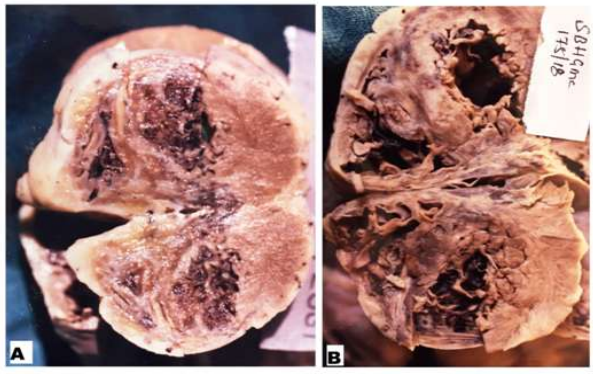


Fig. 2A: Showing apical mural thrombus. **B:** Showing recent and old infarct.

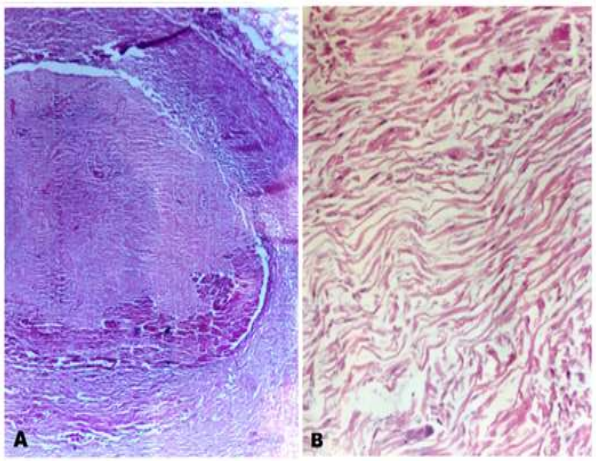


Fig. 3A: Shows thrombus occluding coronary. **B:** Shows waviness of ischaemic myocardial fibers indicating early infarct. (H and E 40x).

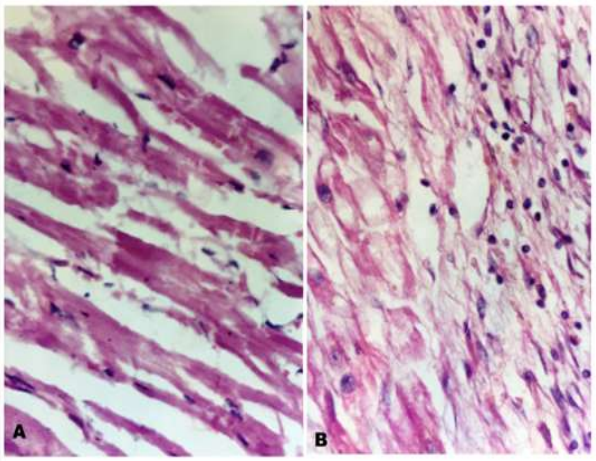


Fig. 4A: Showing contraction band necrosis of ischaemic myocardial fibers. **B:** Showing myocytolysis/vacuolar degeneration a early sign of infarct. (H and E 40x).

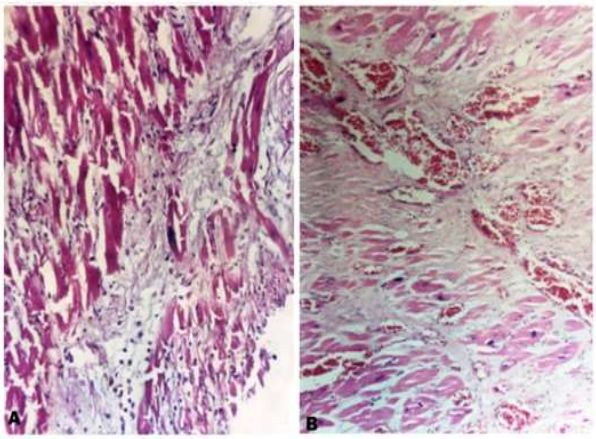


Fig. 5A: Showing well developed phagocytosis of dead cells and early formation of granulation tissue. **B:** Showing well established granulation tissue with neovascularisation and collagen deposition. (H and E 40x).

Discussion

The present study was conducted in tertiary healthcare centre of north Maharashtra region for a period of *two years*. A total 100 post-mortem hearts were grossly and microscopically studied. Out of 100 cases, incidence of myocardial infarction was seen significantly higher among male than females with ratio of 3.5:1. Maximum numbers of cases were found in age ranged from *40–59 years*. In spite of this age range we found 5 cases of < than *30 years* age, indicating. Also 60% of cases had history of chest pain, which were the most common presenting symptoms. Instead most of the cases had multiple symptoms like chest pain, breathlessness, Epigastric pain etc. and history of chronic diseases like diabetes & hypertension. In a study of 90 cases of sudden cardiac death by Farb *et al*. [6] revealed, 52% patients had witnessed collapse and in them 50% had chest pain or dypnoea or both, hypertension was found in 11 patients and diabetes in 9 patients.

In the present study, it was observed that 78% were male and 22% were female which are more or less similar to most of the studies done in the past. Beelwal *et al.*[7] studied a total of 600 cases, 75 cases showed the changes of ischemia and MI and 467 (77.8%) cases were male and 133 (22.8%) were female. Ghag and Kulkarni[8] studied 315 cases of myocardial infarction, most of the cases were found in *40–70 Years* age group with male predominance. Joshi[9] studied 115 cases of which Maximum no. of cases present between the age group of *41–60 years*, 98 (85.21%) were male and 17 (14.78%) were female. Rao *et al.*[10] studied 2449 cases of sudden cardiac deaths of which 104 cases 50.9% death due to MI with overall male to female ratio of 10:1, maximum number of cases found in age ranged from *40–69 years*. Sweating was noted in 159 (77.9%) cases, dypnoea in 136 (66.7%), precordial pain in 161 (78.9%), vomiting in 157 (77.0%), cyanosis, and exhaust looking face in 110 (53.9%). Dhruva *et al.*[12] studied 360 cases in their study atherosclerosis of coronary arteries as predisposing factor in myocardial infarction. They revealed 73.6% were males & 26.4% were females. Most of the cases were seen in *30–60 years* age group. Pandian *et el.*[13] studied 120 cases of sudden cardiac deaths which Males *(n = 104)* were predominant over females *(n = 16)* in the ratio of 6.5:1. The age ranged from 17 to 70 years. Maximum number of death was in the age group of *31–50 years*. Nisha *et al.*[14] observed out of 200 heart autopsies, 184 males and 16 females and maximum number of cases belonged to *41-50 years* of age group. Garg *et al.*[15] examined 115 cases of post-mortem heart, 80.9% were males. Most of the cases were found in *21–60 years* age group. Porwal *et al.*[16] studied 103 heart during autopsy, of these 74.75% were males quite higher than females (25.24%) forming a ratio of 3:1.

In present study, Atherosclerosis was found to the commonest etiological factor for MI. Left anterior descending artery 65 cases (70.65%) was most common predominantly involved artery by atherosclerotic narrowing *i.e.* more than 75% of the lumen. This follows right coronary artery 35 cases (38.40%) and left circumflex artery.

14 cases (15.21%). Calcification 48.91% has to be found the most common complication followed by thrombosis 14.13% and intraplaque hemorrhage 8.69%. In 5 cases (5.43%) plaque ulceration and in 4 (4.43%) cases endothelial erosion, thrombus was present overlying plaque. Out of 14.13% cases of thrombosis, in 8 cases thrombus were found within first *4 cms* of left anterior descending artery and in 5 cases right coronary both proximally and distally. Infarct was noted in anterior and posterior wall respectively. Beelwal *et al.*[7] found atherosclerosis in 52% of cases and the most common artery involved in atherosclerosis is left anterior descending, followed by left circumflex artery, and least involved is right coronary. Farb *et al.*[6] also mentioned in their study that left anterior descending artery most common to involved by atherosclerosis accounting 68% followed by right coronary 50% and left circumflex artery 38% respectively. Ghag and Kulkarni[8] had found atherosclerosis as most common etiological factor (288 cases), left anterior descending artery (74.65%) was the commonest involved artery by the atherosclerotic process (narrowing more than 70% of cross-sectional area of the lumen) followed by right coronary artery (33%) and left circumflex artery (25.34%). Complications of myocardial infarction were seen in 38 cases. Among them ventricular dilatation (17 cases) followed by mural thrombus (15 cases) was found as the most common complications of infarct. Joshi[9] revealed atherosclerosis in 74/115 (64.34%) cases followed by myocardial hypertrophy in 60 (52.17%) cases, among 74 cases of atherosclerotic changes 13 cases were having calcification and 4 cases were present with thrombus in coronaries. Rao *et al.*[10] stated that the left anterior descending artery (87 cases) and right coronary artery (17 cases) are the main arteries involved by the atherosclerosis causing sudden cardiac deaths. The most frequent affected site was proximal *3–5 cms* of anterior descending branch of left anterior descending artery from its origin. Dhruva *et al.*[12] studied total 84 atherosclerosis cases & observed 14.28% calcification and 69.04% of the cases showed significant atheroma *i.e.* grade

4 to grade 7. Left anterior descending was most commonly involved coronary artery. Nisha *et al.*[14] found out of 200 autopsied hearts, 142 (71%) revealed coronary artery atherosclerosis in one or more vessels. Left anterior descending artery was the most commonly involved vessels (137 cases), followed by right coronary artery (119 cases) and left circumflex artery (94 cases). Complicated plaques revealing atherosclerosis with calcification or acute coronary events (thrombus formation, plaque rupture and intramural hemorrhage) were observed in 53, 27, 9 cases respectively. Garg *et al.*[15] revealed an average 3.09% calcification and 14.4% had capillary defect. 46.4% of the cases showed significant atheroma *i.e.* grade 4 to grade 7 amongst the atherosclerotic coronaries. Porwal *et al.*[16] found left anterior descending artery as most frequently involved vessels in 46.6% cases followed by right coronary artery in 41.71% cases. Least frequently involved vessel was left circumflex artery in 38.83%.

Myocardial infarcts were seen in different areas of heart wall. Anterior wall of left ventricle was observed to be the most commonly affected by recent MI, but multiple anatomical site infarctions were seen in this study. Old infarct in the form of grayish white scar was present in 42% of cases. Out of 100 cases, 48 cases had transmural infarct and 8 cases with subendocardial infarct. Majority of the cases having one vessel disease 47.82% *i.e.* Only one vessel was significantly narrowed (> 75 of cross-sectional luminal area), followed by two vessel disease 30.43% and three vessel disease 21.73%.[5]

Farb *et al.*[6] found one vessel disease in 44% of cases, two vessel disease in 32% and three vessel disease in 22% of the cases studied. Crowford[4] found that anterior wall infarct 49%, posterior wall infarct 26%, lateral wall 14.58%, septal 2.08% and circumferential infarct in 6.25% of cases studied. Beelwal *et al.*[7] revealed the maximum number of atherosclerosis cases involved triple vessels, followed by the double-vessel involved cases, and least involved cases were of single-vessel type. Ghag and Kulkarni[8] found anterior wall is most predominantly involved area followed by posterior wall and lateral wall, Healed infarcts (52.38%) were found to be most common in our study, followed by acute infarcts (23.17%). In a study by Pandey *et al.*[11] the most common wall involved was anterior wall which is comparable to the present study. Joshi[9] found 33 cases of MI out of which 15 cases were found to have old infarct. Rao *et al.*[10] found their study of sudden cardiac deaths, MI cases were 49 (24.0%) recent and 55 (27.0%) old and the highest incidence in all three vessels was encountered in the age group of *50–59 years*. Dhruva *et al.*[12] found total 84 atherosclerosis cases, 31 had single vessel involvement whereas two vessels and three vessels were involved in 17 and 36 cases respectively. Nisha *et al.*[14] found maximum cases (52%) had involvement of all the three vessels followed by one vessel (26.4%) and two vessel (21.6%) involvements. Garg *et al.*[15] observed 115 cases of atherosclerosis; Out of these cases 13.3% had single vessel involvement whereas two vessels and three vessels were involved in 42.2% and 44.4% cases respectively. Porwal *et al.*[16] studied 103 cases and observed single vessel involvement in 15% cases whereas two vessels and three vessels were involved in 37% & 40% cases respectively.

Conclusion

In this study we found a significant number of sudden deaths occurring in young adults, particularly in the age group *40–70 years*. Chest pain was the most common presenting symptoms in this study followed by giddiness, sweating and breathlessness. Cardiac causes contributed the maximum number and atherosclerosis being the main culprit in causing myocardial infarction. One vessels disease most of them causing anterior wall infarction and histomorphologically maximum numbers of cases were of less than *12 hours* duration.

Source(s) of support: None

Conflicting Interest: None

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Role of TTC in Early Diagnosis of Suspected Acute Myocardial Infarction Autopsy Cases: Our Experience in Central India

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Abstract

Introduction: Acute myocardial infarction is a most common cause of sudden death. Microscopic evidence of infarction is seen in H & E stained section only if person survived for a minimum period of 6 hours after fatal ischemic attack. So for visualisation of infarct of lesser age TTC test can be used. It is a gross staining procedure which can reveal infarct of within 5–6 hrs. age Aim of this study to incorporate this test in study protocol of sudden cardiac death with aim of visualising infarct rather than giving indirect evidence. *Objective:* To study usefulness of TTC stain as indicator of early myocardial infarction in Autopsy cases. *Materials and Methods:* The present study was conducted in MGM Medical College Indore on 210 Post-mortem autopsy cases of death due to suspected myocardial infarction. Heart obtained from autopsy cases subjected to gross examination of all three coronary vessels. After cleaning heart, complete transverse slices of ventricular myocardium subjected to TTC macro test. Knife cut slice is dipped in 1% solution of TTC for 20–30 minute. *Result:* Out of 210 cases brought for post-mortem examination with history of suspected cardiac attack on which TTC stain applied over heart 60 cases were found to show TTC staining reaction. In these cases, it was infracted area show pale to pink and normal areas as bright red. *Discussion:* Due to the absence of gross and microscopic changes before 6–8 hrs. of post MI survival time, there was a majar hurdle in estabilishing the cause of death by light microscopy in cases of early death due to myocardial infarction. Since biochemical alteration occur following injury to any tissue form pathological changes. After myocardial infarction due to leakage of multiple dehydrogenases enzymes infarcted area did not react with TTC and remain pale and normal myocardial enzyme react with TTC and form Formazone which was bold colour.

Keywords: Sudden cardiac death; Myocardial infarction; TTC Macro test.

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Introduction

Myocardial infarction is a major cause of death in recent era throughout the world. In most of the cases it is due to ischemic heart disease. Narrowing of coronary arteries is major cause of myocardial infarction. If patient survive for more than 6 hrs. then only gross and microscopic finding can be detected and if death occur within 6 hrs. then there is lack of finding by gross and microscopic examination.[1]

In such cases where death occurred in 6 hrs. post infarction, Triphenyl tetrazolium chloride test able to predict infracted area. It is a gross staining procedure. By this test Forensic pathologist able to visualise infracted area during autopsy examination.[2]

The heart should be fresh 36 hrs. old for TTC and should not be fixed in any fixative. If body kept in cold storage then this test can be carried even after 68 hrs. after death but colour intensity may be variable.

The dyes form coloured farmazon over the normal myocardium when this dye (TTC) react with various dehydrogenases and the infarcted

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area is seen as light yellow colour due to loss of cytological dehydrogenases. Clinical reports and experiment show that after myocardial infarction enzymes levels increases in blood but their activities decreases at infracted area.[6–12] After infarction enzymes get destroyed from infracted.[4]

Aims and Objectives

To evaluate usefulness of TTC stain in early diagnosis of myocardial infarction in cases where death occur due to clinically suspected myocardial infarction or there is history of symptoms of myocardial infarction and death occur within six hrs. of symptoms or sustained myocardial infarction.

Materials and Methods

In MGM Medical college indore more than 2500 autopsy done per year. After ethical approval by local ethical committee, a prospective study was carried out 210 cases on in MGM Medical college & MY Hospital, Indore during 2018–2019 on autopsy cases received in forensic department of MGM Medical College, Indore.

Heart of case on which test has to perform is taken out and clean the heart with cold water. Weight of heart is taken. Gross examination of heart is done, surface of heart is observed carefully to see presence of any gray white area is seen over surface of heart. All coronary arteries were examined by serial transverse section and narrowing is noted.

Now a complete transverse slice of heart was taken from ventricular myocardium including both ventricular myocardium and interventricular septum or from those area show infarct by gross appearance. Multiple slices of nearly *1 cm.* were taken for study.

Slice remain unfixed (without formalin) and fresh. Now prepared solution is of TTC dye taken in glass container. This solution is prepared by taking *100 ml.* phosphate buffer solution and *1g.* of TTC salt. After mixing well a light yellow colour solution is prepared. It is Important to know that Ph of this solution should be between 8.5 for better result otherwise formation of formazan pigment remain unsatisfactory.[3–4]

Slice of myocardium were kept in prepared 1% solution of TTC and phosphate buffer, dipped well for nearly 30 minute. Slices should be completely dipped in solution. This procedure was carried out at room temperature. After keeping slices in incubator solution, now container is closed and kept in dark for 30 minutes as light and air reduces potency of solution.

After completion of staining procedure slice is taken out and kept in 10% formalin solution which halt staining procedure and fix the tissue.

In our study those cases were included those were brought with clinical history of heart attack or suspected myocardial infarction. Other 10 cases were included as control. Autolysed cases and cases in which death occurred due to any other reason are not included (except control *cases).*

Image 1: Showing infarcted pale area and cherry red normal myocardium on use of TTC dye.

Results

In our study total 210 cases were taken out of which 180 cases were male and 40 cases were female. Only 22 cases were below *40 yrs*. of age and all others were above *40 yrs*. of age. In our study out of 210 cases, 60 cases were showed infracted area after staining with TTC dye.

On finishing of staining procedure, infracted part of myocardium become light pale to pink while normal part become bright red in colour. If there is no infarction then both surface of slice show uniform bright red in colour.

Discussion

In case of myocardial infarction atleast 6 hours of survival is to be needed for gross and microscopic changes to occur. If there was early death, then it was very difficult to predict cause of death as there was usually, there was no visible gross or microscopic changes (neutrophilic infiltration) in myocardium.[1]

Experimental and clinical reports indicate that there is alteration in enzyme level in myocardial infarction.[2–3] Watchstein and Meisel were found that activity of enzyme succinic dehydrogenase is lost from necrotic muscle with in six to 8 hrs. So possibility of detection of myocardial infarction by detection of alteration of these enzymes is highly significant. Activity of enzyme dehydrogenases and cytochrome oxidase is altered in infarcted myocardium.[5]

TTC reaction depends upon decreased activity of multiple dehydrogenase enzyme. Loss of activity of enzyme dehydrogenase occur due to lekage of enzyme or loss of glycogen storage leads to non deposition of farmazan compound over myocardium.[1] Sandritter and Jestadt became employed triphenyl tetrazolium for detection of myocardial infarction. Oxidation and reduction reaction leads to formation of farmazane compound formation at place where normal mycardium present. They had performed this test on 112 human heart and in eleven cases were found activity of TTC in absence of gross and microscopic activity.[1] Caine and Assmen had been already worked on 14 human heart and out of this 6 cases were clinical diagnosed case of myocardial infarction of 1 or 2 days.

In study by Marvin Nachals Theodor K Shnitka on 23 human heart were included in study and they belongs patients died suddenly or due to CHF or due to hypothermia without coronary perfusion. All cases treated with TTC dye and staining were found positive.[1] Our study had done on 210 cases and TTC staining were found in 60 cases where infarcted area were visible distinctly.

Conclusion

In our study we conclude and recommend that TTC (Triphenyl tetrazolium chloride) can be used for early diagnosis of Myocardial infarction in all sudden death cases. This method is very suitable for forensic doctor also for medicolegal autopsy and they can put this method in their practice. In such cases where survival time is veryless and gross and microscopic changes are not visible, in such cases TTC staining is a rapid, easy and spot techenique to confirm myocardial infarction.

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Study of Awareness about Cybercrime among Medical Undergraduates

Rajesh D Kharat[1], Rahul V Kedare[2]

Abstract

World becomes more digitally sophisticated with the present technological environment. Being a part of e-world, we depend upon internet for various purposes. Earlier days, internet was used for research purpose and communication purposes alone. Today, it got extension into the fields like e-business, e-commerce, e-governance and social networking. The increased reliance on cyber space has paved way for a rapid growth in cybercrimes. As the cybercrime rate is day by day, the need for cyber awareness, laws and its applications gather great momentum. This paper tries to find out awareness of Information Technology among the youth of medical undergraduates in Pune. The paper is entitled as "Awareness about Cybercrime among medical undergraduates". Researchers also investigate youth's awareness on various sections, familiarity with cybercrimes, cybercrimes offenders and victimized youth. The study found that youth of Pune have a basic level of understanding on Information Technology.

Keywords: Cyberspace; Cybercrime; Cyberattacks; Cyber Law; Information Technology.

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Introduction

The youth today use the Internet, among many other things, to find and play music, watch movies, gather information for research and keep their friends posted on their social activities. Recently, the number of online teenagers engaged in content creation has been increasing. The teenagers are not only using the internet as consumers but also contribute to its vast database of blogs, pictures and videos constantly being created.

Cyber crime in all of its forms is one of the fastest growing areas of criminality. More and more criminals are exploring the speed; convenience and anonymity that modern technologies offer to commit a diverse range of crimes, including attacks against computer data and systems, identity theft, the distribution of child sexual abuse images and internet auction fraud.[1]

A social networking site is the phrase used to describe any website that enables users to create public profiles within that web site and form relationships with others users of the same website who access their profile.[2]

The present study is undertaken to touch some aspects, effect and prospects of this cyber technology with special reference to threat poses of cybercrime by India.[3-5]

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Aims and Objectives

Aim

To study awareness about Cyber Crime in Young Generation.

Objectives

1. To provide a general awareness of Cyber Law & Cybercrime.
2. To understand Cybercrime methods.
3. To learn how to keep from being a victim.

Materials and Methods

It was an observational study conducted in the Department of Forensic Medicine, MIMER Medical College, Talegaon Dabhade, Pune. A total of 200 students were participated in this study. A questionnaire based on cybercrime was provided to the students. A single best multiple choice questions (MCQs) paper consisting of 24 questions were distributed and students were asked to attempt all the twenty MCQs within the required time. Each question carries a single mark.

Statistical analysis

The collected data was analyzed by using Primer of Biostatistics software.

Results

Out of 200 respondents, all have shown extensive use of internet.

Majority of the youth are using internet at home, college and on mobiles (Fig 1.).

The various types of data such as power point, applications, documents, movies and songs downloaded by respondents. Being college students, usage for educational purposes is on the rise (Fig 2.).

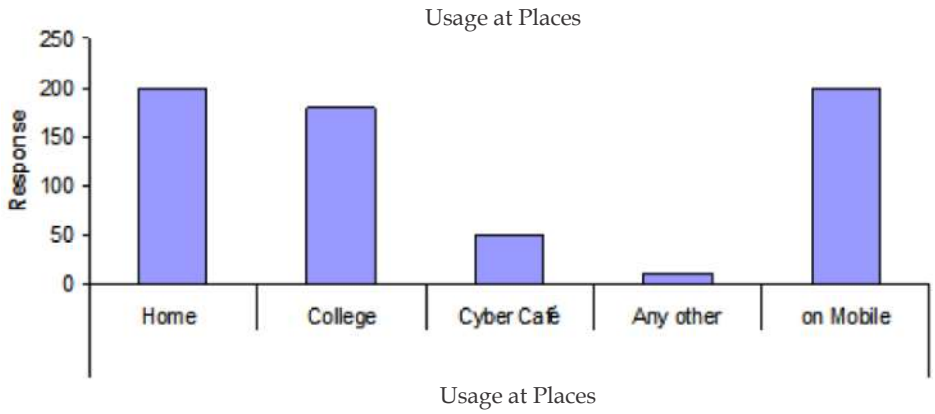

Fig. 1:

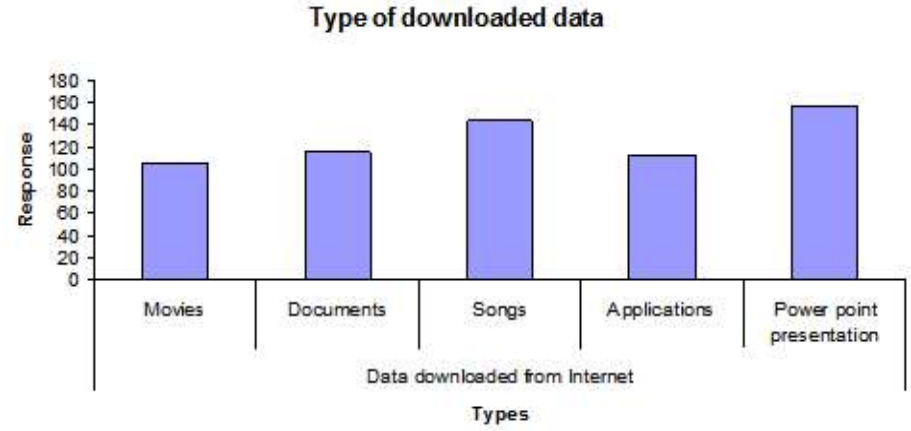

Fig. 2:

Majority of respondents have aware about antivirus updates. Most of them followed by the directions laid down by the antivirus service provider *i.e.* weekly up gradation as well as scanning of system (Fig 3.).

It was observed that maximum respondents using password for systems which shows level of awareness is quite high amongst youth (Fig 4.).

Most of them changing their password by yearly and quarterly. The password should be change more frequently at least after every month (Fig 5.).

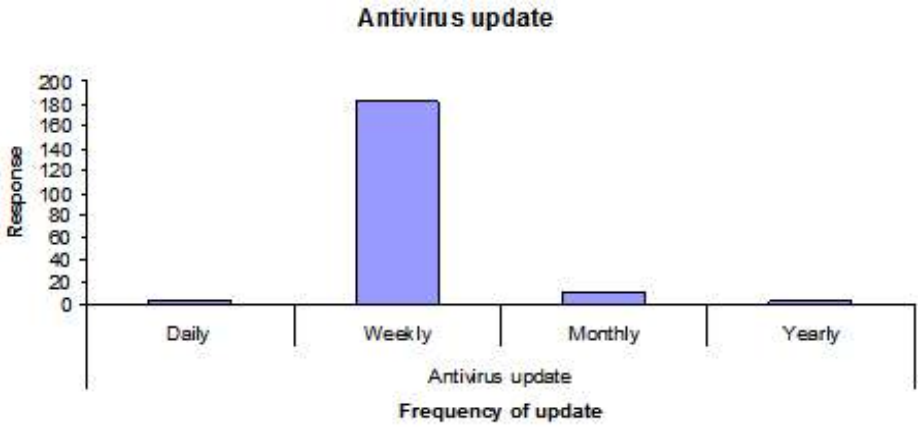

Fig. 3:

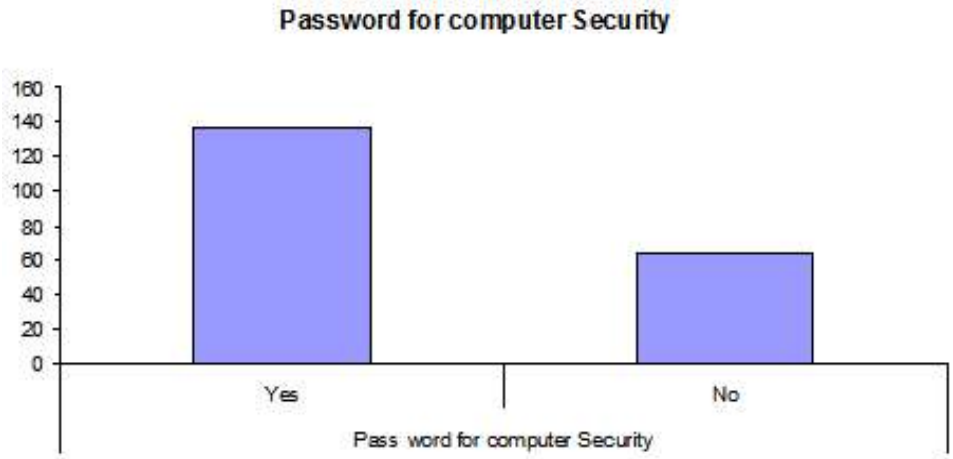

Fig. 4:

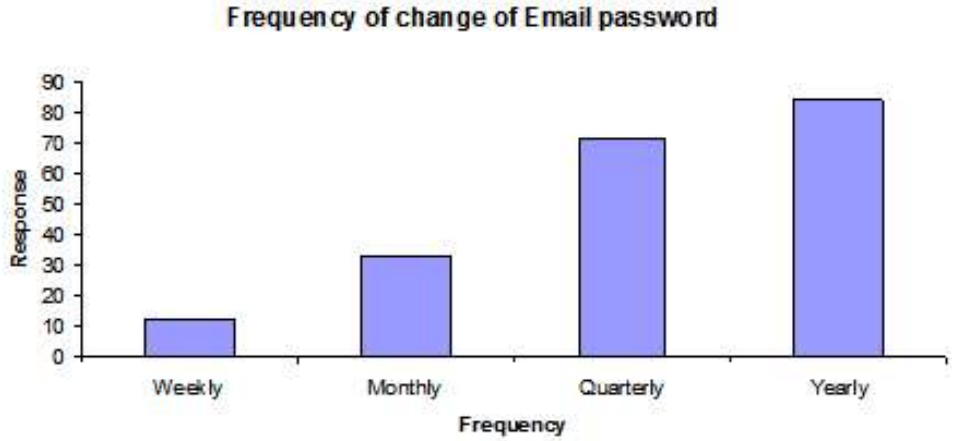

Fig. 5:

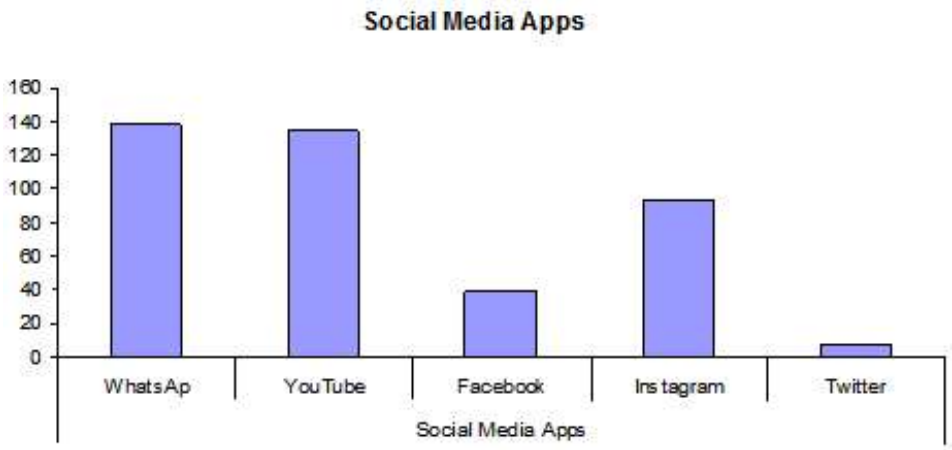

Fig. 6:

Fig. 7:

Majority of respondents have aware about cybercrime.Whatsapp is the most famous application of social media networking followed by Youtube, facebook, Instagram and Twitter (Fig 6.).

Majority of respondents have not disclosed details of cybercrime faced by them to their parents out of fear (Fig 7.).

Discussion

In Saroj Mehta and Vikram Singh's (2013) research paper it emphasizes on the awareness of cybercrime laws in India. It states that even though there exist firewalls, antivirus and many other effective measures to control cybercrime, India is still far behind in combating cybercrime. It also revealed that there lies a significant difference between the awareness level of male users and female users. Jagvinder Singh's (2012) research paper studied cybercrime awareness among XII students in Bathinda, Punjab. It noticed that the gender of the students does not create a difference in the level of awareness of cybercrime. The stream chosen by the students also does not play a part in the awareness level. Bijoy Saima's research paper noted that people's attitude towards information technology is a major cause for cybercrime awareness. This paper intended to find the level of awareness of among Law students. It was found out that there was a moderate level of cybercrime awareness among the students. However, a few percent of students knew and had proper knowledge regarding types of cybercrime which were listed under Information Technology Act, 2000. Teena Jose, Y Vijayalakshmi, Dr Suvanam and Sasidhar Babu researched on the cybercrimes in Kerala. It came to conclusion that with the advancement of technology, cybercrimes increase. The Kochi city in Kerala had the highest cybercrime attacks in the state. The various cybercrimes and the popular mobile crimes are stated there PS Dowland.

SM Furnell, HM Illingworth and PI Reynolds researched on the public attitudes and awareness towards computer crime and abuse. It was found that the environment affects the public attitude. The media are helpful in informing the public regarding cybercrimes however, it did a poor job in providing the proper remedial and corrective information/ actions to counter cybercrime. Sukanya KP and Raju CV (April 2017) research paper focuses on the awareness of cybercrime among youth of Malappuram district. The youth of Malappuram district are aware of IT Act, 2000. Yet, they are ignorant about it in detail. Curricula in Basic ethics and the proper usages on IT applications must be introduced in schools. Also, the media must provide proper information regarding cybercrime. They should also impart knowledge to safe guard the interest of users in general. The study found out that the youth have an idea regarding the security measures for combating cybercrime.

Conclusion

The research showed that only most users were just aware about cyber world and less about cybercrime. It was clear that the ratio of awareness among the respondents regarding cybercrime was high for hacking when compared to other types. However, it also showed that the most of these respondents were not properly aware of the cybercrime laws. Most of the respondents spend more than 2 hours on the internet. Also maximum respondents stated that they have no idea about the safety of their information while being online. It was clear from this that the respondents do not know the proper steps in ensuring that they keep their data safe. Also a large percentage of the respondents rarely change their password for accounts which is also a safety threat. It was also clear that the respondents even though they are just aware about cyber crime still download various content such as movies, games etc. which falls under cybercrime. The study also found out that most of the respondents occasionally receive spam messages and spam calls but hardly anyone of these respondents failed to report it to the cybercrime police in order it to prevent it from occurring again. Further studies are required to assess impact of cybercrime among youth.

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Clinical Profile of the Patients with Antiphospholipid Antibodies: Lupus Anticoagulant and Anticardiolipin Antibodies

Kanika Deora[1], Ruchee Khanna[2]

Abstract

A retrospective analysis of clinical profile of the patients positive for antiphospholipid antibodies (150) that are lupus anticoagulant (83) and anticardiolipin antibodies (57) was carried out from January 2015 to December 2016 in Kasturba Medical College, Manipal. The diagnosis of lupus anticoagulants was based on prolongation of dRVVT, its absence of correction with normal plasma and correction by phospholipids. The presence of antiardiolipin antibodies was based on the technique ELISA (uolmmun). Out of 150 patients positive for antiphospholipid antibodies, the mean age of presentation was 38 years, more commonly seen in the women. The frequency of thrombosis in patients positive for lupus anticoagulants was 55.5% (46), more commonly of venous origin and in the lower limbs. The frequency of patients with lupus anticoagulants presenting with abortion was 26 (31.3%), immune thrombocytopenic purpura, was 80% (67), valvular heart disease was 5 (6%), 35 (42.1%) patients had secondary LA due to autoimmune diseases like SLE, Sjogerns, APS. Anticardiolipin antibodies were present in 57 patients, more common in women. Thrombosis was seen in 28 (49%) patients, more of venous origin and in the lower limbs. Other clinical manifestations were abortions seen in 8 (9%) patients, immune thrombocytopenic purpura seen in 18 (32.5%) patients, valvular heart diseases seen in 8 (14%) of the patients and autoimmune diseases seen in 31.3% of the patients. Patients positive for both lupus anticoagulant and anticardiolipin antibodies (10) had a higher rate of thrombosis around 60%, more commonly of venous origin and had higher associations with autoimmune diseases (80%).

Keywords: Lupus anticoagulants; Anticardiolipin antibodies; SLE.

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Introduction

Antiphospholipid antibodies are a heterogenous family of immunoglobulins that includes lupus anticoagulant and anticardiolipin antibodies. Conley and Harlman in 1952, first described circulating anticoagulants in patients with SLE[1]. In 1972, Feinstein and Rapaport[2] introduced the term Lupus anticoagulants for some of these antibodies that prolong the activated partial thromboplastin time in vitro. Lupus anticoagulants behave as acquired inhibitors of coagulation, prolonging phospholipids dependent in *vitro* coagulation test but in *vivo*, these antibodies are made to interact with the platelet membrane phospholipids, increasing adhesion and aggregation of platelets, accounting for in vivo prothrombotic characteristics. Anticardiolipin antibiodies despite binding to phospholipids bind to protein called *b-2* glycoprotein and presents with various classes namely *IgG*, *IgM*, *IgA*. Antiphospholipids antibodies are detected in patients with autoimmune diseases, SLE, malignancies, drugs, infections and also in normal healthy individuals.[3–6] In the study conducted by bhattacharya *et al.*[7], the clinical features seen in LA positive patients were increase chance of thrombosis, more of venous origin, recurrent abortions and increase chance of

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bleeding. In another study conducted by runchey *et al.*[8], no association of anticardiolipin antibodies and thrombosis was found but increase chance of thrombosis when both lupus anticoagulants and anticardiolipin antibodies were present in patients. Another study conducted by Galli *et al.*[10] showed lupus anticoagulants were at a great risk of thrombosis than anticardiolipin antibodies in antiphospolipid syndrome. Based on the above studies, the present study is to establish the clinical profile of the patients positive for antiphospholipid antibodies, to establish which antibody has more chance of thrombosis and the association of these antibodies with various autoimmune diseases as limited data is available, so a retrospective study was conducted in a tertiary care hospital.

Materials and Methods

All patients positive for antiphospholipid antibodies (150), from January 2015 to December 2016 were the subjects from Kasturba Medical College, Manipal, out of which 83 patients were positive for lupus anticoagulants, 57 patients were positive for anticardiolipin antibodies and 10 patients were positive for both lupus anticoagulant, anticardiolipin antibodies.

Laboratory test-Anticardiolipin antibodies were detected by ELISA (eulommun). For Lupus anticoagulants, venous blood was collected in plastic tubes in 3.2% sodium citrate in a dilution of 9:1 and also in EDTA. Platelet-poor plasma prepared by centrifugation at *2000 g* for 20 minutes. Laboratory tests such as platelet count, the aPTT, prothrombin time (PT), diluted Russel viper venom test (dRVVT), and kaolin clotting time (KCT) were performed in all cases. Diagnosis of the presence of LA was made on the basis of prolongation of aPTT, KCT, or dRVVT, failure of its correction in a 1:1 mixture of patient normal plasma and its correction with commercially available Inositihin (Asolectin-Associated concentrates, USA).[8-9] Prolonged PT up to 7 seconds is known to occur with LA. In patients in whom PT was greater than 7 seconds, tests for thrombin time, mixing studies of aPTT with $Al(OH)_3$ and serum and fibrinogen levels were performed. Specific factor assays and factor inhibitors were looked for wherever indicated by the above mixing studies.

Results

Out of 150 people positive for antiphospholipid antibodies, the mean age of presentation was *38.11 years*, seen more commonly in females, more of venous origin presented in lower limbs. 80 people out of 150 presented with thrombosis (**Fig. 1**) out of which 46 people were lupus anticoagulant positive, 28 people were anticardiolipin antibody positive and 6 people had presence of both lupus anticoagulant and anticardiolipin antibodies (**Fig. 2**). The clinical manifestations of the patients with antiphospholipid antibodies were presence of thrombosis, presence of underlying autoimmune diseases, increase rate of abortions, presence of valvular heart diseases (**Table 1**). The frequency of thrombosis in patients positive for lupus anticoagulants was 55.5% (46), more commonly of venous origin and in the lower limbs. The frequency of patients with lupus anticoagulants presenting with abortion was 26 (31.3%), immune thrombocytopenic purpura was 80% (67), valvular heart disease was 5 (6%). 35 (42.1%) patients had secondary LA due to autoimmune diseases like SLE, Sjogerns, APS.

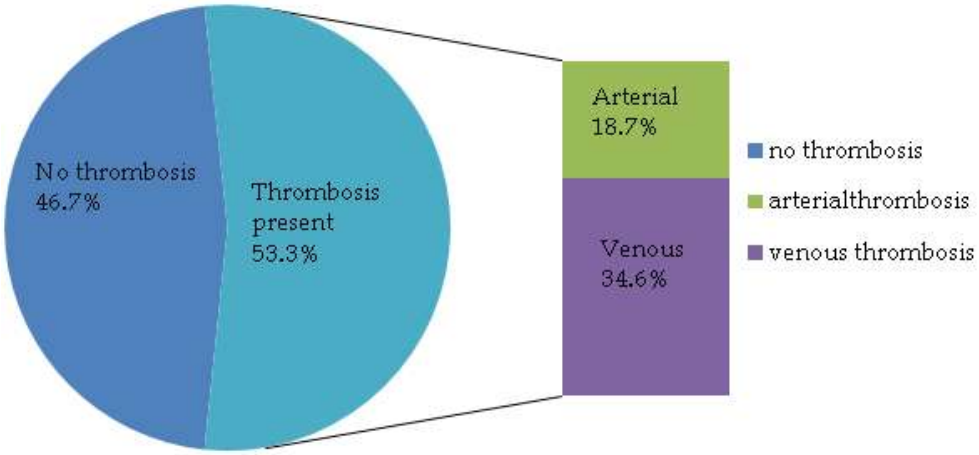

Fig. 1:

Anticardiolipin antibodies were present in 57 patients, more common in women. Thrombosis was seen in 28 (49%) patients, more of venous origin and in the lower limbs. Other clinical manifestations were abortions seen in 8 (9%) patients, immune thrombocytopenic purpura seen in 18 (32.5%) patients, valvular heart diseases seen in 8 (14%) of the patients and autoimmune diseases seen in 31.3% of the patients. Patients positive for both lupus anticoagulant and anticardiolipin antibodies (10) had a higher rate of thrombosis around 60%, more commonly of venous origin and had higher associations with autoimmune diseases (80%). The most commom autoimmune disease presented with thrombosis in patients with Antiphosphlipid antibodies is antiphospholipid syndrome. (LA-30.5%, ACA-32.1%, BothLA, ACA-66.7%) **(Figs. 3–5).**

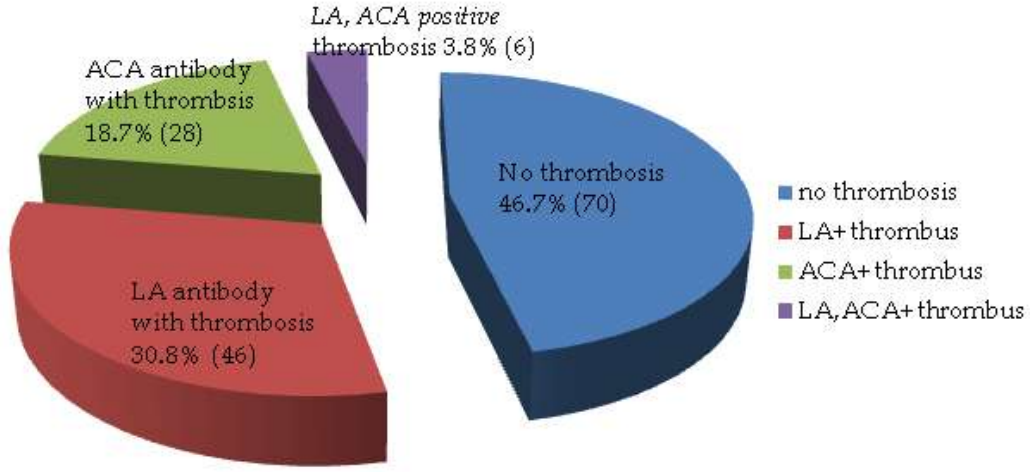

Fig. 2:

Variables		LA antibody +patients		ACA+ patients		Combined	
		n	%	n	%	n	%
Sex	Male	28	33.7	15	42	3	30
	Female	55	66.3	42	73.7	7	70
Thrombosis		46	55.4	28	49.1	6	60
Arterial		15	18.1	11	19.3	2	20
Venous		31	37.3	18	31.6	4	40
Autoimmune		35	42.1	27	47.3	8	80
SLE		14	16.9	14	24.6	2	20
APS		21	25.3	12	21.1	6	0
SJOGERN		0	0.0	1	1.8	0	0
Abortion		26	31.3	8	14	2	20
Valvular		5	6.0	8	14	0	0

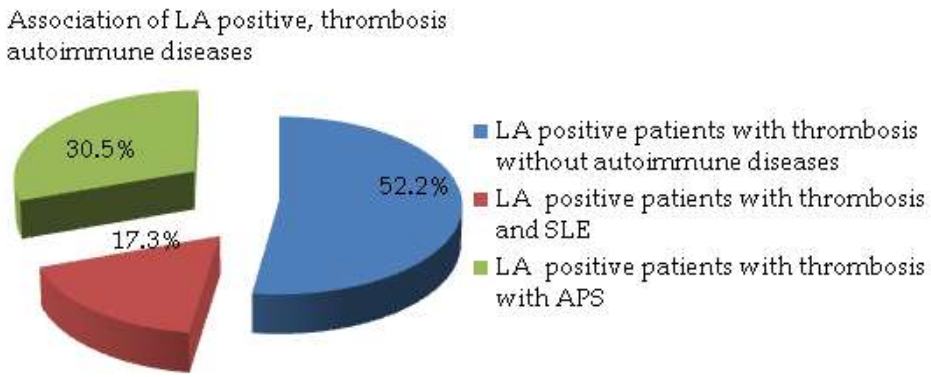

Fig. 3: Association of LA positive, thrombosis autoimmune diseases

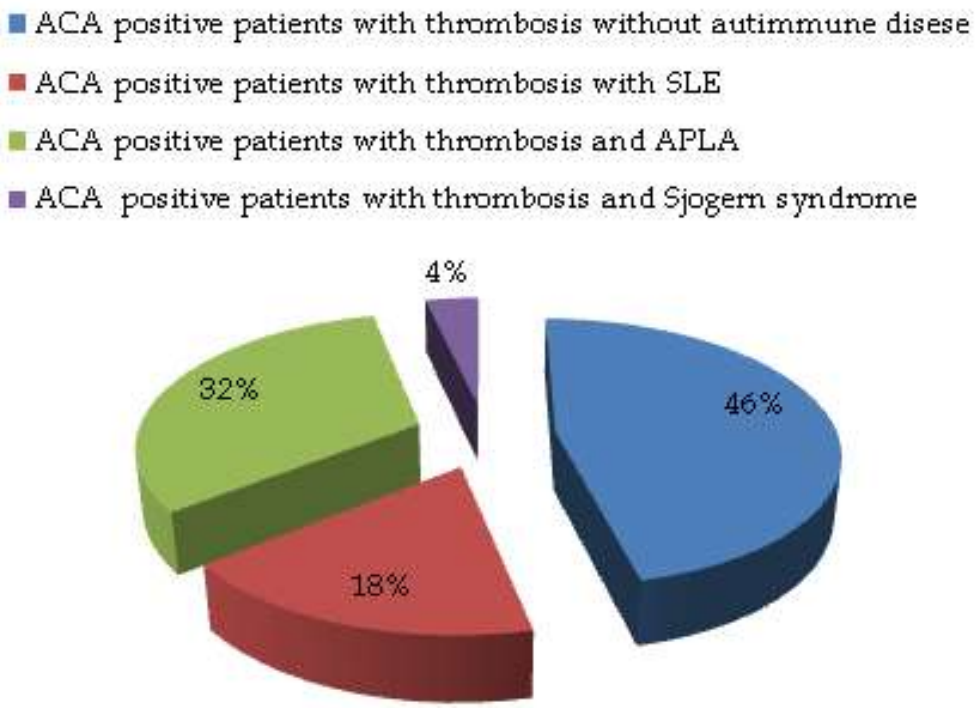

Fig. 4: Association of ACA positive, thrombosis, autoimmune diseases

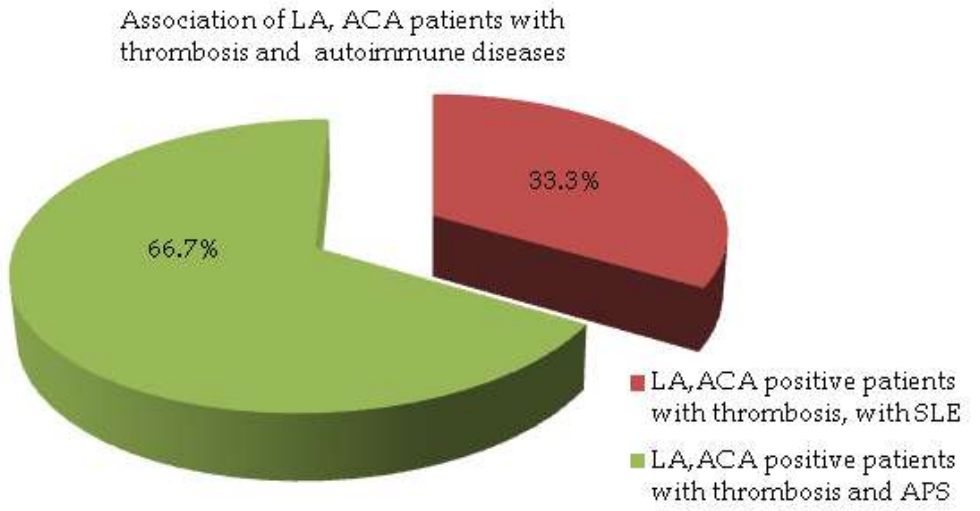

Fig. 5: Association of LA, ACA patients with thrombosis and autoimmune diseases

Discussion and Conclusion

Out of 150 patients with antiphospholipid antibodies, lupus anticoagulant was present in 83 patients, anticardiolipin antibody was present in 57 patients and presence of both was seen 10 patients. The frequency of thrombosis in patients with lupus anticoagulant was 55.4% which is higher than the published literature.[7] Venous thrombosis was more common than arterial and it was seen more commonly in lower limbs just like published articles.[7-11] The abortion rates in patients positive for lupus anticoagulant was higher in our study as compared to study conducted by bhattacharya *et al.*[7]. Other clinical manifestations in patients positive for lupus anticoagulants were immune thrombocytopenic purpura which was seen in 80% (67) of the patients, presence of valvular heart diseases seen in 5% of the patients. The frequency of secondary LA due to autoimmune diseases like SLE, APLA, Sjogerns Syndrome was lower (42%) than the primary LA (57%) in our study.

Anticardiolipin antibodies were present in 57 patients, commonly in women. Thrombosis was seen in 49% of the patients more than the study conducted by Runchey *et al.*[8], more commonly in leg and of venous origin. Other clinical manifestations were abortion (9%), presence of valvular heart disease (15.6%), immune thrombocytic purpura (32.5%) and presence of autoimmune diseases (31.3%) 10 patients had presence of both lupus anticoagulant, anticardiolipin antibodies. Rate of thrombosis seen in these patients was 60% which was higher than patients with only lupus anticoagulant or anticardiolipin antibodies. 8 patients out of 10 had underlying autoimmune disorder, most common being antiphospholipid syndrome.

It is concluded that patients with antiphospholipid antibodies present with various manifestations like thrombosis, immune thrombocytic purpura, abortions, autoimmune diseases, valvular heart diseases. Thrombosis is seen more in patients with both lupus anticoagulants, anticardiolipin antibodies just like other published literature[8], followed by patients with lupus anticoagulants and followed by anticardiolipin antibodies. Abortion rates were seen more in patients with lupus anticoagulant antibodies.[7,12,13] Due to various clinical manifestations pertaining with antiphospholipid antibodies investigating it earlier and treating it can play an vital role.

Conflict of Interest: None

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Original Article

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Medico-legal Evaluation of Burn Deaths in Southern Odisha

Bhakta Narayan Munda[1], Sindhu Sudha Sahu[2], Manoj Kumar Jena[3]

Abstract

Thermal burns and related injuries are a major cause of death and disability affecting the entire world and more so to the developing countries like India. All the cases were analysed to find out different epidemiological factors, precipitating factors, circumstances, manner and cause of such deaths in southern region of the state. Majority of the victims (66.89%) were females and belonged to the *age group of 11–40 years* (77%). Majority of the victims (67.54%) were married, among which 57.36% deaths occurred within *7 years* of marriage. 78.81% victims were from rural area. Maximum (82.11%) incidents took place in indoor between *6 PM* and *9 PM* (25.16%). Most of the cases were due to flame (91.39%) and bursting of kerosene pressure stove (19.21%) which was the most common source of fire. Extremities were involved in 98.57% cases. In 36.42% cases > 90% total body surface area is involved. Most of the victim (65.56%) died within *1 week* when > 50% of TBSA is involved. Septicaemia was the leading cause of death (35.76%). Septicemia (27.15%) and Neurogenic shock (27.8%) were major contributors when > 50% TBSA involved. Maximum numbers of deaths (67.54%) were accidental in nature. > 90% of TBSA is burnt found in 48.18% of suicide cases and in 68.18% of homicide cases. Nearly one-fourth (24.44%) of dowry death cases were due to burns.

Keywords: Thermal burns; Flame; Kerosene; Septicaemia; Accidental; Dowry deaths.

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Introduction

Thermal burns and related injuries are a major cause of death and disability affecting the entire world and more so to the developing countries like India. Annually about *2 million* people suffer from various modes of burn injuries worldwide, of whom more than *1 lakh* die. In India about *60,000 people* suffer from burns annually, more than *50,000* are treated in hospitals and about *10,000* succumb to thermal injury.

Because of its frequent occurrence, burn was classified amongst the fifteen leading causes of death in India in 1998. Although the causative agents vary, burn by dry heat appears to be the most common cause of all burns. Many established factors decide the fate of burn affected patients, but still some hidden factors are there which decide the mortality of the burn victims.

Keeping in view of its importance, the present study has been taken up to know more in detail about the different factors responsible for mortality of the burn patients which in turn will help in reducing the mortality due to burns.

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Materials and Methods

A prospective study was conducted in which 151 cases of burn deaths were taken as study material out of a total 1870 autopsies done in a Medical College and Hospital, in Southern Odisha over a *period of two years*. All the cases were analyzed with respect to the age-sex distribution, religion, marital status, educational status, occupation, time and place of occurrence, geographical distribution, source of the fire, total body surface area involved, survival period, cause of death and manner of death. Information was obtained by perusal of police papers, hospital records, history from the accompanying persons/relatives and autopsy findings; the data so obtained was tabulated, analyzed and compared with findings of other authors.

Results

A total of 151 cases (8.07%) of burns have been reported out of 1870 cases of all types of autopsies during this *period of 2 years*. Female victims (66.89%) outnumbered male victims (33.11%) with a female to male ratio approximately 2:1. **Figure 1** shows almost 77% of the total cases belonged to adolescent and young adult *(11–40 years) age group*. The peak incidence is observed in the *age group 21–30 years* (35.76%). Higher incidence in males was found in *21–30 years age group* (36%). But in females mostly the sufferers were encountered from *11 to 20 years* (38.61%) age group.

Table 1 depicts most of the victims (67.54%) were married and among them 67.32% were females. In married females, 57.36% deaths occurred within *7 years* of marriage. Majority of the victims were

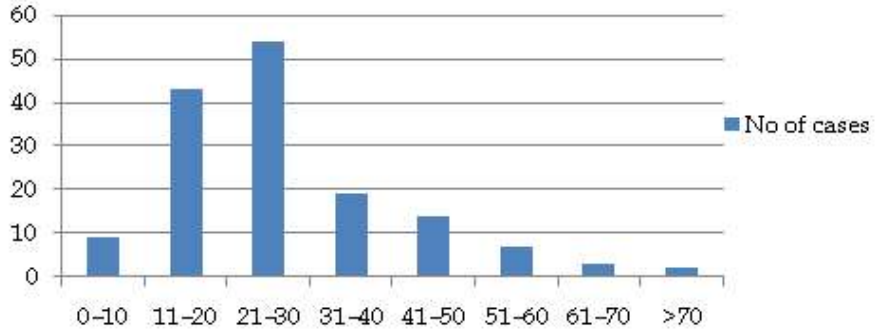

Fig. 1: Age distribution of Burn victims

Table 1: Distribution of Burn cases among married females

Duration of marriage	No of cases	Percentage (%)
< 1 Year	11	16.18%
1–2 Years	7	10.29%
2–3 Years	6	8.83%
3–4 Years	5	7.35%
4–5 Years	3	4.41%
5–6 Years	2	2.95%
6–7 Years	5	7.35%
> 7 Years	29	42.64%
Total	68	100%

Table 2: Geographical distribution

Area	Male	Female	Total
Rural	41	78	119
Urban	9	23	32
Total	50	101	151

$\chi 2 = 0.21$, df = 1, $p = 0.62$

from rural community (78.81%) (**Table 2**). **Fig. 2** reveals maximum (82.11%) incidents took place in indoor. In **Table 3** the highest incidence took place during *6.01 PM–9 PM* (25.16%) followed by 3.01 *PM–6PM* (21.85%), *6.01 AM–9 AM* (15.89%) and least during *9.01 PM–12 Midnight* (1.98%).

Maximum numbers of cases were due to flame burns (91.39%). Only 1.32% cases were scalds. Among flame burns maximum numbers of burn injuries were due to alleged burst of kerosene pressure stove (19.21%), followed by suicidal burn using kerosene (15.23%), clothes caught fire from

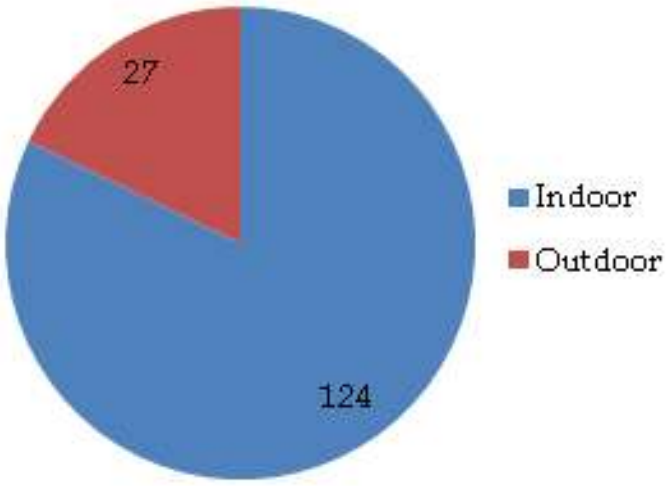

Fig. 2: Place of incidence

Table 3: Time of incidence

Time of incidence	Cases	Percentage (%)
12.01 AM–3 AM	11	7.28
3.01 AM–6 AM	7	6.63
6.01 AM–9 AM	24	15.89
9.01 AM–12 Noon	16	10.59
12.01 PM–3 PM	14	9.28
3.01 PM–6 PM	33	21.85
6.01 PM–9 PM	38	25.16
9.01 PM–12 Midnight	3	1.98
Unknown	5	3.34

Table 4: Sources of Burn

Sources of Burn	Total	Percentage (%)
Flame/dry heat	138	91.39
Kerosene Stove burst	29	19.21
Clothes caught fire from Gas-stove	5	3.31
Clothes caught fire from Kerosene-stove	8	5.29
Clothes caught fire from Open-chullha	17	11.25
Gas leakage	4	2.65
While saving a victim	1	0.66
Fall into Fire	3	1.98
House fire	17	11.25
Accidental Burn from Kerosene lamp, dibiri etc	14	9.27
Clothes caught fire from Religious-candle while worshiping	5	3.31
Suicidal Burn using kerosene	23	15.23
Homicidal Burn using kerosene	12	7.95
Scald from Hot water/Liquid	2	1.32
Lightning	4	2.65
Electricity	7	4.63

open chulha (domestic stove) (11.25%), house fire (11.25%), accidental burns from kerosene lamp (9.27%), homicidal burn using kerosene (7.95%), clothes caught fire from kerosene stove (5.29%) shown in (**Table 4**). In (**Table 5**) majority of the cases (52.32%) wearing synthetic dress at the time of incident.

Most of the victims (74.84%) died within *1 week* of the incidence, among which (50.33%) cases died within *24 hours*. Only 25.16% victims survived for > *1 week*. Most of the victim died within *1 week* when > 50% of TBSA is involved. 13 cases died at the spot where > 90% of TBSA is involved. One case is recorded where < 30% of TBSA is involved and survived for > *2 weeks*. It was observed that in 36.42% cases, more than 90% of the total body surface area (TBSA) is involved. In 93.38% cases, percentage of burn is > 40% TBSA whereas, 10 (6.62%) cases were found with percentage of burn < 40% TBSA (**Table 6**). Major cause of death in burn was septicaemia (35.76%) followed by neurogenic shock (28.47). In majority of shock > 80% of TBSA is involved where as septicaemia is caused when wide range of body surface area involved *i.e*., 30%–100% (**Table 7**).

Maximum numbers of deaths (67.54%) were accidental in nature. In accidental burn there is wide range of involvement of TBSA *i.e*., 31–100%. But it involves > 70% of TBSA in majority of the burn cases of suicide and homicide. Among suicides, > 90% of TBSA is burnt in 13 (48.18%) cases and among homicides it is found in 15 (68.18%) cases (**Table 8**). Commonest sites burnt were the extremities (98.57%) followed by chest (97.85%). Genitals are involved in 42.85% of the cases. Least common sites affected are soles (28.57%) (**Table 9**). Taking dowry death in to consideration, out of the total 45 alleged cases of dowry Deaths, 11 (24.44%) were due to burns and 24 (75.56%) were due to others causes (**Fig. 3**).

Table 5: Nature of wearing apparel

Nature of wearing Apparel	Cases	Percentage (%)
Cotton	59	39.07
Synthetic	79	52.32
Unknown	13	8.61

Table 6: Distribution of survival period according to TBSA involved

Duration of survival	TBSA involved								Total	Percentage (%)
	≤ 30%	31–40%	41–50%	51–60%	61–70%	71–80%	81–90%	91–100%		
Spot death	1	0	1	0	3	0	1	13	19	12.58
< 12 hrs	0	0	1	2	2	2	4	22	33	21.86
12–24 hrs	0	0	4	2	1	2	8	7	24	15.89
2–3 days	0	1	2	4	0	5	2	4	18	11.93
4–7 days	0	1	2	1	4	3	4	4	19	12.58
1–2 weeks	0	2	2	1	3	2	4	5	19	12.58
> 2 weeks	1	4	4	4	4	1	1	0	19	12.58
Total	2	8	16	14	17	15	24	55	151	100

Table 7: TBSA involved and cause of death

Period of survival	TBSA involved								Total
	≤ 30%	31–40%	41–50%	51–60%	61–70%	71–80%	81–90%	91–100%	
Neurogenic shock	0	0	1	2	3	2	4	31	43
Hypovolemic shock	0	2	5	4	1	7	10	11	40
Septicemia	1	6	9	6	11	6	9	9	57
Others	1	0	1	2	2	0	1	4	11
Total	2	8	16	14	17	15	24	55	151
Percentage %	1.32	5.30	10.60	9.27	11.26	9.93	15.90	36.42	100

Table 8: Distribution of manner of death according to TBSA involved

Manner of death	TBSA involved								Total	Percentage (%)
	≤ 30%	31–40%	41–50%	51–60%	61–70%	71–80%	81–90%	91–100%		
Accident	2	8	12	11	12	13	17	27	102	67.54
Suicide	0	0	2	3	3	2	4	13	27	17.89
Homicide	0	0	2	0	2	0	3	15	22	14.57
Total	2	8	16	14	17	15	24	55	151	100

Table 9: Anatomical site involved

Anatomical site	Cases	Percentage (%)
Head and Neck	128	91.43
Chest	137	97.85
Back	130	92.85
Abdomen	120	85.71
Extremities	138	98.57
Genitals	60	42.85
Palms	90	64.28
Soles	40	28.57
Scalp hairs	81	57.85

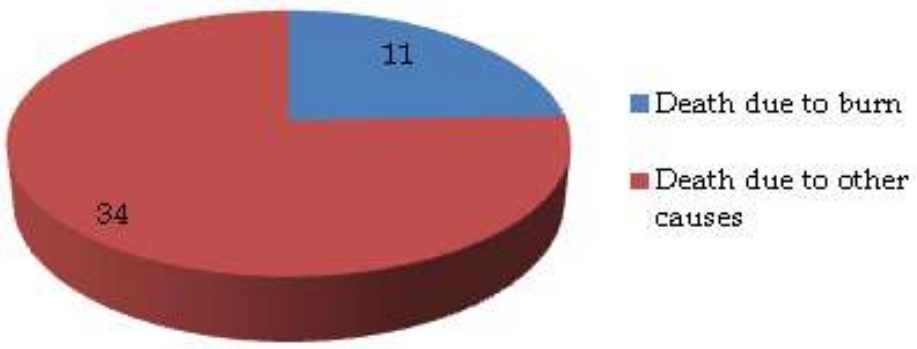

Fig. 3: Dowry death cases

Discussion

Our study revealed that 8.07% of the total medico-legal deaths were due to burn. In contrast, studies conducted in Turkey[7], Imphal[12] revealed a lower percentage of incidences whereas, studies in other parts of India[1,2,4,9,11] reported higher percentage of deaths due to burns.

The female victims (66.89%) outnumbered male victims (33.11%). These findings almost tallies with the studies done in India[1,2,4,8] and in contrast to studies in Turkey[7], Imphal[12] where male outnumbered female. Female preponderance may be due to their involvement in kitchen work and fire sources and traditional clothing pattern in Indian women, illiteracy, poverty, lack of awareness, mental stress, torture by in-laws etc.

The peak incidence is observed in the *age group 21–30 years* involving 35.76% victims, followed by *11–20 years* comprising of 28.47% victims. In females mostly the sufferers were encountered from *11 to 20 years* (38.61%) age group followed by *21 to 30 years age* group accounting 35.64% of the cases. This observation almost tallies with the studies in India[2,9,10,11] Imphal[12], differed from studies in Turkey[7], India[1,3,4,5] attributed to early age of marriage and subjection to dowry torture and dressing style.

It was found that most of the sufferers (67.54%) were married which was almost equal in both sex comprising 67.32% females and 66% males. Among unmarried, males constitute 17 (34%) cases and females constitute 33 (32.68%) cases. Studies in India[1,2,5,7] reported a higher percentage of married victims as compared to our study. The factors attributed to burns among married males could be unemployment, depression and stressful situations. Likewise, the triggering factors for burns in married females could be young age at the time

of marriage combined with inability to cope with the physical and psychological stress of marriage, harassment from in-laws, inadequate precautions during cooking and wearing of the loose clothes like sari.

On analyzing the data further, and concentrating on the duration of marriage of the married females. It was observed that 57.36% deaths occurred within *7 years* of marriage where as 42.64% deaths occurred after *7 years* of marriage out of which 16.18% deaths occurred within *1 year* marriage. This finding almost tallies with a study in India.[8] The reason for such deaths in married females within *3 years* of married-life could be due to nervosness, stress, mal-adjustment, torture, demand of dowry and lack of awareness in kitchen etc.

Incidences of burn death cases were most common in rural areas (78.81%) tallies with studies in India.[2,4,5] The high incidence of thermal burns in the rural areas can be explained by use of kerosene oil lamps for light in the villages, use of substandard kerosene and gas stoves, use of open coal and wood fires for warmth and cooking and lack of safety measures etc.

It was observed that maximum cases (82.11%) had taken place in indoor similar to studies in India.[1,5] Maximum number of burn death cases were found in indoor like kitchen followed by living room in either sex, because female spent most of the time in kitchen, it also serves as a secluded place for suicidal purpose and can be used to escape from homicide allegation.

On analyzing the incidences of burn in different hours of a day, it was observed that highest incidence of burn injury took place during *6.01 PM – 9 PM* (25.16%) followed by *3.01 PM–6 PM* (21.85%). Our study is quite consistent with the study in India.[4] Females were more affected in evening because of poor lighting condition and traditional method of cooking, carelessness in kitchen.

It was found that most burn cases occurred during summer 51 (37.08%). This is quite consistent with the study in India[4], dry and hot atmosphere increasing chances of pressure overload in the pressure stoves which may lead to bursting. There is highest availability of hay, husk, dry leaves and woods etc. during this time.

Majority of the cases were due to flame burns (91.39%), followed by electric burns (4.64%) almost tallies with the studies in India.[11] The high incidence of flame burn is explained by use of oil for lamps in villages, candle for lighting, substandard kerosene and gas stoves, use of open coal and wood fires.

Maximum numbers of burn injuries were due to alleged burst of kerosene pressure stove (19.21%), followed by suicidal burn using kerosene (15.23%), clothes caught fire from open chullha (11.25%), house fire (11.25%), accidental burn from kerosene lamp, dibiri etc. (9.27%), homicidal burn using kerosene 12 (7.95%), clothes caught fire from kerosene stove 8 (5.29%). Thus kerosene was the main offending agent in majority of the cases. The above finding almost tallies with studies in India.[1,3,5]

We observed that majority of the victims (52.32%) wearing synthetic clothes whereas (39.07%) victims with cotton dress. On sex wise analysis, it revealed that majority of the females 67 (66.33%) wearing synthetic dress which is at par with studies in India.[6,10] Synthetic clothes catch fire easily, flare upward and stick to the body surface resulting in difficulty for the victim to save oneself from the burn injury.

On analysing the duration of survival of the burn victims after the incidence, it is observed that most of the victims (74.84%) died within *1 week* of the incidence, among which 50.33% cases died within *24 hours* and (25.16%) cases survived > *1 week*. Studies in India[9,11] found quite similar result as of our study. However, our findings did not tally with the studies in India.[4,8]

On further analysis we tried to find the relation between total body surface areas burnt and burn deaths. Majority of cases (36.42%) had > 90% TBSA involved; followed by 16.43% death when 81–90% TBSA is involved. In 82.85% cases, percentage of burn is > 50% TBSA. In 17.25% cases were found with percentage of burn < 50% TBSA. The above findings are quite similar with the studies in India.[9,11] From the above findings, it is clear that most of the fatality occurred when > 50% of TBSA is involved.

It was observed that maximum number of victims (35.76%) died as a result of septicemia followed by neurogenic shock (28.47%) and hypovolemic shock (26.49%). Our finding almost tallies with the studies in India.[5] Septicaemia as the most important factor for the cause of death appears when the period of survival is more than *5 days*. This is because most of the victims who survived the initial *24 hours* after burns, succumb to infection of the burnt area and its complications. Burns cause devitalisation of tissue leaving extensive raw areas, which usually remain moist due to the outflow of serous exudates. The exposed moist area along with the dead and devitalized tissue provides the optimum environment favoring colonisation and proliferation of numerous micro-organisms,

which is further enhanced by the depression of the immune response.

Our study revealed that maximum numbers of deaths (67.54%) were accidental, (17.89%) deaths were suicidal and (14.57%) deaths were homicidal in nature. > 90% of TBSA of burn was found in 48.18% suicide and 68.18% of homicide cases. The above findings almost tallies with the studies in India.[1,3,11] Turkey[7] detected a quite higher percentage of accidental burn deaths as compared to our study. However, a study in India[2] reported 47.8% were suicidal burns which is quite high in comparison to our study. Highly selective factors, such as socio-economic conditions, domestic quarrels, disturbed domestic life, chronic disease, mental disorder, disappointment in love or failure in examination etc. may determine the number of suicide cases.

Our study revealed that common sites of involvement are the extremities (98.57%) followed by chest (97.85%), back (92.85%), head and neck (91.43%), and abdomen (85.71%). Genitals are involved in 42.85% of the cases. Least common site affected is soles (28.57%). The above finding almost tallies with the study in India.[10] In our study extremities and trunk (chest and abdomen) are frequently involved because fire was lighted from below in most cases as source of fire is in lower level *i.e.*, at the level of floor. This study also shows that fatality is more when trunk is involved more than extremities. This is because more loss of fluid and electrolytes from the body.

Conclusion

The distribution, causes of burns and the different factors responsible for mortality of the burn patients are more or less similar to the pattern found in other Indian studies, even similarity in all the parameters used in this study.

In our study we observed that most of the victims were married females of younger age group, educated up to primary level, from rural back ground and belonging to lower socio-economic strata. Domestic fire was the most common cause and cooking was the common activity when incident took place. Kerosene was found to be the most common offending agent and stove burst, being the main cause. Synthetic clothes/sarees are the important cofactors having a preponderance of accidental manner followed by suicidal. Most of the cases were accidental in nature followed by suicidal. Majority of the victims died due to septicemia within 1 week of hospitalization with burns involving more than 50% of the total body surface area.

The factors like female gender, younger age group, cheap kerosene cooking stoves, loose fitting synthetic garments, wearing dress material and most importantly the percentage of burn are the prime factors which are mainly responsible for mortality in the burn victims. Development of burn wound infections indicating the decrease of natural defences responsible for counteracting them is another major factor influencing the mortality of patients. Dowry death still prevalent in our society shows the social angle and apathy towards society.

As this problem of thermal deaths persists in our country, active awareness and sensitisation mandatory not only by the government but also by different non-government organization to come together with SOP to minimise burn mortality and also to prevent and reduce the incidence.

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Original Article

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Odontometric Approach for Stature Estimation in South Indian Population: A Cross Sectional Analysis

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Abstract

Background: Forensic Odontology is the study of teeth, in the interest of justice, which deals with proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings. At times, skull or facial remains only are brought for examination as well as identification in medico legal practice. *Aims and Objectives:* To establish the relationship of the stature of person with odontometric parameters like Inter Canine width and Inter Premolar width of maxillary arch as well to obtain a linear regression formula for stature estimation. *Study Design:* Cross Sectional Study. *Place of Study:* Study was conducted in the department of Forensic Medicine, Government Medical College Mahbubnagar State Telangana. *Materials and Methods:* The present study consists of a cross-sectional sample of 192 subjects (96 males and 96 females) aged from 19 to 26 years. Stature was measured using the stadio-meter, Maxillary Intercanine distance was measured as horizontal distance between the cusps tips of maxillary right canine to the cusp tip of left canine. Maxillary Interpremolar distance was measured as the horizontal distance between the buccal cusp tips of maxillary first premolar from right side to maxillary first premolar from left side. *Observation and Discussion:* Regression equation of Male stature on IC Length Stature = 100.758 + 1.8286* IC Length, Regression equation of Male stature on IP Length. Stature = 128.2966 + 1.0063* IP Length, Stature is dependent on IC Length & IP Length. Stature = 85.088 + 1.6186* IC Length +0.5702* IP Length the Regression equation of Male stature on IC length and IP length is significant with p value of 0.000088. Regression equation of Female stature on IC Length, Stature = 37.4967 + 3.3692* IC Length, Regression equation of Female stature on IP Length. Stature = 99.5668 + 1.4598* IP Length, Regression equation of Female stature on IC Length and IP Length, Stature = 29.5967 + 3.1706* IC Length + 0.3847* IP Length. *Conclusion:* It can be concluded that Intercanine and Interpremolar distance has a positive correlation and can be used successfully to estimate stature of the individual.

Keywords: Forensic Odontology; Stature estimation; Regression equation.

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Introduction

"Forensic Odontology" is the study of teeth, in the interest of justice, which deals with proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings.[1] Anthropometry is a specialized branch which comprises a series of systematized measuring techniques that expresses quantitatively the dimensions of the human body which also includes skeleton remains. It is common, that mutilated bodies, dismembered body parts or just fragmentary remains are presented for medico legal examination. At times, skull or facial remains only are brought for examination as well as identification in medico legal practice. There are multiple scenarios like fire disaster, wild animals attack in deep forest, road traffic accidents, aircraft crash and terrorist attack where the question about identification is a major objective. In such scenario usual techniques of identification such as fingerprints, facial recognition methods do not give positive results or even it may be of no use, in such scenario help of Forensic Odontologist who makes a post-mortem record helps in identity of

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the victim, also such data can help to determine age, stature, ancestry, sex and socioeconomic class of the individual in question. Somatometry, cephalometry, craniometry, osteometry, and odontometry are the various specialized tools that is being used in anthropometry and such tools had proved to be valid in the identification of human remains. It is also seen that anthropometric difference had a great diversity and varies between races and has been influenced by national social and economic conditions.[2] Many researchers had done studies on various bones of the human skeleton for the determination of stature.[3] It is very much evident that accurate biological correlation of stature is linked with some body parts which include extremities, head, trunk, vertebral column.[4] Long bones have been used for estimation of stature with certain accuracy by forensic anthropologists in various situations, where the other evidence is incomplete and fragmented.[5] In Archeological excavation, forensic investigation for mutilated body or the skeletal remains, all the bones of the individual is not retrieved or found, commonly long bones, head will be available for identification as well to determine stature based on the principle of positive correlation between various long bones and stature.[6–9] Human teeths are extremely durable and withstand at high temperatures and may help in identification even when the rest of the body has undergone late decomposition stage. Hence, they are considered to be an invaluable tool in forensic medico legal investigation. Out of all the teeth in the human dentition, it is the canines which are least frequently extracted teeth, may be due to relatively decreased caries and periodontal diseases as well canines are reported to withstand extreme condition, recovered human remains in air disasters and hurricanes.[10–11] There is a paucity of literature which supports stature estimation from odonotological parameters on south Indian population. Hence, in this present study was conducted to establish the relationship of the stature of person with odontometric parameters like Inter Canine width and Inter Premolar width of maxillary arch as well to obtain a linear regression formula for stature estimation based on each correlating odontometric parameter, as well to check the reliability of the derived regression equation on the same population.

Materials and Methods

Place of study

Study was conducted in the department of Forensic Medicine, Government Medical College Mahbubnagar State Telangana.

Study design

Cross Sectional Study.

Procedure

The present study consists of a cross-sectional sample of 192 subjects (96 males and 96 females) aged from *19 to 26 years*. Subjects were selected irrespective of their caste, religion, dietary habits and socioeconomic status. Sufficient permissions and informed consents were procured before the measurements of the subjects are taken and clearance from the Institutional Ethical Committee is obtained in advance.

Stature

Stature was measured using the stadio-meter; the subject was made to stand barefoot in the standard standing position on its baseboard. Both feet are in close contact with each other and head oriented in Frankfurt's plane. The height was then recorded in centimeter from the standing surface to the vertex in the weight bearing position of foot.

Maxillary Intercanine width (IC)

Maxillary Intercanine distance was measured as horizontal distance between the cusps tips of maxillary right canine to the cusp tip of left canine.

Maxillary Interpremolar width (IP)

Maxillary Interpremolar distance was measured as the horizontal distance between the buccal cusp tips of maxillary first premolar from right side to maxillary first premolar from left side. Both the parameters were recorded with the help of a Digital Vernier Caliper accurate up to 0.01 mm (Insize Digital Caliper, China). Vernier Caliper was disinfected with antiseptic solution (Microsteril) after recording of each patient. The pointed tines of Vernier Caliper allowed accessing the inter proximal areas of teeth. The distance between the tines was read off from the display and then recorded. The measurement of height and Intercanine and Interpremolar breadth was carried out at a particular period of time 10 am to 1 pm to avoid diurnal variations.

Inclusion criteria

Age of the volunteers between *19–26 years*, a complete set of fully erupted, periodontally healthy, noncarious, intact, satisfactorily aligned maxillary teeth subjects were included in the study.

Exclusion criteria

Subjects with History or clinical evidence of cleft palate, crown restoration, orthodontic treatment, trauma, or oral destructive habit, History or clinical features suggestive of endocrinal disorders, metabolic disorders, developmental disorders, or history of prolonged illness were excluded. Also Subject morphologically showing the congenital malformations, Dwarfism/Achondroplasia, features of nutritional deficiencies and injuries to extremities were not included in the present study. Subjects from other regions, NRI, those with deformities of vertebral column & limbs, and history of trauma were excluded from the study.

Data Analysis

Data arrange in tabular form after arranging data was represented graphically. Relationship between stature and CI is presented through scatter diagram. In this study samples were drawn randomly by using simple random sampling technique. Total sample size in this study is 192 which are calculated by sample size determinant formula which is, where a critical value of normal distribution p is is a sample proportion and ϵ is a margin of error. In Digital Vernier Caliper, Length = Reading of the main scale + Vernier coincidence x Vernier constant + mechanical error. (Here Vernier constant = 0.01 and mechanical error = 0) Calculation of stature using regression equation: Stature = value of constant + regression coefficient x Intercanine and Interpremolar breadth. Value of the constant and regression co-efficient was calculated using SPSS Version 19 program. Descriptive statistics like mean, *sd min*, *max*, *CI* etc. was done for all characteristics of variables. To analyze the data we used Pearson correlation to measure the relationship between statures with IC and IP. To predict the stature on the basis of IC and IP we used linear regression and multiple regression equations.

Results

Regression equation of Male Stature on different

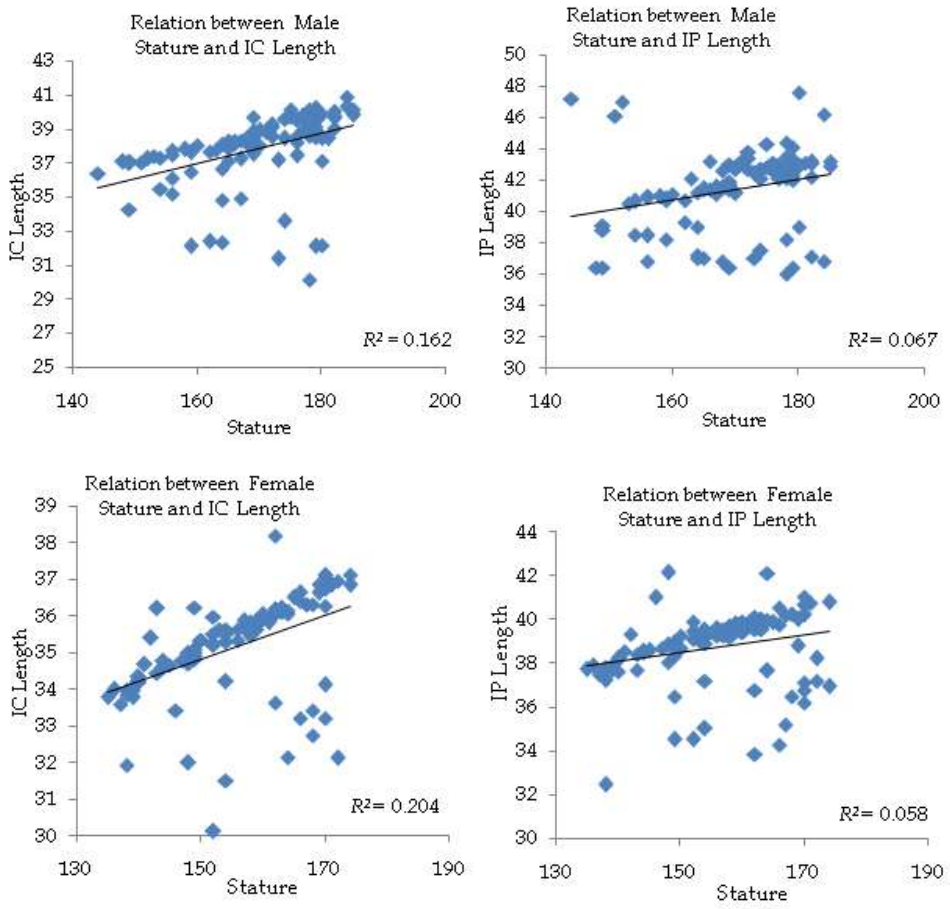

Fig. 1: Scatter diagram and regression line showing the relationship between stature and Intercanine[IC], Interpremolar [IP] distance in Males and Females.

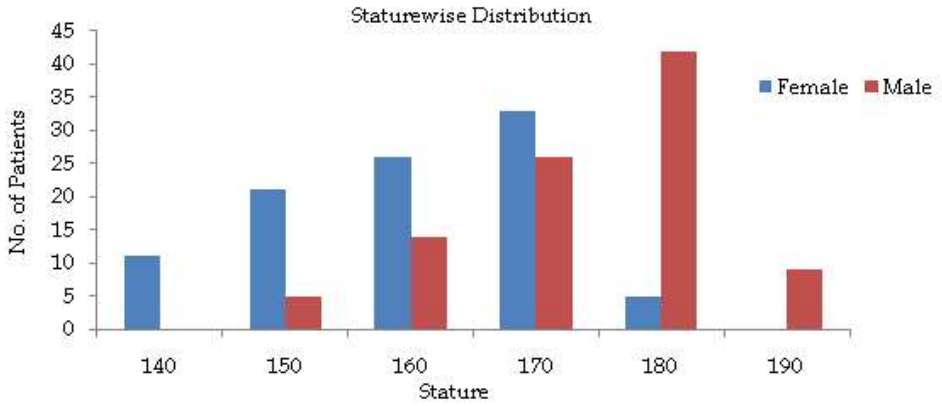

Fig 2: Stature wise distribution.

Table No 1: Gender wise various parameters.

Characteristics		Male	Female	Combine (M + F)
Age	Min	19	19	19
	Max	26	26	26
Stature	Min	144	135	134
	Max	185	174	185
IC	Min	30.15	30.1	30.1
	Max	40.86	38.2	40.86
IP	Min	36	32.45	32.45
	Max	47.6	42.15	47.6

Table 2: Gender wise comparison of parameters.

Variables	Mean		Standard Deviation		Confidence Interval		P-Value
	Male	Female	Male	Female	Male	Female	
Age	22	22.5	2.4	2.29	22 ± 0.5	22.5 ± 0.46	0.7856
Stature	169.98	156.07	9.96	10.46	169.98 ± 1.99	156.07 ± 2.09	0.0032
IC	37.86	35.19	2.1952	1.4042	37.86 ± 0.44	35.19 ± 0.28	0.00324
IP	41.42	38.71	2.5662	1.7326	41.42 ± 0.51	38.71 ± 0.35	0.00185

Table 3: Correlation between Intercanine and Interpremolar distance with stature.

Variables		Stature	P Value
IC	Male	0.4030	0.0000234
	Female	0.4524	0.0000019
IP	Male	0.2593	0.0054
	Female	0.2419	0.0088

Table 4: Regression equation Intercanine and Interpremolar distance with stature.

Variable		Regression equation	P – Value	Significance
IC Length	Male	Stature = 100.758 + 1.8286 * IC Length	0.000047	All are significants
	Female	Stature = 37.4967 + 3.3692 * IC Length	0.0000037	
IP Length	Male	Stature = 128.2966 + 1.0063 * IP Length	0.01074	
	Female	Stature = 99.56680 + 1.4598 * IP Length	0.01759	
IC + IP Length	Male	Stature = 85.088 + 1.6186 * IC + 0.5702 * IP Length	0.000088	
	Female	Stature = 29.5967 + 3.1706 * IC + 0.3847 * IP Length	0.0000492	

parameter, hence Regression equation of Male stature on IC Length Stature = 100.758 + 1.8286* IC Length. The Regression equation of Male stature on IC length is significant with *p* value of 0.000047. Regression equation of Male stature on IP Length. Stature = 128.2966 + 1.0063* IP Length. The regression equation of male stature on IP length is significant with *p* value of 0.01074. Also Stature is dependent on IC Length and IP Length. Stature = 85.088 + 1.6186* IC Length + 0.5702* IP Length the Regression equation of Male stature on IC length & IP length is significant with *p* value of 0.000088.

Similarly for Female Stature, Regression equation of Female stature on different parameters. Regression equation of Female stature on IC Length, Stature = 37.4967 + 3.3692* IC Length. The regression equation of Female stature on IC length is significant with *p* value of 0.0000037. Regression equation of Female stature on IP Length. Stature = 99.5668 + 1.4598* IP Length. The regression equation of Female stature on IP length is significant with *p* value of 0.01759. Also Regression equation of Female stature on IC Length and IP Length, Stature = 29.5967 + 3.1706* IC Length + 0.3847 * IP Length. The Regression equation of Female stature on IC length and IP length is significant with p value of 0.00004919.

Discussion

In skeletal remains, mutilated dismembered bodies the outmost importance is of determination of the individuality especially in Medico legal cases, as well sex, age and ancestry, stature of is a biological parameter and such parameters have a specific characteristics to the individual in his biological profile. Analysis of such specific parameters definitely accelerates the human remains analysis and surely it will narrow the pool of victims to match and will provide a definite markers for the final confirmation.[12]

Preliminary investigation in unknown human remains is stature estimation for the purpose to establish Identification of that individual. However, various methods are being used to establish the identity of unknown human remains, but a specific drawback to such techniques is that it had a limited applicability to fragmentary remains.[13]

Various researchers from all over the world had used different bones of human skeleton like femur to metacarpals to estimate the stature.[14] There may be scenario where unavailability of these bones recording of other body parts can be useful to determine body stature. Various odontometric dimensions are also genetically determined as other bones of the body.[15] Such measurements are unique for each race and geographical area due to environmental variations.[16]

Research related to stature estimation from odontometric parameters are circumscribed in Indian population as well. However, the present research aim to provide the valuable data pertaining to correlation to stature with odontometric dimensions in south Indian population.

In a study performed by Prabhu *et al.*[17] in year 2013 on 95 adult individual used buccolingual and mesiodistal measurement of all teeth, excluding third molars estimated stature. He suggested that the dentition may be used as a supplement to more valid predicator of statures as he observed a moderately significant correlation between two.

However, there was no correlation between tooth width and stature was recorded by Filipson and Goldson[18] in early 1963 in Swedish population, smaller sample size or difference in ethnicity may be the reason to show such low correlation.

In a research conducted by Yadav *et al.* he concluded that regression equations generated from various odontometric parameters shall be used as a supplementary approach for the stature estimation in scenario where extremities are not available but with caution as these studies are population specific and shall not be used on other population of the world. It was concluded by him that canine width can aid in stature estimation as an adjunct when only teeth are available for identification, however he also suggested that it needs a further investigations with larger sample by considering ethnic and community background.[19]

In a study conducted by Hossain *et al.* some degree of positive correlations between stature and tooth crown dimensions like crown height, mesiodistal width, buccolingual width. In forensic situations, using this relationship as a tool shall not give accuracy in stature estimation. Tooth crown dimensions shall be used as a supplementary method for stature estimation in unknown human bodies in forensic identification together with other reliable body remains.[20] It was Kalia *et al.* in 2008 combined width of six maxillary anterior teeth for stature estimation with small statistically significant correlation.[21]

Conclusion

In forensic investigation human skeletal remains provides the vital clues to human identification, teeth and related odontometric feature also serves as a marker which has the capacity to narrow down the search for missing person in forensic investigation. It is a fact that common odontometric parameters have not been much evaluated as forensic tools in estimation of stature.

The present study was carried out to investigate the possibility of estimation of stature of a person from Intercanine and Interpremolar distance by application of regression analysis. It can be concluded that Intercanine and Interpremolar distance has a positive correlation and can be used successfully to estimate stature of the individual. Despite this positive correlation we propose that this is not an exhaustive study, it is an attempt to provide a statistically valid technique. It is advisable that the results may be viewed more as indicative of the feasibility of the technique as in providing regression equations applicable in forensic investigation.

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Ethical Clearance: The articles do not violate any ethical, moral or legal guidelines pertaining to original scientific work.

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Histomorphological Study of Skin Adnexal Tumors and Review

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Abstract

Introduction/Context: Neoplasms of skin appendages are infrequently encountered in practice. Histopathology is the gold standard investigation for the final diagnosis. *Aim of the Study:* Approach to the diagnosis of skin adnexal tumors on the basis of histomorphological patterns and cell morphology. *Materials and Methods:* The present study is a retrospective study done in the department of pathology. All cases are collected from 2004–2018, total of 14 years retrospective study. *Inclusion Criteria:* All skin biopsy diagnosed as skin adnexal tumors. *Exclusion Criteria:* Inflammatory condition, inadequate biopsy, Cyst and tumor like lesions. *Results:* Total 90 cases of skin adnexal tumors were included in the present study. Out of 90 cases, 42 (47%) are male patients and 48 (53%) are female. According to histomorphological pattern, 78% have solid patterns, 17% have solid and cystic, and rest are cystic. As per cell morphology, basaloid cells forms predominant in skin adnexal tumors with 50% of cases. *Discussion:* In the present study, a new concept of histomorphological pattern is included, which is rarely studied. The histomorphological pattern is classified into solid, solid and cystic and predominant cystic pattern. Solid pattern constitutes 78% of adnexal tumors. It is predominantly seen in eccrine gland tumors like Eccrine spiradenoma, Eccrine hidradenoma. Cystic pattern is seen in 5% of adnexal tumors. It is seen in pilar tumors like pilomatrixom a,trichoepithelioma. Solid and cystic pattern is seen in 17% of adnexal tumors. It is seen in both eccrine, apocrine and pilar tumors. *Conclusion:* Hence, combining the histomorphological pattern and cellular morphology helps pathologist to diagnose with ease.

Keywords: Adnexal tumors; Basaloid; Clear cells; Solid pattern.

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Introduction

Neoplasms of skin appendages are infrequently encountered in practice. These are the rare tumors with less frequent excision. Histopathology is the gold standard investigation for final diagnosis. Skin adnexal tumors can differentiate in the direction of any of the four types of skin appendages *i.e.,* eccrine sweat glands, apocrine glands, sebaceous glands and hair follicles. Most of skin adnexal tumors are benign with rare malignant counter part. Simpler approach for the diagnosis of skin adnexal tumors is done in this study by using cellular pattern and morphology.[1,2]

Aim of the Study

Approach to the diagnosis of skin adnexal tumors on the basis of histomorphological patterns and cell morphology.

Materials and Methods

The present study is a retrospective study done in the department of pathology, Shri B M Patil Medical

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College, Hospital and Research Center, Deemed to be University, Vijayapur. All cases are collected from 2004–2018, total of *14 year* retrospective study.

Inclusion Criteria

All skin biopsy diagnosed as skin adnexal tumors.

Exclusion Criteria

Inflammatory condition, inadequate biopsy, Cyst and tumor like lesions. Statistical analysis is done.

Results

Total of 90 cases of skin adnexal tumors were included in the present study. This study includes the cases from *Oct 2004 to Oct 2018*, totally *14 year* duration. All cases belong to the department of pathology, BLDE University.

Gender Distribution

Out of 90 cases, 42 (47%) are male patients and 48 (53%) are female, (Shown as in **Fig. 1.** and also in **Tables 1–3**).

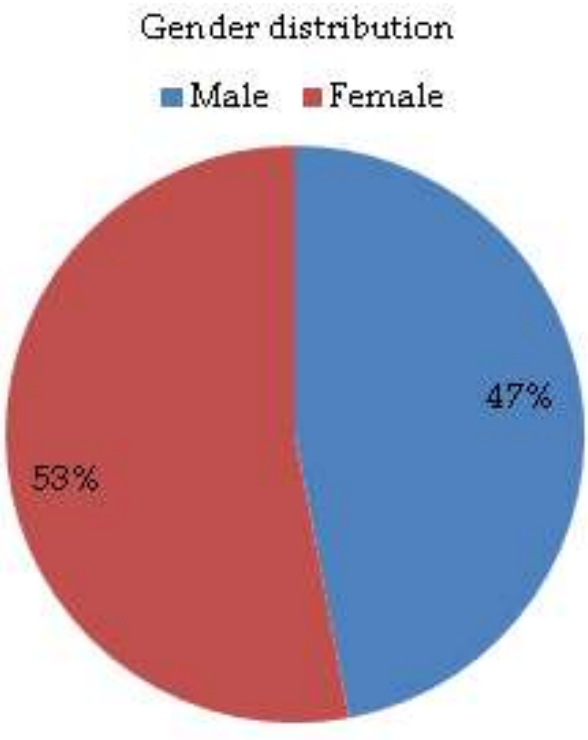

Fig. 1: Bar diagram representing the gender wise distribution of skin adnexal tumors

Table 1: Table depicting the distribution of skin adnexal tumors according to histomorphological pattern

Gross findings	Number of cases	% of cases
Solid	70	78%
Solid and cystic	15	17%
Cystic	05	05%
Total	90	100%

Table 2: Table depicting the distribution of skin adnexal tumors according to cellular morphology

Microscopic pattern	Number of cases	% of cases
Basaloid pattern	45	50%
Clear cell pattern	02	2.2%
Squamoid pattern	09	10%
Basaloid and clear cell pattern	30	33.3%
Basaloid and squamoid pattern	02	2.2%
Squamoid and clear cell pattern	02	2.2%
Total cases	90	100%

Adnexal tumors with solid pattern

Differential diagnosis are Eccrine glands (Eccrine spiradenoma, Eccrine hidradenoma, Eccrine poroma, Eccrine carcinoma, Eccrine acrospiroma), PIlar origin (pilomatrixoma, trichoepithelioma, Trichilemmoma), etc.

Adnexal tumors with cystic pattern

Differential diagnosis are trichoepithelioma, pilomatrixoma

Adnexal tumors with solid and cystic tumors

Differential diagnosis are eccrine tumors and trichilemmal tumors.

Table 3: Table depicting the distribution of skin adnexal tumors according to histomorphological pattern and cellular morphology

	Solid	Solid and cystic	Cystic
Basaloid	Eccrine gland tumor Pilar tumors Sebaceous gland tumor	Eccrine gland tumor Pilar tumors	Pilomatrixoma tricoepithelioma
Squamoid	Eccrine gland tumor	Trichilemmal tumor Eccrine gland tumor	Nil
Clear cell	Eccrine gland tumor	Nil	Nil
Basaloid and squamoid	Sebaceous adenoma	Nil	Nil

Basaloid and clear	Eccrine gland tumor Pilar tumors	Sebaceous gland tumor Eccrine gland tumor	Nil
Squamoid and clear cell	Eccrine gland tumor	Nil	Nil

Discussion

Adnexal tumors are rare tumors, predominantly benign and most often of chronic duration. Salient features of adnexal tumors are described below:

Tumors of hair follicle (pilar) origin[1,2,3]

Trichofolliculoma: It arises from abortive differentiation of cutaneous pluripotent stem cells towards hair follicles. Histologically, it consists of keratin filled unilocular or multilocular cyst lined by infundibular squamous epithelium with prominent granular layer. It gives a "caput medusa" appearance due to radially branching of secondary and tertiary hair follicles from central cavity.

Trichoepithelioma: Aka epithelioma adenoids cysticum. It is most commonly seen in hair bearing regions of head and neck in adults. It can be associated with multiple familial trichoepithelioma. Histologically, it consists predominantly of uniform basaloid cells in nests with peripheral palisading. Stroma is fibrotic. Keratin filled horn cysts are seen frequently.

Trichoadenoma: It is a rare tumor of skin with epithelial islands and keratin filled cystic spaces in a fibrotic stroma.

Trichilemmoma: It arises from outer root sheath of hair follicle, mainly of the bulb region. It is most commonly seen over face of elder patients.

Histologically: Epidermis is hyperplastic with verruca vulgaris like changes. Dermis consists of lobules of PAS positive cells arranged in lobules. Basement membrane is thickened with peripheral palisading of basophilic cells.

Fibrofolliculoma: It is most commonly seen over face and neck. Histologically, it is composed of hair follicle surrounded by thick mantle of basophilic mucoid stroma.

Trichodiscoma: It is tumor arising from retropilar hair disk. Histologically, it consists of loosely aggregates of collagenous and elastic fibers in hyaluronidase sensitive mucinous matrix.

Pilar sheath acanthoma: It is usually seen on the skin of upper lip. It presents as skin color nodule with central pore. Histologically, cystic cavity with multiple lobulated masses of tumor cells radiating from the wall into the dermis.

Pilomatrixoma: It is most commonly seen in children and adolescents. The most common site is head and neck. Histologically, it consists of basaloid cells lining the cystic cavity filled with eosinophilic anucleated shadow/ghost cells with keratin.

Trichoblastoma: It is a rare tumors of hair germ that are purely epithelial. Histologically it consists of nests and cords of solid basaloid germinative epithelial cells that show pallisading. Follicular papillae are characteristically present.

Trichilemmal Carcinoma: It presents as pale tan or reddish papule seen over sun exposed hair bearing areas. Histologically, it consists of solid, lobular, trabecular pattern surrounded by PAS positive membrane. Few dyskeratotic cells with plenty of mitotic figures.

Tumors of sebaceous glands[1,2,3]

Sebaceous adenoma: It is the most common benign skin adnexal lesions seen more commonly in middle age to elderly individuals. It is most commonly seen over forehead and cheeks. Histologically, lobules of mature sebaceous cells with covering of one to two layers of basaloid cells are seen.

Sebaceoma: Aka sebaceous epithelioma, histologically, it consists of basaloid epithelial cells of varying sized lobules.

Sebaceous carcinoma: It is most commonly seen over eyelids. It is also associated with Muir Torre syndrome. Histologically, it has infiltrative growth pattern composed of pleomorphic basaloid cells arranged in sheets. Atypical mitosis are seen.

Steatocystoma multiplex: It is seen more commonly over presternal area, neck and axilla. Histologically, cyst lies in the dermis, lined by squamous epithelium with corrugated eosinophilic cuticle surface. Presence of sebaceous glands is characteristically seen in the cyst wall.

Tumors of eccrine differentiation[1,2,3]

Eccrine hidrocystoma: It is most commonly seen over face as skin color bluish lesion. Histologically, cyst is lined by single layer of cuboidal cells.

Eccrine poroma: It is most commonly seen on palms and sole. Histologically, it form tumor masses extending from lower portion of epidermis. It consists of keratinocytes with well defined cell membranes. Marked acanthosis and lack of pseudohorn cysts are characteristics of poromas.

Spiradenoma: It presents as tender nodules over trunk. Histologically, it consists of lobules of two types of cells: Small darker cells and Larger paler cells. These cells arranged around PAS positive material containing lumina.

Porocarcinomas: It is usually found on lower extremities. Histologically, it is characterized by nodular growth pattern with infiltrative borders. Tumor cells shows basaloid features with high N:C ratio and prominent nucleoli.

Syringoma: It is benign adnexal tumor most commonly seen over cheek. Histologically, it is composed of small ducts embedded in a sclerotic stroma. The ducts are lined by 2 rows of cuboidal to flattened epithelium with lumen containing PAS positive amorphous material.

Eccrine acrospiroma: It is a benign tumor composed of small monomorphous polyhedral cells arranged in nests and nodules in upper dermis. Margin is pushy. Clear cell change may be prominent.

***Tumors of apocrine differentiation*[1,2,3]**

Syringocystadenoma papilliferum: Most of the cases are first noted at birth, usually presents as papule. Histologically, the epidermis is acanthotic, papillomatous with cystic invagination into the dermis. Papillary projections are lined by 2 layers of epithelial cells, columnar luminal cells and cuboidal outer layer. Malformed sebaceous glands and hair structures may be present.

Cylindroma: Slow growing rubbery lesion over scalp, head and neck region. Histologically, it is a dermal tumor without attachment to epidermis. It is composed of oval to polygonal cells arranged in an interlocking jigsaw like pattern. There are two types of cells, small basophilic and large pale stained. Occasionally, it can undergo malignant transformation.

Hidradenoma papilliferum: It usually occurs in vulva and perianal region. Histologically, these are partly solid and cystic tumors containing papillary and glandular areas. These are lined by two type of epithelium: Tall columnar cells and myoepithelial cells. Rare malignant transformation are seen.

Skin adnexal tumors are relatively rare entity. In the present study, total 90 cases have been included. Out of 90 cases, 42 cases (47%) are seen in males and 48 cases (53%) seen in females. The study conducted by yakoob *et al*.[4] also shows similar findings of gender distribution.

In the present study, a new concept of histomorphological pattern is included, which is rarely studied. The histomorphological pattern is classified into solid, solid and cystic and predominant cystic pattern.

Solid pattern constitutes 78% of adnexal tumors. It is predominantly seen in eccrine gland tumors like Eccrine spiradenoma, Eccrine hidradenoma. Cystic pattern is seen in 5% of adnexal tumors. It is seen in pilar tumors like pilomatrixoma, trichoepithelioma. Solid and cystic pattern is seen in 17% of adnexal tumors. It is seen in both eccrine, apocrine and pilar tumors.

Depending on cellular morphology, three types of basic cells are identified: basaloid, squamoid and clear cells. Predominantly basaloid cells are seen in eccrine tumors like syringoma, spiradenoma, poroma, trichoepithelioma, pilomatrixoma. Predominantly clear cells are seen in eccrine adenocarcinoma, eccrine clear cell hidradenoma. Combined basaloid and clear cells are seen in eccrine adenocarcinoma, Combined clear and squamoid cells are seen in eccrine clear cell hidradenoma, malignant trichilemmal tumor. Clear cells are predominantly seen in microcystic adnexal carcinoma. The study conducted by Alsaad *et al.* shows the similar way of approach in the diagnosis of skin adnexal tumors depending of histomorphological pattern. Clear cells, basaloid cells, squamoud cells and its combination has been used for diagnosis. Even solid and cystic pattern is also used for assessment. The findings are aptly correlates with our study.[5]

The study conducted by Alhumidi shows the approach to adnexal tumors with or without connection to epidermis. In cases, where there is no connection to epidermis, the approach will be the same as we have done in our study on cellular morphology. Similar approach of types of cells like basaloid, clear cells are taken in to consideration. Few cells with eosinophilic cytoplasm also considered which is not included.[6]

The study conducted by Stanoszek LM *et al.* shows the study of differential diagnosis of basal cell carcinoma. Here they studied in detail about the basaloid cells arrangement with minor difference. Basaloid cells are seen in basal cell carcinoma, trichopeithelioma, trichoblastoma, sebaceous carcinoma. These differential diagnoses are matching with our study also.[7]

The study conducted by Kaur *et al.* shows histomorphological study of adnexal tumors in relation to cell morphology and pattern of arrangement. The gender wise distribution of adnexal tumors shows similar results as seen in present study.[8]

The study conducted by pujani *et al.* shows approach to various adnexal tumor depending on the morphology as done in the present study. It classified the adnexal tumors based of origin of tissue. The gender distribution of cases is similar to our study. The median age of presentation is *39 years*. Head and neck is the most common site of adnexal tumors as seen in our study.[9]

According to the study conducted by Vijayan P, approach for the adnexal tumors done as done in the present study. The criteria for diagnosis are location of tumor, solid, solid-cystic, cystic, two cell population etc. More common site is head and neck only as seen in our study. Incidence is more common in female than male. Eccrine tumors are more common adnexal tumors as seen our study.[10]

The study conducted Srinivas kumar *et al.* shows a *ten year old* study of adnexal tumor. Total 136 cases have been studied, according to its tissue of origin *e.g.*, pilar, sweat gland and sabeceous gland. Most of the tumors are benign (98%) with similar findings as seen in the present study. Adnxal tumors are most commonly arising from sweat gland. Most common site is head and neck region as seen in various study as well as in our study.[11]

Sai Prasad *et al.* had done the research study related to histopathological evaluation of adnexal tumors. Cases are seen more in female than male patient as seen in the present study. Gross appearance like solid, solid-cystic is used to classify adnexal tumors as used in the present study.[12]

According to the study conducted by Kaur *et al.*, pilar tumors are more common adnexal tumors with predominant benign in nature. The approach for adnexal tumors depends on architectural features as done in the present study.[13] Thus, combining histomorphological pattern and cellular morphology, the approach for the diagnosis of adnexal tumors is easy and reliable.

Conclusion

Skin adnexal tumors are rare tumors with frequent overlap of histopathological findings. Hence, combining the histomorphological pattern and cellular morphology helps pathologist to diagnose with ease.

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Conflict of Interest: Nil

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Profile of Survivors of Sexual Assault in a Tertiary Hospital of North Karnataka

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Abstract

Society free of crime is unimaginable. The incidence of sexual assault cases as well as reporting of such cases is on the rise after the 2012 Delhi gang rape case. The present study was conducted on 35 survivors of alleged sexual assault with the objectives to reveal their "socio demographic profile & medico legal consequences". The current study shows in most cases the accused were known to the victim. The victims may or may not have detectable physical injuries. There was great time lapse between the occurrence of the incident and reporting to police. In some cases even in consensual relationship complain of sexual assault comes into play when breach of trust results. This study may help to increase public awareness, which can increase reporting of incidents and to frame appropriate measures to diminish such events in society.

Keywords: Sexual assault; Rape; POCSO act; Survivor.

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Introduction

Sexual assault is most heinous and violent form of crime on women which causes violation of dignity of those women. It causes long lasting pain and agony in the minds of survivors. Despite many stringent laws like POCSO ACT 2012 and criminal amendment law sexual assault on women still persists in society. Sexual assault on women may fill their lives with pain and terror from which their life becomes miserable. Reporting of such sexual assault cases is never an easy task for the survivor due to various social stigmas in our country[1]. 7 out of 10 rapes are committed by someone known to the survivor[2].

Aims and objectives

To know socio demographic features of survivor of sexual assault.

To tabulate assault characters and positive evidence in survivors examined.

Methodology

This is four year retrospective study conducted by the department of Forensic Medicine and

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Toxicology at BLDE university`s Shri BM Patil Medical College and Research Centre Vijayapura, Karnataka. The data required for the study was obtained from the reports issued by our department from January 2012 to December 2015. Permission from ethical committee of the institution obtained before starting the study. A female gynaecologist has helped us in cases registered under POCSO act. After proper consent being taken, the actual examination procedure comprising of history taking, general physical examination, and local genital examination was conducted. The survivors, if adult (above 18 years) the entire procedure of examination was explained to them and proper consent stating that result of examination may go for or against was obtained. In case of minor, the guardian accompanying the survivor was explained and proper consent was taken accordingly. The examination proper was carried out in front of female attendant. Meticulous history regarding the circumstance of assault, whether the perpetrators were known to the victim, whether she protested, whether she was intoxicated or drugged, were taken. Complete general examination including any injury (abrasion, bruise, cuts, tears, fresh bleeding) followed by local examination including perineum, vulva and condition of hymen was performed. Data were tabulated and percentages are calculated.

Inclusion criteria: All the survivors of sexual assault who consented for the general physical examination and genital examination.

Exclusion criteria: All the survivors of sexual assault who were not consented for examination were excluded from study.

Results

Total numbers of survivors examined were 35; year wise break up is shown in **Table 1**. Maximum numbers of cases were examined in the year 2014 (42.85%). Maximum cases (48.57%) of survivors were of less than 18 years of age. Maximum cases reported to examination after 36 hours of incident (54.28%). Most of the survivors had taken bath and changed clothes before examination (82.85%). 94.28% survivors were unmarried. 8.5% survivors were pregnant at the time of examination. 91.42% accused were known to victim. Maximum incidents (48.57%) took place in lodge. The positive evidence for sexual assault depicted in **Table 7**. Maximum survivors (51%) were students. On questioning 24 survivors have admitted of having consensual sexual intercourse **(Tables 1-10)**.

Table 1: Year wise distribution

Year	No of cases examined
2012	2
2013	9
2014	15
2015	9
Total	35

Table 2: Age wise distribution

Age	Cases
<5	Nil
5-10	2
<18	17
>18	16
Total	35

Table 3: Reporting time after the said sexual assault

Within 24 hours	4
24 hours – 36 hours	5
After 36 hours and within 1 week	19
After 1 week	7
Total	35

Table 4: Taken bath and washed clothes

Taken bath and washed or changed clothes	29
Not Taken bath and not washed clothes	6

Table 5: Married and unmarried survivors

Married	2
Unmarried	33

Table 6: Positive urine pregnancy test

Urine pregnancy test positive	Urine pregnancy test negative
3	32

Table 7: Positive evidence of sexual assault

Contusion on the breast	1
Nail scratch abrasion on the back	1
Torn posterior fourchette	1
Spermatozoa visible on microscopic examination (Pathology Report)	1
Positive seminal evidence on clothes (Forensic Science Laboratory Report)	1
Old healed hymeneal tags	9

Table 8: Accused known or unknown to victim

Known	Unknown
Neighbour – 19 Schoolmate – 05 Relative – 08	
32	03

Table 9: Place of incidence

Survivors home	6
Accused home	4
Farm house	8
Lodge	17

Table 10: Occupation of victim

Occupation	Student	Manual labour	Skilled labour	Housewife
Number	18	8	7	2

Discussion

Despite the fact that rape is regarded heinous and criminal in nature, the number and the level of inhumanity of this crime has been on a rise. Be it in affluent or frugal, educated or non-educated contexts; or open or closed societies, this crime is on a rise.[3]

The rate of rape cases in India increased from 4.1 to 5.6% during 2011–13. The national capital Delhi has explosion in rape cases; it has increased from 7.3 to 18.7% even after made some legal improvements and where the unprecedented public protest and forced the political systems that to be made powerful act for rape.[4]

Our study too has got results in concordance to that. There was a rise in number of cases reported from 2012 to 2014.

Rawat Ramu *et al.* in their research paper got the results that showed that the trends of other rape cases are increased in all age group except age group 50 years and above during their study period (2004–13).[4]

We got the findings that in maximum cases that came the survivor were of age group above 10 yrs and less than 18 yrs followed by age group > 18 yrs.

Biradar G *et al.* also observed the similar results in regard to susceptible age group.[11] But sukul *et al.* found maximum survivors were in the age group between 18–30 years.[12]

Most of these survivors were students studying in schools or colleges and so had to go away from home on a daily basis and thus were regularly vulnerable.

Kumar Pal S *et al.* also in their study observed 48.57% survivors were students.[1]

Apart from social and cultural factors, there are many other factors that are also associated with reporting the rape cases. Approximately 90% of the rape cases go unreported. The demographic factors play, a very important role in reporting the rape cases.[5]

It is already explored by the researchers that, demographic play is an important role, in reporting marital rape cases.[6]

In our findings on reporting the incident we found that a large number of the survivors take quite a lot of time before reporting the incident. Maximum cases reported to examination were after 36 hours of incident.

Also most of the survivors had already bathed and changed their clothes before coming to file a report.

We also gathered that out of the survivors who registered cases more than 90 percent were unmarried and only the rest few were married. Our findings matched with study done by Kumar Pal S *et al.* who found 77.14% survivors were unmarried and only 22.85% were married. Although this points out to the fact that unmarried women are more vulnerable to the rape but there might be a possibility that married women avoid reporting the cases more due to social stigma and to avoid tarnishing their names and destroying their married lives. 8.5% of the cases reported were pregnant survivors. Such is the cruelty of the committers of these crimes that they don't even consider the wellbeing of a child who is still unborn.

Table 7 shows majority of survivors had hymeneal tears which corroborated with findings of Sheryl saures.[8]

Table 9 shows that maximum incidents took place in isolated places like lodge which is in contrast with study conducted in Himachal Pradesh where the common place of incident was house of the victim or accused.[9,10]

Half of the cases reported in our study occurred in lodges as they are safer and isolated places preferred by the committer of such crimes.

In our results we observed that more than 90% of time the accused was known to the survivors. In that too the accused was mostly found to be a neighbour followed by a relative.

Similar results were observed by Arif M *et al.*[13]

Kumar Pal S *et al.* in their study observed only 8.55% accused were known to survivors.[1]

Rawat Ramu *et al.* in their research found that the trends of incest rape cases were consistently going up and down during their study period (2004–13) in age group 14–18 years. The numbers though increased from 116 in 2012 to 151 in 2013. The result also explains after 2011 incest rape cases are increased.[2]

Incest rape (rape by a relative) had remarkable increase in 2005 as compared to other selected years. However, the incest rape cases slightly decreased from 2006 to 2011 across selected years in India. (For age group 18–30).[4]

Furthermore, Incest rape cases radically increased last three years from 2011–2013.[7]

Conclusion

Sexual assault whatever form happens have always adverse impact on society. Crime of sexual assault shakes the foundation of the rule of law. We cannot reduce the incidences of sexual assault unless the public is literate enough to understand the consequences of the act. The government should try all the measures to increase the reporting and lodging a complaint against perpetrates of the crime. The time lapse between occurrence of the incident and reporting seems to be the major concern.The government should also see that justice prevails in society by punishing the perpetrate of crime of sexual assault.

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Original Article

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Efficacy of Low Level Laser Therapy Over Conventional Therapy on Diabetic Peripheral Neuropathy: A Pilot Study

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Abstract

Aim of the study: The study aims to find the effect of low level laser therapy on the diabetic peripheral neuropathy patients. To evaluate the effect of low level laser therapy on the diabetic peripheral neuropathy patients. *Background of the study:* Diabetic peripheral neuropathy is the nerve damage caused by chronically high blood sugar and it leads to numbness, loss of sensation and sometimes pain in the feet,legs or hands. Diabetic Peripheral Neuropathy is a result of injury to the vasa nervosum, axons and atrophy of the axons leading to tissue damage. *Methodology:* Thiswas an experimental study of comparative of pre and post type. 14 patients are selectedselected from the A.C.S College and hospital and they divided into two groups. Group A received low level laser therapy Group B received interferential therapy. Pre and post test measurements taken using Pressure - Mono Filament Method, Vibration – Tuning Fork (128 Hz), Mc GillPain.

Keywords: Diabetic; Laser; Neuropathy.

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Introdution

Diabetes mellitus (DM) is characterized by chronic hyperglycemia and impaired carbohydrates, lipids, and proteins metabolism caused by complete or partial insufficiency of insulin secretion and/ or insulin action. There are two primary forms of diabetes, insulin-dependent diabetes mellitus (type 1 diabetes mellitus, T1DM) and non-insulin-dependent diabetes mellitus (type 2 diabetes mellitus, T2DM). T2DM is the most common form of DM, which accounts for 90% to 95% of all diabetic patients[1] and is expected to increase to 439 million by 2030.[2] In China, the latest statistical data show that diabetes and pre-diabetes are prevalent among older people, with the percentages being 15.5% T2DM.[3] Painful DPN is a result of injury to the Vasa nervosum, axons and atrophy of the axons leading to tissue damage. All nerve fibers may be injured, but small myelinated and unmyelinated fibers that transmit pain and temperature are most affected.

In association with injury to the nerves, reduced microcirculation is responsible for the loss of protective sensation and atrophy of intrinsic foot muscles which later leads to development of foot complications like callus, ulcersand infections of skin and bone in T2DM. subjects with long standing diabetes mellitus. In many subjects with diabetic neuropathy, pain develops as a symptom localized to the lower extremities, primarily the soles and toes. In addition, people with T2DM are often accompanied by complications, such

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as cardiovascular diseases, diabetic neuropathy, nephropathy, and retinopathy. Diabetes and its associated complications lower the quality of people's lives and generate enormous economic and social burdens.[6] Diabetic neuropathy has been defined as presence of symptoms and/or signs of peripheral nerve dysfunction in diabetics after exclusion of other causes, which may range from hereditary, traumatic, compressive, metabolic, toxic, nutritional, infectious, immune mediated, neoplastic and secondary to other systemic illnesses. It involves both small and large fibers and has insidious onset. Typically, the most distal parts of the extremities are affected first, resulting in a stocking pattern of sensory loss. As the sensory symptoms advance above the knees, the distal upper limbs. Symptoms are numbness and deadness in the lower limbs with burning pain, altered and uncomfortable temperature perception, paresthesia, shooting, stabbing and lancinating pain, hyperesthesia and allodynia.

The possible causes are hyperglycemia, polyol pathway, non-enzymatic glycation, free radical and oxidative stress. Peripheral nerves have abundant receptors for nerve growth factor (NGF). NGF is responsible for regeneration of nerves. Circulating NGF concentration is reduced in diabetic patients with neuropathy. The diagnosis of DPN in time is very important because effective intervention will be possible only during the subclinical or early phase of dysfunction. Vibration perception threshold (VPT) is usually assessed by 128 Hz tuning fork, Only large fibers are assessed by the test. Vibration perception is usually assessed at the tip of great toe or over lateral malleolus. Among the electrotherapy modalities, low-level laser therapyhas been usedto manage nerve injuries and otherpathologies of the nerve because it holds the potential to induce a biostimulational effect on the nervous system. In addition, low-level laser therapy has also been used in the management of diabetic complications such as foot ulcers. Even though low-level laser therapy is found to be very effective in nerve regeneration, there is a dearth of literature on effect of low-level laser therapy on painful DPN in T2DM population. Therefore the objective of the present study was to evaluate the effect of low-level laser therapy on Type 2 DM subjects with painful DPN.

Materials and Methods

This study was an experimental study with comparative pre and post type. 14 patients were selected randomly from the 30 volunteers. They were then divided into two groups by simple random sampling method (lottery method). Patients are selected from the Out Patient Department of Physiotherapy in A.C.S Medical College and Hospital, Chennai. The duration of the study is 4 weeks (3 days in a week) [from June 2018-Feb. 2019]. This study included type 2 diabetes mellitus with sensory disturbances both male and female patient, patients aged above 50. Excluded those with patient's presence of diabetic ulcers, peripheral vascular disease, significant musculoskeletal disorders in the lower extremities (Including injury, fracture and surgery), rheumatoid arthritis, neuropathies other than diabetic neuropathy. The samples were fully explained about the study and the questionnaire to be filled. They were then asked to fill the Consent form in acceptance to participate in study, which is duly signed by the samples and therapist. Initially demographic details like age, gender, height, weight were collected assuring confidentiality of the same. Pre and post test done with Mc. Gill Pain, MNSI Questionnaire. A total number of 14 patients were divided into two groups. Group A patients undergone low level laser therapy, the treatment procedure and its benefits is well explained by the physiotherapist. Group A samples received A dosage of 3.4 j/cm^2 and power density of 50–150 mw/cm^2 with treatment duration of 5 minutes. The patients were treated 3 days in a week for 4 weeks. Patient was positioned in lying and with the probe laser biostimulation given to the lateral poplitealnerve (neck of fibula). Group B received Interferential therapy given with a treatment duration of 15 minutes. Patient was treated 3 days in a week for 4 weeks. Patient positioned in lying and 4 pole vector method was used (lower compartment of leg).

Data Analysis

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find the statistical difference within the groups Independent t-test (Student t-Test) was adopted to find the statistical difference between the groups.

[#]Group A – Low Level Laser,[#] Group B – Conventional Therapy

(- $p > 0.05$)(***- $p \leq 0.001$)* The **Table 1** reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and *p*-value of the MNSI between

(Group A) and (Group B) in pre test and post test weeks. This table shows that there is no significant difference in pre test values of the MNSI between Group A and Group B (*$p > 0.05$). This table shows that statistically highly significant difference in post test values of the MNSI between Group A and Group B (***- $p \leq 0.001$)**(Graph 1)**. Both the Groups shows significant decrease in the post test Means but (Group-A) which has the Lower Mean value is more effective than (Group-B).

#Group A – Low Level Laser,# Group B – Conventional Therapy (* p > 0.05)

*(***-$p \leq 0.001$)* The **Table 2** reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and p-value of the Mcgillian pain between (Group A) and (Group B) in pre test and post test weeks. This table shows that there is no significant difference in pre test values of the Mcgillian pain between Group A and Group B (*$p > 0.05$). This table shows that statistically highly significant difference in post test values of the Mcgillian pain between Group A& Group B **(***-** $p \leq 0.001$)**(Graph 1)**. Both the Groups shows significant decrease in the post test Means but (Group-A) which has the Lower Mean value is more effective than (Group-B)

#Group A – Low Level Laser,# Group B – Conventional Therapy (p ≤ 0.001)***

The table 3 reveals the Mean, Standard Deviation (S.D), t-value and p-value of the MNSI between pre-test and post-test within Group – A & Group – BIn MNSI, there is a statistically highly significant difference between the pre test and post test values within Group A and Group B(***- $p \leq 0.001$). **(Graph 3)**.

Results

The results of the study Group A and Group B have significant differences. On comparing pre test and post test within Group A & Group B on MNSI and Mc Gillian pain questionnaire shows highly significant difference in mean values at $p \leq 0.001$. On comparing the mean values of Group A and Group B on MNSI And Mc Gill Pain Questionnaire Score, Shows Significant Increase In The Post Test Mean Values of Group A and Group B, Group A –low level laser therapy shows which has the higher mean value is more effective than Group B-convention therapy at $p \leq 0.001$.

Table 1: Comparison of Mnsi Score Between Group – A and Group - B in Pre and Post Test

#Mnsi	#Group – A		#Group – B		T - Test	DF	Significance
	Mean	S.D	Mean	S.D			
Pre Test	16.4	1.43	16.2	1.68	.254	16	0.805
Post Test	10.1	1.19	13.1	1.66	–4.39	16	0.002

Table 2: Comparison of Mcgillian Pain Score Between Group – A and Group - B in Pre and Post Test

#Mgp	#Group – A		#Group – B		T - Test	DF	Significance
	Mean	S.D	Mean	S.D			
Pre Test	57.6	2.88	53.1	1.83787	3.99	16	0.813
Post Test	43.7	2.95	51.0	1.50	–8.93	16	0.000

Table 3: Comparison of MNSI within Group – A and Group – B Between Pre and Post Test Values

#Mnsi	Pre - Test		Post - Test		T - Test	DF	Significance
	Mean	S.D	Mean	S.D			
Group A	16.4	1.43	10.1	1.19	18.80	8	.000***
Group B	16.2	1.69	13.1	1.66	11.19	8	.000***

Table 4: Comparison of Mcgillian Pain Within Group – A and Group – B Between Pre and Post Test Values

Mcgillian Pain Que	Pre -Test		Post - Test		T - Test	DF	Significance
	Mean	S.D	Mean	S.D			
Group A	57.6	2.88	43.70	2.94	10.96	8	.000***
Group B	51.0	1.85	50.5	1.49	5.16	8	.000***

Discussion

In the present study diabetic peripheral neuropathy patients whose age above 50 were selected. This study was conducted to decrease the pain and improve the sensation. In this study totally 14 patients were selected. The comparison has been done on the effectiveness of low-level laser therapy and interferential therapy for the duration of 10 days.

The result of the study statistically indicates that the described data's such as mean and standard deviation which indicated that improvement in the terms of pain and the sensation at the end of the treatment of both groups. On comparing the results obtained in pre and post test, the result of this study showed that low level laser therapy significant $p \leq 0.001$ improvement than posttest. So, concluded that low level laser therapy is helpful for increasing the sensation. The mean value of MNSI Score in pretest and post test showed a significant difference. The mean value of MCGILL Pain Questionarrie in pretest and post test showed a significant difference.

Conclusion

It was been observed the DPN prevalence of 19.7%. Higher the age, low socioeconomic status, treatment with insulin, longer the duration of diabetes and poor glycemic control were considered to be the risk factors for DPN. Thereby the prevalence of DPN among the elderly population suggest need for early screening and better risk factor management.

Authors Contribution: All authors have contributed equally.

Conflict of Interest: none.

Ethical Considerations: The manuscript is approved by the Institutional Review board of faculty of physiotherapy. All the procedures were performed in accordance with the ethical standards of the responsible ethics committee both (Institutional and national) on human experimentation and the Helsinki Declaration of 1964 (as revised in 2008).

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/ their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Original Article

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Differentiation of Solid Liver Masses by Diffusion Weighted MRI as Benign and Malignant

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Abstract

Background: Due to wide spread uses in clinical sitting of different image modalities for example as ultrasound (US), CT scan (CT), and magnetic resonance image (MRI), lead to discover of many hidden liver lesions in previously un able to diagnosed. Imaging is a critical decision making tool in the diagnosis of liver lesion, because it will discriminate in high degree between malignant and benign in a lot of cases. *Material and Methods:* A cross-sectional study were enrolled 67 patients with solid liver lesion whose admitted to Al-Hilla teaching Hospital between November 2018 and June 2019 with suspicion of solid live r lesion by ultrasound image or CT scan. *Results:* Sixtyseven patients (85 lesion) were included in this study. These patients aged between 25–70 years with mean age 52 ± 11 years. Study included 36 men (53.7%) and 31 women (46.3%). Male to female ratio 1.1:1. ADC values of 85 solid liver lesions were included in the study, an average of 1.2 lesion/patient. ADC range were 0.42–2.78 (10–3 mm^2 /s) and ADC mean 1.2 ± 0.51(10-3 mm^2 /s). The mean ADC and range for benign lesion was 1.7 ± 0.11 (0.72–2.78) and for malignant lesion was 0.61 ± 0.09 (0.42–1.68). Which is statistically significant difference between these value (p = 0.001). *Conclusion:* We concludes that quantitative assessment of solid liver lesion by DWI had best result in differentiate from benign and malignant lesion. The benign liver lesions had high ADC value than malignant lesion.

Keywords: MRI; Malignant; Ultra sound (US); Solid liver.

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Introduction

The important part of component for evaluation a liver lesion are a detail history, physical examination, radiological image, and pathological test.[1] The MRI or CT scan when appropriately reading will give the physician a many clinical detail about the lesions characters, site or liver side right or left and relation to other s structures for example gall bladder and also staging and grade of tumor in case of suspicion of malignant[2]. Imaging is a critical decision making tool in the diagnosis of liver lesion, because it will discriminate in high degree between malignant and benign in a lot of cases.[3] Most of solid liver lesion had a characteristics image detail allow for radiologist to give accurate diagnosis.[4] Magnetic resonance image is considering the best image modalities with high sensitivity and specificity for diagnosis of solid liver lesions. And in comparison with other such as US or CT scan, Magnetic resonance image have good sensitivity in discover of HCC (full form of HCC). In many study reported detected rate of MRI for HCC reach 72% as in comparison to CT scan and US 65% and 48% respectively.[5]

Presentation of liver could be as solitary lesion or multiple lesion which are seen in many patients like those with heamangima, non cirrhotic portal

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hypertension, hepatocellular carcinoma and metastasis tumor in liver.[6] The MRI consider the high quality test from all other images study in provide good resolution and definite diagnosis and non invasive process. Magnetic Resonance images diagnose depend up on the special signal intensity characteristic of a lesion on the T1-weight, T2-weight and diffusion weighted.[7] Thus MRI had superior advantage in diagnosis of solid liver lesion with high sensitivity and specificity in regard to other radiological modalities like as CT scan or ultrasound.[6] The type of MRI, Diffusion Weighted Image (DWI) which new approach with no contrast image study. Give high accurate visualize image with good resolution that will be help in definite diagnosis of lesion with shape and criteria.[5] Principle of action on measure random movement of water in tissues of body. It Supply quantitative data about histology and cells of tissues, to discrimination between healthy tissue and diseases one.

Quantitative assessment of lesion by MRI and DWI which is called apparent diffusion coefficient (ADC) values these coefficient measure the diffusion of water in tissues and evaluate magnitude of it.[8] This coefficient can be measure automatically by software and show as data maps.[9] These are control by drawing region of interest (ROI) on ADC map to permit to calculate ADC value.[10]

Different patterns of appearance for every types of tumors, for malignant solid liver lesion may appear hyperintense due to limited diffusion in tissue, malignant appear hypointense in ADC map.[8] On other hand benign lesion reveal characterize of hyperintense on both DWI at higher value and on ADC map, these thought to be due to high fluid content for example hemangioma or cyst lesions.[11] Now days apparent diffusion coefficient might be had a crucial role for differentiation benign from malignant lesions depend on characteristic of every lesion that will be quantitative measure, with many study support this issue.[10] Others author study these approach but not support the idea for effect of DWI in discrimination between benign and malignant, this a conflict reports regarding benefit of DWI.[12] These reported come from some solid liver benign lesion such as focal nodule hyperplasia hepatic adenoma and haemangioma could be give same ADC number count, these finding limited the task of DWI in differentiation type of lesions.[9] Also these seen in simple cyst that presents high ADC values than solid hepatic. When inclusions of cyst in study so reveal higher significance difference between malignant and benign in ADC values. Its provide idea to increase benefit of DWI in discrimination of lesion but in fact its due to cyst lesion.[11] With this objective the present study was aimed to assessthe beneficial role of DWI in patient with hepatic lesion to discriminate between solid focal liver lesions as benign or malignant.

Materials and Methods

Patients and methodology applied: A cross-sectional study were enrolled 67 patients with solid liver lesion whose admitted to Al-Hilla teaching Hospital between November 2018 and June 2019 with suspicion of solid live r lesion by ultrasound image or CT scan. A complete history was taken from each patient which included age, sex, residence and clinical examination. After this making an appointment and consent for MRI examination, a brief explanation of the examination for patient was done, mentioning the contraindications, advising how long it takes and how to dress for it, inform about the gradient noise will be heard while being immobilized in a narrow space and about the communication via the intercom, or video camera.

MRI was perform with a 1.5 Tesla systems (Achieva; Philips Medical Systems, the Netherlands) using a SENSE body coil. All patients were examined initially with a routine MRI protocol for the upper abdomen that included T2 weighted images, in and opposed phase T1 weighted images and dynamic T1 weighted images. All patients were examined in the supine position throughout the examination.

Diffusion weighted image (DWI) made by multi-slice single shot Echo planar image frequency (time-echo time: 5900 /96 milli seconds, view 250 × 250 mm, thickness of slice 5 mm, acquisation matrix: 128 × 128, B value 0,500 and 1000 s/mm^2).

The morphological features of each lesion were recorded included size, shape, margin and signal characteristics, as well as number and site of the detected focal lesions. The mean ADC of each detected focal lesion is measured by drawing a region of interest (ROI) over the lesion. The ADC was measure twice and the two measurements were averaged. To ensure that the same areas were measured, regions of interest were copied and pasted from DWMRI. Verbal and written consents were obtained from all patients. Data analysis by application of SPSS program version 20. Significance was set at the $p \leq 0.05$ levels in all analyses.

Results

Sixty seven patients (85 lesions) were included in this study. These patients aged between 25–70 years with mean age 52 ± 11 years, thirteen percent of them in age group 22–29 years 19.4% in age groups 30–39 years, 20.8% in age group 40–49 years, 31.4% in age 50–59 years and 15% in age group 60–70 years **(Table 1).** Study included 36 men (53.7%) and 31 women (46.3%). Male to female ratio 1.1:.

Table 1: Distribution of Cases According to Age groups.

Age in years	No	Percent
22–29	9	13.4%
30–39	13	19.4%
40–49	14	20.8%
50–59	21	31.4%
60–70	10	15%
Total	67	

Out of total 85 solid liver lesions taken 45% were haemangiomas, 6% focal nodular hyperplasia (FNHs), 3% hepatic adenoma, 21% hepatocellular carcinomas (HCCs), and 25% liver metastases as depicted in **Table 2**.

Table 2: Types of Liver Lesions

Liver lesion	No.	Percent
Hemangiomas	38	44.7%
Focal Nodular Hyperplasias (FNHs)	5	5.8%
Hepatic Adenoma	3	3.5%
Hepatocellular Carcinomas (HCCs)	18	21.2%
Liver Metastasis	21	24.8%
Total	85	

ADC values of 85 solid liver lesions were included in the study, an average of 1.2 lesion/patient. ADC range were 0.42-2.78 (10^{-3} mm^2 /s) and ADC mean 1.2 ± 0.51(10^{-3} mm^2 /s) as mentioned in **Table 3**.

The mean ADC and range for benign lesion was 1.7 ± 0.11 (0.72–2.78) and for malignant lesion was 0.61 ± 0.09 (0.42–1.68). Which is statistically significant difference between these value (p = 0.001).

Table 3: Status of ADC lesions in Benign and Malignant Livers.

sLesion Status of	ADC range(10^{-3} mm^2 /s)	ADC mean (10^{-3} mm^2 /s) ± SD	p-value
Benign	0.72–2.78	1.7 ± 0.11	0.001
Malignant	0.42–1.68	0.61 ± 0.09	

The difference in mean of ADC between all types of solid liver lesions were statistically significant p < 0.001. The mean ADC for haemangima, FNHs, adenoma, HCCs and liver metastasis were 2.88 ± 1.14, 1.7 ± 0.93, 1.64 ± 0.51, 1.41 ± 0.62, 1.02 ± 0.46 respectively as mentioned in **Table 4.**

Table 4: Show ADC mean in different types of liver lesions

Liver lesion	ADC mean (10^{-3} mm^2 /s) ± SD	p-value
Haemangiomas	2.88 ± 1.14	
focal nodular hyperplasias (FNHs)	1.7 ± 0.93	
Hepatic Adenoma	1.64 ± 0.51	0.001
hepatocellular carcinomas (HCCs)	1.41 ± 0.62	
liver metastases	1.02 ± 0.46	

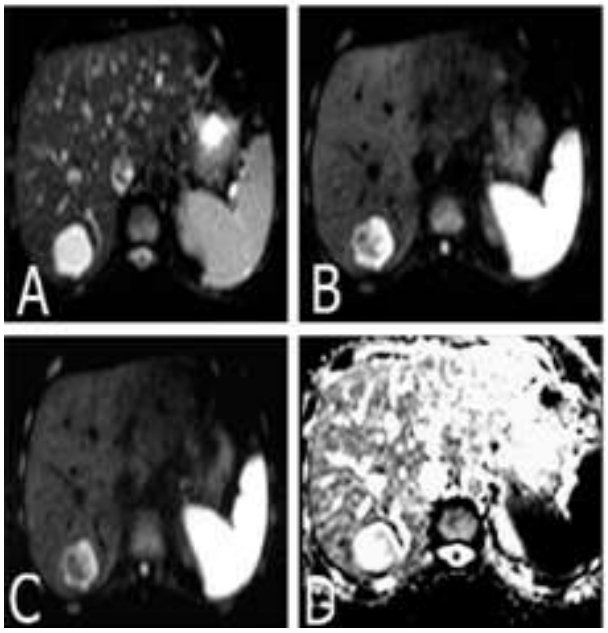

Fig. 1: Showed diffusion weighted MRI of 45 years old male patient with haemangioma, DWI, at b0(A), DWI at b500(B), DWI at b1000(C) and ADC map(D) shows mixed high SI with high mean ADC value at b1000 =2 10 A3 mm 2/s.

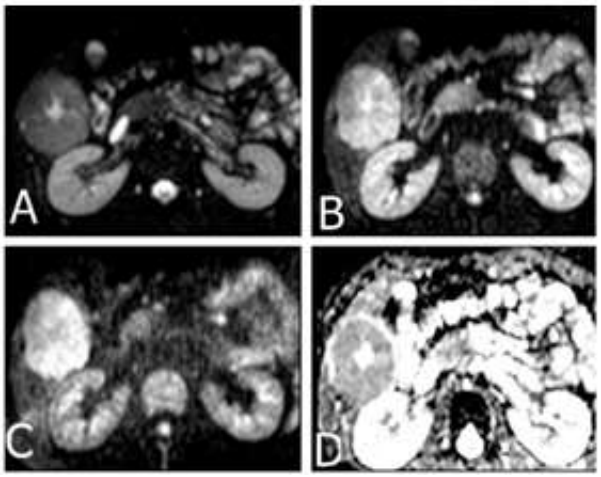

Fig. 2: This figures showed that the diffusion weighted MRI of 50 years old female patient with FNH, DWI at b 0 (A), DWI at b500 (B), DWI at b1000 (C). ROI is located peripherally in the lesion since central part represent vascular scar tissue. Mean ADC value at b1000 (B)=1.3 10 A3 2/s. though lesion is hyperintense at DWMRI, it shows high ADC value.

Discussion

In our study we found male predominant, 53.7% male, 46.3% female, which is go with study by Amr Abdelsamed[13], other study by T. Pankaj Jain[8], found female predominant, 66% female, 34% male, the study by Caraiani for eighty patients were included in the study reported 42 men (52.5%) and 38 women (47.5%)[5]. Regarding age of patients 20.8% were in age group of 40–49 years, 19.4% patient in age groups 30–39 year, 31.4% for age 50–59 year, 13.4% of patient age in 24–29 years and lastly 60–70 years. 15% of patients with mean age equal to 52 ± 11. These figures of age distribution slightly differ from other study in previous years which had mean age more than this study 54 ± 8[8] and other worker reported average age of the patients was of 59.84 ± 11.48.[5] While study by Mohammed had lower mean age of patients 50 ± 12 years.[14]

Our study revealed haemangioma in 44.7% of patients while FNH 5.8% and hepatic adenoma 3.5% on other hand our study reported 21.2% hepatocellular carcinomas and 24.8% liver metastasis by this figure benign lesions constituent 54.1% and malignant 45.9%. Others have reported that the 99 analyze liver lesions were as follow 39 haemangiomas, four focal nodular hyperplasia (FNH), 26 hepatocellular carcinomas (HCCs), and 23 liver metastases.[5] While study by Amr Abdel samed there were found 24 liver lesions 36.7% HCC 3.3% focal nodular hyperplasia 13.3% haemangiomas and 20% metastatic lesions.[13] In our result found mean of ADC values of hepatic lesions were 1.2 ± 0.51 × 10-3 mm^2/sec. These data are close to result by Caraiani.[5]

When classified lesions according to benign and malignant, benign had mean ADC value 1.7 ± 0.11× 10-3 mm^2/sec, and malignant 0.61 ± 0.09 × 10-3 mm^2/sec. These are statistically significant difference with P value 0.001. These findings were similar to result by Amr Abdelsamed in which stated that ADC measurements of benign and malignant hepatic masses were statistically different (p<0.001).[13] Similar observations reported by Onura MR that were reported the mean ADC number of benign lesions are more than malignant lesions.[15] Demir also reported that the average ADC number of benign hepatic lesions were largely more than of malignant liver lesions, p< 0.05.[16] Other researcher Vergara mention that average ADC value obtained for benign lesion differed hugely from the mean for malignant lesions with a p-value <0.05.[17]

Pankaj Jain reported the mean ADC value for benign liver tumor was 1.3 and for malignant liver tumor was 0.9, in turn its statistically distinct p < 0.001. He had concluded all lesion less than 0.9 considered malignant and lesion more than 1.5 were benign.[8] A study conducted by Demirand found that the average ADC number of benign lesion was 2.75 ± 0.21 x $10^{-3}$$mm^2$/sec, whereas for the malignant lesion had an average ADC count of 0.87 ± 0.13 × 10^{-3} mm^2/sec. It is state that the difference between the average ADC number of benign and malignance lesions was statistically apparent with p value <0.01. DW MRI with quantitative ADC measure can be useful tool in the discrimination of benign from malignant liver lesion.[16] In opposite to our result, scientist Testa mention new approach by excluded simple cyst from their data set, by this the difference between mean ADC value of benign and malignant lesions were diminished.[18]

An another study done by T. Pankaj Jain found that all lesions had mean ADC count < 0.9 may had malignant feature, on other hand lesion that had mean ADC count >1.5 goes with benign feature[8]. In theory, malignant lesions by virtue of their increased cellularity are expected to display restricted diffusion and can consequently be differentiated from less cellular, benign lesion.[19]

Our study revealed that the mean ADC value of haemangioma 2.88 ± 1.14 x10-^{3} mm^2 /sec. This result consist to other studies by Elbadrway[20] and turkbey.[21] But slightly different from works by Gomshima, these difference in mean ADC value of haemangioma in variables study may be due to used different b value of DWI or may be distinct sub type of diseases pathology.[22] The mean ADC value for focal nodular hyperplasia (FNHs) 1.7 ± 0.93x10-^{3} mm^2 /sec. and for hepatic adenoma 1.64 ± 0.51x10-^{3} mm^2 /sec. which is lower than of haemangiomas and more than that of malignant tumors, the explanation to that, may be due to FNH and hepatic adenoma had higher cellularity than haemangiomas, which are not as solid lesions. These results concomitant to what reported by Elbadrawy[20] and Kele.[23] For malignant lesion the mean ADC value for hepatocellular carcinomas (HCCs) 1.41 ± 0.62 x10-^{3} mm^2 /sec and for metastases 1.02 ± 0.46 x10-^{3} mm^2 /sec. HCCs had higher than of metastasis and the two types are much lower than of benign lesion. These finding consist to study reported by Taouli[12] and Demir.[16]

The findings of the present study may be useful for a clinicians as well as forensic experts in interpretations of the findings in cases where an expert opinion seek by any patients or agency.

Conclusion

1. Quantitative assessment of solid liver lesion by DWI had best result in differentiate from benign and malignant lesion.
2. The benign liver lesions had high ADC value than malignant lesion.
3. There is superimpose in ADC value between different types of benign lesion also between metastasis and malignant tumor.

Recommendation

1. Due to the best result of DWI use the DWI test may be used in differentiate between different types of solid focal liver lesion through calculate ADC value.
2. further studies need to put cut off point of ADC value variant liver lesions.

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Demographic Profiling of Decapitation Injuries in Train Accidents at Raigarh (C.G.)

Rajesh Ban Goswami[1], A Dutta[2]

Abstract

Background: Accident in rail track is one of the important segment in death investigation. Among the rail track accidents, death due to decapitation is one of the complex segment. Decapitation or beheading is an imminently fatal entity. There are possibilities that decapitation in rail track might be either accidental or homicidal or suicidal. *Materials and Methods:* The present cross sectional retrospective study of death due to railway decapitation cases had been carried out in the Dept. of Forensic Medicine at Late Shri Lakhiram Agrawal Memorial Govt. Medical College, Raigarh, Chhattisgarh. In this study autopsy records of all railway track decapitation death cases, which were autopsied at K.G.H. mortuary, Raigarh during the period of 04 years (2015–2019) were included for research purpose. *Results and Observations:* In our study decapitation injuries were 1.07% of total autopsy and 18.18% of total train accident cases. Males were predominant over females. Victims of age group 21–50 were maximum in number i.e 70.83%. Accidental decapitation was found in most of the cases i.e. 66.67%. *Conclusion:* Decapitation in railway track fatalities are not uncommon. Decapitation injuries are mostly accidental in nature, but suicidal and homicidal death cases have also been reported, so the pattern of injuries in railway decapitation injuries should be assessed cautiously by autopsy surgeons and final opinion should be formed only after considering all circumstantial evidences

Keywords: Rail track; Death investigation; Decapitation; Accidental; Homicidal; Suicidal.

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Introduction

Oxford dictionary had defined decapitation as "The action of cutting off the head of a person or animal".[1] Decapitation or complete severance of the head from the body is a rare event in the civilian setting and is reported to account for approximately 0.1% of medico-legal autopsies.[2] Complete decapitation without any further mutilation of the victim in homicides is relatively rare.[3] Decapitated bodies are predominantly associated with decapitation by wheels of trains or with post-mortem dismemberment following homicide.[4] Some methods of suicide may also result in decapitation, either as an intended outcome or as a result of some unforeseen complication of the method used.[5] Apart from railway mishaps decapitation injuries are also seen in homicides[6]. Decapitations have also been reported in vehicle assisted suicide as well as some cases of complete hanging.[7,8] In the cases of decapitation in railway accidents usual features are the local tissue destruction, usually with grease, rust or other dirt soiling of the damaged area.[9]

Review of Books & Literatures: Biswas (2012)[10] had mentioned maximum number of death due to railway accident in China and India due to wide network and unprotected crossings. Indian

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authoritative figures like Nagesh Kumar Rao (2010)[11], Modi (2013)[12], Umadethan (2016)[13] had mentioned about the incidents of decapitation injuries with respect to death cases in railway accidents. Byard and Gilberd (2004)[14] reported only 13 cases of suicide involving death by decapitation in an autopsy series of 16,589 in 17 years period. Tsokos *et al.* (2004)[15] reviewed 7681 autopsies in 7 years period and reported that only 10 cases of suicidal complete decapitation. Seikhetal (2008)[16] had found 9 cases of decapitation out of 1016 cases i.e. 88%. Satish NT *et al.* (2012)[17] had found 35 cases of decapitation out of 763 cases. Valsala K *et al.* (2017)[18] had mentioned 9.6% of death was due to decapitation injury. P. Ravi Kumar (2017)[19] had found, 20 cases of decapitation out of 300 medico-legal autopsies.

Aims and Objectives

1. Assessment of decapitation injuries in train accidents.
2. Differentiation of decapitation injuries in train accidents and other decapitation injuries involving road accidents and homicidal cases.
3. Frequency of cases based on age, sex etc.

Justification for the study

a. Academic- Study of pattern of injuries in decapitation cases.

b. Helping investigating agencies in correct identification as well as correlation with circumstantial findings.

Materials and Methods

The present cross sectional retrospective study was conducted in the Department of Forensic Medicine & Toxicology at Late Shri Lakhiram Agrawal Memorial Govt. Medical College, Raigarh. All the post-mortem records of decapitation cases due to train accidents conducted at mortuary of KGH, Raigarh (CG) were considered for the research study. All cases other than train accidents and skeletonised cases were excluded from the study. People of all age groups from both sexes were included in the study. The study was conducted from 1st April 2015 to 31st March 2019 (Four Years). All the data were collected and subjected to statistical analysis.

Photographs

Photograph 1: Decapitation in railway accident (S.O.C)

Photograph 2: Railway decapitation injury with findings of grease and dirt over decapitated region of head and neck

Photograph 3: Railway decapitation with deposition of dirt and grease

Results

Table 1: Incident statistics

Sl. No	Year	Total Autopsy Cases	Total Cases of death due to Railway Injury	Total Number of Decapitation cases in Railway
1	2015	473	22	3
2	2016	561	32	8
3	2017	514	28	4
4	2018	551	41	4
5	2019	145	11	5
Total		2244	132	24

The **Table 1** shows that decapitation injuries were 1.07% of total autopsy and 18.18% of total train accident cases.

Table 2: Police station and sex wise distribution of cases

Sl. No	Police Station	Number of Cases		Total
		Male	Female	
1	Chakradhar Nagar	05	01	06
2	City Kotwali	01	00	01
3	GRP-RIG	10	03	13
4	Jute Mill	01	00	01
5	Kotra Road	03	00	03
	Total	20	04	24

Maximum number of cases were referred from G.R.P followed by Non G.R.P P.S. Males were predominant over females **(Table 2).**

In maximum number of cases the identity of the victims was known. The dead bodies recovered from railway track other than railway track in railway station is quite high. Among total death casesabout 1/5th (20%) deceased were suffering from disease **(Table 3)**.

The **Table 4** shows that the victims of age group 21–50 were maximum in number i.e 70.83%.

Table 5: Distribution of cases according to manner of death

Sex	Suicide	Homicide	Accident	Pending	Total
Male	03	0	13	04	20
Female	00	0	03	01	04
Total	03	0	16	05	24

Accidental decapitation was maximum in number i.e. 66.67% **(Table 5)**.

Table 6: Head injuries

Sl. No	Trait	Number of Cases
1	Injury over Head, Face and scalp (Abrasion, Bruise, Laceration)	15
2	Skull Fracture	08
3	Brain Hgs.	07
4	Crush injury	05

Injuries overhead, face and scalp (abrasion, bruise, laceration) were found in most of the cases followed by skull fracture, Brain hgs, crush injuries **(Table 6)**.

Table 3: Profiling of Victim

Residence		Identity		Place of recovery of dead body		Disease	
R	U	K	Un	Railway Track in Railway Station	Railway Track other than Railway Station	Present	Absent
12	12	22	02	03	21	04	20

R= Rural, U= Urban, K= Known, Un= Unknown

Table 4: Age wise distribution

Sl. No.	Age Group	Number
1	0–10	0
2	11–20	1
3	21–30	6
4	31–40	5
5	41–50	6
6	51–60	4
7	61–70	1
8	71–80	1
9	81–90	0
10	91–10	0
Total		24

Table 7: Injuries over other parts of the body

Sl. No	Trait	Number of Cases
1	Injuries (Abrasion, Bruise, Laceration etc.) over upper part of body (Chest, Abdomen, Back and Upper limbs	16
2	Injuries (Abrasion, Bruise, Laceration etc.) over lower parts of the body (Ext. Genitalia, Buttocks, Thigh, Lower Limbs)	01
3	Amputation of Upper Limbs	09
4	Amputation of Lower Limbs	03
5	Crush injuries of Upper Limbs	05
6	Crush injuries of Lower Limbs	02
7	Crush injuries of internal organs	01
8	Injuries to Vital Organs	04
9	Fracture of bones other than Skull and Cervical Vertebrae	09

Discussion

In the present study, the cases of decapitation on railway track found in both GRP as well as in Non GRP P. S., which matches with the study of Sheikh *et al.* (2008)[16] where fatalities in railway accident were also found in both GRP and non GRP P.S. Males were major victims in railway decapitation than females, which also matches with the findings of Satish NT *et al.* (2012).[17] In our study we found that accidental decapitation cases were maximum in number i.e. 66.67%, and this closely matches with the study of Bahadır Kumral *et al.* (2012).[2] The present study also shows that victims of age group 21–50 were maximum in number i.e 70.83% in railway decapitation cases, whereas the study of Wasnik RN (2010)[20] also confirms that maximum number of death in railway fatalities occurred in the age group of 20–49 years i.e. 69.34%.

Conclusion

Decapitation injuries in railway fatalities are increasing in number. Apart from railway mishaps decapitation injuries also had been seen in homicides[6] where persons have been killed by decapitation or else their head have been severed after being killed. Decapitations have also been reported in vehicle assisted suicide as well as some cases of complete hanging.[7,8] So the complex scenario poses a great challenge to the forensic pathologist during discharge of his duty with perfection. Therefore meticulous autopsy with detailed assessment of all circumstantial findings is necessary to rule out any possibility of foul play.

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Conflict of interest: None declared.

Ethical Approval: The study was approved by institutional ethical committee.

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Evaluation of Knowledge and Attitude about Postmortem Examination Among Post Graduate Residents

Sandeep Kadu[1], Sagar Lande[2]

Abstract

Background: Forensic Medicine and Toxicology is an important subject in medical curriculum as it deals mainly with legal aspects of medical practice and postmortem examination. *Aim and objective:* To assess Medicolegal knowledge and attitude about postmortem examination among Postgraduate residents. *Materials and methods:* A cross-sectional, questionnaire based study was conducted from June 2018 to March 2019. The questionnaire based on application of basic and clinical medicolegal knowledge of Forensic medicine and toxicology required during Postmortem Examination (Autopsy) was designed and distributed to Postgraduate residents of Dr. Vitthalrao Vikhe Patil Foundation's Medical College, Ahmednagar (M.S). Their responses were collected and analyzed statistically for number and percentage. *Results:* Total 54 Postgraduate residents were participated in study. Postgraduate residents have passed their MBBS from different government and private Medical colleges from Maharashtra state. It was shocking to know that only 7 (13%) resident were having knowledge regarding, who have the authority to decide whether Medicolegal Autopsy should be carried out or not. It was surprising and disgusting that not a single Postgraduate residents have knowledge about which organs should be preserved for routine viscera preservation for chemical analysis. We found that only 3 (5.6%) resident were having knowledge about preservatives required for chemical analysis. Only 12 (22.2%) were aware that, death in police custody essentially requires two postmortem surgeons and videography. *Conclusion:* This study was an honest attempt to assess knowledge and awareness about Postmortem examination. We observed that a knowledge about Postmortem examination is very poor among the Postgraduate (PG) residents who have passed their MBBS from different government and private Medical colleges from Maharashtra state. Their knowledge should be improved by implementing Competency based curriculum.

Keywords: Postmortem Examination; Autopsy; Medicolegal Knowledge; Forensic Medicine.

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Introduction

Forensic Medicine and Toxicology is an important subject in the MBBS curriculum which deals with medicolegal aspects and postmortem examination. Autopsy, also known as postmortem examination, is dissection of a dead body to know cause, manner and time since death.[1,2] It is beneficial for knowing the rationality of therapeutic technique, potential medicolegal issues surrounding death and providing information of injury to investing officer for proper justice.[3,4] Postmortem findings helps in resolving the criminal cases and giving the justice. Autopsies should be performed by Forensic Medicine experts who have gained special training in the performing autopsies. In medical institutions, postmortem examinations are also demanded for teaching and research works. A clinical postmortem examination is the last step to determine the cause of death or person's illness,

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while medico legal autopsy plays an important role in the administration of justice.[1,5,6]

Day by day there are increasing complaints against doctors by the patients, and judicial system is also passing negative remarks against doctors. In present curriculum Forensic Medicine is taught in II MBBS. After II year MBBS, students starts to forget all the theoretical things, taught in curriculum in due course of time and it is needed to be refreshed on regular basis.[7,8]

Doctors are called to the court to give expert witness regarding various medico legal cases such as assault cases, poisoning cases. Due to lack of poor medico legal knowledge, most of the doctors are badly exposed in the courts. Every doctor should realize that irrespective of postgraduate specialty they choose, throughout their carrier they have to deal with medico legal cases. Hence they should have sufficient and at least basic knowledge about medico legal aspects whether they work in private clinics or government or clinical hospitals.[7,9–11]

As by understanding all of the above facts, the present undergraduate curriculum may not be achieving its objectives. So to know this, we carried out this study to evaluate the knowledge and attitude about postmortem examination among Postgraduate residents.

Materials and Methods

A questionnaire based cross sectional study was conducted in DVVPF's Medical College and Memorial Hospital, Ahmednagar, Maharashtra, India for a period from July 2018 to March 2019 after obtaining approval from Institutional Ethics Committee. A study sample was 54 Postgraduate residents who have passed their MBBS from different government and private Medical colleges from Maharashtra state. A good rapport was established with them. The purpose of study was explained in detail to them and verbal informed consent was obtained. To obtain more reliable & correct answers from them, they were informed about confidentiality of an information collected. A peer reviewed and validated questionnaire containing 10 questions related to knowledge and attitude about basic and applied clinical Forensic Medicine and Toxicology related with autopsy was designed. Postgraduate residents responses were obtained, data was analyzed statistically for number and percentage.

Results

Total 54 Postgraduate residents were participated in this study from various departments. Response rate was 100%. We found that 19 (35.2%) postgraduates were of the opinion that present undergraduate teaching is not sufficient to deal with medico legal aspects. Police officer's written request is required to undertake autopsy was known only to 22 (40.7%) of postgraduates. But it was shocking that almost 32 (59.3%) PG residents does not have knowledge about the deciding authority for carrying out PM examination, which is a basic knowledge. 12 (22.2%) PG residents were aware that two postmortem surgeons and videography is an essentially required if death of an individual occur in police custody. Not a single PG resident was able to tell about how viscera should be preserved for chemical analysis. It is disgusting that only 3(5.6%) PG residents were having knowledge of preservatives used for Viscera preservation for Chemical analysis.

It is very unfortunate that 17 (31.5%) PG residents were of opinion that due to autopsy dead body gets disfigured and 40 (74.1%) PG residents opined that Clinical Postmortem is carried out by Forensic Medicine Department, but it is actually carried by Pathology Department. 33 (61.1%) PG residents were having knowledge of the preservatives used for preservation of viscera for histopathological analysis and 15 (27.8%) postgraduate residents knows that 2 copies of autopsy report should be produced **(Table 1)**.

Table 1:

Do you think that present undergraduate teaching is sufficient to know about medico legal responsibilities of postmortem examination or autopsy?	Yes 35 (64.8%)	No 19 (35.2%)		
Who have an authority to decide that medico legal autopsy should be done or not?	Doctor 23 (42.6%)	Patient's relative 6 (11.1%)	Magistrate 18 (33.3%)	Police 7 (13%)
Whose written request is required to undertake autopsy?	Medical Superintendent 14 (25.9%)	Patient's relative 9 (16.7%)	Police 22 (40.7%)	Judge 9 (16.7%)

In which cases, two postmortem surgeons & videography are essential to carry out postmortem examination?	Sexual assault or rape 24 (44.4%)	Suspicious death 17 (31.5%)	Death in police custody 12 (22.2%)	Dowry death 6 (11.1%)
Which viscera is preserved as evidence in poisoning case for chemical analysis?	No PG residents were knowing about the 3 Viscera bottles and which viscera should be preserved in these 3 bottles.			
What preservatives are used for viscera preservation for chemical analysis?	10% Formalin 32 (59.3%)	Ethanol 7 (13%)	Saturated NaCl solution 3, Potassium oxalate 3, Normal saline 3 each (5.6%)	Rectified spirit and liquid paraffin 2 (3.7%) Don't know 11 (20.4%)
Do you think that due to postmortem examination dead body gets disfigured?	Yes 17 (31.5%)	No 37 (68.5%)		
What are preservatives used for preservation of viscera for Histopathological analysis?	10% Formalin 33 (61.1%)	Ethanol and liquid paraffin 3 (5.6%)	Sat. NaCl and normal saline 2 (3.7%)	Don't know 16 (29.6%)
No of copies of autopsy report produced:	1 2 (3.6%)	2 15 (27.8%)	3 28(51.9%)	As per our wish 9 (16.7%)
Which department carries clinical autopsy?	Forensic medicine and toxicology 40 (74.1%)	Pathology 13 (24.1%)	Anatomy 1 (1.8%)	

Discussion

Postmortem is an important scientific medical examination carried out for solving criminal cases. It is a procedure of detrimental in accurately finding the cause and manner of death in both, natural and unnatural deaths. Clinical Autopsies also helps in confirming ante mortem diagnosis, as well as identification of new and reemerging diseases, and hence it is important for both, in protecting the public health and improving accuracy of vital statistics.[12]

Because of increased public awareness regarding ethical conduct of medical practitioners, litigations against doctors are on hike which is an issue of an immediate concern. To avoid this, doctors need to familiarize themselves with laws and regulations that concern their practice. This will result in fulfillment of ethical, moral and legal obligations in their duties.[13,14]

Our study was carried among 54 postgraduate residents who have passed their MBBS from different government and private Medical colleges from Maharashtra state. We observed that most of them were not having proper basic medicolegal knowledge, which is similar with findings of Giri PA *et al*.[15]

Postgraduate residents have very poor knowledge about basic and clinical applied knowledge of postmortem as seen from results. Most of them were even unknown about authority of Police officer and Magistrate regarding Autopsy. The knowledge of students about preservatives required for viscera preservation for various analysis is very poor, this is in agreement with Ahmad *et al*.[16]

Majority are of view that dead body does not get disfigured coincides with Nihal Ahmad *et al*.[5] But few resident are of negative view that disfiguration of dead body occurs which is not supposed to be expected from Medical graduate.

Resident who have handled Medicolegal cases have good knowledge of different incisions required for autopsy. Only couple of residents were knowing that pathology department carries clinical autopsy to find cause of death which helps in ante-mortem diagnosis. Not a single PG resident was able to tell about how viscera should be preserved for chemical analysis.

List of skills and attitude recommended by MCI desirable for MBBS and Postgraduate students for Forensic Medicine and Toxicology is compulsory to about reporting of injury, collection of biological material.[17,18] Very few were knowing that death in police custody essentially requires two postmortem surgeons and videography. Few students were known about number of copies of postmortem report to be produced. Very few study is done in India on this subject, similar study by Ahmad M *et al*.[16] and G Venkatrao *et al*.[7] compares favorably with present study.

This study has several strengths. First to our knowledge, assessment of medicolegal knowledge and awareness about postmortem examination have not been much investigated. Very few similar studies were carried out.

Conclusion

The findings of this study shows that Indian Medical Graduate have very poor knowledge about postmortem examination. Indian Medical Graduate should have not only knowledge but also skills required for the autopsy. As present curriculum is not emphasizing any proper training related to actual autopsy. The basic need to expose undergraduate medical students to autopsy knowledge and skills cannot neglected because eventually these students will be doing postmortem examination in future. Knowledge and skill of postmortem examination will broaden undergraduate medical student's perspective and help legal system in delivering justice. So, for this Competency based curriculum should be designed and implemented.

Limitation: This study has some limitations as well. This study has been done on only 54 students. Large scale multi centric studies are warranted to confirm results.

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Original Article

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Impact of Zinc on Birth and Placental Weight in Cadmium and Lead Exposure during Pregnancy

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Abstract

Background: Exposure to toxic metals in the prenatal period may have a negative impact on birth weight and placental weight (BW/PW). Low birth weight is an important etiological factor for chronic diseases in advanced ages. The levels of essential elements are also important for healthy progress of pregnancy, but abnormal levels may be harmful, such as excessive zinc (Zn) in the body increases BW/PW. Placental tissue directly provides information to clinician about maternal and foetal exposure. *Aims:* To investigate the impact of cadmium (Cd), lead (Pb) and zinc (Zn) levels on birth weight. *Methods:* This study involved the measurement of metal levels in 150 participants by inductively coupled plasma mass spectrometry (ICP-MS). *Results:* There were positive significant correlations with BW/PW ratio and gestational age (r=0.205, p = 0.012), number of births (r=0.182, p = 0.025), birth weight (r=0.505, p<0.001), and birth size (r=0.296, p < 0.001). Maternal blood Cd levels positively correlated with placental weight (r=0.256, p=0.002) and negatively correlated with BW/PW ratio (r=-0.188 p = 0.021). Foetal placenta Pb levels were positively correlated with BW/PW ratio (r=0.198, p=0.015). Differences between maternal and foetal placenta Zn levels were found to be statistically significant (23.90 ± 3.26 and 25.50 ± 4.69, respectively, p < 0.001). Furthermore, Zn maternal levels of healthy births were found to be statistically different (p = 0.014) when compared with pregnancies with curettages and stillbirths. *Conclusion:* The findings are consistent with the hypothesis that increased Pb and Cd levels in pregnancy results in a low birth weight and these effects cannot be reversed by Zn, the levels of which are positive related with healthy births. Environmental heavy metal exposure in pregnancy should be routinely examined for baby health.

Keywords: Prenatal Care; Stillbirth; Heavy Metals; Zinc supplementation; Birth Weight.

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Introduction

Exposure to toxic metals such as cadmium (Cd) and lead (Pb) in the prenatal period may cause several adverse birth outcomes. Low birth weight has become one of the major risk factors for global disease burden and is known to be associated with coronary heart disease, stroke, hypertension, and non-insulin dependent diabetes mellitus in adulthood.[1,2]

The main routes of human exposure to metals are the ingestion and inhalation of contaminated dust and food, as these toxic metals easily contaminate the food chain, accumulating in different target organs, including the placenta and can cause many deleterious effects on foetus development.[3,4,5] Lead exposure primarily affects the central nervous system development, causing irreversible damage[3] and Cd has developmental toxic effects in the prenatal period.[6,7] Although the placenta acts as a protective and preventive barrier for toxic materials, it is well known that most heavy metals, including Cd and Pb, readily cross it, especially in severe exposure.[8] The adverse effects of these metals

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can be acute, sub-acute or chronic. Furthermore, intrauterine toxic metal exposure can cause low birth weight of the foetus.[9,10] In contrast, zinc (Zn) is an essential metal for the development of foetal endocrine system as well as foetal growth and is known to have a supportive effect on BW/PW.[11,12] Studies in rats, mice, pigs and sheep indicate that severe Zn deficiency increases foetal death due to abortions or anomalies.[13,14]

Disproportionate BW/PW ratio has been linked to many conditions, including increased risk for cerebral palsy, preeclampsia, low birth weight, preterm or post-term labour and low Apgar scores.[15,16] The placenta has been used as a "non-invasive" tool for the prediction of intrauterine toxicity, so the routine use of placenta was proposed for the monitoring of toxic exposure during gestation.[17] The association between placental histopathologic lesions and adverse birth outcomes are controversial, but in notable studies, placental and maternal stromal vascular lesions and villitis of unknown aetiology (VUE) have been found to be more common.[18,19,20] Toxic metals such as Cd and Pb are ubiquitous and environmentally persistent toxic metals that have been implicated in neurotoxicity, carcinogenesis and obesity, whereas essential metals including Zn may alter these outcomes.[21] This study aimed to investigate the positive effect of Zn on BW/PW ratios of Cd and Pb exposed placentas in the prenatal period and was conducted on birth deliveries in Yozgat Bozok University Hospital in 2017.

Materials and Methods

Study area and design

The present study was conducted at the Department of Obstetrics and Gynaecology, Medical Faculty Yozgat Bozok University, in collaboration with the Science and Technology Application and Research Center (Occupational and Environmental Toxicology Laboratory), Yozgat Bozok University, Bozok. The present study included the women who were identified as pregnant during one calendar year, from July 2017 to December 2017, who were enrolled in the Department of Obstetrics and Gynaecology, Medical Faculty Yozgat Bozok University. In the case of a positive pregnancy test, the women were asked to donate cord blood and placenta tissue sample for future analysis and thereafter were invited to the hospital for further examination.

The study has been approved by the research and ethical review committee at the Yozgat Bozok University, Bozok. Oral and written consents were obtained from the all the women those participated to study.

Exposure assessment

Of the 162 women, 150 were donated samples of cord blood and placenta tissue at the delivery. 45 cord blood samples were excluded from analysis due to coagulation. These cord blood and placenta tissues were used for assessment of Cd, Pb and Zn exposure. Information related to age, body mass index (BMI), socioeconomic status (SES), parity, gestational days, characteristics of their new-borns (birth weight, length, head and chest circumference).

Total 150 biological specimens of placenta and cord blood were collected and precautions were taken to prevent contamination between samples. Cord blood samples were stored at 4°C, and the maternal and foetal parts of the placental tissues were separately labelled and stored at -20°C until further analysis.

Outcomes and covariates

Birth weight and placental weight were measured with electronic or beam scales (brand name – BEURER BY 80, Germany), length with a locally produced wooden length board (accurate to 1 mm), and head and chest circumference with a flexible non stretchable measuring tape (accurate to 1 mm). Gestational age was calculated by subtracting the date for the last menstrual period from the date of birth. The date of last menstrual period was obtained by interviewing the women immediately after identification of pregnancy. For women who had forgotten this date, we used the last menstrual period estimated by ultrasound measurements.

Detailed information about various socio-demographic status, maternal tobacco smoking and betel/tobacco chewing during pregnancy, occupation, habitat etc were collected from patients and their relatives. Gender and other informations are processed in voluntary consent form.

Metal Analyses

Standards and Reagents

Nitric acid (Suprapur®, 65%, Merck) and hydrogen peroxide (Emprove®, 30%, Merck) were used for sample and standard reference material digestion. Ultrapure water (Direct-Q®, Millipore) was used for dilution standard (6020 Cal - Inorganic

Ventures; Denge 24 - Inorganic Ventures; 19E Multi Element Standard - Chem-Lab) and sample preparation.

Materials and Methods

Collected samples were sent to Science and Technology Application and Research Center (Occupational and Environmental Toxicology Laboratory), Yozgat Bozok University, for the measurement of heavy metal and trace element levels using a cold chain procedure. Placenta tissues were stored frozen, after thawing at room temperature, the wet tissues were weighed on a precision scale, then transferred onto a glass table. The surfaces of the glass tray and table were pre-dried at 75°C for 24h in an incubator. Tissue samples collected from the incubator were weighed to determine dry matter using a precision scale and transferred to high temperature resistant microwave Teflon tubes. Dry tissue weights were used in all calculations related to placenta.

All blood and tissue samples were digested by Milestone - Start D - Microwave Digestion System. Briefly, 10 ml of 65% HNO_3 was added to the tissues, acid etching was performed in the microwave and the tissue specimens were transferred to 15 ml polypropylene tubes with a rotary cap. The total volume was adjusted to 10 ml with deionised water.[22] One ml of serum and blood samples was placed in high temperature resistant microwave quartz tubes, before the addition of 2.5 ml HNO_3 (65%) and 0.5 m H_2O_2 (30%). The total volume was adjusted to 10 ml with deionised water in 15 ml polypropylene tube. Samples were stored at 4°C in covered polypropylene prior to analysis.

The metal levels of the samples were determined by inductively coupled plasma mass spectrometry (ICP-MS) (Thermo Scientific brand, Icap Qc model). The operating parameters were set as follows: RF power 1550W, nebuliser gas 0.90L min-1, plasma gas 0.80L min-1, nebuliser pressure 3.03 bar, dwell time 0.01, spray chamber temperature 2.9°C. The sampler probe was washed between injections by rinsing with ultrapure water for 30s, followed by washing with 2% HNO_3 for 45s, then rinsing with ultrapure water for 45s. After the wash steps, the instrument automatically ran the next sample. The instrument was operated in the quantitative mode (linear calibration; R^2>0.99) and the interval of calibration was set at 0.5–1000 µg/l for all elements (^{111}Cd, ^{208}Pb and ^{66}Zn). The limit of detection (LOD) of Pb, Cd and Zn were determined based on the standard deviation of the response and the slope of the calibration curves. The LOD values were calculated for Pb, Cd and Zn and found to be 0.007 µg/l, 0.026 µg/l and 0.321 µg/l, respectively. Sample and standard of measurements were performed in triplicate. The methods were validated with Certified Reference Materials (CRM-Seronorm™ Trace Elements Whole Blood L-2), with CRM measured five times on the same day and on different days, moreover the average of the repeated measurements was used for the validation of the methods, whereby the relative standard deviation (RSD) values did not exceed 5%.

Statistical analysis

The relationship between individual information and outcomes was assessed using the SPSS 20.0 statistical programme. The Pearson test was used to evaluate the correlations among variables. Differences in education levels were analysed by post-hoc (Tukey) test and differences originating in groups by post-hoc (Dunnett) test. Regression analysis was used to understand how BW/PW ratios were related to the blood and tissue metal levels. All tests were considered significant at p<0.05 and p<0.01.

Results

Total 162 women were interviewed for participation in the study but 150 were given consent to include in this study. The main parameters including toxicological and demographic are presented in Table 1. Age of participants, gestational days and number of births were found as 27.89 ± 5.44 year, 269.87 ± 10.31 day and 2.20 ± 0.99 respectively (Table 1). The average birth weight, Neonatal length at birth, Head circumference, Placental weight, and Birth and Placental weight ratio were 3.2 ± 0.44 kg, 49.89 ± 2.22 cm, 34.39 ± 2.0 cm, 0.58 ± 0.07 and 5.59 ± 0.75 respectively. In this study, valuable data related to the permeability of Cd, Pb and Zn through the placenta was also obtained. Differences between maternal and foetal placenta in terms of Zn levels were found to be statistically significant (23.90 ± 3.26 µg/l and 25.50 ± 4.69 µg/l, respectively, p<0.001).

Descriptive statistics of the various socio-

demographic data of this study are shown in Table 2. No birth anomalies were detected and about 96% (n=144) of the total births were over 2.5 kg birth weight. Only 10% of the age groups were classified in the risky group (>35 years) and 82% of the pregnant women lived in urban areas. As shown in SI Table 2, only 6.7% of the pregnant women smoked. In addition, the total number of passive smokers were 31 (20.7%) (Table 2).

Table 1: The descriptive statistics of the study variables

N= 150		Mean	SD	Minimum	Maximum
Age (year)		27.89	5.44	18	45
Gestational age (day)		269.87	10.3	210	294
Number of birth		2.2	0.99	1	5
Placental weight (kg)		0.58	0.070	0.40	0.78
Birth weight (kg)		3.21	0.44	1.8	4.2
Birth weight / Placental weight (BW/PW)		5.59	0.75	3.13	9.83
Neonatal Length at Birth (cm)		49.89	2.22	42	56
Head circumference (cm)		34.39	2	30	53
Zn	Maternal blood (mg/L)	0.83	0.08	0.641	1.13
	Maternal placenta (mg/kg)	23.9	3.26	19.17	38.99
	Fetal placenta (mg/kg)	25.5	4.69	18.51	48.07
	Cord blood (mg/L) (n=105)	0.59	0.17	0.24	1.14
Cd	Maternal blood (ug/L)	0.16	0.53	0	5.86
	Maternal placenta (mg/kg)	0.07	0.1	0	1.01
	Fetal placenta (mg/kg)	0.08	0.1	0	0.55
	Cord blood (ug/L) (n=105)	0.46	0.08	0.11	0.66
Pb	Maternal blood (ug/L)	6.8	10	0	97.4
	Maternal placenta (mg/kg)	0.43	0.85	0	8.49
	Fetal placenta (mg/kg)	0.49	0.91	0.02	7.1
	Cord blood (ug/L) (n=105)	11.7	13.3	3.9	84.8

Table 2: Number and percentage of socio-demographic categorical variables related to pregnancy

n=150		n	%*
Gender (n=153)	Girl	72	47
	Boy	75	49
	Twin (boy)	6	4
Birth weight (kg)	<2.5	6	4
	2.5-4.2	144	96
Presence of anomaly	No	150	100
BW/PW percentile groups	<%10	9	6
	%10-90	82	54.7
	>%90	59	39.3
Gestational age (day)	<259	12	8
	259-294	138	92
Delivery method	Normal	53	35.3
	Cesarean	97	64.7
Zn supplematation	No	32	21.3
	Yes	118	78.7
History of stillbirth, curettage or miscarriage	No	106	70.7
	Yes	44	29.3
Number of birth	1	42	28
	2	54	36
	3	37	24.7
	4 and upper	17	11.3
Age groups	≤35	135	90
	>35	15	10
Mother education status	Secondary School and under	77	51.3
	High School	43	28.7
	University	30	20
Mother's occupation	Riskless occupation (housewife and so on)	128	85.3
	Risky occupation (industry and so on)	22	14.7

Place of residence	Village	27	18
	City	123	82
Vegetable consumption	Rarely	106	70.7
	Everyday	44	29.3
Smoking (mother)	Disuse	140	93.3
	Use	10	6.7
Passive smoking (father)	Disuse	77	51.3
	Use	73	48.7
Passive smoking (mother)	No	119	79.3
	Yes	31	20.7

*Row percentages used

Table 3. Pearson correlations of all continuous variables with BW/PW

n=150	BW/PW	Maternal Blood			Maternal Placenta			Fetal Placenta			Cord Blood***		
		Cd	Pb	Zn	Cd	Pb	Zn	Cd	Pb	Zn	Cd	Pb	Zn
Age (year)	0.028	0.007	0.020	0.008	0.014	-0.034	0.077	0.103	-0.067	-0.072	0.112	0.008	-0.053
Gestational age (day)	0.205 *	0.037	0.009	0.023	-0.048	-0.004	-0.108	0.089	0.034	-0.033	-0.168	0.172	0.175
Number of birth	0.182*	0.006	-0.009	-0.056	-0.073	-0.028	-0.124	0.095	0.019	-0.030	0.065	-0.017	0.081
Placental weight (kg)	-0.392**	0.256**	0.144	-0.113	0.024	-0.007	0.013	-0.017	-0.119	0.030	-0.015	0.016	-0.039
Birth weight (kg)	0.505**	0.001	-0.040	-0.041	-0.033	0.034	-0.104	0.035	0.045	0.028	-0.160	0.157	0.062
Birth size (length) (cm)	0.296**	0.061	0.039	0.083	-0.104	-0.096	-0.033	0.035	-0.004	-0.086	-0.248*	0.265**	0.126
Head circumference (cm)	0.053	-0.019	-0.064	-0.077	-0.100	-0.077	-0.042	-0.033	-0.032	-0.085	-0.437**	0.486**	0.100
BW/PW	1.000	-0.188*	-0.136	0.076	-0.065	0.033	-0.134	0.058	0.198*	-0.003	-0.159	0.175	0.146

*p<0.05, **p<0.01, *Cord Blood (n=105)

Table 4. Impact estimates of BW / PW ratio determinants (multiple regression analysis)

Model (n=150)	Point estimate	95,0% Confidence Interval		Adjusted R-squared*
		Lower Bound	Upper Bound	
Zn MB	0	-0.003	0.003	0,967
Cd MB	0.187	0.058	0.316	
Pb MB	-0.043	-0.117	0.03	
Zn MP	-0.001	-0.009	0.007	
Cd MP	0.04	-0.264	0.343	
Pb MP	-0.002	-0.038	0.035	
Zn FP	-0.001	-0.006	0.004	
Cd FP	-0.14	-0.417	0.137	
Pb FP	0.03	-0.004	0.063	
Gestational age	0.001	-0.001	0.004	
Birth weight	0.002	0.002	0.002	
Birth length	0.016	0.003	0.029	
Head circumference	-0.011	-0.023	0.002	
Placenta weight	-0.011	-0.012	-0.011	

Dependent Variable: BW/PW rate; MP: Maternal Placenta, MB: Maternal Blood, FP: Fetal Placenta; *p<0.001

Significant positive correlations were found between BW/PW ratio of participants and gestational age, number of births, birth length and birth weight levels (r=0.205, p<0.05; r=0.182, p<0.05; r=0.296, p<0.001 and r=0.505, p<0.001, respectively). There was a negative correlation between BW/PW ratio and placental weight levels (r=-0.392, p<0.001) (Table 3). The correlation coefficients BW/PW ratio with Cd, Pb and Zn (maternal blood, maternal placenta and foetal placenta) values are shown in Table 3.

In the present study, Zn maternal levels of healthy births were found to be statistically significant (p=0.014) when compared with pregnancies with curettages and stillbirths. The groups from which the differences originated were determined by the post-hoc (Dunnett) test. The mean foetal placental Zn in the age group 35 years and under was higher than the mean age group of 35 years (p<0.05).

The Impact of estimates of BW / PW ratio determinants (multiple regression analysis) are dipicted in Table 4. The Regression analysis was

performed to explain the relationship between BW/PW ratio and all parameters. BW/PW ratios were divided into three categories as low, normal and high, with values below the 10th percentile categorised as "low", while 10–90 and higher than the 90th percentile were categorised as "normal" and "high", respectively. The total parameters included in the model can explain 96.7% of the BW/PW ratios (p<0.001) (Table 4).

Discussion

Environmental and occupational exposure to heavy metals, such as Pb and Cd are major health problems for human health.[1,23,24,25,26,27,28] Many investigations concluded that toxic metals have negative effects on neonate head circumference, birth weight, and height.[29,30] Pb and Cd are toxic substances of interest in pregnancy due to their teratogenicity[31,32], the toxic metal poisoning of the mother indirectly causes diseases, such as chronic kidney disease, hypertension and neurological complications, in the foetus.[33,34] This is the first study to provide possible effects of Pb, Cd and Zn on the BW/PW in Turkish women who experienced environmental toxic metal exposure.

Zn deficiency has been shown to limit growth in young children and deteriorates foetal growth in animal models.[35,36,37,38] Cd and Pb are common environmental pollutants associated with low birth weight. Some important metals can alleviate exposure, but the data are inconsistent.[39] Zn deficiency is common in the developing world, being prevalent in pregnant women and young children.[40] This is supportive for Zn supplementation during pregnancy and the dose regimen should be revised. Pb and Cd are known to interact with essential metals supplied by foods. Pb replaces Zn on heme enzymes and Cd replaces Zn on proteins synthesis, such as metallothionein. In addition, Pb competitively interferes with divalent cations including Zn[41,43,44,45,46] and low zinc levels have been reported to be consistent with heavy metal levels.[9,41,42] However, no inverse correlation was found in the present study. Low birth weight is considered an important public health problem with a high risk of neonatal mortality and increased chronic diseases in adulthood[47], which supports the need to monitor Pb and Cd levels, and recommend Zn supplementation.

Several studies have discussed the effects of heavy metal exposure during pregnancy on birth weight.[48,49,50,51] In our study, maternal blood Cd levels were positively correlated with placental weight (r=0.256, p=0.002) and negatively correlated with BW/PW ratio (r=-0.188, p=0.021). Foetal placenta Pb levels were positively correlated with BW/PW ratio (r=0.198, p=0.015). As these findings are consistent with gestational diabetes, the etiological role of Cd and Pb exposure and pregnancy should be investigated more extensively for gestational diabetes.[52] Conversely, Dwivedi et al.[10] did not detect a correlation of Pb and Cd levels in maternal venous blood with birth weight. Zhu et al.[49] found that maternal low toxic metal levels, in particular Pb, correlated, but there was no association between low toxic metal levels and gestational day or/and preterm birth. In our study, there was a significant relationship between term/preterm birth and BW/PW ratios (p<0.01). These results provide information for the role of exposure of heavy metals on foetuses and possible health outcomes.

BW/PW ratios were divided into three categories as low, normal and high, with values below the 10th percentile categorised as "low", while 10–90 and higher than the 90th percentile were categorised as "normal" and "high", respectively. A low BW PW ratio is associated with an increased risk of cardiovascular diseases and diabetes in childhood. [53,54]

Maternal blood, maternal placental and foetal placental Cd, Pb and Zn levels were examined according to the categories of BW/PW ratios. Cd levels in the maternal blood among categories were different (F = 6.118, p = 0.003). According to the post-hoc test results, different Cd levels in maternal blood may be a result of a low BW/PW ratio (> 10th percentile). The increased maternal Cd level seems to cause decreased birth weight and foetal growth retardation.[12,21] Our data supports the reversal of the deleterious effects of Pb and Cd exposure, but this should be clarified by further studies of larger groups.

Conclusion

This study assessed the relationship between Pb and Cd levels in pregnant women and low birth weight, presenting data consistent with the hypothesis that increased Pb and Cd levels in pregnancy results in low birth weight and that Zn does not reverse these effects, as there was no correlation between the heavy metal levels and Zn. Pregnant women with high toxic metal levels, low gestational age and low birth weight, as well as high placenta weight had a significantly higher health risk of infants or low BW/PW ratio above the 90th percentile. Therefore, it is recommended that environmental heavy

metal exposure in pregnancy should be routinely examined to protect maternal health and foetal intrauterine healthy development.

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Case Report

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Death Due to Hanging in Adolescents: A Case Series

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Abstract

Introduction: Hanging is an important cause of homicidal and suicidal injury in adults, but in adolescents, it is usually accidental, leading to death because of asphyxia as a result of partial or complete hanging. Though rarely observed in children less than 12 years of age, suicide by hanging is a common cause of unnatural death in adolescents, and there are several recent examples. The most common suicidal methods among adolescents are hanging, the use of firearm, jumping from height, drowning and poisoning. *Case Details:* The authors describe three incidents in a metropolitan city, where an adolescent was brought to hospital after being found hanging in his/her own residence by their parents. In the first case, the victim was a 16 year old girl, who was found hanging from ceiling fan using her dupatta. In the second case, a 14 year old girl allegedly committed suicide by hanging herself after her parents had rebuked him regarding his academic performance. In the third case, a 13 year old boy allegedly hanged himself while trying to emulate the suicidal hanging shown in a crime thriller series. The authors discuss the suicide notes found in these cases and also the post-mortem examination findings in each case. *Conclusion:* The authors try to analyze factors associated with death due to hanging in adolescents and also identify areas of intervention for preventing such deaths. The predisposing and precipitating factors in these cases observed were love affair related strife, examination related pressure and emulating television stunts. This case series highlights the importance of crime scene reconstruction to evaluate manner of death in obscure cases.

Keywords: Adolescents; Suicide note; Hanging; Accidental; Ligature material; Autopsy.

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Introduction

Adolescence is the transitional phase of growth and development between childhood and adulthood where several key developmental experiences occur. Besides physical and sexual maturation, these experiences include movement toward social and economic independence, development of identity, the acquisition of skills needed to carry out adult relationships and roles, and also the capacity for abstract reasoning[1] dolescence as per World Health Organization is defined as the age period from 10 to 19 years.[2] Adolescents want very much to show that they are mature enough and 'can handle things themselves', but at the same time, some of the medical and psychosocial issues they confront may require them to be more dependent. Adolescent suicidal behavior represents a grave crisis in the adolescent, a crisis not only affecting the development of the adolescent, but one that also endangers the existence of their lives.[3] Psychological profile of adolescents who attempt suicide in order to die is very different from the profile of adolescents whose attempt is motivated by other factors.[4] Among this adolescent population, the most common predisposing factor to suicide was reported childhood trauma, while

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mental illness was the least when compared to other age groups. In addition, all of these adolescents reported experiencing negative life events, which typically included failing examinations and minor violations of discipline with anticipation of negative consequences.[5] More than 1.1 million adolescents aged 10–19 years died in 2016, over 3000 every day, mostly from preventable or treatable causes.[6] Out of the listed causes, illness, family problems and failure in examination were the main reasons for suicide among children.[7]

Among the different methods of suicide chosen by adolescents, a common form is Hanging, a form of mechanical asphyxia caused by suspension of the body by a ligature which encircles the neck, the constricting force being the weight of the body. Though most hangings are suicidal, accidental hangings occur due to entanglement in ropes or cords; this is relatively uncommon, and is usually seen in infants and children. Homicidal hanging is very rare, outside abuse of human rights and lynching.[8–17] The authors illustrate a Case Series of three adolescents who committed suicide by hanging themselves and discuss the different reasons behind their suicide, along with probable interventions to prevent such incidents in society.

Case Details

Case 1

History: A 16-year-old female was found hanging in her residence. She used a black dupatta as the ligature material, which was tied to a ceiling fan. She was brought to AIIMS, where she was declared brought dead and post-mortem examination was done. A four-page suicide note was recovered from the crime scene, which stated that the reason for her suicide was that her parents were not allowing her to pursue her career in modeling and they were also against her relationship with a person who had promised her a modeling job **(Images 1-4)**.

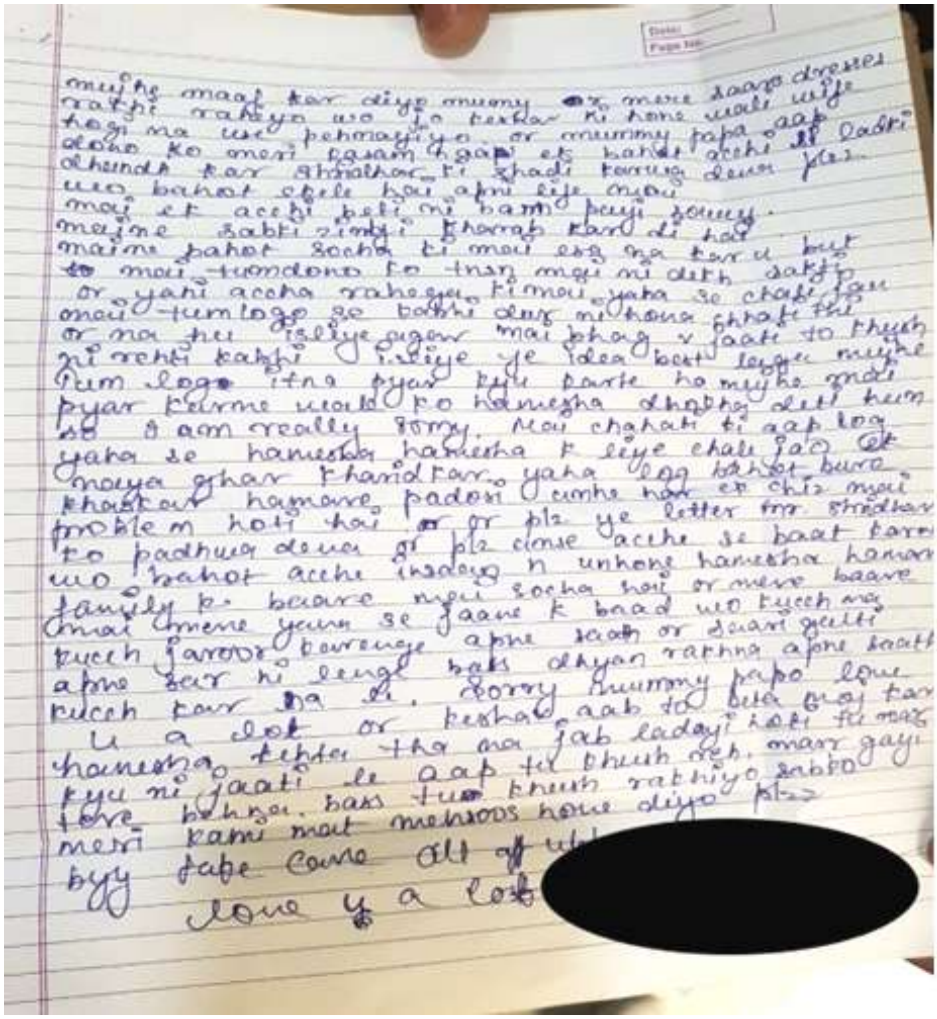

Image 1: Suicide note.

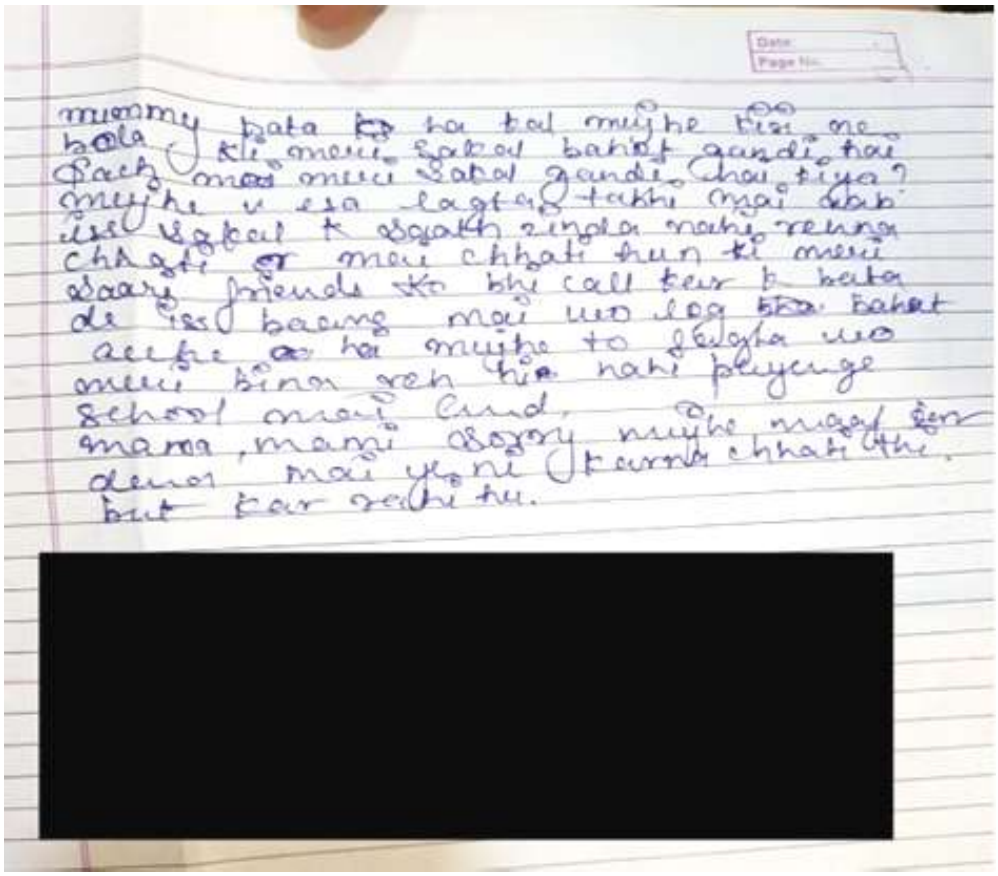

Image 2: Suicide note.

Autopsy Findings: On external examination, bilateral conjunctival congestion was present, the bridge and the ala of the nose, cheek as well as the lips, frenulum and both gums were intact. Bluish discoloration of lips and nail beds were observed. A black dupatta was found in situ, encircling her neck discontinuously. A reddish brown colored parchment like ligature mark was present in the middle one-third of the neck, running obliquely towards the nape of her neck. On dissection, tissue underlying ligature mark was dry, pale, glistening and devoid of any extravasation and hematoma. On internal examination, brain and lungs were congested. Cause of death was given as 'Asphyxia due to Antemortem hanging' and the time since death was about 18–24 hours.

Image 3: Deceased with ligature in situ.

Image 4: Ligature mark on neck.

Case 2

History: A 14-year-old girl was found hanging by dupatta tied to a bar of ceiling in her residence and was taken to a Private Hospital where she was declared brought dead. A suicide note was present in the crime scene, which stated that she had been scolded by her parents recently for poor academic performance, which was the reason for her committing suicide.

Autopsy Findings: On external examination, bilateral conjunctival congestion and bluish discoloration of lips and all nail beds were present. Ligature material with circumference of 27 cm was encircling the neck in a single loop with a single slipping knot at the back of the neck. A reddish brown coloured parchment like non-continuous, oblique ligature mark was present in the middle one-third of the neck. On dissection, tissue underlying ligature mark was dry, pale, glistening and devoid of extravasation and hematoma. Her brain and lungs were congested. Cause of death was given as 'Asphyxia due to Ante mortem hanging' and the time since death was 18–24 hours **(Images 5,6).**

Image 5: Ligature mark on neck of deceased.

Case 3

History: A 13-year-old male was found hanging in his residence with the help of a rope tied to a ceiling fan and was taken to a Government Hospital, where he was declared brought dead. His father alleged that the reason for his suicide could be his interest towards a very famous crime thriller TV series which had a recent episode on suicidal hanging.

Autopsy Findings: On external examination, bilateral conjunctival congestion and bluish discolouration of all nail beds were present. A reddish brown coloured parchment like ligature mark was present in the middle one-third of the neck. On dissection, tissue underlying ligature mark was dry, pale, glistening and devoid of extravasation and hematoma. No other ante mortem injuries were present on the body. On internal examination, internal organs were congested. Cause of death was given as 'Asphyxia due to Ante mortem hanging' and time since death was 12–18 hours **(Image 7).**

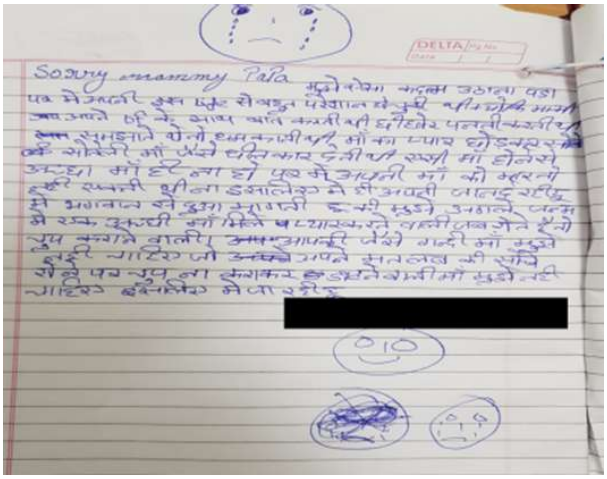

Image 6: Suicide note.

Image 7: Deceased with ligature mark on neck

Discussion

The incidence of suicide and the methods used vary from country to country due to the variations in cultural, religious, and social background.[18] The usage of methods like 'Poisoning', 'Drowning' and 'Fire/Self Immolation' as means of suicide, have reduced in 2014, while 'Hanging' has increased to 41.8% (from 37.0% in 2012).[19] Hanging is a certain, quick method of committing suicide and is straightforward in terms of both access to materials and ease of implementation.[8–17] The ligature material used by the victim for hanging may be anything available at that moment, which includes any household article or belongings of the victim. Dupatta and sari are commonly used as a ligature material mainly by girls as these are part of the attire commonly worn by Indian females. Suicide rates consistently increase from childhood to adolescence, perhaps because of the greater prevalence of psychopathology in adolescents. Older adolescents are also cognitively more capable of planning and executing a lethal suicide attempt and they show greater planning and intent. Furthermore, they receive more autonomy and less supervision and social support from parents, which may increase the opportunity for disconnection and make recognition of imminent riskless likely.[20,21] The lesser incidence of suicide among adolescents of 10–14 year age group could be due to several factors, such as lack of cognitive maturation, high extent of parental care, good relation with parents, lack of development of indistinct ideas of nature of death and less exposure to risk factors.[18]

S.H. Bhosle *et al.*[1] in their study found that in adolescent deaths due to hanging, manner of death was most commonly suicidal (96.08%) in nature. Out of the total number of suicidal deaths due to hanging among adolescents, 81% were among the older adolescent (15–19 years) age group and 19% were observed among the 10–14 year age group. Most of the suicidal deaths due to hanging (83.67%) among adolescents were observed at the victims home. Vijayakumari N[22] also reported that most of the hanging cases in adolescents occurred at home (95.50%) as they prefer any secluded place that suits his/her purpose. Vijayakumari N[22] stated that in 57.14% of cases of death by hanging among adolescents the precipitating factor was failured in school examinations in the presence of intense competition among school children, high expectation from parents and teachers, and inability to attain their academic goals.

The three cases mentioned here, enlightens us with various major issues, which have dangerous outcome for an adolescent brain. Easily available ligature materials, suspension points and secluded places make these suicides very difficult to prevent. The impact of television is more in the above-mentioned cases out of which in one case it had a direct impact by showing a TV series related to suicides and the other two cases making them stigmatic about popularity by fame and romantic relationships. In the first case the deceased hanged herself as she was not being allowed to pursue her career in modeling and her parents were also against her relationship with a person who had promised her a modeling job. In the second case, as per suicide note, deceased stated that she had been scolded by her parents recently for poor academic performance, which was the reason for her committing suicide. She could not cope up with the constant stress and peer pressure, to which she was being subjected to by her parents. In the third case, the father of the deceased boy in his statement stated that the child was too fond of watching Criminal TV serial, which influenced his adolescent mind to such an extent that he became depressed and ultimately committed suicide.

Handley ED *et al.*[23] in his study on socio-economically disadvantaged depressed adolescent girls and their mothers concluded that parental conflict and abuse increases adolescent suicide ideation. These findings highlight the vulnerability of maltreated adolescents and call for relationship based interventions for suicide prevention. As per Sadock *et al.*[24] adolescence is a period of turmoil and negativism in which the individual begins to assert viewpoints in opposition to parental view points, identifies with the omniscient peer group, and prepares for the tasks of adulthood. Piaget[25] identified that intense individuation and desire for decreasing parental authority is a characteristic feature of adolescence phase of life. Martin G[26] in his study suggested that against a background of psychological disturbance, with prior knowledge of a real life suicide, television suicide may contribute to a personal attempt. Gould *et al.*[27] in their study observed that adolescents viewing fictional stories featuring suicidal behavior may themselves experience suicidal behavior.

Conclusion

Behavioral changes observed in the adolescents who are likely to commit suicide are useful for the identification of high-risk adolescents. Warning

signs in a child such as sudden changes in personality or behavior, sleep patterns and eating habits should be noticed and attended to immediately. The predisposing and precipitating factors observed could be domestic strife, school and examination related stress, mental illness, sexual harassment and unsupervised use of internet and television. Adequate public health awareness should be given regarding predisposing factors and prevention of suicides. Intensified supervision, counseling, and identification and early psychiatric consultation of high-risk adolescents are possible useful measures for the prevention of suicidal deaths in this age group. Family members, friends, and teachers have to play a very important role in the prevention of deaths by hanging among this age group. Counseling of adolescents by teachers and parents may be useful to relieve examination related stress in adolescents and thereby avoid depression and subsequent suicidal tendency. Available literature discusses about adolescents in general, including older adolescents, who are nearing their adulthood. Hence, further studies should be done on only younger (10–15 years) adolescents, focusing more on psychological surveys, thereby identifying and confirming possible risk factors for this particular age group which can be utilized by Government agencies in formulating specific prevention strategies. The academic institutions should be equipped with counselors trained to deal with this adolescent age group and initiate appropriate actions to prevent such incidents from happening.

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Case Report

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Homicide by Three Different Asphyxial Methods: A Case Report

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Abstract

Introduction: Methods used for homicide varies enormously such as use of fire arm, use of Sharp weapons and by other means like Strangulation, smothering, poisoning, burning etc. However, employing multiple methods by a single assailant for killing one victim is rarely reported in standard Indian literature. *Case Details:* This case report describes the death of a 31 year old married female, who was killed by employing different methods of mechanical asphyxia. Multiple nail scratch abrasions were present on her cheek and neck. Internal examination showed haemorrhagic infiltration in the muscles of neck and contusion of the inner wall of upper respiratory tract. There was also presence of Sub-dural & Sub-arachnoid haemorrhage and multiple bilateral rib fractures, along with blunt trauma injuries on both her thighs. This case highlights the possibility of involvement of a single person only, in the homicide of a healthy adult female by the application of different asphyxial methods together. *Conclusion:* The autopsy findings helped the autopsy surgeon in reconstructing the sequence of events and the manner in which the act was carried out. All these criminal offences were done by one single assailant who compressed her mouth and nose with the left hand, squeezed her neck with right hand and pressed her thorax with knees. The autopsy findings and probable sequence of events helped the police to establish the crime by suspected assailant. This case emphasizes importance of forensic reconstruction in helping the judiciary.

Keywords: Homicide; Smothering; Manual Strangulation; Traumatic asphyxia; Forensic Reconstruction.

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Introduction

Homicide can be an act of premeditation or a random act of violence. The reason can be multiple and the method of execution can also be variable. Globally fire arms are most commonly used, while in Indian scenario, sharp weapons or poisoning or burning or asphyxia methods are commonly employed. Different asphyxial methods are commonly employed by perpetrators to murder their victims. Asphyxia is a mode of death caused by interference with respiration, in which the cells fail to receive or utilize oxygen (hypoxia) along with failure to eliminate excess of CO_2 (hypercapnia).[1,2] The classical signs of asphyxia like visceral congestion, petechiae, cyanosis and fluidity of blood, are now considered to be non-specific as they can occur in deaths from other causes also.[1,3] Manual strangulation, also known as throttling, is a type of asphyxial death where the perpetrator uses his hand to encircle and compress the front and side of the victim's neck. Traumatic asphyxia is a type of mechanical asphyxia, where there is mechanical fixation of the chest wall leading to restricted respiratory movements and prevention of inspiration.[3] The chest and upper abdomen are compressed by an unyielding substance or object so that chest expansion and diaphragmatic

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lowering are restricted, as can be seen when the person gets buried underneath sand, earth, coal, avalanche and entrapment beneath motor vehicles, heavy machinery.[1-4] It can also occur when one person kneels or sits with the whole weight of his body upon another for a prolonged period.[5] It is not very common for a single assailant to employ more than one methods to murder someone. The authors describe one such instance where the perpetrator used three different asphyxia methods to kill the victim.

Case details

History

A 31-year-old female of body length 145 cm and weight 68 kg was received for autopsy at our mortuary. Inquest papers revealed that the body of deceased was recovered from her bed room, which was locked from outside. Her mobile phone was switched off since morning, which led to arousal of suspicion by her relatives, who finally broke open the door and found her lying unconscious and unresponsive on the floor. Her parents said that she was married 2 years ago without the consent of her family and also revealed that her husband was currently unemployed and frequently physically tortured her.

Autopsy Findings

On external examination, the following ante-mortem injuries were detected:

i. A reddish contusion, measuring 20 cm x 15 cm, situated over parieto-occipital region, across midline, associated with sub-scalp hematoma.

ii. Multiple reddish contusions, situated over face involving both lower eye lids and nasal ala and on both sides of lower jaw **(Image 1)**.

Image 1: Contusions in face

Image 2: Laceration of frenulum

iii. A lacerated wound, measuring 1 cm x 0.2 cm x 0.5 cm, vertically placed at midline of frenulum of upper lip **(Image 2)**. There were several abrasions, mucosal tears and sub mucosal contusions present in inner aspect of upper lip, across midline along with multiple contusions at inferior aspect of tongue.

iv. A lacerated wound, measuring 1 cm x 0.5 cm x 0.5 cm with underlying and surrounding contusions, over right side of lower lip at muco-cutaneous junction.

v. There was congestion of the face, neck and chest **(Image 3)**.

Image 3: Congestion and bruises of face, neck and chest

vi. Multiple linear and crescent-shaped abrasions with concavity towards the left side were present in the mid-frontal region of the neck **(Images 4 & 5)**. Irregular shaped contusions of varying sizes were also present over the front and both sides of the neck.

vii. Multiple brownish abrasions, measuring 1 cm x 1 cm to 4 cm x 1.5 cm over an area of 9 cm x 4 cm, situated over lateral aspect of right breast.

viii. A reddish contusion, measuring 25 cm x 18 cm, muscle deep, situated at the front aspect of lower neck and front of chest, lower margin was at xiphisternum.

Image 4: Crescentic abrasions on neck

Image 5: Abrasions on neck and right jaw

ix. A reddish contusion, measuring 3 cm x 3 cm, muscle deep, situated on front aspect of abdominal wall.

x. A reddish contusion, measuring 18 cm x 13 cm, muscle deep, situated on front and inner aspect of right thigh, 13 cm above knee joint.

xi. A reddish contusion, measuring 21 cm x 11 cm, muscle deep, situated on front and outer aspect of left thigh, 13 cm above knee joint **(Image 6)**.

Image 6: Contusion over left thigh

Image 7: Contused muscles of neck and chest

On dissection, the skull bones were intact. Sub-dural haemorrhage with maximum thickness of 2 mm was present over bilateral parieto-temporal region and base of brain. Thin layer of global Sub-arachnoid haemorrhage was present. There

was contusion of the neck muscles; contusion of the intercostal muscles of the chest; along with fractures of bilateral 2^{nd}—7^{th} ribs at their antero-lateral aspect **(Image 7)**. Two transverse sternal fractures were present at the junction of body and manubrium and at the body itself **(Image 8)**. Pneumothorax and blood of around 500 ml was present on the left side. There was laceration and collapse of a portion of the anterior surface of both lungs corresponding to the rib fractures. Contusion was also seen on the surface of the epiglottis and the inner wall of larynx, trachea and oesophagus. Multiple intestinal and gastric contusions and two mesenteric tears were present and abdominal cavity contained 250 ml of fluid blood **(Image 9)**. The cause of death was opined as "Combined effect of smothering, strangulation and multiple blunt force impact injuries sustained to chest, head and abdomen."

Image 8: Fractures of Sternum

Image 9: Blood in thoraco-abdominal cavities

Discussion

Different methods of asphyxia are commonly employed to commit homicide. In manual strangulation, the face usually appears congested and cyanotic, with petechiae of bulbar conjunctival, the skin of the upper and lower eyelids, the bridge of the nose, the brows and the cheeks.[1] Available literature suggests bruising on the neck to occur because of the assailant's attack, whereas abrasions may be from either the victim or the assailant.[1–6] Scratches produced on the victim may be linear or crescentic, depending on whether a static or a moving force was applied on the neck of the victim by the assailant.[3] The present case showed a combination of these mechanical injuries, and the linear lines were produced because of skidding of nails on the skin, which suggests a fight between the assailant and the victim. Also, haemorrhages were present in the muscles of the neck; epiglottis and the inner wall of larynx, trachea and oesophagus. Asphyxia by smothering is caused by blocking air entry into the lungs by simultaneous closure of the nose and mouth and is usually homicidal, rarely suicidal and very rarely accidental.[7–10] The typical features include bruises or abrasions on the cheeks, around the mouth, lips or lesions within the lips or mouth.[7–10] In this case there were multiple abrasions on the face and contusion on the lip, along with lacerated injuries inside the mouth and lower lips, thus confirming smothering. Smothering is a common method of homicide, most often encountered when the physical size and strength of the assailant exceeds that of the victim.[11] The usual victims are females, children, aged people and those cases where the victim may be incapacitated due to drugs or caught unaware because of the suddenness of the act. Traumatic asphyxia restricts the venous return from the head due to prevention of respiratory movements by compression of the chest by heavy objects.[11,12] The characteristic features of traumatic asphyxia include congestion of head and neck along with petechial haemorrhages of the face, neck, upper chest and conjunctivae.[12] It has been suggested that concomitant injuries indicate the severity of compression in traumatic asphyxia and the presence of such fatal injuries do not influence the pathological findings of asphyxia.[13–16] In this case, there were multiple fracture of ribs and corresponding injuries to the lungs, which indicate application of heavy pressure by the assailant sitting on the victim's chest and applying blunt force to chest and abdomen. This did not obscure the congestion of the face, neck, chest and petechiae of conjunctiva. Traumatic asphyxia is mostly accidental and rarely homicidal. Homicidal traumatic asphyxia by kneeling or sitting on the victim is very rare and such instances have been reported by Lupascu *et al.*[17] and by Das *et al.*[18]

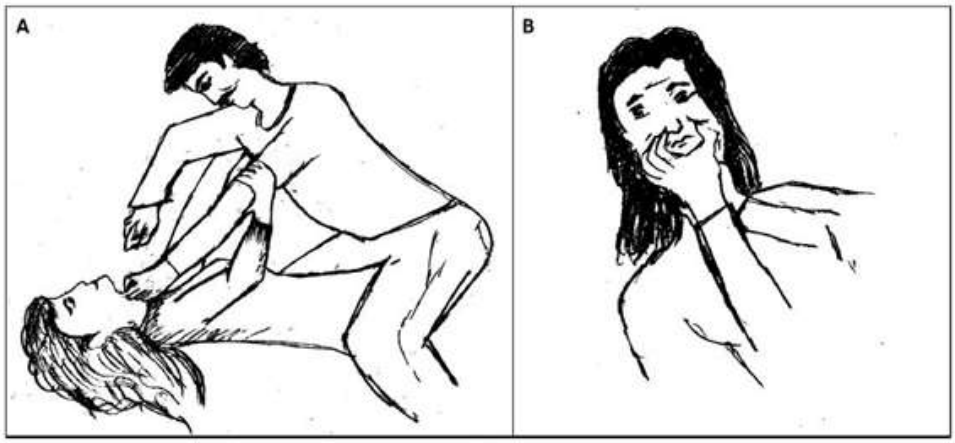

Image 10: Illustration showing relative position of assailant and victim in (A) and position of assailant's both hands in (B)

Initially, there were some speculations regarding multiple assailants being involved, but this multitude of wounds is possible by one assailant only. After assessing the circumstantial evidences and post-mortem findings we reconstructed the scene of crime and opined that probably the homicide was done by a single assailant, **(Image 10)** who compressed her mouth and nose with one hand, squeezed her neck with another, sat on her chest and pressed her trunk with his knees. In between his attempts, the victim also may have struggled, so he might have hold her hair and thrashed her head repeatedly on the floor, which lead to the head injury and the intracranial haemorrhage. As per our analysis, when the victim tried to shout, the assailant used his left hand to smother her resulting in an abrasion on her cheek. In an effort to breathe, the victim may have tried to remove both the hands of the assailant, but managed to lift the left hand which was covering his mouth and nose. The assailant might have again put his hand forcefully over the victim's mouth that produced the abrasion on nose, the left upper eyelid, and possibly the lip contusion. The fracture of the ribs and contusion of the intercostal muscles indicate that the assailant applied considerable amount of force to compress the victim's chest and restrict her movement.

Later, during police investigation, the victim's husband confessed of committing the crime himself single handedly on the sleeping victim. The victim was totally caught unaware as she was sleeping when attacked, and this made the assailant's job easy. He had sat on the chest of the victim, used his right hand to throttle the neck and the left hand to cover the mouth to prevent her from shouting. He also stated that he did not use any ligature material for strangulating her. He also narrated that after their marriage, recently he discovered that the lady was previously married and had divorced her previous husband. Also, she was Retrovirus Positive, and he had contracted the disease unknowingly from her. Both these facts were concealed from him and after accidentally discovering these; he was enraged and frustrated with his own situation and thus murdered his wife single-handedly.

Conclusion

The authors narrated a case of a homicidal death by a combination of three different asphyxial methods. Manual strangulation was confirmed by the presence of nail scratch abrasions and contusions on the neck and haemorrhage of the soft tissues of the neck. Compression of the thoracic region was proved by the rib fractures, haemorrhages of the intercostal muscles, corresponding injuries to the lungs and pneumo-hemothorax. Smothering was indicated by the presence of contusions on the nose, jaw, around the mouth, lips and lacerations underneath the lips and mouth. The cause of death was opined as asphyxia secondary to mechanical obstruction of pulmonary oxygen flow due to smothering and manual strangulation, along with inspiratory insufficiency produced by thoracic compression. Each of these three methods acted simultaneously and in varying combinations leading to the fatal outcome. This case emphasizes the role of a forensic pathologist in reconstructing the crime scene from autopsy findings and thereby helping the judicial authorities.

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Short Communication

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History of Dactiloscopy in Hungary

Petrétei Dávid

Abstract

This paper in a brief overview of the "fingerprint history" in Hungary, from the medieval naive usage through the scientifically sound personal identification till the recent situation. This conference paper was presented in Bratislava, 18th of October, 2018, at the celebration of 100 years old Slovak Police (100 ROKOV ČESKOSLOVENSKEJ ŠTÁTNOSTI, PRÁVNICTVA A BEZPEČNOSTI).

Keywords: Dactiloscopy; Friction ridge; Fingerprint; History; Hungary; Medieval; Habsburg; Gendarmery.

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(The Lord) sealeth up the hand of every man, that all men whom he hath made may know `it'. (Job 37:7).[1]

All of the finger print community of the world know well that the history of dactiloscopy has started at least four thousand years ago. As we can see in the motto from the Holy Bible, the ancient people were also interested in the special patterns on their fingertips and palms. The naive or primitive usage of fingerprints is well-known from the age of Hammurapi (Babylon)[2] or the Far-East cultures (like China during the Tang Dynasty)-finger prints (especially prints of the thumb or the right index finger) were widely used as a personal signature on contracts or official documents.

The Hungarian forensic literature before the second world war mentions the first naive usage of finger prints in Hungary (and in Europe): like in China, in the medieval Transsylvania contracts and other official documents were often signed by finger prints.[3] Possibly this is the only one known utilization of finger prints in the medieval Europe. Unfortunately, in the second world war, all of the dactiloscopy records and collections were completely destroyed, so, today we can not find original medieval fingerprint-signed documents, supposedly all of them are lost.

As that time Hungary was part of the Habsburg Empire the great Czech anatomist Jan Evangeliste Purkinje should be mentioned, who first recognized the nine different pattern type of the human fingerprints. He was professor in Wrocław (Vratislava, Boroszló) University.

In the third half of the 19th century the French method called "Bertillonage" became the first scientific base of the personal identification. It had three parts: portrait photography, "portrait parlé" (description) and measurement of many anatomic features of the adult body.

Note that the "portrait parlé" (description of personal details) and the portrait photography is part of the criminal records even the recent practice of personal identification. After a famous miss-identification, the measurement of anatomic features (third but main part of Bertillonage) were changed to the dactiloscopy, worldwide, int the first decade of the twentieth century. In the end of the nineteenth century Hungary didn't have enough

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money to establish the Bertillonage system.[4] So, in Hungary the rising dactiloscopy had no rival.

The first handbook of forensic science in Hungary was published in 1897. It was the adaptation of the Handbook of Hans Groß (1893). In the first Hungarian handbook, just after five years of the "Finger Prints" of Francis Galton,[5] the author mentions the fingerprints, in the chapter of blood stains. The author highlighted the marks of the bloody hands and fingers, which would provide personal identification, because of the uniqueness and permanency of the friction ridges. Also wrote a proper method to collect known prints.[6]

In 1902 the deputy commander of Budapest City Police (BRFK) spent his summer holiday in London. During his holiday he visited the Scotland Yard, and observed the brand new fingerprint method for personal identification. In the next years official delegations visited London, and in 1904 the dactiloscopy has been started, second in Europe after England, first in the Continental Europe. In 1904, the Budapest City Police established the first fingerprint record database, in the next years many other police departments followed this, and in 1909 the fingerprint database became nationwide. Initially the fingerprint method was for identifying criminals and outcasts (hobos, vagabonds, gypsies). Forensic usage of latent prints from crime scene has started in 1907.

In 1907, the notorious crime case of Dános, where four people were robbed and murdered, had been solved by latent prints, which were developed from a wine bottle.[7] In 1907, the rural area of Dános belonged to the jurisdiction of the Hungarian Royal Gendarmery, but that time only the Budapest City Police had fingerprint lab. The gendarme officer recognized the potential importance of the evidence, collected and preserved it and sent it to the lab from the scene. Gábor Béla, expert of fingerprints examined the wine bottle and the known prints from the suspects, and introduced the evidence in front of the court in 1908. Denying suspects faced with the "brand new" evidence confessed. The case of Dános became famous everywhere in Europe at that time, including the role of the fingerprint evidence. Other cases (mostly burglaries) were also solved by fingerprints in 1907–1908. Dános was the first crime scene with fingerprints, but not the first court trial with fingerprint evidences and expert witnesses.

Till the Second World War many criminal records were collected and dactiloscopy kept it's indisputable role in crime scene investigation and personal identification. Practical manuals and forensic books discussed the fingerprints in details. The first handbook of fingerprints was published in 1905,[8] first handbook on he latent prints of crime scenes was published in 1912.[9]

In the First World War the country became smaller but Budapest and the criminal records remained intact.

In 1924, a forensic handbook wrote that not every police station has the capability to do fingerprinting. So, the small police stations or law enforcement units in rural area needed to request the "Royal Prosecutor Offices" or the local courts– these offices were equipped with fingerprinting tools and employed trained personnel also.[10] In 1925, a fingerprint book described the powdering-lifting method and the iodine fuming method. The author also complained about the neglect detectives who can easily destroy the latent prints at the crime scene.[11]

In 1936, the most detailed handbook of forensic science was published in the royal Hungary. It mentions the complex and differentiated fingerprint record system: fingerprints of criminals, fingerprints of gypsy people, mono-dactiloscopy records for burglars.[12] The handbook contains a very detailed discussion on the development of latent prints. Describe 13 different type of fingerprint powders. Also wrote about the following chemical enhancement methods: silver nitrate, osmium acid, iodine fuming, Sudan black, tannin, palladium chloride.[13]

In the Second World War, during the siege of Budapest, the police buildings were destroyed. The Bureau of Criminal Records was destroyed in an air raid, all records of the first forty years were burned. In addition, many policemen and gendarme also died in the war, some of the survivors were convicted, some survivors escaped. The first half decade were spent to re-establish everything.

In 1949, a short manual was published on the dactiloscopy. The manual copied the 1936 handbook (without citing…) and mentions the chemical enhancement techniques (with misspelling…). It details only the iodine fuming technique. Also mentions sticky or wet surfaces.[14] (Many handbooks and issues from the socialist era had this attitude: Copy of the older books and articles without citing, and in the same time, deny every value of the pre-socialist forensic science…).

In 1972, three main problems were discussed and published in a "Top Secret" issue of the Ministry of Interior. These problems were the following: The Hungarian CSI personnel do not use the foreign

(western) fingerprint powders what were bought for USD, they use only the old types. CSI personnel do some kind of pre-evaluation, without adequate (expert) competency. Because of this two point, the crime rate became higher but the number of the developed fingerprints decreased.[15]

During the sixties, crime scene investigator units were established in every police unit. County departments were equipped with crime labs. The central unit, "Crime Technical Institute" were also established. Fingerprint records were collected continuously.

During the socialist-era some development in dactiloscopy science also happened, for example the efforts for a complex mono-dactiloscopy system by Kiss Ernő. He had started to develop his one-fingerprint recording system before the Second World War, but finished it only in the sixties. Also a five-fingerprint recording system were established till the eighties, but had not worked properly.[16]

In 1989, as the socialist-era had been ended, an extremely crime boom had occured. In addition, some of the most experienced police personnel were retired or left the police. In addition, the forensic units, like all of the police, were faced to underpayment and lack of financing.

The early ninety's were the age of the first applications of automated fingerprint identification systems (AFIS). Mono-dactiloscopy was tried to be computerized in the mid-eighties, but it was not a proper AFIS system, yet.[17] Even Hungarian companies were made AFIS (Recoware), but the first AFIS became Printrak (1992), then Sagem Morpho (2002), and last the Cogent (2012).

The first palm-print identification with computer had been done in 1994, Szolnok, Hungary. This was the very first palmprint identification in the world.[18] The second was made by Scottish Police in 1996.[19] The palm-print identification software and the know-how later was sold to the USA. Today, the National Institute of Forensic Science (NSZKK, Budapest) has monopoly in fingerprint identification. The identification process follows the internationally recognized ACE-V methodology, and has been accredited under the ISO 17025 standard. Latent prints under 10 minutia are insufficient for identification. There is no probability result: It can only be 100% identification or 100% exclusion.

The four basic databases (criminal records, immigration records, records of asylum-seekers, and latent prints from crime scenes of unsolved cases) are connected with other EU countries through the Euro DAC and the Prüm Treaty. Criminal database has over *1 million* records, immigration and asylum-seeker database has about *200–200,000 records*, crime scene database has about *100,000 records*.

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Article in supplement or special issue

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Corporate (collective) author

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