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From the Editor's Desk

JIAFM

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I feel immense pleasure to present before you the fourth and last issue of 2011. I assure you about the quality of research papers and quality of printing in future issues. The quality of our journal is increasing day-by-day as evidenced by the demand of few papers by US based research agencies, authors contribution is of immense value for me. Your valuable suggestions are always encouraging me and I heartily welcome for future suggestions. On behalf of Executive Committee of IAFM for the years 2010-2013, I took resolution to further improve the quality and status of our Journal. We always learn from mistakes and try to improve upon these. I am happy to inform you that the journal has been included in **Scopus**. SciVerse Scopus is the world's largest abstract and citation database of peer-reviewed literature and quality web sources.

Professor [Dr.] Mukesh Yadav
Editor, JIAFM

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Editorial

Highest Compensation for Medical Negligence A Matter of Great Concern for Medical Fraternity

Introduction:

A petitioner claimed a total compensation of Rs.770745000/- (Seventy Seven Crores Seven Lakhs Fourty Five Thousand only). Later he also filed another complaint no. 179 of 2000 before National Consumer Dispute Redressal Commission (NCDRC) against Breach Candy Hospital, Mumbai, its doctors and functionaries claiming a further compensation of Rs.25.30 crore (though the said complaint was later on withdrawn), thereby made claim of compensation exceeding Rs.102 crores, perhaps the highest ever claimed by any complainant for medical negligence before any consumer fora in India established under the provisions of Consumer Protection Act, 1986. These facts made Dr.Kunal Saha vs. Dr.Sukumar Mukherjee & Others, O. P. No. 240 of 1999, NCDRC, New Delhi, date of judgment: 21st October 2011, case an extra ordinary in the field of medical negligence in Indian Context.

Brief facts:

Complainant a doctor by profession (husband of deceased victim of medical negligence Anuradha) felt that the doctors who treated Anuradha and the hospitals where she was treated were grossly negligent in her treatment and her death was occasioned due to gross negligence of the treating doctors and hospitals. Complainant, accordingly, got issued a legal notice to as many as 26 persons i.e. various doctors who treated Anuradha between end of April, 1998 to the date of her death (May 1998) alleging negligence and deficiency in service on their part. He filed the complaint on 09.03.1999 before NCDRC, New Delhi.

This case was filed against few doctors and one hospital at Culcutta, namely, Dr.Sukumar Mukherjee, Dr.B.Haldar (Baidyanath Halder), Advanced Medicare and Research Institute Limited (AMRI Hospital) and Dr.Balram Prasad and Dr.Abani Roy Chowdhury (physician) and Dr.Kaushik Nandy (plastic surgeon), the Directors of the AMRI Hospital and others. The complaint was resisted by the doctors and the hospital on a variety of grounds thereby denying any medical negligence or deficiency in service on their part.

Role of Supreme Court:

The Apex Court by order dated 07.08.2009 dismissed the Criminal Appeals filed by Shri Malay Kumar Ganguly but allowed the Civil Appeal No. 1727 of 2007 filed by the complainant and set aside the order of NCDRC dated 01.6.2006 dismissing the complaint and remanded the matter to this Commission for the limited purpose of determining the adequate compensation, which the complainant is entitled to receive from the subsisting opposite parties by observing as under:

"So far as the judgment of the Commission is concerned, it was clearly wrong in opining that there was no negligence on the part of the Hospital or the doctors. We, are, however, of the opinion, keeping in view the fact that Dr.Kaushik Nandy has done whatever was possible to be done and his line of treatment meets with the treatment protocol of one of the experts viz.. Prof. Jean Claude Roujeau although there may be otherwise difference of opinion, that he cannot be held to be guilty of negligence.

We remit the case back to the Commission only for the purpose of determination of the quantum of compensation."

Principle of compensation:

*"170. Indisputably, **grant of compensation involving an accident is within the realm of law of torts. It is based on the principle of restitutio in integrum.** The said **principle provides** that a person entitled to damages should, as nearly as possible, get that sum of money which would put him in the same position as he would have been if he had not sustained the wrong." [Livingstone v. Rawyards Coal Co]*

Effect of contributory negligence:

In this connection, the observations made by the **Supreme Court in Para 123**, which read as under:

*"To conclude, it will be pertinent to note that even if we agree that there was interference by Kunal Saha during the treatment, it in no way diminishes the **primary responsibility and default in duty on part of the defendants.** Inspite of a possibility of him playing an overanxious role during the medical proceedings, the **breach of duty to take basic standard of medical care on the part of***

defendants is not diluted. To that extent, contributory negligence is not pertinent. It may, however, have some role to play for the purpose of damages."

On the other hand it was submitted in defense that the Supreme Court though holding that there was possibility of the **complainant playing an overanxious role during the medical treatment**, the question of **contributory negligence** was not pertinent but at the same time, it was observed by the Supreme Court that this contributory negligence on the part of the complainant have some role to play for the purpose. We have therefore no manner of doubt that the above noted circumstances of interference which can be said to have been established on record are relevant for the purpose of determination of the extent of compensation. [Para 8.7]

The next submission put forth on behalf of the AMRI Hospital is in regard to **the liability of the hospital to pay any compensation much less the compensation claimed** by the complainant from it either on account of **pecuniary or non-pecuniary damages or special damages**. [Para 8.8]

Doctrine of Apportionment of Liability:

The question before NCDRC was "whether any amount should be deducted from this amount on account of the contributory negligence of the complainant arising out of his conduct i.e. interference in the treatment of Anuradha during her hospitalization in AMRI hospital."

In Para no. 123, the Supreme Court has held that said interference of the complainant may be a relevant and may have some role to play for determining the amount of compensation.

Therefore, having held that complainant has interfered in treatment of Anuradha, NCDRC was inclined **to deduct a sum equivalent to 10% from the above payable amount**. [Para 13.1]

The **most intriguing task** before NCDRC was, to apportion the liability to pay the awarded amount of compensation amongst the opposite parties. **No straight jacket formula exists or perhaps can be laid down in a case where so many doctors and hospitals are found negligent in the treatment of patient**. The Supreme Court has not indicated the criteria for apportionment of the compensation amongst the opposite parties but going by the findings of the Supreme Court in **regard to the nature and extent of negligence / deficiency in treatment on the part of the opposite parties** and Dr. Abani Roy Chowdhury as enumerated in para 158 to 166 of the judgment, we must apply a formula which appears just to us. Supreme Court has primarily found Dr. Sukumar Mukherjee and AMRI hospital guilty of negligence and deficient in service on several counts. Therefore, going by the said findings and observations of the Supreme Court, ncdrc considered it appropriate to apportion the liability of Dr.Sukumar Mukherjee and AMRI hospital in equal portion i.e., each should pay 25% of the awarded amount. Remaining half of the awarded compensation should be divided amongst Dr.B.Haldar and Dr.Balram Prasad and Dr. Abani Roy Chowdhury (heirs of whom have been given up by the complainant by forgoing his right to claim compensation from them). **[50% divided among three parties] [Para 14.1]**

Cost of Litigation:

In the Annexure submitted along with the synopsis of submissions, the complainant has claimed a sum of Rs.11250000/- towards the loss of income for missed works, Rs. 7000000/- towards traveling expenses, a sum of Rs. 15000000/- towards advocate fees paid to senior advocates for over 12 years and a sum of Rs. 1500000/- towards other legal expenses. **These claims appear to be highly exaggerated**. In any case, the complainant has **not furnished any cogent proof of having actually incurred the above expenditure**. **The Supreme Court had already awarded a cost of Rs. 600000/- while deciding the criminal and civil appeals**.

In NCDRC opinion having regard to **peculiar facts and circumstances** of the present case and as a special case, the complainant is at best entitled to cost of Rs. 500000/- (Rupees five lakh only), lest it becomes **too onerous for the opposite parties to pay the same**. [Para 15.1]

In view of the foregoing discussion, NCDRC concluded as:

- The facts of this case viz., residence of the complainant and Anuradha (deceased) in USA and they working for gain in that country; Anuradha having been a victim of a rare and deadly disease Toxic Epidermal Necrolysis (TEN) when she was in India during April-May 1998 and could not be cured of the said disease despite her treatment at two superspeciality medical centres of Kolkata and Mumbai and the huge claim of compensation exceeding Rs.77 crores made by the complainant for the medical negligence in the treatment of Anuradha makes the present case somewhat extraordinary. [Para 16.1]
- The findings given and observations made by the Supreme Court in its judgment dated 07.08.2009 are absolutely binding on this Commission not only as *ratio decidendi* but also as *obiter dicta* also. [Para 16.2]
- The task entrusted to the Commission may appear to be simple but the facts of the present case and the voluminous evidence led on behalf of the complainant has made it somewhat arduous.

Still difficult was the task of apportionment of the liability to pay the awarded amount by the different opposite parties. [16.3]

- Multiplier method provided under the Motor Vehicles Act for calculating the compensation is the only proper and scientific method for determination of compensation even in the cases where death of the patient has been occasioned due to medical negligence / deficiency in service in the treatment of the patient, as **there is no difference in legal theory between a patient dying through medical negligence and the victim dying in industrial or motor accident.** The award of lump sum compensation in cases of medical negligence has a great element of arbitrariness and subjectivity. [Para 16.4]
- The foreign residence of the complainant or the patient and the income of the deceased patient in a foreign country are relevant factors but the compensation awarded by Indian Fora cannot be at pars which are ordinarily granted by foreign courts in such cases. Socio economic conditions prevalent in this country and that of the opposite parties / defendants are relevant and must be taken into consideration so as to modulate the relief. **A complainant cannot be allowed to get undue enrichment by making a fortune out of a misfortune.** The theoretical opinion / assessment made by a Foreign Expert as to the future income of a person and situation prevalent in that country cannot form a sound basis for determination of future income of such person and the Commission has to work out the income of the deceased having regard to her last income and future prospects in terms of the criteria laid down by the Supreme Court. [Para 16.5]
- There exists no straight jacket formula for apportionment of the awarded compensation amongst various doctors and hospitals when there are so many actors who are responsible for negligence and the apportionment has to be made by evolving a criteria / formula which is just going by the nature and extent of medical negligence and deficiency in service established on the part of different doctors and hospitals. [Para 16.6]
- On a consideration of the entirety of the facts and circumstances, evidence and material brought on record, NCDRC held that overall compensation on account of pecuniary and non pecuniary damages works out to Rs.17287500/- in the present case, out of which we must deduct 10% amount on account of the contributory negligence / interference of the complainant in the treatment of Anuradha. That will make the net payable amount of compensation to Rs.15558750/-(rounded to toRs.15560000/). From this amount, we must further deduct a sum of Rs.2593000/- which was payable by Dr.Abani Roy Chowdhury (deceased) or his Legal Representative as the complainant has forgone the claim against them. [Para 16.7]
- In view of the peculiar facts and circumstances of the case and as a special case, NCDRC have awarded a sum of Rs. 500000/- as cost of litigation in the present proceedings. [Para 16.8]
- The above amount shall be paid by opposite parties no. 1 to 4 to the complainant in the following manner:
 - i. Dr.Sukumar Mukherjee shall pay a sum of Rs.4040000/- (Rupees Forty Lakh Forty Thousand only) i.e. [Rs.3890000/- towards compensation and Rs.150000/- as cost of litigation]
 - ii. Dr. B.Haldar (Baidyanth Halder) shall pay a sum of Rs.2693000/- (Rupees Twenty Six Lakh Ninety Three Thousand only) i.e. [Rs.2593000/- towards compensation and Rs.100000/- as cost of litigation]
 - iii. AMRI hospital shall pay a sum of Rs.4040000/- (Rupees Forty Lakh Forty Thousand only) i.e. [Rs.3890000/- towards compensation and Rs.150000/- as cost of litigation]
 - iv. Dr. Balram Prasad shall pay a sum of Rs.2693000/- (Rupees Twenty Six Lakh Ninety Three Thousand only) i.e. [Rs.2593000/- towards compensation and Rs.100000/- as cost of litigation]
- The opposite parties were directed to pay the aforesaid amounts to the complainant within a period of eight weeks from the date of this order (21.10.2011), failing which the amount shall carry interest @ 12% p.a. w.e.f. the date of default. [Para 16.9]

There is an urgent need for medical fraternity to introspect on the issue of medical negligence with great concern in changed global socio-economic scenario and rising of medical tourism as potential country for providing medical care to the world community.

Editor
Dr.Mukesh Yadav

Original Research Paper

Forensic View on Aluminium Phosphide Poisoning

*Vijayanath, V., **Anitha M.R., ***Raju, G.M., ****Vijayamahantesh, S.N.

Abstract

In India, acute aluminium phosphide poisoning (AAIPP) is a serious health care problem. This study aimed to determine the characteristics of AAIPP and the predictors of mortality at the time of patients' admission. We studied consecutive admissions of patients with AAIPP admitted to the intensive care unit (ICU). We noted 38 parameters at admission to the hospital and the ICU and compared survivor and non-survivor groups. A total of 54 patients were enrolled comprising 10 females and 44 males and the mean ingested dose of poison was 0.75 ± 0.745 grams. The mortality from AAIPP was 59.3%. We found the following factors to be associated with an increased risk of mortality: a serum creatinine concentration of more than 1.0 mg % ($P = 0.01$), pH value less than 7.2 ($P = 0.014$), serum bicarbonate value less than 15 mmol/L ($P = 0.048$), need for mechanical ventilation ($P = 0.045$), need for vasoactive drugs like dobutamine ($P = 0.027$) and nor adrenaline ($P = 0.048$) AAIPP causes high mortality primarily due to early haemodynamic failure and multi-organ dysfunction.

Key Words: Aluminium Phosphide, Mortality, Poisoning

Introduction:

Acute aluminium phosphide poisoning (AAIPP) is a large, though under-reported, problem in the Indian subcontinent. Death is reported to result from profound shock, myocarditis and multiorgan failure. The mortality rates from AAIPP published in literature vary from 40-80%. [1]

However, the actual numbers of cases affected are much larger, as less than 5% of those with AAIPP eventually reach a tertiary care centre. [2] Since 1992, when aluminium phosphide became freely available in the market, it has reportedly, overtaken all other forms of deliberate poisoning like organophosphorus and barbiturate poisoning in India. [3] In one study AAIPP was the major cause of death among all poisonings. [4]

Despite these large numbers, there has been little progress in our understanding of the characteristics of the poison and limited Indian data is available on the predictors of mortality in these patients. The purpose of this study was to retrospectively study the profile of patients presenting with AAIPP and to identify the factors at admission that might be useful in predicting mortality.

Material and Methods:

Study design: All consecutive cases of AAIPP presenting to a tertiary care hospital in northern karnataka from January 2001 to December 2006 were retrospectively reviewed. The diagnosis of AAIPP was based on history of consumption of the poison (obtained from the patient or the closest relative) and symptomatology at admission. Instances where the patients had presented with an unclear diagnosis of poisoning or where there was consumption of more than one substance were excluded from the study.

All patients were admitted into our ICU after initial resuscitation and gastric lavage. A baseline electrocardiogram was recorded and blood samples for biochemical and haematological investigations were sent. Infusion of vasoactive agents and mechanical ventilatory support were instituted where indicated. We collected 38 variables, like age, gender, nature of poisoning (suicidal/accidental), the dose poison consumed and the delay in presentation to hospital. The nature of any first aid instituted before reaching this hospital as well as laboratory parameters on admission to the hospital and ICU were also noted.

The severity of the poisoning was assessed from the extent of organ dysfunction (renal, hepatic, neurological, gastrointestinal, cardiovascular, etc.), the need for mechanical ventilation and the requirement of drugs for vasoactive support.

Statistical analysis: The SPSS computer program was used to process the data and generate the statistics. Univariate analysis was performed to compare survivors with non

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survivors groups ($P < 0.05$ was considered significant).

Results:

A total of 54 patients with AAIPP were admitted into our ICU during the study period. The majority of patients were young and in the age group from 21 to 40 years with males outnumbering females by more than 4: 1. Most of the cases involved suicidal consumption of the poison (92%) and 60% of the poison was consumed in the unexposed form of the tablet and an average of 1.53 grams of drug was consumed. There was a mean delay of 2.1 ± 1.55 hours before presenting to this hospital. There was no significant association between the dose of poison consumed or the time delay in presentation to the hospital with mortality.

At presentation to the hospital, the most predominant feature experienced by patients was vomiting and nausea (92.6%). A few patients had respiratory distress (7%). The mean Glasgow coma scale at admission was 13.29 ± 2.825 and the mean partial pressure of oxygen in arterial blood (paO_2) and partial pressure of carbon dioxide in arterial blood (paCO_2) in patients were 72.63 ± 4.06 mm Hg and 26.37 ± 7.46 mm Hg, respectively. A total of 14 patients (25%) had high serum creatinine values at admission, all of whom eventually died. Serum creatinine levels were found to correlate well with mortality. Survivors had significantly lower serum creatinine levels at admission as compared to non- survivors (0.82 ± 0.1418 milligram per deciliter versus 1.375 ± 0.642 mg per deciliter respectively, $P = 0.011$).

The mean pH of patients at admission too, was a good indicator of prognosis. Survivors had a much higher average value (7.284 ± 0.151) than non-survivors (7.148 ± 0.120) and this difference was statistically significant ($P = 0.015$). Similarly, serum bicarbonate levels at admission also correlated well with the eventual outcome in these patients ($P = 0.048$).

All patients had normal levels of sodium at admission to the hospital while 48% of patients had hypokalemia. These variables were statistically insignificant. Increased serum levels of bilirubin, aspartate aminotransferase, alanine aminotransferase and random blood sugar at admission did not show any association with mortality. We found that 81% of patients had cardiac symptoms, mainly in the form of hypotension and/or arrhythmias on admission to the hospital. A total of 26 patients had dysrhythmias at admission, of which, the majority (69%) were of supraventricular origin. Though the presence of electrocardiographic abnormalities did not predict mortality, there was

a trend towards increasing mortality in patients with dysrhythmias ($P = 0.07$).

Immediately on admission into the intensive care unit, 50% of the patients required mechanical ventilatory support while non invasive ventilation was used only in one patient. Eighty nine percent of the patients were in shock at admission despite adequate fluid resuscitation and needed vasoactive support, predominantly dobutamine and nor adrenaline. In all patients, magnesium sulphate was used for treatment while systemic steroid therapy (injectable hydrocortisone) was initiated in 70% of patients (mainly depending on the treating physician).

The overall mortality from AAIPP poisoning in our unit during the study period was 59.3%. The statistically significant factors useful in predicting mortality in our study were, an elevated serum creatinine conc. ($P = 0.01$) at admission, need for mechanical ventilation ($P = 0.045$), need for vasoactive drugs like dobutamine ($P = 0.027$) and nor adrenaline ($P = 0.048$), pH value less than 7.2 ($P = 0.014$), a low serum bicarbonate value ($P = 0.048$)

Discussion:

Aluminium Phosphide is an extremely toxic compound and resulted in a high mortality rate of 59.3% in our study. The toxicity of Aluminium Phosphide is attributed to the liberation of phosphine gas which is cytotoxic and causes free radical mediated injury.

Phosphine a nucleophile, acts as a strong reducing agent capable of inhibiting cellular enzymes involved in several metabolic processes. Early studies on phosphine demonstrated specific inhibitory effects on mitochondrial cytochrome c oxidase. [5]

Experimental and observational studies have subsequently demonstrated that the inhibition of cytochrome c oxidase and other enzymes leads to the generation superoxide radicals and cellular peroxides. Cellular injury subsequently occurs through lipid peroxidation and other oxidant mechanisms. [6, 7] One study reported that, serum phosphine levels correlate positively with the severity of poisoning and levels equal to or less than 1.067 ± 0.16 mg % appear to be the limit of phosphine toxicity. [8]

The major lethal consequence of aluminium phosphide ingestion i.e., profound circulatory collapse, is reportedly secondary to these toxins generated, which lead to direct effects on cardiac myocytes, fluid loss, and adrenal gland damage. [9]

In addition, phosphine also has corrosive effects on tissues. [9] As less than 5% of patients with AAIPP eventually reach a tertiary care hospital, it is extremely difficult to know the

actual incidence of these poisonings in our country and it is postulated that the spectrum of actual cases may be much larger than that reported. In one study, aluminium phosphide was found to be the commonest poison consumed (79.8%) in the Haryana- Rohtak belt with a mortality of 67.6%. [10]

In our study we found that most of the victims were young with males outnumbering females. As with other poisonings, aluminium phosphide is a common method of attempting suicide among the younger, productive age group of society. The patients in our study typically developed gastrointestinal symptoms early in their presentation and the predominant early toxic manifestation was cardiac (hypotension and arrhythmias).

Most patients needed some form of vasopressor/ionotrope support and the need to use these early after admission was clearly associated with a poorer outcome. One study reported gastrointestinal symptoms as the commonest while conduction disturbances and arrhythmias occurred in 38% of patients and an overall mortality rate of 77%. [1]

The management of AAIPP remains purely supportive. Though magnesium sulphate was used in the treatment of all our patients, there is conflicting data in literature on the role of magnesium sulphate in the treatment of acute aluminium phosphide poisoning. [11, 12, 13, 14]

We found five factors that can be assessed at admission to the hospital to predict mortality from aluminium phosphide ingestion. These include an elevated serum creatinine concentration, a low pH value (less than 7.2), a low serum bicarbonate value (less than 15), an early need for mechanical ventilation and for vasoactive drugs like dobutamine and nor adrenaline for haemodynamic support. These findings are similar to that obtained by Louriz *et al.*, who concluded that the prognostic factors associated with mortality from AAIPP, included low Glasgow coma scale score, shock, electrocardiogram abnormalities, the presence of acute renal failure, low prothrombin rate, hyperleukocytosis, use of vasoactive drugs and use of mechanical ventilation. [15] In a recent update on AAIPP, the development of refractory shock, ARDS, aspiration pneumonitis, anaemia, metabolic acidosis, electrolyte imbalance, coma, severe hypoxia, gastrointestinal bleeding, and pericarditis were the factors reportedly associated with poor prognosis.

They also noted that the outcome from AAIPP correlates best with the number of vomiting the patient gets after ingestion and the severity of hypotension that the patient

develops. [16] The limitation of our study was that it was retrospectively designed. Hence, larger prospective studies need to be done in the future to conclusively support our results.

Conclusion:

We conclude that aluminium phosphide is an extremely toxic compound with mortality close to 60%. The variables at admission which could be used to detect patients at greater risk of mortality from AAIPP include, need for mechanical ventilation, hypotension at admission requiring vasoactive drugs, low pH values, low serum bicarbonate levels, low serum creatinine levels.

References:

- 1.Chugh SN, Dushyant K, Ram S, Arora B. Incidence and outcome of aluminium phosphide poisoning in a hospital study. Indian J Med Res 1991; 94:232-35, 5.
- 2.Chugh SN. Aluminium phosphide poisoning. J Indian Acad Med 1999; 4:83-9.
- 3.Singh D, Jit I, Tyagi S. Changing Trends in Acute Poisoning in Chandigarh Zone: A 25- Year Autopsy Experience from a Tertiary Care Hospital in Northern India. Am J Forensic Med Pathol 1999; 20:203-10.
- 4.Singh D, Dewan I, Pandey AN, Tyagi S. Spectrum of unnatural fatalities in the Chandigarh zone of north-west India- a 25-year autopsy study from a tertiary care hospital. J Clin Forensic Med 2003; 10:145-52.
- 5.Chefurka W, Kashi KP, Bond EJ. The effect of phosphine (gas toxic to insects) on electron transport in mitochondria. Pestic Biochem Physiol 1976; 6:65-84.
- 6.Bolter CJ, Chefurka W. Extramitochondrial release of hydrogen peroxide from insect and mouse liver mitochondria using the respiratory inhibitors phosphine myxothiazol, and antimycin and spectral analysis of inhibited cytochromes. Arch Biochem Biophys 1990; 278:65-72.
- 7.Chugh SN, Arora V, Sharma A, Chugh K. Free radical scavengers and lipid peroxidation in acute aluminium phosphide poisoning. Indian J Med Res 1996; 104:190-3.
- 8.Chugh SN, Pal R, Singh V, Seth S. Serial blood phosphine levels in acute aluminium phosphide poisoning. J Assoc Physicians India 1996; 44:184-5.
- 9.Alex T. Proudfoot. Aluminium and zinc phosphide poisoning. Clin Toxicol 2009; 47:89-100.
- 10.Siwach SB, Gupta A. The profile of acute poisonings in Hararyana-Rohtak study. J Assoc Physicians India 1995; 43:756-9.
- 11.Chugh SN, Kolley T, Kakkar R, Chugh K, Sharma A. A critical evaluation of anti-peroxidant effect of intravenous magnesium in acute aluminium phosphide poisoning. Magnes Res 1997; 10:225-30.
- 12.Chugh SN, Jaggal KL, Sharma A, Arora B, Malhotra KC. Magnesium levels in acute cardiotoxicity due to aluminium phosphide poisoning. Indian J Med Res 1991; 94:437-9.
- 13.Singh RB, Singh RG, Singh U. Hypermagnesemia following aluminium phosphide poisoning. Int J Clin Pharmacol Ther Toxicol 1991; 29:82-5.
- 14.Siwach SB, Singh P, Ahlawat S, Dua A, Sharma D. Serum and tissue magnesium content in patients of aluminium phosphide poisoning and critical evaluation of high dose magnesium sulphate therapy in reducing mortality. J Assoc Physicians India 1994; 2: 107-10.
- 15.Louriz M, Dendane T, Abidi K, Madani N, Abouqal R, Zeggwagh AA. Prognostic factors of acute aluminum phosphide poisoning. Indian J Med Sci 2009; 63:227-34.
- 16.A Wahab, MS Zaheer, S Wahab, RA Khan. Acute aluminium phosphide poisoning: an update. Hong Kong J Emerg Med 2008; 15:152-5.

Original Research Paper

Age Determination from Radiological Study of Epiphysial Appearance and Union around Wrist Joint and Hand

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Abstract

To establish exact identity of an individual age determination is essential not only in cases of living but also for the dead too. Age has to be determined not only for identification purpose but also for various civil and criminal purposes. The determination of age presents a task of considerable importance from the view-point of the administration of justice. A roentgenographic study was carried out with the objective to assess the general skeletal maturity around wrist and hand, of subjects in Mumbai region. 205 males and 94 females between age group of 3-25 years attending the outpatient department of this hospital are selected. Age confirmed from history and noting the birth dates. The cases selected after ruling out the nutritional, developmental, and endocrinal abnormality which affects the skeletal growth. Data analysis was done in P4 computer using HPSS software. At the end conclusions were drawn which are compared with available results of various previous studies

Key words: Age Estimation, Wrist Joint, Radiological

Introduction:

To establish exact identity of an individual age determination is essential not only in cases of living but also for the dead too. Age has to be determined not only for identification purpose but also for various civil and criminal purposes. Determination of age presents a task of considerable importance from the view-point of the administration of justice. It is not possible to enunciate a hard and fast rule for age determination from this union for the whole India because India is composed of areas which differ in climatic, dietetic and disease factors which affect skeletal growth. Age Determination of an individual from appearance & fusion of ossification centers is a well accepted fact. The present study was carried out retrospectively to study the epiphysial appearance and union at wrist joint with hand in subjects between age group of 3 to 25 years attending outpatient department of this hospital.

Aims and Objectives:

- To assess the skeletal maturity at wrist joint and hand for a known chronological age
- Comparative study of appearance & fusion of ossification centers at wrist jt. and hand.

- To evaluate sex related variation & its correlation with age.
- To know variation if any & exception of appearance & fusion of centers of ossification.
- To evaluate the medico-legal aspects of different ages.
- To suggest any additional radiological investigation to aid and to reduce range in determining age.

Material and Methods:

The study was carried out in Government Hospital in Mumbai which is a tertiary referral centre attached to Government Medical College with the objective to assess the general skeletal maturity of wrist joint and hand of subjects in Mumbai region. 205 males and 94 females between age group of 3-25 years attending the outpatient department of this hospital are selected. Age confirmed from history and noting the birth dates. The cases selected after ruling out the nutritional, developmental, and endocrinal abnormality which affects the skeletal growth. X-ray of wrist with hand is taken at department of radiodiagnosis. The epiphysis of wrist with hand were observed appearance (A) and not appeared (NA) and different phases of fusion were graded according to Dr. William Sangma et al and Mckern and Stewart 5 stages as fallows

Stage 1 (F1): Non union – when the epiphysial cartilage did not begin to decrease in thickness

Stage 2(F2): Commence of union – when the thickness of epiphysial cartilage was found to be reduced appreciably (1/4th united)

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Stage 3(F3): Incomplete union – when the epiphysis has begun to fuse with shaft and complete union was well underway (1/2 united)

Stage 4(F4): Complete union – when the epiphysal cartilage was bony in architecture and its density indistinguishable from the epiphysis and diaphysis in its neighbourhood but an epiphysal line called epiphysal scar could still be distinguished. (3/4 united)

Stage 5(F5): Complete union – with absence of epiphysal scar.

Skeletal maturity was evaluated radiologically studying the various centres of ossification and the results were compared with the previous known standard studies. Only appearance and last two stage of fusion cases were taken in this paper, remaining cases were in early stages of fusion

Results and observations:

Fusion of distal end of radius: It is clear from table-1 that in male subjects in majority of cases in age group 15-16 and 16-17 show near fusion (F4), where as in age groups 17-18 and onwards majority of cases showed fusion (F5)

It is clear from table-2 that in female subjects in majority of cases in age group 15-16 and 16-17 show near fusion (F4), where as in age groups 17-18 and onwards majority of cases showed fusion (F5)

Appearance of distal end of ulna: It is clear from table-3 that in male subject in majority of cases in age group 7-8 and 8-9 does not show appearance of distal end of ulna. The appearance of ulna is seen in age group 9-10, 10-11, 11-12 in male

It is clear from table-3 that in female subject in majority of cases in age group 6-7 and 7-8 does not show appearance of distal end of ulna. The appearance of distal end of ulna is seen in age group 8-9, 9-10, 10-11 in females

Fusion of distal end of ulna: It is clear from table-4 that in male subjects in majority of cases in age group 16-17 and 17-18 show near fusion (F4), where as in age groups 17-18, 18-19 and onwards majority of cases complete showed fusion (F5).

It is clear from table-5 that in female subjects in majority of cases in age group 15-16 and 16-17 show near fusion (F4), where as in age groups 16-17, 17-18 and onwards majority of cases complete showed fusion (F5).

Carpel bones appearance in both males and females: In male subjects below 8 years of age (13.66%) scaphoid is not appeared where as in age group 7-8 and above (86.34%) its appearance is seen. Lunate is not appeared below 6 years of age (6.34%) where as in age group 5-6 and above (93.66%) its appearance is

seen. Pisiform is not appeared below 13 years of age (34.15%) where as in age group 12-13 and above (66.85%) its appearance is seen. Trapezium is not appeared below 6 years of age (10.73%) where as in age group 5-6 and above (89.27%) its appearance is seen. Trapezoid is not appeared below 6 years of age (2.92%) where as in age group 5-6 and above (97.07%) its appearance is seen.

In female subjects below 7 years of age (15.96%) scaphoid is not appeared where as in age group 6-7 and above (84.04%) its appearance is seen. Lunate is not appeared below 5 years of age (8.51%) where as in age group 5-6 and above (91.49%) its appearance is seen. Pisiform is not appeared below 12 years of age (35.11%) where as in age group 10-11 and above (64.89%) its appearance is seen. Trapezium is not appeared below 6 years of age (9.57%) where as in age group 5-6 and above (90.43%) its appearance is seen. Trapezoid is not appeared below 5 years of age (5.32%) where as in age group 4-5 and above (94.68%) its appearance is seen.

Fusion of base of 1st metacarpal: It is clear from table-6 that in male subjects in majority of cases in age group 15-16, 16-17, and 17-18 show near fusion (F4), where as in age groups 16-17, 17-18 and onwards majority of cases showed complete fusion (F5)

It is clear from table-6 that in female subjects in majority of cases in age group 14-15, 15-16, and 16-17 show near fusion (F4), where as in age groups 15-16, 16-17 and onwards majority of cases showed complete fusion (F5)

Fusion of phalanges in males: It is clear from table-7 that in male subjects for proximal row of phalanges in majority of cases in age group 15-16, 16-17, and 17-18 show near fusion (F4), where as in age groups 16-17, 17-18 and onwards majority of cases showed complete fusion (F5). for middle row of phalanges in majority of cases in age group 15-16, 16-17, and 17-18 show near fusion (F4), where as in age groups 16-17, 17-18 and onwards majority of cases showed complete fusion (F5). for terminal row of phalanges in majority of cases in age group 15-16, 16-17, and 17-18 show near fusion (F4), where as in age groups 16-17, 17-18 and onwards majority of cases showed complete fusion (F5).

Fusion of phalanges in females: It is clear from table-8 that in female subjects for proximal row of phalanges in majority of cases in age group 14-15, 15-16, and 16-17 show near fusion (F4), where as in age groups 15-16, 16-17 and onwards majority of cases showed complete fusion (F5). for middle row of phalanges in majority of cases in age group 13-14 and 14-15

show near fusion (F4), where as in age groups 15-16 and onwards majority of cases showed complete fusion (F5). for terminal row of phalanges in majority of cases in age group 14-15, and 16-17 show near fusion (F4), where as in age groups 15-16, 16-17 and onwards majority of cases showed complete fusion (F5).

Discussion:

The documented study done previously in Mumbai region was by Homi S. Mehta is available for standard comparison in Mumbai region. Observation of present study correlates with Homi S Mehta for females at the centres of distal end of radius, ulna. At wrist, the complete union of epiphysis is seen by 18 - 19 years in males and 16 - 17 years in females. As compared to Flecker's study in Australians and Davies and Parsons Study in England ossification center appearance and fusion occurs one to two years earlier in this study.

The present study signifies that all centres in females mature 1-2 years earlier than in Males. These observations correlate with the previous studies. Comparison of observations of present study has been made with other workers with reference to age of fusion in both sexes. (Table 9)

Conclusions:

Apart from consideration of centers of ossification by Dr. Homi S Mehta for population of Mumbai region additional centers of ossification have been studied in this study which will be helpful to arrive at correct diagnosis with closer range.

As compared to Bengali Hindu female's ossification center fusion occurs one to two year later in Mumbai region females. As compared to Hepworth study in Panjabi region skeletal maturity is delayed by 6 months to 1 year in Mumbai region. As this study is done in Mumbai region the application of standards can be considered ideal for application in Mumbai region. Due to very narrow borderline range of differentiation between various stages of fusion (i.e. Stage 1 to Stage 5), it is difficult to consider stage of fusion as age indicator.

References:

1. **Homi S Mehta**: Medical Law and Ethics in India 1st edi. March 1963, p 336 - 339
2. **R.N. Karmakar, J.B. Mukharjees** Essential of forensic Medicine and toxicology 3rd edi. p 126, 146, 147, 154, 155
3. **V. B. Gaur, V. B. Sahai, Amarjit Singh, Amit Khout.** Determination of age in living by closure of cranial sutures a radiological study et al journal of IAFM Vol 29 No.1 2007. P 32-34
4. **H. Flecker**, Roentgenographic observations of the times of appearance of epiphyses and their fusion with the diaphyses, J. Anat. 67 (1933), pp. 118-164.
5. **Krogman WM, Iscan, MY** in The human skeleton in Forensic Medicine, Charles C. Thomas Publisher, Illinois, USA. II Edition, 1986.

6. **Hepworth SM.** Determination of age in Indians from study of ossification of long bones Ind. Med. Gaz., 64,128,1929

7. **Basu SK and Basu S:** A contribution to the study of diaphysiophysal relation at elbow of young Bangalore girls. Indian journal of Paediatrics, 5, 202-204, 1938.

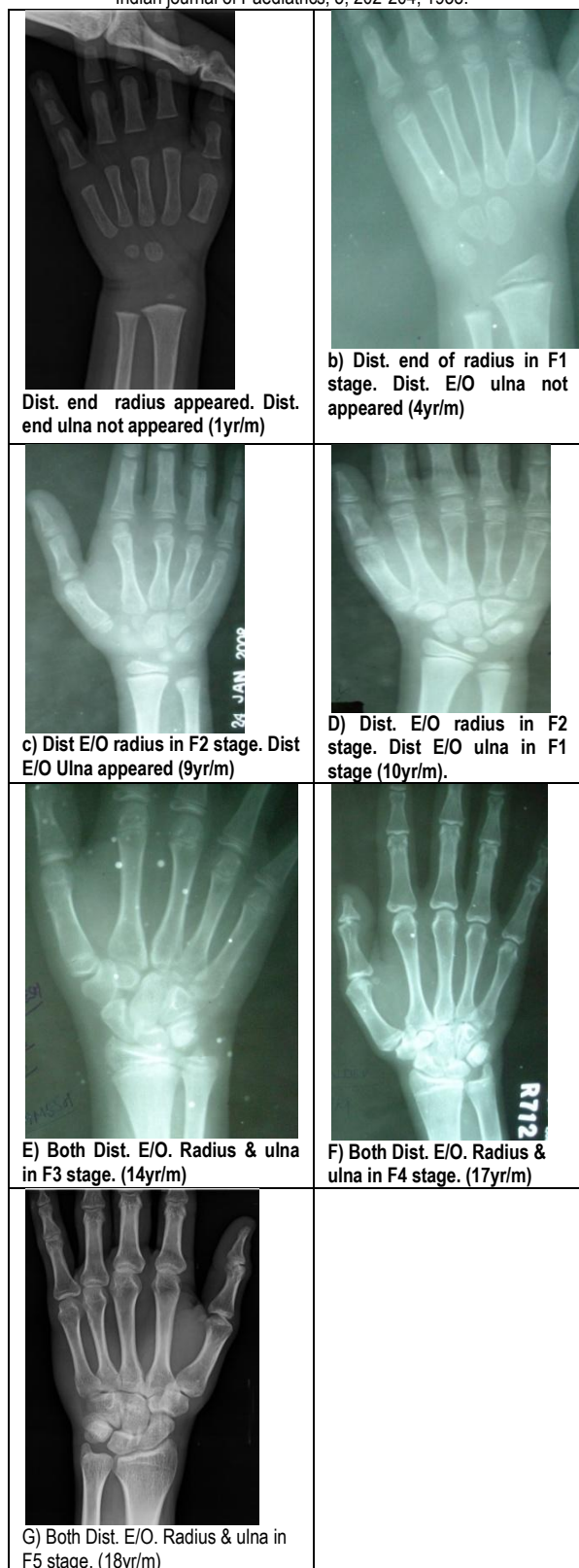


Table-1: Fusion of distal end of radius in males

Age [Yrs]/ Stage of Fusion	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-25	Total
F4	3 (13%)	8 (34.8%)	12 (52.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	23 (100%)
F5	0 (0%)	0 (0%)	1 (1.6%)	18 (29.5%)	14 (23%)	10 (16.4%)	7 (11.5%)	11 (18%)	61 (100%)

Table-2: Fusion of distal end of radius in females

Age [Yrs]/Stage of Fusion	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-24	Total
F4	1 [8.3%]	1[8.3%]	4 [33.4%]	6 [50%]	0	0	0	0	0	12
F5	0	0	0	0	3 [9.1%]	6[18.2%]	6[18.2%]	10[30.3%]	8[24.2%]	61

Table-3: Distal end of ulna appearance

Age [Yrs]/ Stage of Fusion	Sex	3-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13 & 13-14	Total
Not appeared	M	23[45.1%]	2[3.9%]	8[15.7%]	9[17.6%]	3[5.9%]	3[5.9%]	3[5.9%]	0	51
	F	11[45.8%]	7[29.2%]	5[20.8%]	1[4.2%]	0	0	0	0	24
Appeared	M	0	0	0	0	2[14.3%]	7[50%]	5[35.7%]	0	14
	F	0	0	0	2[40%]	1[20%]	2[40%]	0	0	5

Table-4: Fusion of distal end of ulna in males

Age [Yrs]/ Fusion Stage	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-25	Total
F4	0	2[9.1%]	7[31.8%]	12[54.5%]	1[4.5%]	0	0	0	22
F5	0	0	0	1[1.7%]	17[18.3%]	14[23.3%]	10[16.7%]	18[30%]	60

Table-5: Fusion of distal end of ulna in females

Age [Yrs]/ Stage of Fusion	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-24	Total
F4	0	1[12.5%]	2[25%]	5[62.5%]	0	0	0	0	0	8
F5	0	0	0	1[2.9%]	3[8.8%]	6[17.6%]	6[17.6%]	10[29.4%]	8[23.5%]	34

Table-6: Fusion of base of 1st metacarpal

Age in yrs Stage of fusion	sex	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-25	Total
F4	M	0	0	2[8.7%]	7[30.4%]	9[39.1%]	5[21.7%]	0	0	0	23
	F	0	0	3[33.3%]	3[33.3%]	3[33.3%]	0	0	0	0	9
F5	M	0	0	0	0	3[4.2%]	8[11.3%]	18[25.4%]	14[19.7%]	28[39.4%]	71
	F	0	0	0	0	3[7.9%]	2[5.3%]	3[7.9%]	6[15.8%]	18[47.3%]	38

Table-7: Fusion of phalanges in males

Age [yrs] stage of fusion		12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-25	Total
Prox. Row	F4	0	0	0	3[14.3%]	10[47.6%]	7[33.3%]	0	0	0	21
	F5	0	0	0	0	2[3%]	5[7.5%]	18[26.9%]	14[20.9%]	28[41.8%]	67
Midd. Row	F4	0	1[4.3%]	3[13%]	8[34.8%]	5[21.7%]	6[26.1%]	0	0	0	23
	F5	0	0	0	0	7[9.5%]	7[9.5%]	18[24.3%]	14[18.9%]	28[37.9%]	74
Term. Row	F4	0	0	0	7[35%]	9[45%]	3[15%]	0	0	0	20
	F5	0	0	0	0	3[4.1%]	10[13.7%]	18[24.7%]	14[19.2%]	28[38.3%]	73

Table-8: Fusion of phalanges in females

Age [yrs] Fusion Stage		12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-25	Total
Prox. Row	F4	0	2[22.2%]	4[44.4%]	1[11.1%]	2[22.2%]	0	0	0	0	9
	F5	0	0	0	5[11.9%]	4[9.5%]	3[7.1%]	6[14.3%]	6[14.3%]	18[42.9%]	42
Midd. Row	F4	0	2[28.6%]	4[57.1%]	0	1[14.3%]	0	0	0	0	7
	F5	0	0	0	6[13.6%]	5[11.4%]	3[6.8%]	6[13.6%]	6[13.6%]	18[40.9%]	44
Term. Row	F4	2[18.2%]	2[18.2%]	4[36.4%]	0	3[27.3%]	0	0	0	0	11
	F5	0	0	0	6[14.3%]	3[7.1%]	3[7.1%]	6[14.3%]	6[14.3%]	18[42.9%]	42

Table-9: Comparison of age of fusion by different workers

Author	Present study				Galstaun study				H. S. Mehta		Pillai	Franklin
Centre of ossification	Appearance (Yr)		Fusion (Yr)		Appearance (Yr)		Fusion (Yr)		Fusion (Yr)			
	M	F	M	F	M	F	M	F	M	F		
Dist. end of radius			17-18	16-17			17-18	16.5-17	18-19	16-17	14-18	17-18
Dist. end of ulna	9-11	8-10	17-19	16-17			18	17	18-19	16-17	14-18	17-18
scaphoid	7-8	6-7			7-11	6						
lunate	5-6	5-6			5	5						
pisiform	12-13	10-12			12-17	9-12						
trapezium	5-6	5-6			7	5-6						
trapezoid	4-6	4-5			4-7	5-6						
Base of first metacarpel	3-5	----	16-18	15-17	4	3	16-18	14-15				
Phalanges- prox. row			16-18	15-17	2-4	1.5	17-18	14-15				
Midd. row	4-6		16-18	15-17	3	2-3	16-18	14-16				
Term. row	4-6		16-18	15-17	3-5	3	17-18	15				

Original Research Paper

The Pattern of Poisoning in Khammam

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Abstract

This study was undertaken to study the patterns of poisoning cases admitted at Mamata General Hospital Khammam, Andhra Pradesh from June 2005 to June 2010. The poisoning was common mode of suicide and one of the common causes of death in developing countries, particularly in agricultural workers. The emphasis was given on age, sex, socioeconomic status, etc. type and mode of poisoning. Organophosphate compounds were the most commonly 74.10% abused substance. The common motive of poisoning was suicidal 93.43% in both male 85.85% and female 14.14% with male to female ratio 6.07: 1%. Peak incidence was observed in the age group 21-30 years 50.59% and majority were from Hindu community 90.83% as compared to other community.

The overall mortality of poisoning is 17.33%. Majority 366 (72.90%) were consumed the approximate amount of poison is 400-500 ml and maximum number of deaths 74 (985.05%) are associated with highly toxic amount of 400-500ml of poison consumed.

The study observed increasing trend of suicide by organophosphate compounds and rat poison, whereas other poisons for committing suicide are less commonly used and here with—reflecting the pattern of poisoning in Khammam.

Key Words: Poisoning Pattern, Suicide, Organophosphate Compounds, Khammam

Introduction:

Poisoning is a common mode of suicide has been known since antiquity. The choice of agents abused for poisoning depends on the availability, cost, and harmful effects of poison and regional consideration. A thorough knowledge about the nature and depth of the problem in a particular area is essential for early diagnosis and treatment but also important to make a new policy by government for prevention of poisoning cases because nature and profile of different modes of poisoning varies significantly in the different parts of India.

The mortality rate due to poisoning in developed countries is only 1%-2% but in developing countries like India, it varies in between 15% -30% and which is one of the common causes of death, especially in rural areas. Due to fast development in the field of agriculture and industrial sectors, easy availability of toxic substance in market without any objection or documentation is becoming global phenomena but also plays a major role in accidental and suicidal poisoning in developing countries like India.

As per W.H.O., about 3 million cases of poisoning occur every year in the world wide, of which 99% of fatal poisoning cases occur in developing countries annually.

The aim of the present study was to know the actual magnitude, pattern and profile of poisoning at a tertiary care hospital in the Khammam region of Andhra Pradesh.

Material and Methods:

This retrospective study was conducted in Mamata General Hospital Khammam, for a period of 5 years from June 2005 to June 2010, the General and referral center for Khammam region of Andhra Pradesh. A total 502 cases of poisoning were analyzed during this period. Identification of abused substance or etiological, precipitating factor responsible for poisoning was made by discussing the matter with patient or relatives after establishing a proper rapport with them.

The clinical diagnosis of the type of poison consumed was based on the actual history, presentation of the remaining stuff or container from which the poison had consumed, gastric aspirates and suggestive clinical manifestations, which further confirmed by postmortem examination and further confirm the nature of the poison as per the reports obtained by chemical analysis and postmortem findings are studied to corroborate the diagnosis in cases where such chemical examination reports unavailable.

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The data was collected from all poisoning cases admitted in the emergency, in a Proforma as per the history given by the patient or attendant, friends, police, hospital records with particular emphasis being given on the demographic profile, pattern of trend of poisoning, type and motive of poisoning. All data was analyzed, documented and interpreted with previous studies and concluded.

Observations:

During the study period 4306 emergency cases were admitted, out of 502 cases were of poisoning [11.65%]. Remaining cases were accidents, assaults, burns and other medical and surgical emergencies. The incidence of poisoning is increasing from year by year. The incidence of poisoning observed in the present study ranges from 7.87%-9.64% with average of 6.75% and the overall incidence of poisoning is 11.65%. It was found that there was apparent increase in proportion of poisoning cases during last five years. Out of total cases of poisoning, 431 were male [85.85%] including 10 male children and 71 female [14.14%].

The higher incidence was found in 3rd decade of life. Incidence of poisoning was observed highest in 3rd decade, that is from 21-30 years 248 [50.59%] with more males followed by 104 [20.71%] 31-40 years age group and less in the extremes of age, 10 [1.99%] cases were observed in age group of 0-10 years. Out of 431 males were 341 [67.92%] were married and 90 [17.92%] were unmarried. Out of the 71 females 64 [12.74%] were married and 07 [1.39%] were unmarried.

Married 405 [80.67%] were outnumbered the unmarried 97 [19.32%]. The medium socioeconomic class were commonest 398 [79.28%] and followed by low 96 [19.12%] and the least involved were upper class 8 [1.59%]. The maximum were from joint family 318 [63.84%] and minimum were from nuclear family 184 [36.65%]. Area wise distributions of poisoning 359 [71.51%] were belong to rural and 143 [28.48%] urban area. It was found that in rural areas numbers of poisoning cases were increased. Reference to religion majority victims were from Hindu 396 [78.88%] followed by Muslim 68 [13.15%] and minimum from Christian 38 [06.37%] community.

Literacy status reveals that at the time of poisoning, most of the victims was either literate 361 [71.91%] or educated up to high school level and 141 [28.08%] illiterate. Out of 431 males, 310 [61.75%] were literate and 121 [24.10%] were illiterate. Out of 71 females 51 [10.15%] were literate and 20 [3.98%] illiterate. Occupation wise farmers were on the top of the list 256

[50.99%] that was followed by unemployed 112 [22.31%] and next is house wife 64 [12.74%] and least 26 [5.17%] students.

Maximum incidence of cases were encountered in summer season 203 [40.35%] followed by rainy 159 [31.67%] and next is spring 82 [16.13%] and least during winter 59 [11.75%]. As per place of incidence, maximum victims are consumed poison at domestic front 365 [72.70%] followed by work place 122 [24.30%] and least consumed outside 25 [04.98%]. Considering the time of poison intake, the majority 389 [77.49%] were consumed poison during the day time [6 am-6 pm] and 113 [22.50%] night [6pm-6am]. Ingestion was the most common route of administration 501 [99.80%] as compared to skin and inhalation. It to be almost a universal phenomenon and signifies the need of more emphasis in treatment of poisoning by ingestion as compared to other routes.

According to survival period, total 502 cases were hospitalized for various durations, whereas 166 [33.06%] were hospitalized within 1-4 hours of intake of poison, spot death was not recorded and 87 [17.33%] were succumbed death due to poisoning complications, 12 hours after poison intake. The deaths could be related to the doses ingested as well as the elapsed between ingestion and arrival at the hospital.

As for level of consciousness, maximum victims were conscious at time of admission 417 [88.84%] followed by semi-conscious 56 [11.15%] and 29 [5.77%] were unconscious. With reference to the manner of poisoning, suicidal poisoning 469 [93.47%] was the common motive of poisoning followed by accidental 33 [6.57%] and homicidal poisoning was not reported in this study. As per incidence of poisoning mortality is increasing year by year that is ranges from 14.63% [2005-06]-18.75% [2009-10] with overall mortality is 17.33%. It was found that there was apparent increase in proportion of poisoning cases during last five years.

According to history, maximum number of victims 366 [72.90%] were consumed 400-500ml of approximate amount of poison followed by 69 [13.74%] were 300-400ml and 21 [4.18%] were consumed 100-200ml and 19 [3.78%] were consumed 200-300ml and 13 [2.58%] consumed 50-100ml of poison, including one inhaled poisoning also observed. Maximum deaths associated with 400-500ml of poison 74 [85.05%] followed by 12 [13.79%] and 1 [1.14%] with more than 500ml.

From the study it observed that, insecticide 390 [77.68%] was commonest poison

followed by zinc phosphide 29 [5.778%] and benzodiazepines 16[3.18] and medicinal drug 16[3.18%] equally abused and phenolic acid 9[1.79%], glass pieces 1 [0.19%], alcohol 1[0.19%] and kerosene 1[0.19%]. In 16 [3.18%] cases type of substance ingested was not known. In 23 [4.59%] cases was due to snake bite 16[3.18%] and scorpion sting 7 [1.38%] also reported. Organophosphate compounds were the commonest 372 [74.10%], followed by Organo Chloro compounds 12 [2.39%] and Carbamate 6 [1.39%].

The total deaths in this study was 87[17.33%] due to insecticide. Maximum numbers 72 [82.75%] were of poisoning due to organophosphate compounds followed by zinc phosphide 12 [13.79%], next Organochlorine 6 [6.89%] and least cases were Carbamate 6 [6.89%].

According to trade name of insecticide, out of 479 cases, maximum victims were consumed insecticide poison compound monochrotophos 264 [70.96%] followed by malathion 22 [5.91%] next Chlorpyrifos 21[5.64%] and Endosulphon 8 [2.15%], Quinalphos 6 [1.16%] and Forate 6 [1.16%] least Dimethoate 2 [0.53%]. In 16 cases consumed poison was not known and zinc phosphide 29 [5.77%] also observed.

Discussion:

The comparison of scientific observations of present study and these are indicating some significant aspects. The incidence of poisoning observed in this study ranges from 7.87% [2005-06] - 9.83% [2009-2010]. It was found that there was apparent increase in proportion of poisoning cases during last five years. [23]

Out of 502 poisoning cases admitted 87 [17.33%] cases succumbed to death due to complications of poisoning. The overall mortality of poisoning is 17.33% with average mortality is 6.75% due to acute poisoning. The incidence was affected with poisoning was more [1-23] male than female; the ratio is 6.1: 1.

This study reveals that there is an increasing trend of poisoning with age up to 30 years and then declines with a peak incidence in the age group 21-30 years which represented 248[50.59%]cases. The younger and middle aged persons are more common victims of poisoning due to various common socioeconomic problems. [1-11]

The number of cases from rural area [1-11] was high even the center is in a town city involve more rural area as catchments of the health center. Whereas rat poisoning incidence increasing from urban population. [12] Incidence

of poisoning was more amongst [1-11] married as compared to unmarried. Married person were more vulnerable to the poisoning than unmarried. Maximum cases were from joint family⁴ as compared to nuclear family. [21]

The poisoning is more prevalent among the medium [19, 21] socioeconomic group. Incidence of poisoning was more amongst literate than Illiterate which is consistent with others 4, 8, 21] A season-wise variation was seen in the poisoning incidence in this study with summer [2, 18, 19] showing the maximum numbers of victims. The most of victims were consumed poison mostly during day time [2, 19] as compared to night time. According to religion maximum victims were from Hindu community [1, 4] than other community. Regarding occupation, majority of victims were farmers [21] as compared to other occupation like unemployed and house wife.

The maximum numbers of victims were consumed poison at domestic [2] fronts and work place. Majority victims are conscious [9] at time of admission then partially conscious and unconscious. Ingestion [23] was the most common route of administration than other routes. This is to be almost universal phenomena. Regarding survived period, majority of victims were admitted in hospital within 1-4 hrs [5], no spot death was reported and 87 cases [17.35%] were succumbed death after 12 hours of poison intake.

The deaths could be related to the doses ingested as well as the elapsed between ingestion and arrival at the hospital. With reference to manner of poisoning, majority cases are suicidal in nature [1-20] and minimum cases were accidental and homicidal case was not found. The higher incidence of suicidal manner can be due to higher use of pesticides in an agricultural state like Andhra Pradesh. The incidence of poisoning is increasing [5] year by year that is from 7.87%-9.38% with average 6.75%.

The overall mortality was 17.33% in present study may be due to deference in pattern of poisoning and poison consumed [i.e.O.P.C], geographical variation and rural area having more population with agriculture background as compared to other area. [23] In 16 cases the history of a particular type of ingested substance was not available.

As regards to current pattern of poisoning, the commonest poisoning was organophosphate compounds 372 [74.10%], next rat poison [zinc phosphide] 29 [5.77%] and benzodiazepines 16 [3.18%] and medicinal drugs 16[3.18%] were equally abused. These agricultural poisons constituted insecticides 390,

O.P.C-372, Organochlorine -12, and Carbamate 6. these are consistent others. [1-23]

The incidence of snake bite is more common in rural area as compared to other area. [4, 5, 19, 23] Increasing trend of poisoning by Zinc phosphide [5, 19, 23] and medicinal drug abuse in urban area which are basis for diagnostic and therapeutic facilities improvement at hospital. According to history, maximum number of victim were consumed 400-500ml of approximate amount of poison [23], to be considered as highly toxic and less toxic amount 300-400ml consumed by 69 victims and one inhalation poison also recorded.

Majority deaths associated with 400-500ml of poison as compared to 300-400ml of approximate amount of poison consumed and with more than 500ml. these are consistent with others. [2, 4, 5, 19, 23] Only 87 [17.33%] cases succumbed to death with treatment after 12 hours of poison intake and no spot death was observed. [22] Organophosphate compounds are the most commonly consumed poison accounting 82.75% of total death cases, and Organo chlorine 9.86% and Carbamate 6.89%. [19] No characteristic smell was observed from stomach contents at autopsy in (38) 43.67% cases. [5, 18, 23]

This is due to majority of poisoning cases are commonest route of administration is ingestion and followed by gastric lavage is a choice of treatment to empty the stomach contents leaving no characteristic odour at autopsy. Mortality is increasing year by year observed [18, 22, 23] that is from 2.39%-4.18% with overall mortality 17.33%.

Conclusion:

The present study helps to interpret the pattern of trends of poisons and poisoning is the commonest method of committing suicide and Organo phosphate compounds are choice of poison in Khammam region of Andhra Pradesh and rural people are more prone to poisoning due to occupational hazards and day to day problems and rain dependent profession. It is inevitable that younger generation becomes victim of poisoning with the number increasing year after year. Absence of history of a particular poison is difficult in diagnosis of particular poisoning become more challenging which is lessened by set up of bedside chemical tests and an analytical toxicological set up.

Higher incidence of O.P.C and Zinc phosphide can be restricted by having a control on their sale and distribution. The high incidence of suicide by poisoning among young adults can be checked by frequent psychological counseling and by tackling their problems

sympathetically. Education of the community with regard to proper storage and use will reduce the incidence of poisoning. Laws to strict the sale of commonly abused drugs without proper prescription of a qualified doctor should be implemented.

References:

1. Aggarwal N K, Aggarwal: B B L: Trends of poisoning in Delhi; J I A F M, 1998, vol 20. No 2; 32-36.
2. B K Guntheti, Sheik Khaja. A study of serum cholinesterase levels in organo phosphorus poisoning cases. , journal of Indian Academy of Forensic Medicine, 2010; 32[4]:332-335.
3. Batra A K, Keoliya A N, Jadhav G U. Poisoning: An unnatural cause of morbidity and mortality in Rural India. J A P I, Octo 2003; 51:955-959.
4. B D Gupta, P C Vagehela. Profile of fatal poisoning in and around Jamnagar; J I A F M, 2005; 27 [3]:145-148.
5. Dalal J S, Gorla R K, Aggarwal A K, Thind A S and Sandhu S. Poisoning trends –a postmortem Study, journal of Indian Academy of Forensic Medicine, 1998; 20[2]:27-31.
6. Dhatterwal S K, Dalal S S. Profile of deaths due to poisoning in Rohtak, Haryana in the year. Journal of Forensic Medicine and Toxicology. 1995; 14[1]; 51.
7. Dhatterwal S K and Harnam Singh. Profile of deaths due to poisoning in Rohtak, Haryana. Journal of Forensic Medicine and Toxicology. 2001; 18 [2]: 28-29.
8. Eddleston M., Phillips M R, Self poisoning with pesticides B M J 2004; 328: [3] 42-44.
9. Gargi J, Rai H, Chanana A, Raj G, Sharma G, Bagga I J S. Current trends of poisoning. A Hospital Journal of Punjab Academy of Forensic Medicine and Toxicology. 2003; 3:41-45.
10. Kohli A, Benerjee K K. Fatal unintentional poisoning –A five year review of deaths in a teaching hospital in Delhi. Journal of Indian Academy of Forensic Medicine, 2002; 24[3]:86-88.
11. Kapila P, Sekhon H S, Mishra V K. Study of poisoning deaths in and around Shimla, internet Indian Journal of Forensic Medicine and Toxicology. 2003; 3:1[2].
12. Mohanty M K, Siddhartha P, Arun M, Menezes R G, Palimar V. Correlation between post mortem diagnosis and survival time in poisoning deaths. journal of Indian Academy of Forensic Medicine. 2005; 27[1]:23-27.
13. Murari A, Sharma G K. A comparative study of poisoning cases autopsied in L H M C New Delhi and J I P M E R, Pondicherry, Journal of Forensic Medicine and Toxicology. 2000; 19[1]:18-20.
14. Nigam M, Jain AK, Dubey B P, Sharma V K. Trends of organophosphorus poisoning in Bhopal region –An autopsy based study, journal of Indian Academy of Forensic Medicine. 2004; 26[2]:62-65.
15. Sharma B R, D Harish. poisoning in northern India: changing trends, causes and prevention there of; Med. Sci. Law, 2002, vol 42, no; 251-257.
16. Sharma B R, Dasari G, Sharma V, Vij K. The epidemiology of poisoning. An Indian view point, Journal of Forensic Medicine and Toxicology. 2000; 19[2]:5-11.
17. Singh V P, Sharma B R, Dasari H, Kkrishan V. A ten year study of poisoning cases in a care hospital, internet Indian Journal of Forensic Medicine and Toxicology. 2004; 1[2].
18. Singh Karamjit Singh, S. S Oberoi, D S Bhullar: poisoning trends in the Malwa region of Punjab AFMAT, 2003, vol 3; 26-29.
19. Shreemanta Kumar dash: Sociodemographic profile of poisoning cases; J I A F M, 2005. 27[3]; 133-138.
20. Shetty B Vinay, Pawar Gurudatta S, Inamadhar P I. Profile of poisoning cases in district and medical college hospitals of north Karnataka. Indian Journal of Forensic Medicine and Toxicology. 2008; 2:26-28.
21. Subhash C. Joshi, Arun Joshi, Pranesh Nigam, Godawari Joshi, Chandra Prakash. Pattern of poisoning cases admitted at a tertiary care centre in the Kumaon region of Uttarakhand. Indian Journal of Forensic Medicine and toxicology, january-june, 2010; vol 4 [1]:4-5.
22. V Chand Basha, S. Siraj Mohiyuddin, S. Rajeshareddy, L Anadakumar. A retrospective study of organo-phosphorus compound poisoning in tertiary hospital in Hyderabad region. Indian

.Journal of Forensic Medicine and toxicology, janvary-june, 2010;
vol 4 [1]:6-8.

23. Rohith C.Z ariawla, S.P Merchant; J I A F M, 31[2], 125-132.

Table 1: Yearwise distribution of poisoning

Year	No. of cases	Total admissions	%age
2005-6	82	1041	7.87
2006-7	93	1222	7.78
2007-8	106	1099	8.46
2008-9	109	1088	9.64
2009-10	112	1078	9.83
Total	502	4306	11.65

Table 2: Year wise sex of victims

Year	Male	%	Female	%	Total
2005-06	70	13.94	12	2.39	82
2006-07	78	15.53	15	2.98	93
2007-08	90	17.92	16	3.18	106
2008-09	94	18.72	15	2.98	109
2009-10	99	19.72	13	2.58	112
Total	431		71		502

Table 3: Year wise age

Year	<10y	20Nov	21-30	31-40	41-50	>50	Total
2005-06	2	13	41	19	7	-	82
2006-07	1	12	44	20	12	4	93
2007-08	2	14	53	21	11	2	106
2008-09	3	17	58	22	8	1	109
2009-10	2	16	61	22	11	-	112
Total (%)	10 (1.99)	72 (14.34)	257 (51.19)	104 (20.71)	49 (9.76)	7 (1.39)	502

Table 4: year wise marital status

Year	Married male	Unmarried male	Married female	Unmarried female	Total
2005-06	58	16	7	1	82
2006-07	69	13	10	1	93
2007-08	70	22	13	1	106
2008-09	71	20	16	2	109
2009-10	73	19	18	2	112
Total (%)	341 (67.92)	90 (17.92)	64 (12.74)	7 (1.39)	502

Table 5: Pattern of poisoning

Poison	2005-06	2006-07	2007-08	2008-09	2009-10	No. of cases	%
Organophosphate and compounds	58	71	78	82	83	372	74
Organochlorine	2	3	2	3	2	12	2.4
Carbamate	1	1	2	1	1	6	1.4
Benzodiazepines	2	3	4	4	3	16	3.2
Rat poison (zinc phosphide)	3	4	5	7	10	29	5.8
Alcohol	-	-	-	1	-	1	0.2
Medicinal Drugs	3	2	3	2	5	15	3
Corrosives	1	-	-	-	-	1	0.2
Phenol	2	1	2	1	2	8	1.6
Datura	1	-	-	-	-	1	0.2
Snake bite	3	3	4	3	3	16	3.2
scorpion sting	2	1	1	2	1	7	1.4
Kerosene	1	-	-	-	-	1	0.2
Glass pieces	1	-	-	-	-	1	0.2
Unknown poison	2	4	5	3	2	16	3.2
Total	82	93	106	109	112	502	

Table 6: year-wise mode of poisoning

Year	Accidental	Homicidal	Suicidal	No Male	No female
2005-06	7	-	75	70	12
2006-07	6	-	87	78	15
2007-08	6	-	100	90	16
2008-09	7	-	102	94	15
2009-10	7	-	105	99	13
Total (%)	33 (6.57)	-	469 (93.42)	431 (85.85)	71 (14.14)

Original Research Paper

Radiological Study of Fusion of Iliac Crest by Digital Method

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Abstract

Forensic medicine experts have to evaluate age in different medico legal situations. The study of epiphyseal union of bones is considered a reasonable scientific and accepted method for estimation of age by the courts of law all over the world. Most of the data generated till now was based on the routine X-ray methods and not using digital X-Ray method. The present study was carried out on 150 persons of age group between 17-21 years by using digital X-ray method in the Department of Forensic medicine and Toxicology at Govt. Medical College & New Civil Hospital, Surat. The present study possibly may generate the data giving shorter age intervals of fusion of centers of iliac crest (as compared to the standard text books or on the other end, may even positively reconfirm the evidential value of current data by using modern technique of digital X-ray).

This study will also study the effect of nutritional status, socio-economic condition, type of work, height, weight of the person on fusion of iliac crest.

Key Words: Digital X-ray, Iliac crest, Antero-posteriorly

Introduction:

Estimation of age is an important task for the forensic medicine experts especially in developing countries, when birth records are often not well maintained. Though the general development including height, weight, and secondary sexual character are helpful, but eruption and development of teeth are quite reliable data for estimation of age. Changes in bones especially time related appearance and fusion of different ossification centers in growing periods are also valuable indices for assessing the age.

According to Banerjee KK and Aggarwal BBL [1], the study of epiphyseal union of bones is considered a reasonable scientific and accepted method for estimation of age, by the court of law all over the world. There are many factors which affect the appearance and fusion of various bony centers like environmental, nutritional etc., so it is necessary to follow the latest data available for a particular place for estimation of the age of the population of that area. The Indian population differs widely from the western population in hereditary, dietary & socio-economic factors.

Studies done in India are few. Galstaun³ in 1930 and 1937 has done a study in Bengali population. Bajaj [2] in 1967 has done a study in Delhi. Other studies done in India are Pillai⁴ (Madarasis) in 1936, Hepworth [5] (Punjabis) in 1929, Basu and Basu⁶ (Bengalis) in 1938, Agarwal and Pathak (Punjabis) in 1957, Das, Thapar and Grewal (Punjabis) in 1965, Jit (Punjabis) in 1971, Kalpesh shah⁷ (in Gujarati's) in 1991, which are all based on the fusion of ossification centres. Most of the data generated till now, is based on the routine X-ray method and not using digital X-Rays.

The Advantages of Digital X-Rays are Increased image quality, Clear View and detect anomalies in dark or light areas of the film, Highlight certain structures, Enhance cortical outlines, Change image brightness, Magnify the image, No lost or damaged images, Reduction of repeat x-rays (reducing the amount of radiation to the patient), No film or chemicals used (cheaper), No processor maintenance or darkroom needed, No need for film filing envelopes or physical storage space as compared to the conventional X-rays.

The present study will consider the nutritional status, socio-economic condition, type of work, height & weight etc. of the person. By comparing the results of this study with the earlier ones, the effect of these factors will be studied.

Materials and Methods:

The present study was conducted in the Department of Forensic medicine and Toxicology, Govt. Medical College & New Civil Hospital, Surat; from October 2008 to

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September 2009. This study was carried out on 150 persons between the age group of 17-21 yrs attending the OPD. Only those persons who were apparently healthy having age between 17-21 years were selected. The aim of present study was to finalise the age of epiphyseal union in persons of Gujarat state by using digital x-ray method, so only those persons, who were residing in this state, since their birth & having the exact date of birth with documentary proof like birth certificate, school leaving certificate, S.S.C. mark sheet etc were selected.

Persons suffering from any chronic illnesses like congenital heart disease, any nutritional deficiency, any endocrinal disorders, having major skeleton disease or any deformity were excluded. Written consent for X-ray was taken from all the subjects. Information for address, handedness, native of the subject, monthly income, no. of family members, diet, and any habit was taken from the subjects himself. Their height, weight and sex were recorded. X-ray of the pelvis bone showing iliac crest, Antero-posterior view was taken by using digital X-ray method and the cassettes was submitted. Radiological assessment of the fusion of iliac crest was done by reading the X-ray findings of soft copies of X-rays and was grouped according to stage of fusion as follows.

Stage 0: Fusion not started

Stage I: Union begins near 1/3rd of iliac crest

Stage II: Fused in half of iliac crest

Stage III: Fused in ¾th part of iliac crest

Stage IV: Complete Fusion

Comparison was done with previous studies & Critical evaluation of the results was carried out.

Observations:

We had also included few participants below 17 years and above 21 Years.

Age and Sex wise distribution: The cases were divided in the following age groups. The age group 17-18 yrs was considered as those who had completed 17 years and 18 years been not completed, also same for the other three age groups. We have also included few participants below 17yrs & above 21 yrs but below 22yrs.

Shows majority of participants were males & belonged to age group b/w 19-20 Years (34 %) followed by 20-21 Yrs (34 %), 18-19 Years (21.3 %) & 17-18 Years (9.3 %). (Table 1)

Table 1: Age and Sex wise distribution

Age Groups	SEX		TOTAL
	Females	Males	
<17 Yrs.	3(7.1%)	7(6.5%)	10(6.7%)
17-18 Yrs.	3(7.1%)	11(10.2%)	14(9.3%)
18-19 Yrs.	13(31.0%)	19(17.6%)	32(21.3%)
19-20 Yrs.	15(35.7%)	36(33.3%)	51(34.0%)
20-21 Yrs.	7(16.7%)	32(29.6%)	39(26.0%)
<22 yrs.	1(2.4%)	3(2.8%)	4(2.7%)
TOTAL	42	108	150

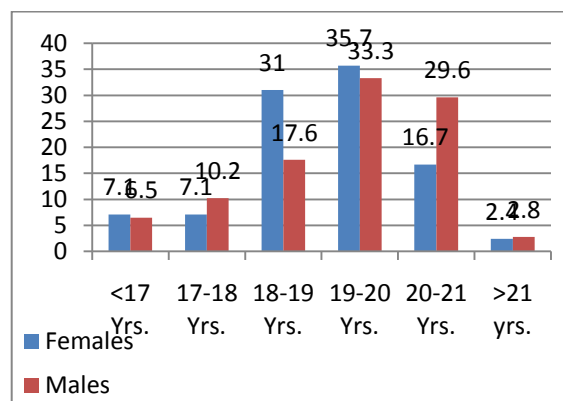


Diagram: 1

It was observed that, as the age increased the percentage of complete fusion (stage 4) cases increased and the percentage of partially fusion cases (Stage 1, Stage 2, Stage 3) decreased. In majority of persons complete fusion of iliac crest was seen at the age between 19-20 Years. It was observed that the fusion of iliac crest starts from posterior superior iliac spine and goes anteriorly as the age increases in both sexes. It was observed that the fusion of iliac crest occurs at same age on both right and left side of the same subject symmetrically. (Table 2) Majority of male participants showed complete fusion at the age 19-20 Years. (Table 3)

Distribution of fusion of iliac crest in females: It shows that the majority of female participants had complete fusion at the age of 18-19 Years.

Diet and fusion of iliac crest: In the present study it was observed that, out of total 150 persons, 87(58%) were vegetarian and 63(42%) were non vegetarian. (Table 4)

Table 4: Occupation and fusion of iliac crest

Occupation	No. of persons	Percent
At Home	4	2.7%
Compounder	1	0.7%
Fine worker	11	7.3%
Hard worker	1	0.7%
Housewife	7	4.7%
Laborer	16	10.7%
Mild worker	6	4.0%
Student	103	68.7%
Watch man	1	0.7%
Total	150	100.0%

To study the effect of diet; age was divided in two groups i.e. <19 Yrs, & >19 years. X2 test was applied to know the association. It was observed that, the observed difference between age group and diet in relation to complete fusion of iliac crest was statistically non significant in males and females.

As per occupation they were divided in to three groups, like Mild workers, Moderate workers and Heavy workers. Mild workers were those who were at home and housewives. Moderate workers were those who were

students, compounder, fine workers and watch man. Heavy workers were those who were hard worker and laborers. In our study majority of participants were students 103 (68.7%). (Table 5) In the present study to know the association between type of occupation and age group in relation to complete fusion of iliac crest, age was divided in two groups i.e. <19 Yrs and >19 years. The X² test was applied to know the association & it was observed that, the observed difference between age group and occupation in relation to complete fusion of iliac crest was statistically non significant both in males and females.

Socio-economic class and fusion of iliac crest: According to modified Prasad classification⁸, the subjects were distributed into five socio economic classes on the basis of their family income and no. of persons in that family. It was observed that the majority of participants belonged to SE Class 1: 55(36.7%), followed by SE class 4 : 34(22.7%), SE class 2 : 32(21.3%), SE class 3 : 25(16.17%) and in the last SE class 5 : 4(2.7%)

In this study, to know the effect of socio economic class on complete fusion of iliac crest, the SE class were divided in two groups the upper class (class 1, 2 and 3) and Lower class (class 4 and 5) & the Age was divided in three groups <19 Yrs, 19-20 Yrs. And >20. For this X² test was applied & found that, the relation between the age group and SE class was statistically non significant both in males and females.

Basal metabolic index and fusion of iliac crest: It was observed that, out of total 150 persons 103(68.7%) were averagely built, 38(25.3%) were good and 9(6%) were poorly built and nourished.

Table 5:

Age Group	Under weight	Average	Over weight	Total
<17 yrs.	0	0	0	0
17-18 Yrs.	1	0	0	1
18-19 Yrs.	7	15	3	25
19-20 Yrs.	10	29	5	44
20-21 Yrs.	7	28	3	38
>21 Yrs.	0	3	1	4
TOTAL	25	75	12	112

Table 6: Here for the study of relation of Height and Weight with the fusion of iliac crest we had found the Basal metabolic index⁹ as follows.

B.M.I. = Weight (kg.) / Height (m²)

- Under weight: <18.5
- Average: 18.5-24.99
- Over weight: > 25

To know the association of fusion of iliac crest with Basal metabolic index, we have clubbed the above table in three groups <19 Years, 19-20 Years and >20 Years. It was observed that, the age group and Basal metabolic index in relation

to complete fusion of iliac crest was statistically non significant ($\chi^2=4.18$, d.f. =4, p value= 0.38). It was observed that the fusion of iliac crest had no association with Height and Weight, also calculated in both males and females.

Discussion:

In the present study, the effect of various factors like socioeconomic status, height, weight, basal metabolic rate, nutritional status, occupation on the fusion of iliac crest was studied.

1.Age and fusion of iliac crest:

A) Comparison with studies carried out in foreign countries: It was found that, the fusion of iliac crest occurs at 19-20 years in males and at 18-19 years in females, which is a higher age range than that of Flecker¹⁰ [Australia] findings, who observed complete fusion at the age of 18 years in males and at the age of 15-16 years in females. Mc-Kern and Stewart¹² [New York], Davies and Parson¹¹ [England] observed the ages of fusion to be still higher, than that of our study, i.e. 23 years without any discrimination between males and females.

B) Comparison with studies carried out in India: Our findings are very much in accordance with that of Kalpesh Shah's [Gujarat] ⁷ and R. K.Gupta¹³ et al (Kanpur) findings. Galstaun³ [Bengal] found that, the fusion of iliac crest was complete by 20 years in males and by 19 years in females, except that the fusion in females starts 1 year in advance i.e. 17-19 years as compare to Gupta R.K.¹³ who observed that the fusion starts at 16 years in males and 15 years in females.

In contrast with the above studies, William Bilkey Ch. Sangma et al [14] [north east region of India] observed that the fusion is complete [i.e. 4th degree fusion] by the age of 22 years in females [no findings about male subjects were mentioned]. However William Bilkey Ch. Sangma et al [14] and our study have shown concurrent findings in that respect, i.e. as the age increases the degree of fusion also increases.

2.Sex and fusion of iliac crest:

As far as the relation of sex with fusion of iliac crest is concerned, our findings are very much in accordance with the findings of all other studies, (i.e. both foreign and Indian studies). pryor J.W and Gerulich, Pyle in USA, Barret J H in Burma, Lall and Townsend [15] in up also found that, the fusion of the iliac crest occurs earlier in females as compared to males and that too by one to one and half years before.

3.Diet and fusion of iliac crest:

Except the present study and Kalpesh Shah [7], no other researcher has studied the

effect of diet on fusion of iliac crest. in both the studies it was observed that there is no effect of diet on the fusion of iliac crest in both males and females.

4. Occupation and fusion of iliac crest

Kothari D.R. [16] in rajasthan and our team over here are the only who had tried to find out the effect of nature of occupation (that is hard work/moderate work/sedentary work), on fusion of iliac crest, based on the assumption that higher metabolic rate in people engaged in work requiring more physical activity, may lead to early/late fusion, although we did not find any such association, Kothari D.R. [16] has found that, fusion occurs earlier in hard workers, however he has not mentioned how much earlier it occurs and how he came to this conclusion [which test of significance was applied and what is the level of significance].

5. Socio economic class and fusion of iliac crest:

In the case of study of relationships of socio economic class with fusion of iliac crest, only we and Kalpesh Shah et al [7] studied under the assumption that higher socio economic class will lead to better nutrition and hence may cause earlier fusion but no such relationship was found in any of the study.

6. Height, weight and basal metabolic index:

Contrary to the widely believed/proved facts that dwarfs are because of earlier fusion of epiphyseal plates, we did not find any association between height weight and fusion of iliac crest, contrary to this Kalpesh Shah et al [7] found that epiphyseal union occurred earlier in taller subjects but he has not mentioned how much earlier it occurs.

Apart from the above factors and their association with fusion of iliac crest the direction of fusion of iliac crest and its bilateral symmetry was also studied in the present study.

A. Direction: In our study we found that iliac crest fuses postero-anteriorly, that is beginning from posterior superior iliac spine and proceeding anteriorly. This is in contrast with study of Mc Kern and Stewart [12] [New York] who has divided fusion of iliac crest into 4 inappropriate confusing stages (stage: 1 internally: Union begins near the anterior superior iliac spine, stage: 2 internally: Fused in anterior half; occasionally posterior end.

Externally: Fused at anterior superior iliac spine, and in middle third, stage:3 **Internally:** United only at a point just above the junction of the iliac fossa and articular area. **Externally:** United only at a point of greater anterior thickness, stage: 4 Completed unions)-

the projected idea of which, as perceived by us, is that fusion occurs anterior to posteriorly.

But this can be disregarded looking at the confusing division given above and the fact that conventional x-ray method was used [study was carried out in 1954], as compared to our method that is digital radiography the advantages of which are obvious.

B. Bilateral symmetry: All the studies like Pryor J .W. USA, Galstaun [19, 20] in Bengal and Kothari D.R. [16] in Rajasthan, along with our study all are well in accordance with each other, i.e. there is no great disparity in ossification of iliac crest between the 2 sides of the same individual. [Thus avoiding the need to take bilateral x-ray of any person in future for age determination]

Conclusions:

1. The complete fusion of iliac crest with ilium occurs at the age of 19-20 years in the males and 18-19 years in the females of Gujarat State population.
2. The fusion of iliac crest occurs one year earlier in females than in the males.
3. The fusion of iliac crest starts from posterior superior iliac spine and proceeds anteriorly.
4. The complete fusion of iliac crest occurs 3 years earlier in Gujarati population than the subject of England and America.
5. The fusion of iliac crest is bilaterally symmetrical.
6. In the present study there is no association of fusion of iliac crest with diet, occupation, socio economic class, height and the weight of person in both males and females.

References:

1. Banerjee KK and Aggarwal BBL: Estimation of Age from Epiphyseal Union at the wrist and ankle joints in the capital city of India, *Journal of forensic science international*: (1983), 1-39.
2. Bajaj I.D.: Epiphyseal union- Ages of epiphyseal union in long bones of inferior extremity in U.P. subjects (A study of 300 Boys and 25 Girls). *Thesis of M.S. (Anatomy)*, King George's Medical College, Lucknow (University of Lucknow), (November 1954).
3. Galstaun G: A study of ossification as observed in Indian subjects. *Indian J.M. research*, (July 1937), 25:267-324.
4. Pillai J.S.: The study of epiphyseal union for determining the age of South Indians. *Indian Journal of Medical Research*, 23(April 1936):1015-1018.
5. Hepworth SM: Determination of age in Indians from study of the calcification of the long bones. *Ind. Med. Gaz.* (1929); 64:128.
6. Basu S.K. and Basu S.: The age order of epiphyseal union in Bengali Girls. *Journal of Indian Medical Association*, (August 1938). 571.
7. Kalpesh shah: A Study of fusion of iliac crest in relation to age, sex and physical development in adolescent boys and Girls (Age group 17-22 years) in Gujarat. *Thesis for M.D. (Forensic medicine)*, Gujarat University, 1991.
8. Kumar P.: Social Classification need for constant upgrading, *Indian journal of community medicine*, 18 (1993): 60-61.
9. K. Park: Preventive and Social Medicine. 20th edition; 2009, 347-348.
10. Flecker H.: Time of appearance and Fusion of ossification centers as observed by roentgen graphic methods, *American Journal of roengenology*, 47(January 1942): 97-157

11. Davies, D.A. and Parsons, F.G.: The age order of the appearance and union of normal epiphysis as seen by X-rays. *Journal of Anatomy*, 62(October 1972):58-71.
12. Mac kern, T.W. and Stewart, T.D.: Skeletal age changes in young American males, analyzed from the standpoint of identification, New York, *Wenner-Gren found for anthropology Research*, 1954.
13. Alok Kumar, Yadav Mukesh, Gupta R.K. et al: Estimation of Age from pelvis – A Radiological study, *ijfimt* 1(2004):3.
14. William Bilkey Ch. Sangma, Fremingston K. Marak, M. Shyamo Singh, and Biona Kharrubon: *Journal of Indian Academy of Forensic Medicine*, 29, vol-4 (2007): 102-104.
15. Lall R and Townsend RS: Ages of Epiphyseal Union at the Elbow and Wrist Joints amongst Indian Girls, *Indian Medical Gazette*; 74(1939): 614-616.
16. Kothari D.R.: Age of Epiphyseal Union at Elbow and Wrist Joints in Mar war region of Rajasthan, *Journal of Medical Association*; 63(October 1974): 8-16.

Digital x-ray films:



Plate 1: X-ray of 19 yr old boy showing fusion of 1/3rd iliac crest (stage 1)



Plate 2: X-ray of 19 yr 11 months old boy showing the fusion of 1/2 iliac crest (stage 2)



Plate 3: X-ray of nineteen-year and eight months old girl with fusion of 3/4th iliac crest (stage 3)

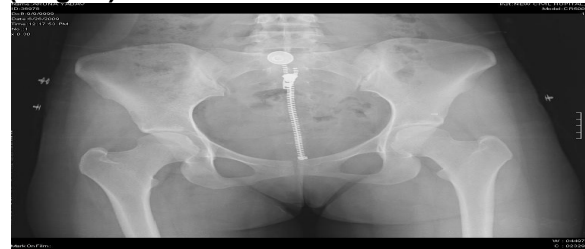


Plate 4: X-ray of 19 yr 6 months old girl with complete fusion iliac crest (stage 4)

Table 1: Fusion of iliac crest in females

Age Gp (yrs)	stage 0	1	2	3	4	Tot.al
<17	0	0	3(100%)	0	0	3
17-18	1(33.3%)	0	1(33.3%)	1(33.3%)	0	3
18-19	0	0	0	1(7.69%)	12(92.3%)	13
19-20	0	0	0	1(6.66%)	14(93.3%)	15
20-21	0	(3.12%)	0	0	7(100%)	7
<22	0	0	0	0	1(100%)	1
Tot.	1(2.38%)	0	4(9.52%)	3(7.14%)	34 (80.95%)	42

Table 2: Age wise fusion of iliac crest

Age Gp	stage 0	stage 1	stage 2	stage 3	stage 4	Total
<17 yrs.	3 (30.0%)	1 (10.0%)	5 (50.0%)	1 (10.0%)	0 (0.0%)	10
17-18	3 (21.4%)	1 (7.1%)	6 (42.9%)	3 (21.4%)	1 (7.1%)	14
18-19	1 (3.1%)	1 (3.1%)	2 (6.3%)	3 (9.4%)	25 (78.1%)	32
19-20	0 (0.0%)	2 (3.9%)	3 (5.9%)	2 (3.9%)	44 (86.3%)	51
20-21	0 (0.0%)	1 (2.6%)	0 (0.0%)	0 (0.0%)	38 (97.4%)	39
<22	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (100%)	4
TOTAL	7 (4.7%)	6 (4.0%)	16 (10.7%)	9 (6.0%)	112 (74.7%)	150

Table 3: Fusion of iliac crest in males

Stage	0	1	2	3	4	Tot.al
<17 yrs.	3 (42.85%)	1 (14.28%)	2 (28.57%)	1 (14.28%)	0	7
17-18	2 (21.4%)	1(7.1%)	5 (42.9%)	2 (21.4%)	1 (7.1%)	11
18-19	1 (5.26%)	1 (5.26%)	2 (10.52%)	2 (10.52%)	13 (68.42%)	19
19-20	0	2 (5.55%)	3 (8.33%)	1 (2.77%)	3 (0.3%)	36
20-21	0	1 (3.12%)	0	0	31 (96.87%)	32
<22 Yrs.	0	0	0	0	3 (100%)	3
Total	6 (5.55%)	6 (5.55%)	12 (11.1%)	6 (5.55%)	78 (72.22%)	108

Original Research Paper

Effect of Ageing & Environmental Condition for Detection of Blood Group from Blood Stain

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Abstract

It is an established fact that laboratory investigations involving biological fluids play a vital role in crime investigations. Blood as a source of evidence associated with crime, can provide valuable information that may solve the case. Proper collection, preservation and dispatch of this crucial evidence to the Forensic Science Laboratory is hence very essential. Improper collection and preservation can weaken or destroy a potential source of facts in a case. Many times the suspects may hide valuable blood stain evidence either on the object or the clothes in different conditions which may adversely affect the investigation. Hence, proper collection and preservation of blood stain is of paramount importance, as it may provide a strong link between an individual and a criminal act.

The present study was undertaken to find out the maximum duration for which blood grouping is possible when the stains are exposed to varied environmental conditions.

Key Words: Blood Stain, Evidence, Blood grouping, Crime scene.

Introduction

It is an established fact that laboratory investigations involving biological fluids play a vital role in crime investigations. It is useful scientific evidence as it forms an important link in chain of evidence or supports circumstantial evidence. [1]

Edmond Locard (1877-1966), a lawyer and a physician, proposed that every criminal carries some elements with him/ her from the scene of crime by which he / she can be linked with the crime. Blood and Blood stains, likewise are a very important entity in medico legal practices, as factors like source of blood and their stains help in solving the crime of Violence, Sexual offences, Vehicular accident cases, Disasters etc. [1] It helps to establish the relation between the offence, offender, the offended and the offending agent.

A careful preservation of Blood samples and blood stain is therefore important. A careful laboratory investigation of Blood and Blood stain can yield information useful in the court of law with a varying degree of reliability. [2]

Blood stains may be present on any material. Environmental changes affect its morphology & its contents.

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Last but not the least the time lapse from its occurrence to its examination is also an important factor. Hence it was thought appropriate to take up the study to find out the effect of ageing and environmental factors on blood stains.

Material & Methodology:

This study was carried out in the Department of Forensic Medicine Jawaharlal Nehru Medical College, Sawangi (Meghe) Wardha over a period of 3 years.

For the study stains were prepared on different fabrics like Cotton cloth, terelene cloth and cotton gauze pieces of 2" x2" size. Known blood group samples were taken from the blood bank, Department of Pathology, where grouping of samples is done before transfusion. With the known blood group, stains were prepared by putting a drop of blood with the help of dropper over the cut pieces of fabrics with blood spread evenly on all parts of the fabric. The stains prepared were labeled (known group and with date on which it was prepared) and were subjected to different environmental conditions.

Stains prepared on each fabric were equally divided and were kept in five different conditions. The stains, so prepared were stored in five (5) different conditions as under:

1. **Moist:** Immediately wrapped in plain paper or kept in zip locked polythene bag.
2. **Semi moist:** Stain was allowed to dry for 6-8 hours at room temperature and then wrapped in plain paper or zip polythene bag.
3. **Dry:** Stains were completely dried at room temperature under normal condition and

then wrapped in plain paper or zip polythene bag.

4. **Air dried:** Stain was kept directly in front of fan to dry and then stored.
5. **Heat dried:** Stains were dried using indirect heat e.g. by keeping near the heater and then wrapped.

Stains belonging to each group were then stored in different environmental conditions: one in the refrigerator at 4-6 °C temperature and another at room temperature, which varied from 9.4°C to 46°C during the period of study.

These stains were then examined at fixed and regular intervals of time (Weekly) using absorption elution method, which is the most common technique used and the observations were noted.

Observations:

In the present study stain prepared on different fabric and exposed to different environmental conditions before wrapping, were examined after every seven (7) days and result for clumping of cells were noted by absorption elution method. Clear clumping of cells was taken as positive result while any doubt about the clumping of cells due to any reason was taken as inconclusive result.

On regular and fixed interval of time, stain examination for blood grouping, it is observed that stains kept in conditions like moist condition, air dried or heat dried prepared on **cotton gauze** and **terelene cloth**, gives positive result upto **6 weeks** after that results were inconclusive. While on **cotton cloth** stains exposed to same conditions gives positive result up to **10 weeks**. (Figure 1)

Whereas stains prepared on all these 3 fabrics and wrapped in **semi moist condition** the detection of blood group on stain examination is positive for a longer duration i.e. up to **1 year**, irrespective of the fabric.

Similarly the stains prepared on these 3 fabrics if dried completely at room temperature in normal conditions (without using artificial means for drying) and kept at room temperature the result vary on different fabrics, the stain on terelene cloth gives positive result up to 18-20 months i.e. (up to 1 ½ years), stain on cotton gauze piece gives positive result up to 24-26 months i.e. (up to 2 years) and the stains on cotton cloth it is observed that the result is positive up to 3 years, the maximum period for which the study is carried out. (Figure 2)

Overall stains examined, kept under different environment conditions made on different fabrics shows positive result up to 6 months in moist condition, up to 1 year in semi moist condition & up to 3 yrs in stains kept at

room temperature in normal condition. (Figure 3)

Discussion:

Detection of blood group on blood stain examination depends on various factors like on which substrata that stain is present or how the blood stain was preserved whether the stain was exposed to extreme temperature, direct sunlight or was the stain dried using fan or indirect heat using heater.

And at what interval of time the stain is examined after preserving, whether the stain was kept at room temperature or was it refrigerated or frozen if stain is not dispatch to the concerned forensic science laboratory immediately. In the present study, all these factors were taken into consideration and study was carried out on different parameters as stains were prepared on different fabrics like cotton cloth piece, cotton gauze piece and terelene cloth piece and were exposed to different environment conditions i.e. stains were either air dried, kept at 4-6 °C temperature or in moist condition wet before packing in poly zip bag or paper envelop and then examined at different interval of time.

In this study it was found that stains which were allowed to dry naturally at room temperature and then wrapped in paper envelop or zip poly bag gives positive result up to 3 years on cotton cloth, which is observed by James et al. & others. The stains which were either wrapped in moist conditions or dried using fan or heat shows positive result upto 6-10 weeks as heat if applied to the blood stain, causes physical changes within the blood stain. In the present study all the stains dried using fan or heat on any fibre shows inconclusive results after 10 weeks as fan blows foreign material onto the stain leading to contamination & gives inconclusive result. [4] Grouping on the dried blood stain is more difficult.

The time lapse, exposure to direct sunlight, extreme temperature and other natural conditions yield changes that reduces the possibility of successful grouping of the blood stain. In this study all the stains which were moist (wet) & semi moist i.e. kept at 4-6 °C before wrapping in the paper envelop or poly zip bag shows positive result up to 6 weeks in cotton gauze & terelene cloth pieces & up to 10 weeks on cotton cloth piece. Dry Stains on cotton cloth piece gives positive result up to 3 years while on cotton gauze up to 2 year & on terelene up to 1 ½ year.

Conclusion:

It is concluded that blood stain should be dried properly. Blood stain should not be

sealed in moist condition, as moisture allows the growth of microorganisms that can destroy or alter the evidence and causes difficulty in determining the blood group on blood stain examination by conventional serological method. [4] In semi moist stain, there is a possibility of bacterial growth thus chances of having contamination. Drying should be avoided using electric fans or heater. After air drying the stain should be wrapped in fresh blotting paper or plain or news paper. No preservative is required. It can be transported at room temperature. [3]

Proper collection and preservation of exhibits is very important for administration of justice. [5] Over the years, criminals have tried many ingenious ways to hide, clean up, and remove the blood evidence, but it is an area where criminal justice technology has always stayed one step ahead of them.

Blood has always been considered class evidence, but the potential exists for individualized blood typing. Strong possibility estimates linking a single individual from a blood stain.⁶ Blood evidence is usually more informative in cases where a suspect and victim are in contact or close proximity. [3] Blood analysis is a comparison analysis. Blood stains are not easy to eradicate.

Inferences:

Blood stains:

- 1) Should be dried properly before storing.
- 2) Should not be sealed in moist or semi moist condition. (Moisture allows the growth of microorganisms).
- 3) If in Moist & Semi moist condition, it should be examined immediately
- 4) Drying should be avoided using electric fans or heater.
- 5) After air drying the stain should be wrapped in fresh blotting paper or plain or news paper.
- 6) No preservative is required.
- 7) It can be transported at room temperature.
- 8) Blood can be collected on a ½" X ½" cotton square cloth piece.

References:

1. James Stuart H, Eckert William C. Interpretation of blood stains evidence at crime scenes, 2nd edition.
2. Robert. Serological evidence in sexual assault investigations
3. R.J.Grispino.M.A FBI Law enforcement bulletin October, 1990.
4. Anupama Raina et al. Methods of collection, preservation and forwarding of biological material for DNA fingerprinting.IJFMT 1 (2) 2003.
5. D.N.Bhardwaj et al. Preservation of exhibits in medico legal cases in casualty. Jour. of Acad. of hosp. adm..Vol.15 no.2 (2003-07-2003-12)

6. Borrmann, Dodd and Lincoln. Blood group serology, Churchill Livingstone 1977.
7. George Schiro Collection and preservation of Blood evidence from crime scenes. Forensic scientist Louisiana State Police Crime Laboratory.
8. Modi's Medical jurisprudence and toxicology 21st edition 2nd reprint 2004.
9. Nageshkumar G.Rao., Text book of Forensic Medicine & Toxicology 1st edition 2000.
10. Apurba Nandy. Principles of Forensic Medicine 1st edition 1995.
11. P.V.Guharaj. Text book of Forensic Medicine 2nd edition 2003.

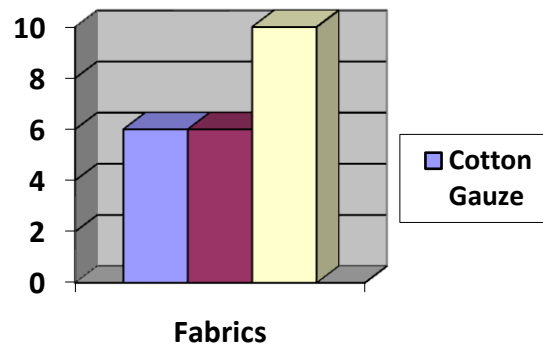


Figure 1: Blood stain showing positive result in weeks made on different fabrics kept in Moist, Air dried & Heat dried condition

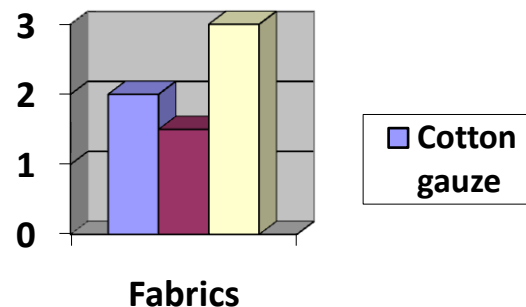


Figure 2: Stain showing positive result in years for blood grouping made on different fabrics kept in normal condition at room temperature

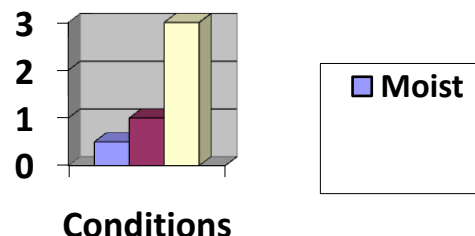


Figure 3: Stains showing positive result for grouping kept in different environmental conditions

Original Research Paper

Pattern of Burns Cases Brought to Morgue, Sion Hospital, Mumbai: A Two Year Study

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Abstract

The present study was carried out in the Department of Forensic Medicine & Toxicology of Lokmanya Tilak Municipal Medical College & General Hospital, Sion Mumbai and total 237 cases were collected for this study purpose. Female victims were most commonly affected as compared to male victims. The age group of 21-30 years 97 (40.93%) was most commonly affected followed by age group 31-40 years 54 (22.79%). The thermal burns 184 (77.63%) was most commonly noted followed by electrical burns 23 (9.71%). Married females 114 (76.51%) most common victims and most of victims survived for a period of 12 to 24 Hours 61 (25.74%). Head, face & neck 206 (86.91%) region of body was most commonly affected followed by Chest 174 (73.41%) region of body. The most of victims sustained 51 to 75% burns 133 (56.12%) and most common manner of death was accidental burns 147(62.02%).

Key Words: Burns, Types of burns, Percentage of burns over the body, Manner of death

Introduction:

Burns injuries have been a major cause of concern since prehistoric time to the present era of modern medicine. Burns injuries were most important as they were commonest cause of unnatural death in India. Dowry deaths by burns was most common in India & at the same time accidental burns in females also occur often while cooking food in their kitchen. The higher incidences of burns in the Mumbai region and high mortality rates in these cases motivated us to undertake this study.

Aims and objectives:

The present study was undertaken with following aims and objectives:

- To study the pattern of burns injuries in relation to age and sex.
- To study the pattern of burns injuries in relation to marital status and types of burns.
- To study the pattern of burns injuries in relation to manner of death and period of survival.
- To study the pattern of burns injuries in relation to area of body burnt and total percentage of burns sustained.

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Material and Methods:

The present study was carried out in the Forensic Medicine Department of Lokmanya Tilak Municipal Medical College & General Hospital, Sion Mumbai.

Total 237 cases were collected from 1st Jan 2009 to 31st Dec 2010 from post mortem reports, statements of relatives and police panchnama. The data was collected in a predetermined proforma and it was analysed and presented for the discussion. The cases where data was incomplete such cases were excluded.

Observations & Results:

Present study demonstrated preponderance of female 149 (62.86%) victims over male 88 (37.14%) victims with male/female ratio of 1:1.69. (Table 1) Age gp, 21-30yrs [40.93%] was most commonly affected followed by 31-40yrs [22.79%]. (Table 1)

Thermal burns 184 (77.63%) was most common, followed by electrical burns 23 (9.71%). (Table 2) Married females 114 (76.51%) most common victims of present study followed by married males 63 (71.59%). (Table 3) The most of the victims survived for period of 12 to 24 Hours 61 (25.74%). (Table 4) Head, face & neck 206 (86.91%) region of body was most commonly affected followed by Chest 174(73.41%) region of body. (Table 5) The most of victims sustained 51 to 75% burns 133 (56.12%). (Table 6) Most common manner of death was accidental burns 147(62.02%). Out of total 26 cases of spot death of burns in 17 (65.38%) cases black coloured soot particles

were found in trachea during post mortem examination. In the present study total 18 (7.59%) victims found under the influence of alcohol and 23 (9.71%) victims were found to be used kerosene as an inflammable material for suicidal purpose. (Table 7)

Table 1: Distribution of Cases Age-Sex wise

Age gp (Yrs)	Male (%)	Female (%)	Total (%)
1-10	4 (4.54%)	7 (4.69%)	11 (4.64%)
11-20	14 (15.91%)	20 (13.43%)	34 (14.34%)
21-30	34 (38.64%)	63 (42.29%)	97 (40.93%)
31-40	19 (21.59%)	35 (23.48%)	54 (22.79%)
41-50	7 (7.96%)	13 (8.74%)	20 (8.44%)
51-60	6 (6.82%)	7 (4.69%)	13 (5.48%)
61-70	4 (4.54%)	4 (2.68%)	8 (3.38%)
Total	88 (100%)	149 (100%)	237 (100%)

Table 2: Type of burns

Type of Burns	No of cases	Percentage (%)
Thermal	184	77.63
Electrical	23	9.71
Chemical	19	8.01
Scalds	11	4.65
Total	237	100

Table 3: Cases according to marital status

Marital status	Male (%)	Female (%)	Total (%)
Married	63 (71.59%)	114 (76.51%)	177 (74.68%)
Unmarried	25 (28.41%)	35 (23.49%)	60 (25.32%)
Total	88 (100%)	149 (100%)	237 (100%)

Table 4: Cases according to period of Survival

Period of survival	No of cases	Percentage (%)
Spot death	26	10.97
Up to 6 Hours	37	15.62
6 to 12 Hours	51	21.52
12 to 24 Hours	61	25.74
24 to 36 Hours	18	7.59
36 to 72 Hours	19	8.02
3 to 7 days	10	4.22
>7 days	15	6.32
Total	237	100

Table 5: Cases according to area of body burnt

Area of body burnt	No of cases	Percentage (%)
Head, face & neck	206	86.91
Chest	174	73.41
Abdomen	137	57.80
Back	146	61.60
Upper limbs (Right & Left)	98	41.35
Lower limbs (Right & Left)	76	32.06
Genital	28	11.81

Table 6: Cases according to percentage area of burns

Percentage of body burned (%)	Male (%)	Female (%)	Total (%)
Up to 25	4 (4.54%)	3 (2.02%)	7 (2.95%)
26 to 50	25 (28.41%)	17 (11.42%)	42 (17.72%)
51 to 75	41 (46.59%)	92 (61.72%)	133 (56.12%)
76 to 100	18 (20.46%)	37 (24.84%)	55 (23.21%)
Total	88 (100%)	149 (100%)	237 (100%)

Table 7: Cases according to Manner of death

Sr	Manner of death	No of cases	Percentage (%)
1	Accidental	147	62.02
2	Suicidal	62	26.16
3	Homicidal	28	11.82

Discussion:

The present study demonstrated preponderance of female 149 (62.86%) victims over male 88 (37.14%) victims which also

reported by other researchers. [1, 2, 4, 8, 12, 14] The age group of 21-30 years 97 (40.93%) was most commonly affected in the present study which was consistent with the studies of other researchers. [1, 2, 3, 4, 12]

The thermal burns 184 (77.63%) was most commonly noted which was consistent with study of H.M. Mangal, Akhilesh Pathak². Married females 114 (76.51%) most common victims of present study followed by married males 63 (71.59%) which was consistent with studies of 2, 13. The most of the victims survived for period of 12 to 24 Hours 61 (25.74%) which was also reported in the study of H.M. Mangal and it was not consistent with the study of Memchoubi, H. Nabachandra where period of survival of less than 1 Hour 32 (49.23%) was most common.

The most of victims sustained 51 to 75% burns 133 (56.12%) which was consistent with H.M. Mangal et al but it was not consistent with the study of Usama B.Ghaffar et al where 26 to 50% burns 116 (28.8%) was most commonly affected the burns victims. Most common manner of death was accidental burns 147 (62.02%) which was consistent with other study. [1, 2, 4, 11, 14]

References:

1. Bangal RS: Thermal Injuries-A study of mortality patterns. JFMT; 1995, XII (1&2), 1-4.
2. H.M. Mangal, Akhilesh Pathak: The Fire is Both "A Blessing & Scourge to the Mankind" JIAFM, 2007 – 29(4) 75-77.
3. Kailash Zine, A. Mugadlimath: Study of some socio-etiological aspects of unnatural female deaths at Government Medical College, Aurangabad. J Indian Acad Forensic Med, 2009, 31(3) 210-17.
4. Memchoubi, H. Nabachandra: A Study of Burn Deaths in Imphal. JIAFM, 2007 - 29(4) 131-134.
5. Mohanty et al: Self inflicted Burns fatalities in Manipal. Medicine Science Law; 2005; 45: 27-30.
6. Murty OP, Paul G: Bride burning and burns-certain differentiating aspects thereof. JFMT 1995; XII (3&4): 13-26.
7. Nagesh Kumar G. Rao: Study of fatal female burns in Manipur. J Forensic Med Toxicology. 1997; 14(2): 57-59.
8. Rao NG: Study of fatal female burns in Manipal. JFMT 1997;14(2): 57-59.
9. Rooh-ul-Muqim, Mohammad Zareen, Dilbag, Muhammad Hayat: Epidemiology and outcome of Burns at Khyber Teaching Hospital Peshawar. Pak J Med Sci, 2007; 23(3): 420-24.
10. Satpathy D K: Burning bride-A medicolegal study. Med. Sci. Law 1995; 14: 547-552.
11. Sharma BR, Harish D, Sharma A, Sharma S, Singh H: Accidental Fatal burns in Indian Kitchens: Are they really accidental? JIAFM; 2006: 28(1), 14-17.
12. Sharma BR, Sharma V & Harish D: Suicides in Northern India- Causes, Methods used and Prevention thereof, Med. Sci. Law, 2003, 43(3); 221-229.
13. Usama B.Ghaffar, Munnawar Husain and Shameen J Rizvi: Thermal Burn: An Epidemiological Prospective Study. J Indian Acad Forensic Med, 2008, 30(1) 10-14.
14. Verma VCS and Das P K: Observations on cases of burns and their medicolegal aspects. J Indian Acad Forensic Med, 1990, 12(1) 19-24.

Original Research Paper

Study of Profile of Deaths due to Poisoning in Bhavnagar Region

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Abstract

The present study was undertaken to evaluate the pattern of poisoning deaths in Bhavnagar region of Gujarat. The Paper presents the study of 143 cases of poisoning during the span of one year from 01/04/2008 to 31/03/2009. Out of 878 Post mortem examination done during the study period 143 cases were of poisoning. The cases were then analyzed on various parameters in the proforma prepared for this purpose. We concluded that majority of victims were married, Hindu, males from rural area and low socioeconomic group. The incidence of poisoning was more common during 21-30 years of life. Suicidal cases were more common than accidental cases. No case of homicidal poisoning was detected in present study, chemical analysis of viscera done in 122 cases. Insecticide still topped the list as killer, while Aluminium phosphide & snake bite was second common fatal poisoning.

Key Words: Poisoning, Insecticide, Death, Post Mortem, Bhavnagar

Introduction:

Due to rapid development in science and technology and vast growth in the Industrial and agricultural sector, the incidence of poisoning is spreading like a wild fire. A number of chemical substances, which are developed to save the agriculture products from rodents and pests, so as to protect the human beings from starvation, are infact, themselves proving to be man-eaters. [1, 2]

Death as a reason of poisoning/drug abuse is of enormous medical, legal and social significance. Due to easy availability of poisons and low cost, many people prefer it for the purpose of suicide, as poisons leading peaceful death. Even though the advanced medical treatment and awareness, the poisoning cases are increasing day by day.

Accidental ingestions are most common in children less than 5 years old. According to WHO, 3 million acute poisoning cases with 220000 deaths occur annually. [3, 4] Of these, 90% of fatal poisoning occurs in developing countries, especially, amongst the agricultural workers. Developing countries such as India and Sri Lanka have reported alarming rates of toxicity and deaths due to poisons. [5]

Everyday around the world almost 700 people die of poisoning and several thousands more are affected by poisoning. It has been estimated that about 5-6 persons per lakh of population die due to poisoning every year. [6]

More recently, Aluminium phosphide, because it is cheap, easily available, highly toxic, and has no antidote, has emerged as the most common suicidal agent. [7, 8]

Since 1985, aluminium phosphide poisoning has been reported as a commonest cause of intentional poisoning in northern parts of India. Therefore, present study was undertaken to study epidemiological aspects, pattern, mortality and other significant features of poisoning and to compare with the observations of various authors.

Material and Methods:

This study has been carried out at Government Medical College and Sir T. Hospital, Bhavnagar (Gujarat) during the period of one year from 01/04/2008 to 31/03/2009. This institute is a referral center for whole of Bhavnagar, Junagarh, Amreli region and acts as an apex referral institution.

During the present study period 878 autopsies were conducted in the mortuary of Sir T. Hospital, Bhavnagar, were included. Out of total 878 cases of post mortem examination, poisoning was observed in 143 cases. Relevant history was obtained from relatives of the deceased or the investigating police officer. Post mortem examination was conducted. Detailed and complete examination of bodies was done. Routine viscera was preserved by using appropriate preservative according to

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nature of poison and then sent to regional Forensic Science Laboratory, Junagarh for chemical analysis examination.

Observations:

Maximum numbers of cases were observed in age group 21 – 30 i.e. 43 cases (30.06%), followed by 38 cases (26.56%) in 11 – 20 yrs & least incidence was found in 61 – 70 years & 71 -80 years, i.e. 3cases (2.10%) each. (Table 1)

Maximum numbers of poisoning cases were observed in Sept.2008 21 cases, (14.68%) followed by July 2008 & August-2008, 17 cases (11.88%) each. Least incidence in the month of March i.e. 4 cases (Table 2)

Out of 143 cases incidence was more in rural area i.e. 83 cases (58.05%) while 58 cases (40.55%) from urban area. (Table 3)

Incidence of poisoning cases was maximally observed in Hindu people 129 cases (90.20%) (Table 4)

Maximum cases were from Nuclear family 92 cases (64.33%) as compared to joint family 48 cases (33.57%). (Table 5)

Out of total 143 cases maximum persons were illiterate 75 cases (52.44%) followed by Primary 26 cases (18.18%). (Table 6) Incidence was higher in married persons 90 (62.93%) cases compared to unmarried persons 50 cases (34.97%). Out of 93 male cases, 59 males (41.25%) were married and 31 males (21.68%) were unmarried. Out of 50 females, 31 females (21.68%) were married and 19 females (13.29%) were unmarried. The male to female ratio of married person is 1.9:1 while in unmarried is 1.6: 1 (Table 7)

Maximum cases were from lower socio-economic class – 94 cases (65.73%) while 42 cases (29.37%) from middle class and 04 cases (02.80%) from upper class. (Table 8)

The maximum incidence of poisoning was found in Agri cultural Labourer – 48 cases (33.56%), house wife – 25 cases (17.48%). Followed by dependent 20 cases (13.98%) followed by Business man 18 cases (12.58%). own land owner & cultivator, milkman, fruit man, etc. are included in business category. (Table 9)

The maximum death were occurred within 1-6 hours (44.75%) while in 16 cases (11.18%) within 1- 3 days. In 13 cases (09.10%) duration of survival was within 1 hour. (Table 10)

The incidence of suicidal cases was higher in 103 cases (72.02%) followed by accidental cases 37 (25.88%). In 03 (02.10%) cases in was not possible to determine the manner of death. (Table 11)

Out of 143 cases Viscera was preserved in 122 cases (85.31%) while in 21 cases (14.69%) viscera was not preserved. (Table 12) Chemical Analysis reports were received in 98 (80.32%) cases. Out of these 98 cases insecticide poison detected in 59 (48.36%) cases, out of which Monocrotophos detected in 24 (19.68%) cases, Quinalphos in 07 (05.73%) cases, Methyl Parathion in 06 (04.91%) cases, Endosulphan in 06 (04.91%) cases, while Phoselon, Chlorpyrifos, Carbamate and Phosphamidon in 01 (00.82%) case each. Kerosene detected in 02 (01.64%) cases. Alphas detected in 23 (18.86%) cases. In 13 (10.66%) cases no poison was detected. (Table 13) In 143 cases in 39 (27.27%) cause of poisoning was unknown while in 104 (72.73%) cases following were causes of fatal poisoning.

Most common cause of the fatal poisoning is family problem in 40 (27.97%) cases, folloed by financial problem. In 06 (04.20%) cases illness was the cause of fatal poisoning, in 03 (02.10%) cases poison was consumed after quarrel, love affair failure was the cause in 02 cases (01.40%), in 09 (06.30%) cases poisoning was due to mistake, unemployment was the cause in 01 (00.70%) case. Accidental poisoning was in 26 (18.18%) cases. (Table 14) Common place of poisoning was home in 80 (55.94%) cases, farm was in 32 (22.37%) cases, outside home in 28 (19.59%) cases and at workplace in 02 (01.40%) cases. (Table 15)

Table 1: Poisoning according to Age & Sex

Age gp (in yrs)	Male		Female		Total	
	Case	%	Case	%	Case	%
00 – 10	03	02.10%	02	01.40%	05	03.50%
11 – 20	19	13.28%	19	13.28%	38	26.56%
21 – 30	29	20.27%	14	09.79%	43	30.06%
31 – 40	13	09.10%	06	04.20%	19	13.30%
41 – 50	20	13.98%	03	02.10%	23	16.08%
51 – 60	05	03.50%	04	02.80%	09	06.30%
61 – 70	01	00.70%	02	01.40%	03	02.10%
71 – 80	03	02.10%	00	00.00%	03	02.10%
Total	93	65.03%	50	34.97%	143	100%

Table 2: Month wise distribution

Month	Tot. PM	Hosp. Death	Brought dead	Total Cases	%
April – 2008	90	06	03	09	06.30%
May – 2008	61	08	03	11	07.69%
June – 2008	75	06	04	10	06.99%
July – 2008	68	10	07	17	11.88%
August – 2008	73	09	08	17	11.88%
Sept. – 2008	85	17	04	21	14.68%
Oct. – 2008	74	05	04	09	06.30%
Nov. – 2008	65	09	06	15	10.48%
Dec. – 2008	75	08	06	14	09.80%
Jan. – 2009	75	06	03	09	06.30%
Feb. – 2009	77	04	03	07	04.90%
March – 2009	60	03	01	04	02.80%
Total	878	91 (10.3)	52 (05.92)	143 (16.28)	100%

Table 3: Poisoning cases according to area

Area	Cases	%
Urban	58	40.55%
Rural	83	58.05%
Unknown	02	01.40%
Total	143	100%

Table 4: Poisoning cases to religion

Religion	Cases	%
Hindu	129	90.20%
Muslim	07	04.90%
Christian	01	00.70%
Sindhi	02	01.40%
Other	02	01.40%
Unknown	02	01.40%
Total	143	100%

Table 5: Poisoning cases to type of family

Family	Cases	%
Nuclear	92	64.33%
Joint	48	33.57%
Unknown	03	02.10%
Total	143	100%

Table 6: Poisoning and Educational status

Educational Status	Frequency	%
Below SSC	20	13.98%
Graduate	03	02.10%
HSC	03	02.10%
Illiterate	75	52.44%
Not Applicable	02	01.40%
Not known	04	02.80%
Post Graduate	01	00.70%
Primary	26	18.18%
SSC	09	06.30%
Total	143	100%

Table 7: Poisoning cases to marital status

Status	Male		Female		Total	
	Case	%	Case	%	Case	%
Married	59	41.25	31	21.68	90	62.93
Unmarried	31	21.68	19	13.29	50	34.97
Not Known	03	02.10	00	00.00	03	02.10
Total	93	65.03	50	34.97	143	100

Table 8: Poisoning to Socio-economic class

Class	Frequency	%
Lower	94	65.73%
Middle	42	29.37%
Upper	04	02.80%
Not known	03	02.10%

Table 9: Poisoning to Occupation

Occupation	Cases	%
Agri Labourer	48	33.56%
Labourer	08	05.60%
Employed	06	04.20%
Business	18	12.58%
Diamond Worker	07	04.90%
House wife	25	17.48%
Unemployed	06	04.20%
Dependent	20	13.98%
Student	02	01.40%
Not known	03	02.10%
Total	143	100%

Table 11: Poisoning cases to manner of death

Manner	Cases	%
Suicide	103	72.02%
Accidental	37	25.88%
Homicidal	00	00.00%
Un determined	03	02.10%
Total	143	100%

Table 10: Poisoning to duration of survival

Duration	Cases	%
Spot death	04	02.79%
Within 1 hour	13	09.10%
1 – 6 hours	64	44.75%
6 – 12 hours	15	10.48%
12 – 24 hours	09	06.30%
1 – 3 days	16	11.18%
3 – 7 days	14	09.80%
More than 7 days	08	05.60%
Total	143	100%

Table 12: Poisoning to Viscera preserved

Viscera Preserved	Cases	%
Yes	122	85.31%
No	21	14.69%
Total	143	100%

Table 13: Poisoning cases to the poisonous Compound detected after Chemical analysis

Compound	Cases	%
Aluminium Phosphide	23	18.86%
Monocrotophos	24	19.68%
Quinalphos	07	05.73%
Methyl parathion	06	04.91%
Endosulphan	06	04.91%
Malathion	04	03.28%
Dimethioate	05	04.10%
Dichlorowash	03	02.45%
Kerosene	02	01.64%
Phoselon	01	00.82%
Chlorpyrifos	01	00.82%
Carbamate	01	00.82%
Phosphamidon	01	00.82%
Zinc Phosphide	01	00.82%
No poison detected	13	10.66%
Report not received	24	19.68%
Total	122	100%

Table 14: Poisoning cases to cause

Cause	Cases	%
Accidental	25	17.48%
Affair	02	01.40%
Catching snake	01	00.70%
Family	40	27.97%
Finance	17	11.88%
Illness	06	04.20%
Mistake	09	06.30%
Quarrel	03	02.10%
Unemployment	01	00.70%
Unknown	39	27.27%
Total	143	100%

Table 15: Poisoning cases to places

Place	Frequency	%
Farm	32	22.37%
Home	80	55.94%
Not known	01	00.70%
Out Side	28	19.59%
Work Place	02	01.40%
Total	143	100%

Discussion:

Distribution of poisoning cases:

Study/Author	Total PM cases	Poisoning Cases
A. K. Kapoor [7]	1752	205 (11.70%)
Dalal J. S. et al [8]	1059	163 (15.39%)
Dhattarwal S.K. et al [10]	1238	290 (23.42%)
Sanjay Gupta et al [11]	4160	413 (09.92%)
Vaghela P.C. [15]	826	132 (15.98%)
Present study	878	143 (16.28%)

Maximum author found incidence of poisoning between 10-20% among all cases of PM across the country except Dhatarwal S.K. et al.

Age wise distribution of cases of poisoning

Study/Author	Age group showing higher incidence (Age Group)
Zine K. U et al [3]	16-25
A. K. Kapoor [7]	21-30
Dalal J. S. et al [9]	21-30
Dhatarwal S. K. et al [10]	11-30
Sanjay Gupta et al [11]	21-30
Manish Nigam et al [12]	21-30
Karamjitsingh et al [13]	21-25
Sharma B.R. et al [14]	21-30
Vaghela [15]	21-30
Present study	21-30

Maximum incidence of poisoning seen in 21–30 years age group (30.06%). Observation of all workers in above mentioned studies show higher incidence of poisoning in the individuals of young age group 15-30 years particularly between 21 – 30 years which can be explained by the fact that the persons of this young age group are suffering from stress of the modern life style, failure or less percentage in the exams, scolding from parents or teachers, failure in love, family problems etc.

Sex wise distribution of cases of poisoning

Study/Author	Male % cases	Female % cases
Zine K. U et al [3]	68.23 %	31.77%
S. Chaudhry [6]	57.69%	42.30%
Dalal J. S. et al [9]	63.19 %	36.81 %
Dhatarwal S.K et al [10]	68.62%	31.37%
Sanjay Gupta et al [11]	66.10 %	33.90 %
Karamjitsingh et al [13]	67.43 %	32.57 %
Sharma B.R. et al [14]	69.97 %	30.03 %
Vaghela [15]	62.10%	37.90%
Present study	65.03 %	34.97 %

Male group (65.03%) showing higher incidence of poisoning than the female group (34.97%). Though all studies were conducted in different parts of India, male predominance was a common and constant feature in all.

Month wise distribution of poisoning cases

Study/Author	Months showing higher incidence
S. Chaudhry [6]	May, March, June, October
A. K. Kapoor [7]	August, July, May, April
Dhatarwal S.K et al [10]	June, May, July, October
Sanjay Gupta et al [11]	May, June, April, March
Karamjitsingh et al [13]	June, July, August, March
Vaghela [15]	July, August, September, January
Present study	September, July, August, November

As shown in the above mentioned table, maximum number of poisoning deaths occurred in the month of June, July, and August as compared to other months of the calendar year. This is mostly due to the increased farming activity like spraying of pesticides in this season. We have an agricultural based country; hence major population depends upon farming activity. Majority of farming activity is done in monsoon

season – months of June, July, August and September.

Area wise distribution of cases of poisoning

Study/Author	Urban	Rural
S. Chaudhry [6]	64.90%	35.10%
A. K. Kapoor [7]	31.71%	61.46%
Dalal J. S. et al [9]	23.92 %	74.84 %
Dhatarwal S.K et al [10]	28.97 %	71.03 %
Karamjitsingh et al [13]	36 %	64 %
Sharma B.R. et al [14]	37.24 %	62.76 %
Vaghela [15]	37.12%	62.88%
Present study	40.55 %	58.05 %

As shown in the table, maximum number of poisoning deaths occurred in the rural areas as compared to the urban areas. There is more farming activity in rural areas, due to which the rural population is more exposed to insecticides and pesticides in their day-to-day life.

Along with these, lack of awareness, large size of family, high percentage of ignorance, illiteracy, distance from the hospitals are the important factors for causing deaths in rural areas. Poisoning trend also increased in urban area due to migration and urbanization. Increasing trend of use of grain preservative and other house hold poisons responsible for poisoning in urban area.

Poisoning cases according to religion:

Higher incidences of poisoning were found in Hindu people. Major population of India is Hindu. So probably the incidence of poisoning is more in Hindu people

Poisoning cases to educational status

Study/Author	Educational status
Dhatarwal S.K et al [10]	Below metric, illiterate
Manish Nigam et al [12]	Illiterate
Karamjitsingh et al [13]	Below metric, illiterate
Vaghela [15]	Below metric, illiterate
Present study	Illiterate, Primary & below metric

Above mentioned all studies suggest that incidence of poisoning was more in illiterate and people with less education, this may be due to lack of knowledge and inability to succeed in life etc. These data also show that even less educated people have knowledge of poisons and their effects.

Poisoning cases according to marital status

Study/Author	Married	Unmarried
S. Chaudhry [6]	66.35%	33.65%
Dhatarwal S.K et al [10]	66.55 %	33.45 %
Sanjay Gupta et al [11]	74.81 %	25.19 %
Karamjitsingh et al [13]	68 %	32 %
Sharma B.R. et al [14]	58.86 %	41.14 %
Vaghela [15]	57.60 %	42.40 %
Present study	62.93%	34.97%

From the above table observation is made that the incidence of poisoning was high in married people compared to that in unmarried people. Probable causes are the early marriages in the rural community, familial responsibilities, social customs, limited sources

of income, frustrations, dowry, family quarrels, mal – adjustments in marriage life, marital conflicts, low level of education, infidelity, unemployment, etc are the important causes of more deaths in married people.

Poisoning cases to socio- economic class

Study/Author	Socio economic Class showing higher incidence
S. Chaudhry [6]	Middle Class, Lower Class
Dhattarwal S.K [10]	Middle Class
Vaghela [15]	Lower Class
Present study	Lower Class

Above mentioned studies show that the incidence of poisoning was higher in middle and lower socio-economic class compared to upper class. This can be explained by the fact that individuals of lower and middle socio-economic class having less education, unemployment, more family responsibilities, financial crisis, comparison of their life style to modern life style, poverty, large family size, etc.

Poisoning cases according to occupation

Study/Author	Occupation showing higher incidence
Dhattarwal S.K et al [10]	Agricultural, labourer
Sanjay Gupta et al [11]	Labourer, House wife
Vaghela [15]	Farmers
Present study	Agricultural Labourer

In the present study, the incidence of poisoning was higher in agriculture labourer. This can be explained by the fact that major population of India mainly depends upon agricultural activities and seasons. So sometimes the farmers are able to grow their crops and sometimes they fail due to seasonal variations and irregularity of monsoon season. This lead to less income compared to the hard work done, financial crisis, tensions, etc. for more deaths among farmers.

Poisoning cases as per the manner of death

Study/Author	Manner of death
S. chaudhry [6]	Suicide (92.78%)
Dalal J. S. et al [9]	Unclassified (80.98 %)
Karamjitsingh et al [13]	Suicide (69.00 %)
Sharma B.R. et al [14]	Suicide (89.05 %)
Vaghela [15]	Suicide (68.20 %)
Present study	Suicide (72.02 %)

Above mentioned all the studies show that most of the cases were suicidal deaths followed by accidental deaths. This can be explained by the fact that the inability to cope up with the demands put by the standards set by the materialistic modern society is the major culprit. Easily availability of poison, social problems, financial crises, low level of education, immaturity, etc are the other responsible factors for suicide.

Poisoning cases as per the family type:

In the present study more deaths due to poisoning seen in persons who belongs to

nuclear family (64.33%) as compared to joint family (33.57%). Lack of guidance of experienced and elderly persons leads to take such extreme step in stressful condition. In joint family availability of other members of family to share sorrow, failure and financial loss and the guidance of senior member of family gives moral support, thus avoids person to takes such extreme step in stressful condition.

Out of total 143 cases of poisoning, viscera were preserved for chemical analysis in 122 cases (85.31%). Out of 122 viscera report received in 98 cases (80.32%). Poison detected in 85 (69.67%) cases while in 13 cases (10.65%) no poison was detected. Study of Manoj Kumar Mohanthy et al (16) shows similar finding, in his study, report was received in 88.40% cases & poison was detected in 70.60% cases while poison was not detected in 17.80% cases. Out of total 122 cases, insecticides were found in 59 cases (48.36%) followed by aluminium phosphide poisoning – 23 cases (18.85%), snakebite poisoning – 21 cases (17.21%). Among insecticides, the organophosphorus compounds were found in – 52 cases (88.13%), followed by Organochloro compounds – 06 cases (10.16%) and Carbamates – 01 case (01.69%).

Nigam et al (12) have studied that in organophosphorus poisoning cases, most of the victims had consumed cypermethrin and monocrotophos, and this can be explained by the fact that these types of synthetic compounds are becoming more potent insecticides available in the market than rest of the other compounds. Similarly in present study monocrotophos was the most preferred compound for suicide by victims as it is more potent, easily available and cheap value. It is available in the market as various trade name like Phoskill, Monocil, Microphos, Monocron, Monokem, Entopos, Corophos etc. and concentration is 30 – 40 %. It is extremely toxic and highly toxic compounds and used in almost all crops as insecticides. Other compounds like Kinnadon (Phosphamidon), Lacer (Cypermethrin) etc. are also used as insecticides in this region but they are comparatively less toxic and less frequently used than Phoskill.

Most of the authors have studied the incidence of poisoning according to poison on the history given by police officers, relatives of the victim and by medical cases papers. They have not mentioned the poisonous compound in their studies after chemical analysis except Nigam et al [12] & Vaghela P.C. [15] While in present study we have scientifically and accurately calculated the incidence of

poisoning according to the poison after the chemical analysis reports.

Summary:

The present study comprising of 143 autopsy cases of poisoning were conducted during the period of a year, from 01/04/2008 to 31/03/2009 at the department of Forensic Medicine, Government Medical College & Sir T Hospital Bhavnagar. Summarily, following epidemiological and medico legal significant scientific facts emerged from the study.

During the year 01/04/2008 to 31/03/2009, total 878 autopsies were conducted and out of these 143 autopsies were cases of poisoning.

The incidence of poisoning was more in persons of age group 21 – 30 years, while least incidence was found in the age group of 0 – 10 years. Majority of victims were male. The incidence was higher in Hindu people, Agricultural labourer among males while housewives among females.

Most of the victims were married, illiterate, were from Nuclear family and low socio economic class. They were from rural areas. Majority of cases were died on the spot and within 1-6 hours after the poisoning. Suicide cases were far more common than accidental cases, while not even a single case of homicidal was found. Poisoning cases were more in the months of September, July and August than rest of the months of calendar years.

Most common cause of poisoning was found to be family problems. Financial problems, Illness, Love affairs, are the other causes. Most common route of poisoning was ingestion. Most common place of poisoning was home.

The most preferred poisons were insecticides for suicidal purpose, while in accidental cases snakebite poisoning was more common. After the chemical analysis it is observed that among insecticides, Organophosphorus compounds were most commonly used like Monocrotophos, Malathion, Methyl parathion etc., followed by Organochloro compounds, Carbamate. Cases of aluminium phosphide poisoning were also commoner while acid poisoning was least common. In 13 cases, no poison could be detected after chemical analysis.

References:

1. Rathod S. N., (2000) "Study of acute poisoning cases admitted at Govt. Medical College and Hospital, Aurangabad"
2. Sharma BR, Harish D, Singh S, Vij K. Poisoning scenario in Northern India-Challenges and Sugestions, JMGIMS 2002; 7 (I): 37-42.
3. Zine K. U. (1998) Pattern of acute poisoning at Indira Gandhi Medical College and Hospital, Nagpur, JIAFM, Vol – 20, No. 2, pp; 37 – 39.
4. Reddy K. S. N., "The essentials of Forensic Medicine & Toxicology". 26th edition pp; 432 – 436.
5. Senanayke NPH. Mortality due to poisoning in developing agricultural country over 20 years. Hum Exp Toxicol 1995; 14: 437-45.
6. S. Chaudhry, Prospective study of Fatal poisoning cases in Rajkot Region.
7. A.K. Kapoor, "An epidemiological study of Aluminium Phosphide poisoning at Allahabad." IJFMT 4(1) 2006.
8. Jayaram KS. Death pills from pesticides. Nature 1991; 353: 177.
9. Dalal J.S., Gorla R.K., Aggrwal A.K., (1998) Poisoning Trends – a post mortem study, JIAFM, Vol-20, No-2, pp.27-31.
10. Dhatarwal S.K. and Hamamsingh (2001) Profile of death due to poisoning in Rohtak, Haryana, Journal of Forensic Medicine and Toxicology, Vol – 14, No. 1, pp. 51
11. Sanjay Gupta, M. I. Sheikh, study and changing trends of poisoning in year 2004-05 at Surat, India. International Journal of Medical Toxicology and legal Medicine Vol – 10, No:01, July-Dec 2007, Pp:16-19.
12. Nigam M., Jain A. K., Dubey B.P. (2004) Trends of organophosphorus poisoning in Bhopal region – An autopsy based study, JIAFM, Vol. – 26, No.-2, pp 62 - 65.
13. Shingh K., Bhullar D.S. (2003) Poisoning Trends in the Malwa Region of Punjab, Journal of Punjab Academy of Forensic Medicine And Toxicology, Vol-3, No. 26-29.
14. Sharma B.R., Dasari H., and Vij K. (2000) The epidemiology of poisoning – An Indian view point, Journal of Forensic Medicine and Toxicology, Vol – 19, No. 2, July-December, pp. 5-11.
15. Vaghela P. C. (2005), "Study of prevalence of fatal poisoning in Jamnagar region"
16. Manojkumar Mohanty, Pinnamaneni, Vikaram Palimar, Co-relation between post mortem diagnosis and survival time in poisoning deaths, JIAFM, 2005 Vol-27, No:01, pp:23-27.

Original Research Paper

Incidence of Post Burn Septicemia at a Tertiary Care Hospital

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Abstract

A severe burn injury is a life threatening incident to the patients in many ways and infection is one of the most common complications of burns. This prospective study was conducted to assess the incidence, magnitude and profile of post burn septicemia in burn cases coming to Government Medical College Hospital, Chandigarh. During the one year study period, a total of 89 cases of burns were admitted, with an overall male to female ratio of 1: 1.14. Septicemia was seen in 60% cases of which 28% were males and 72% were females; incidence of septicemia was 40% in males and 73% in females, respectively. Fifty-two percent of the septicemic patients were from rural areas, with 71% incidence of septicemia. Flame burns were seen in 96% cases studied, of which 66% suffered septicemia. Eighty-eight percent had suffered accidental burns and they had 58% incidence of septicemia. The mean age of the septicemic patients who survived was 26.8 years and it was 30.2 years in the fatal cases. Mean TBSA was 37% in the septicemic patients who survived and it was 68% in the fatal cases.

Key Words: Burns, Burns Septicemia, Burn Mortality, Chandigarh

Introduction:

Burns and burn injuries are a major social, economic and public-health problem due to their mortality, morbidity and long term disability. They lead to a severe strain on the financial and professional resources of any institution involved in the care of the burn victim. In India, they rank second, after road traffic accidents, as a leading cause of death. [1]

This is compounded by the fact that in our country, there has been a steady increase in the incidence of female victims of burns, particularly the newly married ones, over the years, clearly indicating that such deaths cannot always be attributed to accidents and that something more sinister is at play-bride burning, for want of dowry. [2]

The vast clinical experience and understanding regarding burn patho-physiology revolutionised the treatment of burns which dramatically changed the cause of death in such patients. [3-6] Earlier majority deaths were associated with fluid loss; these are now preventable by effective fluid resuscitation.

Once the initial acute phase is over, the morbidity and mortality of post burns patients is mostly linked to burn wound consequences.

As the patients nowadays survive long enough for infection to establish and cause consequent septic complications, it is now estimated that more than 75% of mortality following burn injuries is related to infections. [2-9]

Materials and Methodology:

This study was conducted at Government Medical College and Hospital (GMCH), Chandigarh. All burn victims admitted to the Burns Ward of the hospital, excluding the those who were referred out/ discharged/died within two days of the burn event (<48 hrs post burn) were included in the study. Information was gathered during their hospital stay regarding age, sex, place of residence, marital status, time of incident, delay in primary treatment, etc. The burn wound & blood cultures were subjected to microbiological examination to diagnose septicemia.

Observations:

A total of 89 cases admitted during the study period were followed up in the hospital. The young and productive age group of 21-35 years comprised 65% of burn cases with 62% incidence of septicemia. The extremes of age; 0-15 years and above 60 years recorded very few cases of burns and hence of septicemia.

With respect to age, maximum cases in males were 11, in 26-30 yrs with 46% incidence of septicemia and in females, it was 21 in 26-30 yrs with 62% incidence of septicemia. Gender analysis showed 45% incidence of septicemia in males and 74% in females, against an overall incidence of 61% in the study. (Table 1)

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Maximum cases were seen in the month of February, (19% (17) of burns cases and 21% (11) septicemic cases). The cases were distributed evenly throughout the rest of the year. The months from March to August recorded 20 septicemic cases against a total of 41 burns with 49% septicemia incidence whereas the months from September to February showed 33 septicemic cases against a total of 48 burns with a 69% incidence of septicemia. (Figure 1)

The overall incidence of septicemia was 72% for the rural population, 70% for slum dwellers, and 45% for the urban population. In males, there were equal number of cases from rural and urban areas, 7 each; but the incidence of septicemia was 54% for rural males and 33% each for their urban and slum counterparts. Similarly, the number of female cases was almost equal from rural and urban areas but the incidence of septicemia was 81% for rural females, 57% for urban and 86% for slum dwellers. (Table 2)

Kitchen was the most common place for sustaining burn injury, 71% burns and 83% of septicemic cases, respectively. The overall incidence of septicemia in these cases was 70%. But a gender split of these cases showed that only 45% of males suffering burns in the kitchen developed septicemia as against 80% of females. The percentage of septicemia cases was only 4% in other rooms of the house and 9% for burns suffered at workplace, with a gender-wise septicemia incidence of 20% and 36%, respectively (Table 3).

In accidental burns incidence of septicemia was 59%, whereas for suicidal burns, it was 63%. In the accidental burns group, females recorded a septicemia incidence of 75% as against 36% for males; whereas in suicidal group, it was 67% for males and 60% for female burn victims. (Table 4)

Flame burn was the most common type of burns (86% of burn cases and 96% of septicemic cases). The overall incidence of septicemia in flame burn group was 66% (50% for males and 75% for females. In males one case each of septicemia was recorded in electrical and chemical burns with a septicemia incidence of 20% and 50% respectively. (Figure 2)

Twenty-two percent of the patients who reported to GMCH within one hour post burn showed a 40% incidence of septicemia. The patients who recorded a delay between 1-6 hours (40%) had a 66% incidence of septicemia; where as in the 26% patients with a delay of 6-12 hours, septicemia was seen in 100% cases. For the 26% cases who had reported to GMCH

after > 1 day post burn, incidence of septicemia was 57%. The gender wise incidence of septicemia was 25% in males and 63% in females for up-to 1 hour delay group; 46% versus 77% in 1-6 hours group and 100% each in the 6-12 hours delay group. (Figure 3)

The TBSA wise incidence of septicemia was recorded at 19% in <30% TBSA; 51% in 31-50% TBSA; 91% in 51-70% TBSA and 75% in >70% TBSA range. The gender wise incidence of septicemia was 0% in males and 50% in females with <30% TBSA; 44% versus 57% in 31-50% TBSA; 83% and 93% in 51-70% TBSA range and 67% versus 77% in >70% TBSA in males and female burns respectively. (Table 5)

The incidence of septicemia in the fatal cases was 86% with a gender-wise incidence of 87% in males and 86% in females. The same was 24% in the patients who survived the burn injury with an incidence of only 5% in male survivors and 47% in female ones. Within the septicemia group only 17% survived being constituted by 7% of septicemic males and 21% of females. Eighty-three percent of post burn septicemic patients died, with a gender wise death incidence of 93% in septicemic males and 79% in septicemic females. (Table 6, Figure 4)

Discussion:

During the period of study, 53 (59.5%) cases developed septicemia, of which 15 (28.3%) were males and 38 (71.7%) were females. The results of the study indicated that young and productive population (21-35 years age group) of Chandigarh area is not only the major contributor to burns patient load at GMCH (65% of burns victims) but also has a high risk of developing post burn septicemic complications, with 62% incidence of septicemia in this age group.

The gender analysis of septicemic cases showed a female predominance with a male to female ratio of 1: 2.5, moreover the incidence of septicemia was 74% for females' as compared to 45% for males and 61% in the overall study. Similar findings have also been reported by Harish et al [3], Sharma et al [4-6], Singh et al [7] and Taneja et al. [8]

The hotter months from March to August recorded 41 burns cases with 49% incidence of septicemia, whereas the colder months from September to February had 48 burns cases that had 69% incidence of septicemia. Ideally it is expected that infection rates should be lower in colder conditions so a lower septicemia incidence is expected, but a higher TBSA involved in burn injury was seen in these cooler months so the resultant increased risk of septicemia was recorded. Similar findings of

burns involving higher TBSA in colder months has been reported by Harish et al [3], Sharma et al [4-6] and Alireza et al. [10]

The overall incidence of septicemia was recorded at 72% for rural population, 70% for slum and 45% for the urban population. Moreover gender analysis showed that incidence risk of septicemia is more in rural females (81%) than in rural males (54%). The low socioeconomic status, unhygienic living conditions and poor access to burn care health facilities contribute to expose these post burn patient to multiple infection sources producing a higher septicemia incidence in this group. [2-7, 11]

The overall incidence of septicemia for burns suffered in kitchen was 70%, further the gender split of these cases showed that only 45% of males burnt in kitchen developed septicemia as against 80% of females' burnt in kitchen. The other rooms of the house had a septicemia incidence of 20% and it was 36% burns suffered at workplace. This higher rate of septicemic complications in kitchen burnt cases specially the female patients was due to the higher TBSA involved in such burn injuries. [3, 7, 11]

Only 12 (22.6%) of the septicemic cases lived in joint family setup and the incidence of septicemia within this group was 63% where as nuclear families recorded 41 (77.4%) cases with a 58.5% incidence of septicemia within this group. The difference in risk of septicemic incidence was not much based on family type but was high with respect to marital status as 81% septicemic patients were married and this group had 60% incidence of septicemia as compared to 55% in the unmarried group. This is again explainable by the fact that 84% of the females studied were married and they constituted 62% of the married group and as females had a higher TBSA involvement by burns so had higher septicemic risk. [7]

Majority (96.2%) of the cases developing septicemia had suffered flame burns and this group had 66.2% incidence rate for septicemia. There was only 1(1.9%) septicemic case among the electrical burns with 16.7% incidence rate for septicemia. Similarly, 1 (1.9%) case developed septicemia in the chemical burns group with 50% incidence rate for septicemia within this group.

Accidently suffered burns had a 58.8% incidence rate for septicemia which was 75% for suicidal group and the only case of homicidal burns developed septicemia. The higher TBSA involved by flame burns and by suicidal burns explains the higher incidence of septicemia in these patients.

Patients who reported to GMCH within one hour post burn showed a 40% incidence of septicemia as compared to 66% for the patients with a delay between 1-6 hours and 100% for patients with a delay of 6-12 hours. But cases who had reporting to GMCH after > 1 day post burn the septicemia incidence was 57%. The delay and gender wise incidence of septicemia was 25% in males and 63% in females for up-to 1 hour delay group; 46% versus 77% in 1-6 hours group and 100% each in the 6-12 hours delay group.

In the present study it was observed that the severely burnt injured patients, which had more of females, were directly brought to GMCH and had higher risk of septicemia due to high TBSA involved despite early treatment. Those patients who had less severe burns had reported late or were referred to GMCH after variable periods for the management of other post burn complications. [12-16]

The incidence of septicemia with TBSA burnt showed an almost directly proportional relationship with 19% in <30% TBSA; 51% in 31-50% TBSA; 91% in 51-70% TBSA and 75% in >70% TBSA range. The female patients recorded a higher septicemia incidence within the same TBSA ranges when compared to the male patients.

The gender wise incidence of septicemia was 0% in males and 50% in females with <30% TBSA; 44% versus 57% in 31-50% TBSA; 83% and 93% in 51-70% TBSA range and 67% versus 77% in >70% TBSA in males and female burns respectively. The mean TBSA in the patients who developed septicemia was 61.3% while it was 35.1% in those who did not develop septicemia. The patients with severe burn injury are immune-compromised, with the entire spectrum of host defenses being affected or depressed beyond the mere loss of the mechanical barrier of skin; this predisposes the burn victims to burn wound sepsis and to septicemia. [4-6]

As the study design inherently excluded majority of the deaths caused by burn shock by excluding deaths which occur within the first 48 hours post burn, so 45 (88%) deaths recorded in the study were caused by post burn septicemia. Within the septicemia group 81.8% patients died and they had a mean TBSAB of 67.6%.

The mean age of the septicemic patients who survived was 26.8 years and it was 30.2 years in the fatal septicemic cases. Similarly the mean TBSA was 37% the septicemic patients who survived and it was 67.9% in the fatal septicemic cases. Septicaemia as the major cause of death in the burn victims has also been observed by other

workers also. [1-8, 14, 16] TBSA burnt is the most important risk factor for development of septicemia as well as post burn mortality and this risk is even higher for females.

References:

1. Subrahmanyam M. Epidemiology of burns in a district hospital in Western India. Burns. 1996;22(6):439-42.
2. Sharma BR, Harish D, Sharma V. Kitchen accidents vis-à-vis dowry deaths. Burns. 2002;28:250-3.
3. Harish D, Kumar A, Sharma BR. Burns septicemia-Leading cause of burn mortality. JPAFMAT, 2008 (2):10-16.
4. Sharma BR, Singh VP, Bangar S, Gupta N. Septicemia: The Principal Killer of Burns Patients. American Journal of Infectious Diseases. 2005; 1(3):132-8.
5. Sharma BR. Medicolegal considerations in burns. Physicians Digest. 2004; 4:35-44.
6. Sharma BR. Delayed death in burns and the allegations of medical negligence. Burns. 2006; 32: 269-75.
7. Singh D, Singh A, Sharma AK, Sodhi L. Burn mortality in Chandigarh Zone: 25 years autopsy experience from a tertiary care hospital of India. Burns. 1998; 24:150-6
8. Taneja N, Emmanuel R, Chari PS, Sharma M. A prospective study of hospital-acquired infections in burn patients at a tertiary care referral centre in North India. Burns. 2004; 30: 665-9.
9. Bhat VG, Vasaikar SD. Bacteriological profile and antibiogram of aerobic burn wound isolates in Mthatha, Eastern Cape, South Africa. South Afr J Epidemiol Infect. 2010;25(4):16-19
10. Alireza E, Ahmad H, Enayat K, Mahmood L, Abbas K. Epidemiology of hospitalized burn patients during 5 years in Khuzestan province, Iran. Iranian Journal of Clinical Infectious Diseases. 2010; 5(1):40-44.
11. Sharma BR, Harish D, Sharma V, Vij K. Kitchen accidents vis-a-vis dowry deaths. Burns. 2002; 28:250-3.
12. Serhat O, Yeşim O, Abdullah E, Selçuk A, Ramazan K, Yasemin H, İlker E, Mesut Ö. The effect of delayed admission in burn centers on wound contamination and infection rates. Turkish Journal of Trauma & Emergency Surgery 2005: 230-38
13. Zorgani A., Zaidi M., Ranka R., Shahan A.: The pattern and outcome of septicemia in a burns intensive care unit. Ann. Burns Diasters, 2002; 15: 179-182.

14. Bangal RS, Ajankar AJ, Tirpude BH, Naik RS. Burn Septicemia-Bacteriological Confirmation at Autopsy. Int J Med Tox Legal Medicine. 1998; 1(1): 9-10.

15. Dhar S, Saraf R, Singh K, Raina B. Microbiological Profile of Chronic Burn Wounds among Patients Admitted in Burn Unit. JK Science 2007; 9: 182-185

16. Bang RL, Sharma PN, Sanyal S, Najjadh IA. Septicaemia after burn injury: a comparative study. Burns. 2002; 28: 746-51.

Figure 2: Burn Wise Incidence of Septicemia

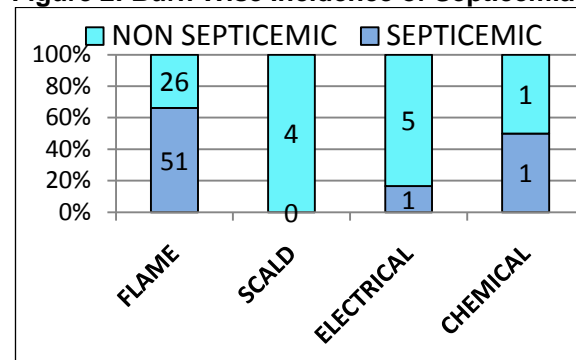


Figure 3: Delay Wise Incidence of Septicemia

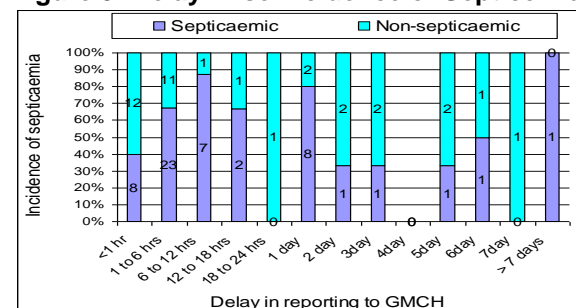


Table 1: Age and Gender Distribution of Cases

AGE IN YRS	MALE (%)			FEMALE (%)			TOTAL (%)		
	Cases (n=37)	Septi (n= 15)	Incidence septi	Cases (n=52)	Septi (n=38)	Incidence septi	Cases (n=89)	Septi (n=53)	Incidence septi
0-15	2 (2.5)	0 (0)	0%	1 (1.2)	1(2.6)	100%	3 (3.4)	1 (1.9)	33.3%
16-20	1 (1.2)	1(6.7)	100%	10 (11.2)	8 (21.1)	80%	11 (12.4)	9 (16.9)	81.8%
21-25	5 (5.6)	2 (13.3)	40%	15 (16.7)	10 (26.3)	66.7%	20 (22.5)	12 (22.6)	60%
26-30	11 (12.4)	5 (33.3)	45.5%	10 (11.2)	8 (21.1)	80%	21 (23.6)	13 (24.5)	61.9%
31-35	8 (8.9)	2 (13.3)	25%	9 (10.1)	6 (15.8)	66.7%	17 (19.1)	8 (15.4)	47.1%
36-40	1 (1.2)	1 (6.7)	100%	2 (2.5)	1 (2.6)	50%	3 (3.4)	2 (3.8)	66.7%
41-50	6 (6.7)	2 (13.3)	33.3%	4 (4.5)	3 (7.9)	75%	10 (11.2)	5 (9.4)	50%
51-60	3 (3.4)	2 (13.3)	66.7%	1 (1.2)	1 (2.6)	100%	4 (4.5)	3 (5.7)	75%
>60	0 (0)	0 (0)	0%	0 (0)	0 (0)	0%	0 (0)	0 (0)	0%
TOTAL	37 (100)	15 (100)	40.5%	52 (100)	38 (100)	73.1%	89 (100)	53 (100)	59.6%

Table 2: Place of Residence- Wise distribution of Cases

ADDRESSES	MALES			FEMALES			TOTAL		
	CASES (N=37)	SEPTI (n=15)	Incidence Septi	CASES (N=52)	SEPTI (n=38)	Incidence Septi	CASES (N=89)	SEPTI (n=53)	Incidence Septi
RURAL	13 (35.1%)	7 (46.7%)	53.8%	26 (50%)	21 (55.3%)	80.8%	39 (43.8%)	28 (52.8%)	71.8%
URBAN	21 (56.8%)	7 (46.7%)	33.3%	19 (36.5%)	11 (29%)	57.9%	40 (44.9%)	18 (34%)	45%
SLUM	3 (8.1%)	1 (6.7%)	33.3%	7 (13.5%)	6 (15.8%)	85.7%	10 (11.2%)	7 (13.2%)	70%
TOTAL	37 (100%)	15 (100%)	40.6%	52 (100%)	38 (100%)	73.1%	89 (100%)	53 (100%)	59.6%

Figure 1: Month Wise Incidence of Septicemia

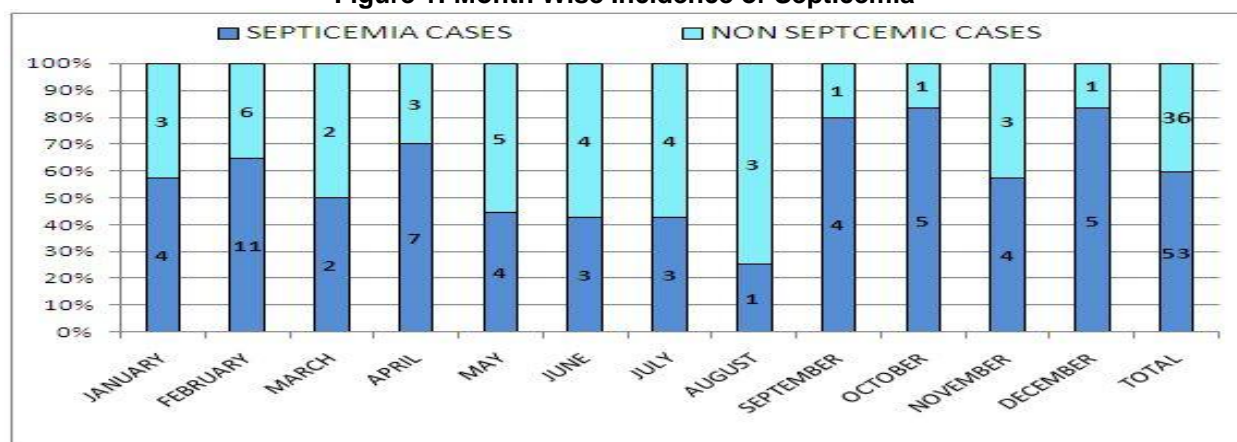


Table 3: Place of Burn- Wise distribution of Cases

PLACE OF BURNS	MALES			FEMALES			TOTAL		
	CASES (N=37)	SEPTI (n=15)	Incidence Septi	CASES (N=52)	SEPTI (n=38)	Incidence Septi	CASES (N=89)	SEPTI (n=53)	Incidence Septi
Kitchen	18 (48.7%)	8 (53.3%)	44.4%	45 (86.5%)	36 (94.7%)	80%	63 (70.8%)	44 (83%)	69.8%
Other room	5 (13.5%)	2 (13.3%)	40%	5 (9.6%)	2 (5.3%)	40%	10 (11.2%)	2 (3.8%)	20%
Workplace	14 (37.8%)	5 (33.3%)	35.7%	0 (0%)	0 (0%)	0%	14 (15.7%)	5 (9.4%)	35.7%

Table 4: Manner of Burn- Wise Distribution of Cases

MANNER OF BURN	MALES			FEMALES			TOTAL		
	CASES (N=37)	SEPTI (n=15)	Incidence Septi	CASES (N=52)	SEPTI (n=38)	Incidence Septi	CASES (N=89)	SEPTI (n=53)	Incidence Septi
ACCIDENTAL	33 (89.2%)	12 (80%)	36.4%	47 (90.4%)	35 (92.1%)	74.5%	80 (89.9%)	47 (88.7%)	58.8%
SUICIDAL	3 (8.1%)	2 (13.3%)	66.7%	5 (9.6%)	3 (7.9%)	60%	8 (9%)	5 (9.4%)	62.5%
HOMICIDAL	1 (2.7%)	1 (6.7%)	100%	0 (0%)	0 (0%)	0%	1 (1.1%)	1 (1.9%)	100%
	37 (100%)	15 (100%)		52 (100%)	38 (100%)		89 (100%)	53 (100%)	

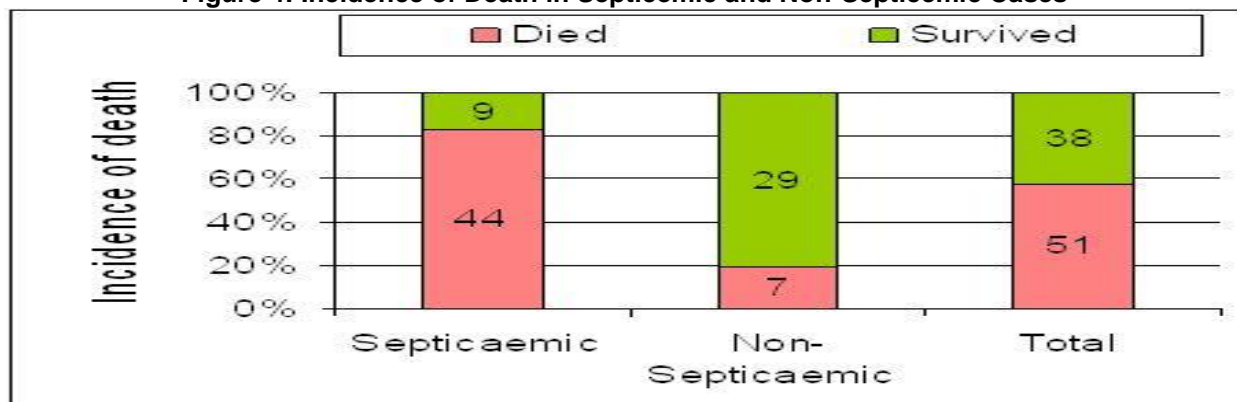
Table 5: Distribution of Cases by Total Body Surface Burnt

TBSA%	Male			Female			Total		
	Cases (N=37)	Septi (N=15)	Incidence Septi	Cases (N=52)	Septi (N=38)	Incidence Septi	Cases (N=89)	Septi (N=53)	Incidence Septi
<30 %	10 (27%)	0 (0%)	0%	6 (11.5%)	3 (7.9%)	50%	16 (18%)	3 (5.7%)	18.8%
31- 40 %	10 (27%)	3 (20%)	30%	7 (13.5%)	4 (10.5%)	57.1%	17 (19.1%)	7 (13.2%)	41.2%
41- 50 %	8 (21.6%)	5 (33.3%)	62.5%	7 (13.5%)	4 (10.5%)	57.1%	15 (16.9%)	9 (17%)	60%
51- 60 %	4 (10.8%)	3 (20%)	75%	6 (11.5%)	6 (15.9%)	100%	10 (11.2%)	9 (17%)	90%
61- 70 %	2 (5.4%)	2 (13.3%)	100%	9 (17.3%)	8 (21.1%)	88.9%	11 (12.4%)	10 (18.9%)	91%
71- 80 %	0 (0%)	0 (0%)	0	3 (5.8%)	3 (7.9%)	100%	3 (3.4%)	1 (1.9%)	33.3%
>80 %	3 (8.1%)	2 (13.3%)	66.7%	14 (27%)	10 (26.3%)	71.4%	17 (19.1%)	14 (26.4%)	82.4%

Table 6: Gender Distribution of Fatal Septicemic Cases

Outcome of burn	MALES			FEMALES			TOTAL		
	Cases (N=37)	Septi (N=15)	Incidence Septi	Cases (N=52)	Septi (N=38)	Incidence septi	Cases (N=89)	Septi (N=53)	Incidence Septi
Died	16 (43.2%)	14 (93.3%)	87.5%	35 (67.3%)	30 (79%)	85.7%	51 (57.3%)	44 (83%)	86.3%
Survived	21 (56.8%)	1 (6.7%)	4.8%	17 (32.7%)	8 (21%)	47.1%	38 (42.7%)	9 (17%)	23.7%

Figure 4: Incidence of Death in Septicemic and Non-Septicemic Cases



Original Research Paper

A Study of rational use of Drugs among the Ophthalmic-in-Patients of a Government Teaching Hospital

In View of Forensic Pharmacology

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Abstract:

Inappropriate, irrational and cost-ineffective practices of pharmaceuticals are worldwide phenomena. A retrospective study was conducted among the Ophthalmic-in-patients to investigate the nature of utilization of drugs in respect of rationality correlating the clinical and forensic pharmacology. Prescriptions in the Bed Head Tickets were the study samples which were analyzed according to the WHO/INRUD Indicators. Incurred cost per day per prescription was calculated. Commonly prescribed drugs were also studied. Result revealed that proportion of drugs from Essential Medicines List (EML) was 51.62%, while 54.05% was prescribed by generic names. Most commonly prescribed drugs were antibiotics (100%), analgesic-anti-inflammatory agents (100%) and mydriatic-cycloplegic agents (91.98%).

Average number of drugs per prescription was 4.03 ± 1.5 and average cost per day per prescription was 99.22 INR (Indian Rupees). Injectables were prescribed in 97.36% cases, and 10.81% of total drugs (37) prescribed. Prescribing practices were not always in accordance with the WHO criteria for rational use of drugs. It is suggested that there is a felt need to provide more inputs to the Ophthalmologists to promote rational use of drugs.

Key Words: Essential medicine, Fluoroquinolones, INRUD indicators, Mydriatics, Polypharmacy

Introduction:

A number of interfaces exist between drugs, medical practice, and the law. It is essential in modern society that every individual involved in the health care system have at least a cursory exposure to those aspects of the law that are intimately involved with the practice of medicaltherapeutics.”[1]

Forensic Pharmacology offers a unique and comprehensible account of pharmacological methods and knowledge dealing with illicit drug use, poisoning and toxicology, and the relevant aspects of prescription writing. [1, 2]

It focuses on the detection, analysis, and consultation pertaining to the negligence in prescribing and administering drugs, and adverse drug effects that result in harm, criminal activity, or death. [1, 3] Drug utilization research, part of clinical pharmacology, explores the links between pharmacotherapeutics and forensic science (forgery of prescriptions).

Inappropriate and cost-ineffective uses of pharmaceuticals are worldwide phenomena especially in the developing countries. [4] Drug utilization research may provide insights into different aspects of drug prescribing including pattern, determinants, outcomes of drug use and quality control cycle (signals of irrational use and interventions to improve drug use). [4]

Rational use of drugs should be one which meets up patients' clinical needs in doses that meet their own individual requirements for an adequate period of time at the lowest cost to them and their community. [5] In spite of extensive programs on rational use of drugs and the Essential Medicine List (EML) of WHO, [6] prescribing behavior has not been changed significantly. In the legal and ethical context special care needs to be taken, when treating institutionalized populations. [7] Several studies of drug utilization pattern for varieties of morbid

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conditions were carried out and published. But a few ocular drug utilization data has been generated, that also upon Out Patient Department, [8-11] and there exists a paucity of reports upon indoor ocular patients. Hence, the present study has been contemplated to ascertain the situation in this sector aiming to focus on drug utilization pattern and to identify the basic defects in rational use of drugs.

Materials and Methods:

The study was record based, retrospective and cross sectional. Preparatory work was carried out in the Department of Pharmacology. Necessary approval was obtained to handle the records from the Department of Ophthalmology and Medical Record Section (MRS) of the Institution. The study protocol was approved by the Institutional Ethics Committee. Prescriptions from Bed Head Tickets (BHTs) of all discharged patients of Ophthalmology Department between April 2007 and March 2008 were the study material and collected from the MRS.

Census method of sampling of data was followed to collect all those BHTs. Data from those BHTs were copied in a structurally designed Case Report Form (Annexure – I) and the process was exercised for a period of 6 months.

All collected data were compiled, audited and analyzed according to the WHO/INRUD (International Network for Rational Use of Drugs) indicators [12] for number of drugs per prescription, number of antibiotics per prescription, number of drugs prescribed by generic name, number of drugs prescribed from the WHO Model List of Essential Medicines (EML), [6] and number of injectables per prescription. The cost per day per prescription was calculated in Indian Rupees (INR). Moreover, the commonly prescribed drugs were also looked into. All the data were expressed in standard statistical format.

Results:

Screening the records of one year from MRS, 948 BHTs were obtained as prescriptions for ophthalmic-in-patients (Table 1). Majority (97.36%) of them was surgical cases (923) including cataract surgery, dacryocystorhinostomy, dacryocystectomy, pterygium excision, repair of corneal rupture, evisceration, enucleation, trabeculectomy, lid mass removal, lid repair, correction of ptosis, squint and entropion. Medical cases were corneal ulcer, uveitis, hyphaema, endophthalmitis, vitreous hemorrhage, retrobulbar neuritis, acute dacryocystitis and glaucoma. Table 1 shows the pattern of drug

utilization for ophthalmic-indoor prescriptions (N = 948), whereas Table 2 describes the prescribing behavior for total drugs (n = 37) prescribed over 948 prescriptions. Among the studied prescriptions, the most common groups of drugs prescribed were antibiotics (100%), analgesic-anti-inflammatory agents (100%) and mydriatic-cycloplegic agents (91.98%).

Average number of drugs per day per prescription was 4.03 ± 1.5 . Number of antibiotics per prescription was at least one with preponderance of fluoroquinolones. Different members of fluoroquinolone family with preponderance of norfloxacin seconded by ofloxacin were prescribed. In 2.71% cases 2 antibiotics (one topical with one oral) were prescribed. For 948 prescriptions 96.42% was topical fluoroquinolones whereas 3.58% was oral antimicrobial agents out of which mostly fluoroquinolones.

Analgesic-anti-inflammatory agents were NSAIDs in majority (95.63%) cases and corticosteroids in few (13.56%) cases. NSAIDs were prescribed in the form of either topical flurbiprofen or oral ibuprofen. Antacid (96.22%) and or H_2 blockers (78.18%) were prescribed too often along with ibuprofen. Surgical cases (97.36%) were prescribed with injectables which was 10.81% out of total drugs (37) prescribed over 948 prescriptions. Number of injectables per prescription only for surgical cases was 2 ± 1 . Topical and oral NSAIDs were prescribed during pre- and post-operative period respectively.

Since there is no Hospital Formulary, the prescription of drugs was studied from the EML. Results showed that proportion of drugs prescribed from EML was 51.62%, and 54.05% was prescribed by generic names. Symptomatic drugs were 56.76 % of total drugs (37) prescribed.

Average cost per day per prescription was INR 99.22 ranging between INR 57.95 and INR 140.50. Most commonly prescribed mydriatic-cycloplegic agent was tropicamide (90.56%); in 73.10% cases cyclopentolate and in few cases (1.26%) atropine were prescribed. Prescriptions containing other medications like timolol, acetazolamide, diazepam, alprazolam and tear substitutes were observed in some encounters. Among the surgical cases children (1.3%) received general anaesthesia for the surgery. Local anaesthetic agent (LA) was utilized for the adult or older patients. Lignocaine was the routinely used LA in combination with adrenaline, bupivacaine and hyaluronidase. Patients with raised blood pressure received LA without adrenaline.

Discussion:

Forensic Pharmacology may be grouped into four categories: Drugs and public safety, Federal food, drug and cosmetic laws, Federal drug abuse control laws, Drugs and medical malpractice. [1] The present study was in relation to the fourth category (drugs and medical malpractice). We studied the relevant and judicial (proper and improper) use of therapeutic agents administered to hospitalized ocular patients. Inadequacy of data regarding drug utilization pattern for in-patients of Ophthalmology prompted us to study the utilization pattern of drugs prescribed for ophthalmic in-patients. The present study exclusively attempted to estimate the prevalence of ocular medications and the rationality of their use.

Pattern of drug prescribing was not always based on WHO criteria for rational use of drugs. Drugs prescribed from EML were average with prevalence of antibiotics, analgesic-anti-inflammatory agents and mydriatic-cycloplegic agents. Prevalence of generic prescription was average (54.05%) which needs improvement. The notable observation pertaining to the choice of antibiotic prophylaxis in surgical cases was the use of fluoroquinolones. Different types of fluoroquinolones of different price were prescribed.

Most commonly prescribed analgesic-anti-inflammatory agent was NSAID which was effective for both medical and surgical cases. Sometimes corticosteroids were also prescribed alone or simultaneously with NSAID for relief of pain and inflammation. It was used minimally and indicated in few severe cases in the present study. Corticosteroid, advocated earlier as mainstay therapy in ocular inflammation, has been restricted because of advantages of NSAIDs in producing analgesia and sustained pupillary dilatation, preventing postoperative cystoid macular oedema, and reducing different intra- and extra-ocular inflammation. [13]

Prescriptions of tropicamide eye drop with or without phenylephrine for older patients and atropine ointment for children as mydriatic-cycloplegic agents were rational. Cyclopentolate was usually prescribed post-operatively instead of tropicamide. Use of LA without adrenaline for patients with raised blood pressure was also rational. Bupivacaine was used for prolonged action of LA. Hyaluronidase helps in diffusion of LA. Symptomatic drugs were prescribed more than essential medicines indicating polypharmacy. Adverse events and deaths have been increased due to legal and illegal

(inappropriate) medication use in combination and overdose, polypharmacy and complex medication regimens due to increased availability of medications. [1, 3, 7]

In the present study no adverse reaction was noted. Polypharmacy leads to economic burden on patients and society, and makes healthcare unaffordable to the common people. The varied price of the individual member and formulation of fluoroquinolones led to varied ranges of cost per day per prescription in our study. In spite of today's cost-containment pressures health care providers should create a cost-effective treatment which meets the standards of care. [7]

Drug utilization study should be followed by feedbacks to the prescribers, since the feedback was shown to have a favorable impact on compliance with hospital guidelines, especially on antimicrobial prescribing. [14, 15] Considering cost-benefit ratio it is necessary to prescribe medicines in generic names from EML, and prescribers' education is essential in this respect. Lack of standardized training and certification regarding complexity of forensic pharmacology have left a void. [3]

There is a clear need for the development of prescribing guidelines and educational initiatives to encourage the rational and appropriate use of drugs. [16] Improvements could be achieved through continuing medical education on rational prescribing practices. The curriculum for such education should emphasize upon many agenda like Good Clinical Practices, Standard Treatment Guidelines, Essential Medicines List and Unbiased Sources of Drug Information. [4, 6, 12, 16]

A carefully considered formulated treatment plan is crucial for avoiding both tragic outcomes and malpractice litigation. [7] Every institution must have a Drugs and Therapeutics Committee under supervision of which several activities like publishing Hospital Formulary, prescription auditing may perform.

Conclusion:

Results indicate that there is scope for improvement of prescribing habits through minimizing the cost by rational use of antimicrobial agents, generic prescription and reducing polypharmacy. Towards achieving these successes the necessity of continuous supervision and imparting education to the ophthalmologists at the tune of WHO Program on Rational Use of Drugs [4, 5] could not be ruled out.

Table 1: Drug utilization in ophthalmic-indoor prescriptions (N = 948)

S	Indicators of Drug Utilization	Number / %age
1	Average number of drugs per prescription	4.03±1.5
2	Number of antibiotics per prescription	1
3	Antibiotics (topical 96.42%, oral 3.58%)	100%
4	Analgesic-anti-inflammatory agents	100%
5	Mydriatic-cycloplegic agents	91.98%
6	Number of injections per prescription (only for surgical cases : 97.36%)	2±1
7	No. of total drugs prescribed over N = 948	37
8	Average cost per day per prescription	INR 99.22

Table 2: Prescribing behavior for total drugs (n = 37)

S.	Indicators of prescription audit	%age
1	Essential drugs used from EML	51.62 %
2	Symptomatic drugs	56.76 %
3	Generic prescription	54.05 %
4	Dosage form	
	topical (eye drops & ointment)	35.14 %
	oral (tablet, capsule & syrup)	54.05 %
	injections (i.m / i.v)	10.81 %
5	Strength of the preparations	67.57 %

References:

1. Maickel RP. Forensic Pharmacology. In: Pradhan SN, Maickel RP, Dutta SN (eds). Pharmacology in medicine: Principles and practice. Maryland, USA: SP Press International Inc. 1986. p 68 – 73.
2. Ferner RE (Author), Norman E (Contributor). Forensic Pharmacology: Medicines, Mayhem, and Malpractice (Oxford Medical Publications). Rawlins MD (Foreword). 1995. Available from : ukcatalogue.oup.com/product/9780198548263.do - United Kingdom, & <http://www.amazon.com/> > Books > Health, Mind & Body.
3. AIPS.net Center Directory – Center for Forensic Pharmacology. Available from : www.aips.net/centers/detail/center_for_forensic_pharmacology
4. World Health Organization (WHO). Introduction to Drug Utilization Research. WHO Library Cataloguing-in-Publication Data. Oslo, Norway, 2003. p 6 – 48. Available from: www.whooc.no/filearchive/.../drug_utilization_research.pdf
5. WHO. The Rational Use of Drugs – Reports of the Conference of Experts, convened by the WHO, Nairobi, 25-29 November, 1985.
6. WHO model list of essential medicines. 15th edition, March, 2007. p 1 – 27. Available on www.who.int/medicines/.../08_ENGLISH_indexFINAL_EML15.pdf
7. Bursztajn HJ, Brodsky A. Ethical and Legal Dimensions of Benzodiazepine Prescription February 16, 1997. Available from : www.forensic-psych.com/articles/artBenzop.php
8. Biswas NR, Jindal S, Siddiquei MM, Maini R. Patterns of prescription and drug use in Ophthalmology in a tertiary hospital in Delhi. *Br J Clin Pharmacol* 2001;51(3):267 - 9.
9. Mohanty M, Mohapatra S. Drug utilization pattern of topical ocular antimicrobials in a tertiary care hospital. *Indian J Pharmacol* 2003;35(6): 399.
10. Nehru M, Kohli K, Kapoor B, Sadhotra P, Chopra V, Sharma R. Drug utilization study in outpatient Ophthalmology Department of Government Medical College Jammu. *JK Science* 2005;7(3): 149 - 51.
11. Stein JD, Sloan FA, Lee PP. Rates of glaucoma medication utilization among older adults with suspected glaucoma 1992 – 2002. *Amer J Ophthalmol* 2007; 143(5): 870 - 2.
12. Holloway K (Editor), Green T. Drugs and Therapeutics Committees– A Practical Guide. World Health Organization, 2003. Geneva, Switzerland. WHO/EDM/PAR/2004.1
13. Reddy MS, Suneetha N, Thomas RK, Battu RR. Topical diclofenac sodium for treatment of post-operative inflammation in cataract surgery. *Indian J Ophthalmol* 2000;48:223. Available from : <http://www.ijo.in/text.asp?2000/48/3/223/14870>
14. Arnold FW, McDonald LC, Smith RS, Newman D, Ramirez JA. Improving Antimicrobial use in the hospital setting by providing usage feedback to prescribing physicians. *Infect Control Hosp Epidemiol* 2006;27(4):378-82.
15. Willems L, Simoons S, Laekeman G. Follow-up of antibiotic prophylaxis: impact on compliance with guidelines and financial outcomes. *J Hosp Infect* 2005;60(4):333-9.
16. de Vries TPGM, Henning RH, Hogerzeil HV, Fhresle DA. Guide to Good Prescribing (A practical manual). World Health Organization Action Programme on Essential Drugs.1994, Geneva.WHO/DAP/94.11

Annexure – I
CASE REPORT FORM

No.

Date of collection:

Patient's personal data

Name:

Age:

Sex:

Religion:

Address with P.S.:

Date & Day of Admission:

Registration No.

Diagnosis:

Date of Discharge:

Investigations; BP:

Tn.:

PPBS:

Microbiology:

Others

Surgical Cases: Date of Surgery:

Type of Surgery done: ECCE ± IOL (PC/AC) / DCR / DCT / Trab. / Others

Anaesthesia: GA / LA

Drugs prescribed: Medical Cases./ Surgical Cases: 1. Pre-operative, 2. Per-operative, 3. Post-operative

Drugs' Name	Dose / Dosage form	Route of administration	F Frequency	Duration

Outcome of Treatment in relation to efficacy, safety and cost of drugs

Sign.of Data Collector

Sign. of Chief Investigator

Original Research Paper

Natural Deaths in Custody: A 10 Year Mortality Study

*Rajesh Bardale, **Pradeep Dixit

Abstract

Death in custody is usually associated with apprehension and community concern, and raises the suspicion of violation of human rights. Studies conducted in few countries have shown that people in custody have increased rate of morbidity and mortality than those not in custody. Many of these deaths are premature deaths and can be prevented with proper care and treatment. The present postmortem examination based retrospective study was undertaken to examine natural deaths in custody and provide mortality pattern in this population. A total 165 autopsies were performed during the 10 year period out of which 142 (86.06%) cases were of natural deaths. The study population consists of 138 (97.18%) males and 4 (2.81%) females and their age ranged from 21 to 78 years (mean age 46.80 years). It was noted that most common cause of death was diseases of the respiratory system (40.8%) followed by cardiovascular system (19.01%).

Key Words: Death, Forensic, Autopsy, Custody, Police Cell, Prison

Introduction:

Death in custody whether during arrest, in police lock-up, or in jail, is usually associated with apprehension and community concern, and raises the suspicion of violation of human rights. If such death is due to natural cause then various issues such as negligence in providing medical aid or improper health care facilities etc are raised. Correspondingly studies conducted in few countries have shown that people in custody have increased rate of morbidity and mortality than those not in custody. [1, 2]

Many of these deaths are premature deaths and can be prevented with proper care and treatment. In addition, having knowledge and data regarding such deaths is important to focus attention on prison medical services and can facilitate the implementation of preventive programs. Such studies would also guide the prison authorities in setting priorities for the allocation of their healthcare services and budget. [3]

But for this purpose updated studies of morbidity and mortality are required and such data is lacking in India. Therefore, we undertook this study to examine natural deaths in custody and provide mortality pattern in this population.

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Material and Methods:

This is a postmortem examination based retrospective study conducted in Department of Forensic Medicine, Government Medical College and Hospital, Nagpur.

We examined all available files of inquest papers, autopsy reports, toxicological analysis reports, histopathology reports and case papers into the death of people in custody through 2000 to 2009. A standard Proforma was designed to collect the information to ensure consistency for the whole sample. Information collected includes age, sex, and type of custody (jail or police cell), place of death, medical attention received, and presence of any associated disease, history of any psychiatric illness, substance abuse and cause of death. Only deaths due to natural causes were included in the study.

Results:

During the 10 year period, total 165 autopsies were performed out of which 142 (86.06%) cases were of natural deaths. The year-wise distribution of the cases is presented in fig 1.

Age and Sex:

The study population consists of 138 (97.18%) males and 4 (2.81%) females and their age ranged from 21 to 78 years (mean age 46.80 years) (table 1). The age-wise distribution of case is provided in table 2 and maximum number of deaths were recorded in the age group of 61 years and above (19.01%) followed by 31-35 years age group (13.38%). About 28.87% of deaths were noted in age group 21 to 35 years.

Type of Custody:

Table 3 provides the type of custody and it was observed that 95.07% death occurred in jail while 4.92% death occurred in police lock-ups.

Cause of Death:

Table 4 provides system-wise affection of the diseases and it was noted that most common cause of death was diseases of the respiratory system (40.8%) followed by cardiovascular system (19.01%). Table 5 provides the cause of death and it was observed that maximum number of deaths were caused due to tuberculosis (n = 36, 25.35%) followed by ischemic heart disease/myocardial infarction (n = 24, 16.90%) and consolidation (n=20, 14.08%).

The division of tuberculosis related death is given in table 6. While analyzing age and cause of death, it was found that the majority of deaths from respiratory system causes were due to pulmonary tuberculosis and consolidation and the mean age at death was 45.70 years while majority of deaths from cardiovascular causes were due to ischemic heart diseases and the mean age at death was 51.29 years.

Associated Conditions:

Table 7 shows the presence of associated illness/ condition present in the deceased individuals. It was noted that systemic hypertension was common disorder (n=24, 16.09%) followed by presence of HIV (n = 20, 14.08%), cerebrovascular episode/paresis (n = 15, 10.56%) and anemia (n=15, 10.56%). Similarly 10 (7.04%) individuals had chronic renal disease, 10 (7.04%) had alcoholic liver disease while 8 (5.63%) had seizure disorder.

Discussion:

In legal parlance custody is defined as any point in time when a person's freedom of movement has been denied by law enforcement agencies such as during transport prior to booking or during arrest, prosecution, sentencing and correctional confinement. [4] However, the persons held in custody retain their basic constitutional right except for their right to liberty and a qualified right to privacy. [5] The custodians are bound by the law to provide adequate necessary amenities to ensure the health and safety of persons in their custody, including medical assistance and treating the inmates in a humane manner. [4]

The person who is held in custody is totally dependent on his or her custodian for proper care and enough medical attention. [6] Therefore whenever death occurs in custody, a thorough investigation is needed.

This investigation will not only ascertain the cause and circumstances leading to death but many times will alleviate the anxiety and speculations of the relatives as to what might have happened inside a police or prison cell.

Studies of deaths while in custody show that natural death is much more common than both suicides and homicides combined. [4-6, 7] On global scenario, many of the custodial deaths are related to natural causes. A study in Ontario showed 41% natural death, England and Wales had 44.3% natural deaths while in California it accounts for 62% of custodial deaths. [1, 4] In a study conducted by Wobeser et al (2002) in Ontario, Canada, the authors had noted that the rate of death by both violent and natural causes in custody exceeded by far the rates in the general population. [2]

It was noted that rate of death from cardiovascular diseases were higher than the rate in the Canadian male population and about 24% deaths occurred in inmates having age less than 30 years. In one of the larger retrospective study conducted by the Police Research Group (PRG) of the Home Office in England and Wales over the 6 year period between 1990 to 1996, the common five cause of death were heart problems (39%), head injury (33%), lung problems (10%), epilepsy (5%) and liver problems (4%). [8]

Considering India, in recent years few studies have looked at the cause of death among people in custody but most of these studies dealt with all types of death and very little information is available regarding the natural deaths in custody. [4-6]

About 97.18% deaths were noted in men and the finding is consistent with other studies conducted worldwide. [7, 9-12] While analyzing the death by age, it was noted that about 28.87% deaths were in the age group of 21 to 35 years while 19.71% deaths were noted in above 61 years age group. Death occurring in early age is of great concern and highlights the importance of effective implementation of screening and diagnostic program.

Routine enquiry about presence of any disease or taking treatment for any ailment will solve the problems in many cases. Similarly the elder prisoners should undergo routine evaluation and necessary treatment should be provided.

The majority of deaths from respiratory system causes were due to pulmonary tuberculosis and consolidation and the mean age at death was 45.70 years while majority of deaths from cardiovascular causes were due to ischemic heart diseases and the mean age at death was 51.29 years.

The findings are in agreement with Fazel et al however, Wobeser et al and Fruehwald et al had noted majority of deaths by cardiovascular diseases in young people. [2, 3]

As far as tuberculosis is considered, about 25.35% inmates were suffering from the infection and amongst them 11.97% had disseminated tuberculosis while 14.08% were associated with HIV infection. About 4.22% inmates were defaulter. Previous reports also highlight the high prevalence of tuberculosis in prisoners. [4-6]

Prisoners constitute a high risk group for acquisition of tubercular infection as compared to general population owing to overcrowding, closed living conditions, insufficient ventilation, poor living conditions and poor nutrition. [13] There is urgent need to identify such individuals and initiate treatment. Nevertheless, the public health authorities should initiate a special action plan for these inmates. The associated conditions affecting the prisoners and it were noted that 16.90% had systemic hypertension, 10.56% had cerebrovascular episode, 10.56% had anemia, and 7.04% had chronic renal failure and so on. (Table 7) Therefore identifying such individuals and providing appropriate treatment would prolong the life of inmate.

Conclusion and Suggestions:

Custodial deaths are among the most difficult and contentious deaths for investigation. The inmates in custody are marginalized populations that have poor access to healthcare in the community. The Magistrate inquest is conducted for all deaths in custody and is the only means of inquiry available to obtain information. Unfortunately, the inquiry reels around the cause of death and nothing substantial surfaces out regarding preventive aspect. The Article 21 of the Constitution of India enshrines the fact that no person shall be deprived of his life and personal liberty except according to the procedure established by the law. Though it is true that not every case of death in custody will be avoidable but it is possible to reduce the number of such deaths by preventive measures. [14] An attempt had been made in this study to identify the mortality pattern in custodial setting and some measures are suggested as below:

Reception Screening:

The prison authorities should have detailed history of the inmate along with treatment record, follow-up record, investigations, any operative measures taken etc. History regarding alcohol dependence/drug abuse should be recorded. Any history of psychiatric illness needs attention. A specific

form may be designed for this purpose and should be filled at the time of reception. If needed, initial medical evaluation should be undertaken.

Medical Facilities:

Improper medical facilities and inability to provide timely medical aid are the major areas and the prison administration needs to work on this aspect. A structured delivery of health care services can be provided by setting "Prison Health Services". The coordination with academic institutes should be encouraged and for this purpose the help of telemedicine could be taken to access to subspecialties and super-specialties. The management of illness could be improved by using standard disease management guidelines. The medical record should be computerized. The Doctors working in these institutes should be encouraged to undergo periodic continued medical education program. This will lead to improved medical care for prisoners and this not only would be a humane course of action, but also would serve the best interests of society as a whole. [15]

Improving the Prison Condition:

The prison conditions need improvement relating to the design and structure. Decongestion of the cells is needed. The dietary plan for the inmate as per illness (for e.g. chronic renal failure, diabetes mellitus) should be considered. If needed, the help of dietician should be taken in consultation with the treating physician.

Research:

Commissioning research and interdisciplinary help is the need of the hour. Feedback from the referral institutes and monitoring of the existing health care facilities should be undertaken.

Training of Custodian People:

The people related with custodial responsibilities should be properly trained for providing primary aid and to recognize when medical intervention is required. Similarly these people should be sensitized to treat the inmates with compassion. Awareness of prisoners: this is important aspect because without the initiative and willingness of these people any action taken by the administration would be ineffective.

References:

1. Fazel S, Benning R. Natural deaths in male prisoners: A 20 year mortality study. *Eur J Public Health* 2006;16: 441-4.
2. Wobeser WL, Datema J, Bechard B, Ford P. Causes of death among people in custody in Ontario, 1990-1999. *CMAJ* 2002; 167: 1109-13.
3. Fruehwald S, Frottier P. Death behind bars. *CMAJ* 2002;167:1127-8

4. **Bansal YS, Murali G, Singh D.** Custodial deaths – an overview of the prevailing healthcare scenario. J Indian Acad Forensic Med 2010; 32: 315-7
5. **Bardale R, Shrigiriwar M, Vyawahare MS, Dixit PG, Tayade SN.** Death behind bars: A five-year study of custodial deaths. Medicolegal Update 2005;5:10-12
6. **Sonar V.** A retrospective study of prison deaths in western Maharashtra (2001-2008). Medicolegal Update 2010;10:112-4
7. **Huddleston DJ, Kocoshis TA.** Death in custody due to a colopericardial fistula. Am J Forensic Med Pathol 1997;18:194-8
8. **Young JG, Chiasson DA, Cairns JT, Payne-James J, Carter EJ.** Custody and restraint deaths. In: Payne-James J, Busuttill A, Smock W (eds) Forensic Medicine – clinical and pathological aspects, 1st ed 2003. Greenwich Medical Media Ltd, London. 115-32
9. **Copeland AR.** Death in custody revisited. Am J Forensic Med Pathol 1984;5:121-4
10. **Bhana BD.** Custody related deaths in Durban, South Africa, 1998-2000. Am J Forensic Med Pathol 2003;24:202-7
11. **Southall P, Grant J, Fowler D, Scott S.** Police custody deaths in Maryland, USA: An examination of 45 cases. J Forensic Leg Med 2008;15:227-30
12. **Smialek JE, Spitz WU.** Death behind bars. JAMA 1978;240:2563-4
13. **Stead WW.** Undetected tuberculosis in prison. JAMA 1978;240:2544-7
14. **Heide S, Kleiber M, Hanke S, Stiller D.** Deaths in German police custody. Eur J Public Health 2009;19:597-601
15. **Barclay WR.** Medical care in prisons. JAMA 1978; 240: 2570.

Table 1: Sex-wise distribution of cases

Sex	No. of cases (%)	Range (in years)	Mean age
Male	138 (97.18)	21-78	46.63
Female	4 (2.81%)	40-70	52.5
Combined	142	21-78	46.80

Table 2: Age-wise distribution of cases

Age group (in yrs)	Male	Female	Total cases	%
21-25	9	--	9	6.33
26-30	9	--	9	6.33
31-35	23	--	23	16.19
36-40	17	2	19	13.38
41-45	15	--	15	10.56
46-50	12	--	12	8.45
51-55	16	--	16	11.26
56-60	10	1	11	7.74
> 61	27	1	28	19.71

Table 3 showing type of custody

Type of custody	Number of cases	%
Jail	135	95.07
Police	7	4.92

Table 4: System-wise cause of death

System affected	No. of cases	%
Cardiovascular system	27	19.01
Central nervous system	17	11.97
Gastrointestinal system	12	8.45
Genitourinary system	10	7.04
Infectious diseases	08	5.63
Neoplasm	9	6.33
Respiratory system	58	40.84
Others	1	0.70

Table 6: Tuberculosis related deaths

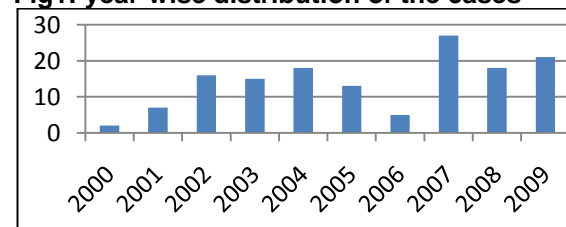
Tuberculosis	Number of cases	%
Pulmonary tuberculosis	19	13.38
Disseminated tuberculosis	17	11.97
Associated with HIV	20	14.08

Table 5: Cause of death

Cause of death	No. of cases	%
Adenocarcinoma ovary	2	1.40
Adenocarcinoma intestine	1	0.70
Bronchial asthma	2	1.40
Carcinoma larynx	2	1.40
Cerebral infarction	2	1.40
Carcinoma gall bladder	1	0.70
Carcinoma lung	1	0.70
Carcinoma oesophagus	1	0.70
Cardiac tamponade	1	0.70
Cerebral abscess	1	0.70
Cerebral oedema	3	2.11
Consolidation	20	14.08
Encephalitis	2	1.40
Epilepsy	1	0.70
Gastric carcinoma	1	0.70
Gastroenteritis	2	1.40
Gastrointestinal hemorrhage	1	0.70
Hemolytic anemia	1	0.70
Hepatitis	2	1.40
Hepatic failure	3	2.11
Intestinal obstruction	1	0.70
Intracranial hemorrhage	7	4.92
Ischemic heart disease	24	16.90
Meningitis	1	0.70
Myocarditis	2	1.40
Pancreatitis	3	2.11
Renal failure	10	7.04
Septicemia	8	5.63
Tuberculosis	36	25.35

Table 7: Presence of associated illness

Associated conditions	No. of cases	%
Anemia	15	10.56
Alcohol dependence	7	4.92
Alcohol liver disease	10	7.04
Bronchial asthma	2	1.40
Cerebrovascular episode/paraplegia	15	10.56
Chronic obstructive pulmonary disease	6	4.22
Chronic renal disease	10	7.04
Chronic Suppurative Otitis Media	2	1.40
Cocaine abuse	1	0.70
Dementia	3	2.11
Diabetes mellitus	3	2.11
Generalized cerebral atrophy	2	1.40
Hepatitis	3	2.11
Human immunodeficiency virus disease	20	14.08
Hypoproteinemia	7	4.92
Ischemic heart disease	8	5.63
Lepromatous leprosy	1	0.70
Parkinsonism	1	0.70
Psychiatric illness	6	4.22
Pyelonephritis	2	1.40
Rheumatoid arthritis	1	0.70
Seizure disorder	8	5.63
Sickle cell disease	2	1.40
Systemic hypertension	24	16.90
Tuberculosis (defaulter)	6	4.22

Fig1: year-wise distribution of the cases

Original Research Paper

The Study of Aluminium Phosphide Poisoning in a Tertiary Care Hospital, Amritsar

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Abstract:

Trend of poisoning had been constantly changing throughout the world, as the advent of new agents, has always replaced the older one due to their innumerable merits and demerits. Similarly in India, the pattern of ingested poisons has also changed. A number of chemical substances which are developed to save the agricultural product from rodents and pests are in fact themselves proving to be disastrous for mankind. Recently in the last two decades aluminium phosphide [Alphos] used as pesticide, rodenticide, fumigant for storage of food grains has created havoc with the human lives differently i.e. suicidal, accidental and very rarely homicidal poisoning agent. Alphos, a solid fumigant used for storage of food grains, freely accessible in the market is commonly used suicidal agent with high mortality rate as no antidote or specific treatment is available.

The present study of 50 cases of aluminium phosphide poisoning showed male dominance, common in sikhs and educated persons. Heart is the first organ to be affected. Shock was present in majority of cases. Sufficient time was available for recording dying declaration.

Key Words: Aluminium Phosphide, Poisoning, Suicide, Mortality Rate

Introduction:

Trend of poisoning had been constantly changing throughout the world with advent of new agents. In India, the pattern of ingested poisons has also changed.

A number of chemical substances which are developed to save the agricultural product from rodents and pests are in fact themselves proving to be disastrous for mankind. Recently in the last two decades Alphos used as pesticide, rodenticide, fumigant for storage of food grains has created havoc with the human lives differently i.e. suicidal, accidental and very rarely homicidal poisoning agent.

Alphos is an inorganic compound. Alphos is a solid fumigant in use since 1940s. [1] It has emerged as an ideal fumigant because of its low cost, long lasting effects, easy to handle, its action being in the gaseous form so easy penetration to areas otherwise inaccessible for application (grain storage areas, rodent run away).

It is available as white coloured or dark brown tablets of 3 gm each with 20 mm diameter and 5 mm thickness, packed in a pen shaped air tight plastic/tin container and remains fresh as long as the container is not opened.

Each tablet of Alphos consists of 56% w/w Alphos as active ingredient and 44% w/w aluminium carbonate or carbamate as the inert ingredient. It liberates phosphine gas (active ingredient) which in its pure form is colourless and odourless but smell like garlic or stale fish due to added impurities.

History and Review of Literature:

Since 1960, the mean death rate from suicide made by WHO has remained at about 10 per 100,000 (WHO 1974). Currently the rate varies from 5 to 40 per 100000 with high Scandinavian countries. The rate of attempted suicide is 8-10 times more than the completed suicide. [2] There were both accidental and suicidal poisoning with the aluminium phosphide. The number of self poisoning is much more than accidental cases. Majority of patients are from 15-35 years age groups with rural background

Fatal Dose: Less than 500 mg of unexposed pellet of aluminium phosphide is lethal for an adult (usual being 150 - 500 mg for a 70 kg individual). The inhalation of phosphine at a concentration of 290- 300 ppm is dangerous to life, 400-600 ppm, it is lethal within half an hour; 1000 ppm, it is rapidly fatal. [3]

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Fatal Period is One hour to four days. Majority die within twenty-four hours. [4] Singh et al 1989 studied cardiovascular manifestations of aluminium phosphide intoxication and reported massive focal myocardial damage resulting in raised cardiac enzymes. Out of 32 cases studied cardiac arrhythmias were present in 28 cases and hyper magnesemia in 13 patients. Twenty two patients died of which 18 cases died within 24 hours of ingestion of aluminium phosphide. Histopathological examination after autopsy or biopsy of organs showed marked congestion, patchy necrosis and mononuclear cell infiltration, severe peripheral capillary leakage in lungs, heart, stomach, kidney and brain. There is either patchy or global myocardial injury. There is alveolar capillary membrane damage which could cause ARDS. Thickening of alveoli, cellular aggregation around bronchioles, patchy areas of gray hepatization consistent with ARDS could also occur. [5]

Gupta & Rao 1995 studied 30 cases of aluminium phosphide poisoning admitted to emergency medical wards of Rajendra Hospital, Patiala to find out its clinical profile. The poison was taken orally for suicidal purposes in all the 30 cases. M: F ratio was 1.8: 1 and commonest age group was 21-30 Years (53.33%). Cardio respiratory collapse, shock, vomiting with relatively preserved sensorium was hallmark of clinical presentation. Cases which survived for more than 12 hours had end organ damage such as myocarditis [7], ARF [4] and hepatocellular damage. Overall mortality rate was 80% and they concluded that aluminium phosphide although a potent insecticide is a human "killer with high mortality rate" and hence need to check its easy availability. [6]

Aims and Objectives:

Our study consists of 50 admitted cases to Medicine Department of Guru Nanak Dev Hospital attached to Government Medical College, Amritsar and was done to determine:

1. Various epidemiological features such as age, sex, religion, educational status of the patients.
2. The sequence of signs and symptoms in relation to cardiovascular system.
3. The ECG changes.
4. Time elapsed between the ingestion and admission to the hospital and time for dying declaration.
5. Mortality Rate

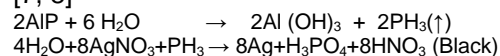
Material & Methods:

Our study was on 50 cases of aluminium phosphide poisoning admitted to Medicine Department of Guru Nanak Dev Hospital, attached to Government Medical

College, Amritsar during the period from 01-10-2004 to 15-04-2006. The diagnosis was done by history of ingestion, garlic/decaying fish like odor and confirmation was done by silver nitrate filter paper test with gastric aspirate having high sensitivity even with low concentration of phosphine which darkens the paper and to prevent false positive cases another filter paper impregnated with silver nitrate has to be kept outside as control. The data and information pertaining to the cases were collected by interviewing the patient, relatives or friends of the patient and recorded on the proforma.

Procedure: With Gastric aspirate:

5 ml of gastric aspirate is mixed with 15 ml of water, a round strip of filter paper impregnated with AgNO₃ (0.1 N) was placed on mouth of flask & heated at 50°C for 15-20 min. Blackening of filter paper occurred as follows: [7, 8]



Observations:

Table 1: Age & Sex Wise Distribution

Age in years	Male		Female		Total	
	No.	%age	No.	%age	No.	%age
0-10	----	----	----	----	----	----
11-20	4	8%	5	10%	9	18%
21-30	12	24%	5	10%	17	34%
31-40	10	20%	5	10%	15	30%
41-50	5	10%	2	4%	7	14%
Above 50	2	4%	----	----	2	4%
Total	33	66%	17	34%	50	100%

In 50 cases, 33(66%) were males and 17(34%) were females with male dominating the study as shown in table 1. Male: female ratio being 1.94:1. Majority of the patients were i.e. 34% (24% males & 10% females) in the 21-30 years age group. There was no case in the age group of 0-10 years in both males and females. The minimum age was 16 yrs both in males & females. The maximum age was 63 years in males and 42 yrs in females in our study.

Table 2: Incidence & Distribution of Religion

Religion	Male		Female		Total	
	No.	%age	No.	%age	No.	%age
Hindu	14	28%	04	08%	18	36%
Sikh	15	30%	13	26%	28	56%
Christian	04	08%	----	----	04	08%
Total	33	66%	17	34%	50	100%

A large chunk (56% patients) belonged to Sikh religion followed by Hindus (36%) of all poisoning cases. Out of these 30% were males and 26% were females in Sikh community and 28% males, 08% females in Hindu community. There were 08% males & no female from Christian community. (Table 2)

Table 6: Mortality Rate in Alphas Poisoning

No. of patients	Expired		Survived	
	No.	%age	No.	%age
50	38	76%	12	24%

Table 3: Educational Status of Individuals

Educational status	Male		Female		Total	
	No.	%age	No.	%age	No.	%age
Educated	26	52%	10	20%	36	72%
Uneducated	07	14%	07	14%	14	28%
Total	33	66%	17	34%	50	100%

The educational status of 50 patients is shown in Table 3. The incidence of poisoning was seen more in educated persons (72%). Out of which 52% were males & 20% were females.

Table 4: CVS Manifestations in Alphas

Symptoms & Signs		No. of Cases	
		No.	%age
Palpitation		46	92
Giddiness		47	94
Restlessness		47	94
Pulse rate	More than 90/min	16	08
			32
		16	02
	60-90/min less than 60/min Unrecordable	01	25
			50
Blood Pressure Unrecordable		25	22
			50
Systolic B.P. \leq 90 mmHg		03	
			06
Systolic B.P. $>$ 90 mmHg			
Shock		47	94

The patients were presented with restlessness (94%), giddiness (94%) and palpitation (92%). The major physical sign shock was present in 94%. Pulse rate was below 60 /min in 2% cases and unrecordable in 50% cases. B.P was unrecordable in 50% cases & systolic blood pressure was below or equal to 90 mm of Hg in 44% cases.

Table 5: ECG Changes in Alphas Poisoning

E.C.G Changes	No. of Cases	
	No.	%age
Supraventricular tachycardia	08	20.51%
Atrial fibrillation	07	17.95%
Brady tachyarrhythmia	02	5.13%
ST-T segment elevation	02	5.13%
ST-T segment depression	22	56.41%
Ventricular tachycardia	01	2.56%

Out of 50 patients, 39 patients of Alphas poisoning where ECG was done at admission or subsequently, formed the subject matter of this study. In 11 patients ECG was not possible due to early death. ECG changes were analyzed for type & pattern of ST-T changes, arrhythmias. Most common ECG abnormality observed was ST-T depression (56.41%). ST-T segment elevation was seen in 5.13% cases. Supraventricular tachycardia (20.51%), atrial fibrillation (17.95%) bradytachyarrhythmia (5.13%) & ventricular tachycardia (2.56%).

Table 7: Time of Intake of Poison Mortality

Time elapsed between intake of poison and admission to the hospital	No. of patients died		No. of patients survived	
	No.	%age	No.	%age
0-2 hrs	7	14%	06	12%
+2-4hrs	25	50%	06	12%
+4-6hrs	04	08%	-----	-----
+6-8hrs	01	02%	-----	-----
More than 8hrs	01	02%	-----	-----
Total	38	76%	12	24%

Time elapsed between intake of poison and admission to the hospital. 24% survived cases reached hospital within 4hrs after the ingestion of the poison. Not a single patient was reported to survive when the time elapsed exceeded 4 hours. (Table 7)

Discussion:

Age & Sex wise Distribution: Majority of the patients (24% males & 10% females) in our study were young in the age group of 21-30 years. There was decline in incidence with increasing age. Frustration due to imbalance between ambitions and available avenues, poor performance in studies, strict discipline by parents and unsuccessful love affairs were the major causes of poisoning in young generation. In our study males were more prone to poisoning as compared to females (Table 1). This ratio coincides with ratio observed by Chugh et al 1991 [9] (2: 1 & mean age 26.5 years). The high incidences in males may be because males were more exposed to stress & strain, economic instability and also to occupational hazards.

Incidence & Distribution of Religion: As far as incidence and distribution of religion of aluminium phosphide poisoning cases is concerned a large chunk belonged to Sikh religion comprising of 56% of all poisoning cases (Table 2). In contrast Sinha et al 1999 [10] observed that incidences were more in Hindus (approx. 85%) as compared to other religions. The high rate of incidences in Sikhs could be due to the reason that they form the main chunk of population of this region.

Educational status: 72% cases were educated and 28% were uneducated (Table 3). The same was observed by Siwach and Gupta 1995¹¹ in their study of acute poisoning in Haryana – Rohtak study where 65.30% cases were educated having education above primary and 34.70% cases were either illiterate or having education below primary. Puranim et al 1989 [12] studied 33 cases of acute aluminium phosphide poisoning where education level of all cases were below H.S class. The poisoning among educated persons are more because of many reasons like failure on education front, lack of employment opportunities, a more stressful life, urbanization, breakup in family support system, economic instability etc.

Patients came to emergency with symptoms of restlessness (94%), giddiness (94%) and palpitation (92%) as shown in Tables 4 & 8. Majority of the patients were restless in our study as well as in study by Singh, Rastogi & Singh 1989. [5] Cardiovascular manifestations may be due to direct toxicity or systemic

absorption of phosphine. Shock (94%) was the major physical signs observed in our study. Same was observed by Gupta, Malik & Sharma 1995. [14] Shock was invariably present in majority of cases signifying that the cardiovascular system bears the burnt earliest and is most severely affected.

Pulse rate was below 60/min in 2% cases and unrecordable in 50% cases. B.P was unrecordable in 50% cases and systolic blood pressure was below or equal to 90 mm of Hg in 44% cases our results are comparable to the findings by other workers. Acute cardiovascular collapse with low to unrecordable B.P, false steady pulse is the commonest mode of presentation. [15]

Out of 50 patients, only 39 patients of aluminium phosphide poisoning where ECG was done at admission or subsequently, formed the subject matter of this study. In 11 patients ECG was not possible because the patients died within few minutes after admission. The various ECG changes present were shown in Table 5. ECG changes in aluminium phosphide poisoning are diverse as mentioned in so many previous studies by various authors (Table 9) and also from our study. ECG changes have been a cardinal feature of aluminium phosphide toxicity to the myocardium. Chugh et al 1991 [9] proposed that the probable mechanisms of ECG changes:

1. Disturbances in permeability to ions causing transmembrane action potential alterations and subsequent myocardial necrosis.
2. General protoplasmic poisons interfering with enzyme process (cytochrome oxidase).
3. Direct toxic effect on myocardium producing ischaemia or necrosis of muscle tissue.
4. Hypomagnesaemia.

Overall, ST-T segment changes dominated the ECG changes in present study with total of 61.54% the cases showing the same. The preponderance of ST-T changes denotes that there is ischaemia, toxic myocarditis or myocardial necrosis. This is evident from postmortem examination of patients showing myocardial damage. The ECG changes vary in different studies because of difference in number of patients studied, the amount of poison consumed and already existing status of the heart. The mechanism of death from aluminium phosphide poisoning appears to be cardiogenic as evidenced by cardiogenic shock and ECG abnormalities. The ECG changes were not secondary to shock and some ECG abnormalities appeared before a substantial fall in blood pressure. [17]

Mortality rate in alpos poisoning cases:

Our study showed mortality rate 76% as in Table 6. The mortality rate observed by the different workers were 37.5% (Chopra et al 1986) [19], 85% (Agarwal, Agarwal & Jain) [20], 52% (Kalra et al 1991) [21] and 80% (Chugh et al 1996). [22] This mortality rate difference could be because of variation in the number of patients studied, facilities available to treat the patient and first aid / treatment received at the periphery. The dose and freshness of the tablets also played a significant role in deciding mortality. The high mortality is due to rapid absorption of phosphine throughout the body producing organ damage and lack of any specific antidote available.

Table 10: Time Elapsed from intake of Poison with Mortality

Study	Mean pre-hospital time in hours
Singh et al 1985 [23]	5.3
Sepaha et al 1985 [24]	3.20
Chopra et al 1986 [19]	4.3
Kalra et al 1991 [21]	3.5
Present study 2006	3.02

In our study the minimum time elapsed between intake of poison & admission to the hospital is 50 minutes and maximum time was 9.10 hours. Only those cases who reached hospital within 4 hours survived (24%). The mean pre-hospital time is 3.02 hours. Our results are comparable with Sepaha et al 1985 [24] (Table 10). Gupta & Rao 1995 [6] studied 30 cases and majority of cases brought to the hospital within 2 hrs and mortality rate is 80%. Siwach et al 1998 [18] observed that 80% of the cases reported within 2 hrs of intake of poison & none of the patient had received any primary treatment at home or at the nearest PHC/Civil hospital and the mortality rate was 43.3%. Easy availability of transportation facility, easy understanding of symptoms, nearby availability of hospital and prompt treatment {immediate induction of vomiting, gastric lavage, immediate treatment with cardioprotective drugs, intensive supportive treatment and oxygen therapy} are some of the factors which could reduce mortality rate.

Summary:

1. The male to female ratio was 1.94: 1.
2. Poisoning was predominant in age group 21-30 years (34%).
3. Majority of victims (56%) belonged to Sikh.
4. Educated victims (72%) outnumbered the uneducated ones.
5. Shock (94%), unrecordable pulse rate (50%) were major signs suggesting myocardial damage.
6. The main ECG changes were ST-T segment depression (56.41%), supraventricular tachycardia (20.51%), atrial fibrillation (17.95%).

7. Mortality rate was 76%.
8. The mean time elapsed between intake of poison and admission to the hospital was 3 hours 2 minutes.

Conclusions:

Alphos is a systemic lethal protoplasmic poison. The clinical hallmark of acute poisoning includes arrhythmias and shock. Heart is the first organ to be affected. Sufficient time is available to record the dying declaration. There is no antidote available hence treatment is entirely symptomatic and is directed mainly to remove the poison from the stomach or to prevent its absorption. Public awareness and immediate first aid can be life saving. The forensic medicine departments must have well established toxicology units where not only the patients can be managed but also research oriented programmes can be carried out. The present study showed increased in alphos poisoning cases in this part of India.

References:

1. **Vij K.** Forensic Toxicology. Textbook of Forensic Medicine and Toxicology. IIIrd ed. Elsevier- A division of Reed Elsevier India Private Limited; New Delhi 2005: 603, 750-5.
2. **Narang RL, Mishra BP, Mohan N.** Attempted suicide in Ludhiana. Indian Journal of Psychiatry 2000; 42(1): 83-7.
3. **Chugh SN.** Aluminium phosphide poisoning. Journal of Association of Physician of India 1992; 40 (6): 401-5.
4. **Reddy KSN.** Toxicology. The Essentials of Forensic Medicine and Toxicology. 25th ed. K. Suguna Devi, Malakpet; Hyderabad 2005: 418-422, 445-7.
5. **Singh RB, Rastogi SS, Singh DS.** Cardiovascular manifestations of aluminium phosphide poisoning intoxication. Journal of Association of Physician of India 1989; 37(9):590-1.
6. **Gupta RS, Rao HK.** Clinical profile of aluminium phosphide poisoning as seen at M.C Patiala. Journal of Association of Physician of India 1995; 43 (12): 907.
7. **Chugh SN, Santram, Chugh K, Malhotra KC.** Spot diagnosis of aluminium phosphide ingestion: An application of a simple test. Journal of Association of Physician of India 1989; 37 (3): 219 – 20.
8. **Mital HS, Mehrotra TN, Dwivedi KK, Gera M.** A study of aluminium phosphide poisoning with special reference to its spot diagnosis by silver nitrate test. Jour. of Association of Physician of India 1992; 40(7): 473- 4.
9. **Chugh SN, Chugh K, Santram, Malhotra KC** Electrocardiographic abnormalities in aluminium phosphide poisoning with special

reference to its incidence, pathogenesis, mortality and histopathology. Journal Indian Medical Association 1991; 88(2): 32-5.

10. **Sinha US, Kapoor AK, Agnihotri AK, Srivastava PC.** A profile of poisoning cases admitted in SRN hospital, Allahabad with special reference to aluminium phosphide poisoning. Journal of Forensic Medicine and Toxicology 1999; 16(1): 40- 3.
11. **Siwach SB, Gupta A.** The profile of acute poisoning in Haryana–Rohtak Study. Journal of Association of Physician of India 1995; 43 (11): 756- 9.
12. **Puranim CM, Raman PG, Sarmar P, Kulkarni CV, Verma M.** Aluminium phosphide poisoning–A clinical, biochemical and histopathological study. Journal of Association of Physician of India 1989; 37(1): 29.
13. **Khosla SN, Handa R, Khosla P.** Aluminium phosphide poisoning. Tropical Doctor 1992; oct.: 155-7.
14. **Gupta MS, Malik A, Sharma VK.** Cardiovascular manifestations in aluminium phosphide poisoning with special reference to echocardiographic changes. Journal of Association of Physician of India 1995; 43 (11): 773- 80.
15. **Sainani GS, Anand MP, Chugh MP et al.** Toxicology. API Textbook of medicine 5th ed. Association of Physician of India; Bombay 1992: 1394-5.
16. **Katira R, Elhence GP, Srivastava SSL, Agarwala RK (Meerat).** ECG changes in aluminium phosphide poisoning. Journal of Association of Physician of India 1989; 37(1): 66.
17. **Katira R, Elhence GP, Mehrotra ML, Srivastava SSL, Mitra A, Agarwala R, Ram A.** A study of aluminium phosphide poisoning with special reference to electrocardiographic changes. Journal of Association of Physician of India 1990; 38(7): 471- 3.
18. **Siwach SB, Singh H, Jagdish, Katyal VK, Bhardwaj G.** Cardiac arrhythmias in aluminium phosphide poisoning studied by on continuous holter and cardioscopic monitoring. Journal of Association of Physician of India 1998; 46(7): 598-601.
19. **Chopra JS, Kalra OP, Malik VS, Sharma R, Chandna A.** Aluminium phosphide poisoning: A prospective study of 16 cases in one year. Postgraduate Medical Journal 1986; 62: 1113- 5.
20. **Agarwal HK, Agarwal MP, Jain S.** Aluminium phosphide poisoning – Study of forty cases. Journal of Association of Physician of India 1989; 37(1): 66.
21. **Kalra GS, Anand IS, Jit I, Bushnurmah B, Wahi PL.** Aluminium phosphide poisoning: Haemodynamic observations. Indian Heart Journal 1991; 43(3); 175-8.
22. **Chugh SN, Pal R, Singh V, Seth S.** Serial blood phosphine levels in acute aluminium phosphide poisoning. Journal of Association of Physician of India 1996; 44 (3): 184- 5.
23. **Singh S, Dilawari JB, Vashisht R, Malhotra HS, Sharma BK.** Aluminium phosphide ingestion. British Medical Journal 1985; 290: 1110-1.
24. **Sepaha GC, Bharani AK, Jain SM, Raman PG.** Acute aluminium phosphide poisoning. JIMA 1985; 83(11): 378- 9.

Table 8: CVS Manifestations in Aluminium Phosphide Poisoning Cases

Symptoms & Signs	Singh RB et al	Khosla et al	Gupta MS et al	Present study 2006
Palpitation	78%	-	12%	92%
Giddiness	78%	-	-	94%
Restlessness	Majority	-	-	94%
Pulse rate More than 90/min 60-90/min less than 60/min Unrecordable	-	35% 35% }15%	24% 12% 52% 12%	32% 16% 02% 50%
Systolic B.P≤90mmHg Systolic B.P>90mmHg	-	}61%	—	50% 44% 06%
Shock	-	61%	100%	94%

Table 9: ECG Changes in Aluminium Phosphide Poisoning Cases

Study	S V T	Atrial Fibrillation	Bradytachy Arrhythmias	ST-T Segment Depression	ST-T Segment Elevation	V. T.
Singh, Rastogi & Singh (1989) [5]	6.25%	9.37%	3.12%	18.75%	6.25%	---
Katira et al 1989 [16]	75%	10%	---	---	33%	---
Katira et al 1990 [17]	17.5%	5.2%	---	63.1%	21%	17.5%
Chugh et al 1991 [9]	17.9%	7.4%	2.1%	6.3%	22.1%	2.1%
Gupta, Malik & Sharma (1995) [14]	20%	4%	25%	36%	4%	4%
Siwach et al 1998 ¹⁸	46.7%	20%	---	90%	10%	40%
Present study 2006	20.51%	17.95%	5.13%	56.41%	5.13%	2.56%

Original Research Paper

Study of Medico-legal Case Management in Tertiary Care Hospital

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Abstract

Article 21 of the constitution guarantees protection of life and liberty to every citizen as well as non-citizens. Right to health care and medical assistance is integral to the right to life and the state has a constitutional obligation to provide health facilities. Failure of a government and other hospital to provide a patient timely medical treatment results in violation of the patient's right to life.

The study comprising about medicolegal case (MLC) management, awareness and prevalent practices among the health care professionals especially among those who directly or indirectly involve with treatment of patients. As for awareness is concern regarding especially regarding procedural awareness, the documentation and various other medico-legal issues were studied in detail. Contrary to the popular belief that doctors who deals with the extreme situation of life but suffer some kind of medicolegal phobia in his work except few especially those who are in feeling of government immunity have genuine or in-genuine boldness in dealing with medicolegal cases.

Key Words: Right for protection of Life, Accidents, Right to Privacy, Human Dignity, Medicolegal Case

Introduction:

No greater opportunity, no greater responsibility, no greater obligation can fall to any other human being than to become a medical professional. In the care of suffering the medical professionals need scientific knowledge, technical skill, moral understanding of profession and awareness about the relevant laws of the land. Primarily doctors but also on other ancillary and administrative staff of the hospital have several ethical and legal obligations in the performance of their duties.

It is important therefore, that every concerned person of the hospital, related with treatment and care of the patients must understand the nature of obligations and thus fulfills these obligations to the best of their ability, to maintain nobility of medical profession.

Most of doctor, irrespective of his/her specialty, would have been faced certain cases, which at the time or subsequently, would be labeled as "medico-legal".

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Not only medical professionals but also various private medical institutions are usually apprehensive in dealing with these, for, according to them, an MLC (Medico-legal Case) implies – lot of disputes, unwanted burden, 'rough speaking' police officials, 'inordinate hours' in the court, 'unrelenting' defense counsels, etc. Because of this "fear-factor", they either try to avoid the cases or try to 'get rid of' them as soon as possible. With these improper understanding about implications of the cases, they invite mistakes, deliberation, which may land them in trouble.

Members of the medical profession are liable to be called upon to give medico-legal assistance in varied circumstances and situations by police and law. Like any other witness, the medical practitioner is also bound to answer truly all questions posed to him in the court of law. The law usually requires reliable evidence of facts and authoritative opinions.

Thus, a doctor has not only to play a vital role struggling to save the life of the patients or relieving their sufferings but also has to fulfill the required minimum formalities on medico-legal aspects in each case. This emphasizes the most frequent dilemma faced by the doctors: which case is to be booked as medico-legal?

Aims and Objectives:

This study was designed to know the following main objectives.

- a. To know the status of awareness regarding medico-legal case management, among the

medical and paramedical staff of the tertiary care hospital.

- b. To know the various medico legal procedures being followed in institution.
- c. To know about status of various documentation concerning medico-legal case management.
- d. To find out commonly encountered problems or specific problem by the doctors during medico legal case management.
- e. Try to find out solution of the commonly encountered problems/specific problem by the doctors during medico-legal case management.

Material & Methods:

The material for the present study was comprised of information gathered by the medical professionals (especially Doctors) working in casualty and different clinical and para-clinical departments, who were directly or indirectly engaged in treatment and care of various kind of medico-legal case management. And it was by means of written questionnaire with suggestive answers in the form of MCQs as well as short conclusive answers, and information reveal by them in interview. This study was carried out at tertiary care hospitals of Lucknow (Era's Lucknow Medical college and others), after due informed consent of participants and with due assurance of confidentiality, ethical regulations and repute of the institution and individual.

The questionnaire was designed to know the standard of knowledge and skill, practical application, customary practices, in their hospital as it may or may not be within the control of the doctors and ancillary staff. Appropriateness in documentation in case-files, record keeping, care of preserving material of evidence of medicolegal cases for purpose of law as per guidelines of regulatory authorities.

This study was conducted with 119 doctors out of approximately two hundred. The questionnaire was mainly designed to extract knowledge in regard to promptness, procedural awareness, awareness of law, insight about causes of negligence and their experience with agencies if crime investigation and administration of justice. Finally various grouped responses were correlated with the nature of customary practice in their subjects and medico-legal requirements and expectations of law.

Observation:

During this study the group response emphasizing awareness status regarding medico-legal case management was analyzed precisely and they are grouped under four categories like Aware, Partly Aware, Not Aware

and No response. Awareness responses were grouped according to accuracy of knowledge, tested with their written responses and their clarifications during personal interviews. Aware are those who have more than 60% correct response, partly aware are between 30% to 60% correct responses and not aware are those having below 30% correct responses. Those responses which were not attempted in the provided questionnaire and no comment were given in personal interview.

Awareness status regarding different medico-legal case management like medico-legal cases, Promptness in examination of victim of sexual assaults, Death certification in MLC, Evidence Preservation in MLC, Medico-legal severity of injury, Importance of Identity in MLC, Criminal Abortion Cases, Awareness of Law related to medical Practice, Real causes of Negligence complaints, Awareness regarding the provisions of PCPNDT Act, Importance of good medical record and Rights of the patients etc. 33.69% were aware, 31.02% were partly aware and 24.93% were not aware and 10.36% has given no response in related subject matter or issues. (Table 1)

Discussion:

"The health of my patient will be my first consideration." These words of Declaration of Geneva of the World Medical Association bind the physicians towards their duty to promote and safeguard the health of the people.

A medico-legal case is a case of injury/ illness where the attending doctor, after eliciting history and examining the patient, thinks that some investigation by law enforcement agencies is essential to establish and fix responsibility for the case in accordance with the law of the land. [1] It can also be defined as a case of injury or ailment, etc., in which investigations by the law-enforcing agencies are essential to fix the responsibility regarding the causation of the said injury or ailment. [2]

In the casualty, while attending to an emergency, the doctor should understand that his first priority is to save the life of the patient. He should do everything possible to resuscitate the patient and ensure that he is out of danger. **All legal formalities stand suspended till this is achieved.** This has been clearly exemplified by the Hon'ble Supreme Court of India in **Parmananda Katara Vs Union of India:** [3]

"Every doctor is bound to provide medical aid to the victims irrespective of the cause of injury; he cannot take any excuse of allowing law to take its course". In the same case, the MCI (Medical Council of India) filed an

affidavit stating that "the MCI expects that all registered medical practitioners must attend to the sick and the injured immediately and it is the duty of the medical practitioner to make immediate and timely medical care available to every injured person, whether he is injured in an accident or otherwise.....Life of a person is far more important than the legal formalities" Again, in *Pattipati Venkaiah Vs State of Andhra Pradesh* [4], the Hon'ble High Court of Andhra Pradesh decreed that "doctor's duty is to attend to the injuries of the person produced before him. His primary effort should be to save the life of the patient and then inform the police/ document clearly all the injuries observed by him in medicolegal cases". This means that the duty of the doctor to provide medical aid, even in MLCs, has been extended to the private doctors also.

The next important duty is to identify, after carefully analyzing the injuries on the person of the patient, the history given, and the other circumstances of the case; whether the said case falls under the category of an MLC or not. If it does fall in this category, then he must register the case as an MLC and/ or intimate the same to the nearest police station, either by telephone or in writing. An acknowledgement of receipt of such a message should be taken for future reference. If the intimation is given orally or on phone, the diary number (DD or the Daily Docket number) should be taken down as proof of intimation and should be properly documented in the patient's records. According to the Hon'ble Supreme Court, "whenever any medico-legal case comes to the hospital, the medical officer on duty should inform the Duty Constable, giving the name, age, sex of the patient and the place of occurrence of the incident and should start the treatment of the patient. It will be the duty of the said Constable to inform the nearest concerned police station or higher police functionaries for further action"[3]. Every big hospital usually has either a police post at the casualty or has a police official posted there for this purpose. Police should also be informed regarding the discharge/ death of the said patient in the Casualty/ any other department of the hospital.

A **medico-legal register** should be maintained in the casualty of every hospital and details of all medico-legal cases should be entered in this register, including the time and date of examination and the name of the doctor who is dealing with the case. This would be of immense help for future reference, when the patient through the court/ the police, requests for a copy of the medicolegal report. A case may be registered as an MLC even if it is brought several days after the incident.

In current medical practice most therapeutic as well as diagnostic procedures involve inherent risks. This is due to high technology computerized centre for diagnostic & therapeutic medical care, the intensified competition, more and more medico-legal awareness, economic stress, and inclusion of medical care delivery in consumer protection act 1986 led to the breakdown of the trustworthy traditional relationship between patient and licensed medical care provider.. It is the duty of the physician to promote and protect the health with respect to rights and **autonomy** of the patient. Except emergency cases, in elective care where there is time for consultation, clinicians should discuss the case in detail with the patient or with his nominated representatives. In India the real enemy of informed consent is insufficient resources and inadequate manpower to allow enough available time for the detailed communication to occur. However, it should be remembered that an informed consent is a *patient's right and a physician's duty*.

The medical science is advancing and law is encroaching in almost every area of medical practice. It also cannot be ignored that society deserves the right to nourish great expectation from the advances and modern medicine and legal provisions aimed at their welfare. [5]

The average percentage of awareness is as 33.89% were aware, 31.09% were partly aware and 24.79% were not aware and 10.36% has given no response in related subject matter or issues. (**Table 2**)

The average percentage of awareness is as 27.90% were aware, 30.08% were partly aware and 30.42% were not aware and 11.60% has given no response in related subject matter or issues. (**Table 3**)

Study reveals that few commonly encountered problems or specific problems/query by the doctors who are dealing with medico-legal cases. (**Table 4**) In the present study 33.69% medical professional are overall aware about various implications of medico legal case management, 31.02% are partly aware and 24.93% are not aware. Most of the people are either well aware (55.46%) or partly aware (41.18%) about the cases which qualify as medico-legal cases. Overall awareness response regarding medico legal case management, 33.69% doctors of the study group know that they have to attend the MLC's as per merit of the case, 31.02% partly aware and 24.93% did not know it.

This study reveals very important finding that very few person were really aware about the importance of evidence preservation in MLC

cases (32.77%), Importance of Identity in MLC (27.73%), criminal abortion cases (22.69%), importance of good medical record (26.89%) and rights of the patients (21.08%).

Almost every medical specialty might have exposed to medicolegal issues but obstetrics and gynecology and surgery are few of the risk prone specialties. The varied and unpredictable nature of obstetrics' practice and increasing complexities of various gynecological procedures put these specialist in an inherent problematic zone of complains and litigations similar situation arises when the dilemma is as to whether death in a MLC is to be certified or not. It was found in this study that 26.05% were confused about procedure of death certification and 31.09% were not aware of it at all, which is more or less similar to the findings of S.D.Nanandkar and G.S.Chavan in their study of assessment of medico legal awareness of practicing Obstetrician and gynecologist. They observe that 18.98% were confused and 35.45% were not aware of it at all. [6]

The act of omission ranges from failure to obtain consent to failure to use aseptic technique. Same is the story for act of commission. Here they range from operation resulting in sterility to problems of pregnancy following tubectomy. [7] There is tremendous rise in the cases of violence against women in last few decades. In this category particularly important are the cases of sexual assaults, marital torture and child abuse. In these cases in addition to the clinical competence law requires these professionals to be wise and well versed in understanding and implementing legal provisions. The study observations indicate that 27.73% doctors were ignorant of promptness and procedures of examining victim of sexual assault.

Quality treatment, information, safety and redressal are the important rights of patient recognized by CPA. It was clear in our study that 38.66% of doctors had the insight of real causes of negligence, litigations while 32.77% were confused and 19.33% were not aware of the same. In recent years the CPA 1986 has widen its scope mainly in relation to issues like vicarious liability and corporate negligence. [8]

The cases of prenatal, abortion (MTP Act, 1971 and Amended in 2002) [9] and assisted reproduction exposed the obstetricians and gynecologist to grate professional stress and controversies. These specialists too understand the gravity of change in appreciation of the situation by law. Because previously the sex determination was professional misconduct but now same treated as proscribed cases. [10]

It was noticed that 20.17% Doctors were not aware of laws governing there practice however 37.82% of them knew about details of PC PNDT Act which is somewhat better situation in comparison of private practitioners 32.91 were not aware of law as revealed in the study of S.D.Nanandkar and G.S.Chavan in their study of assessment of medico legal awareness of practicing Obstetrician and gynecologist.

Awareness regarding various medico-legal procedures of medico-legal Case Management is 33.89% were aware, 31.09% were confused and 24.79% did not know at all.

The average percentage of awareness is as 27.90% were aware, 30.08% were not well acquainted and 30.42% were not aware at all.

Despite of all measures large proportion of doctors were guarded and tight lipped about but expressed their worries about inadequate and incompetent supporting staff and their negligent acts which is prima-facie under the control of doctor but not in actual. They also feel lack of professional independence of some degree but he has to survive also. And it is very hard to prove corporate negligence due to master-servants relation rather than employer-employees relationship especially in private and corporate sectors.

The Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulation, 2002 [11] has made few things quite clear as regards to legal awareness of the doctors. In these regulations it has been specifically mentioned that the physicians shall observe the law of the country in regulating the practice of medicine and shall also not assist others to evade such laws. He should be cooperative in observance and enforcement of sanitary law and regulation in the interest of public health.

A physician should the provision of state Acts like Pharmacy Act, Drug and Cosmetics Act, Narcotics Drugs and Psychotropic Substance Act, Medical Termination Of Pregnancy Act, Mental Health Act, Transplantation of Human Organ Act, Environmental Protection Act, PC PNDT Acts, Biomedical Waste Rules, Persons with Disability Act (MCI Act, 1956 Amended in 1997- 2000 and 2002) and Right to the Information Act, 2005. One interesting finding in the study was regarding overall impression of these doctors about agencies concerned with the crime investigation and administration of justice.

It was observed that a significant number of them had good opinion but proportionate quantum of average and bad opinion can be expected to give appropriate

massage to the concern hence cannot be ignored.

In the changing social and legal scenario the benefits of being doctors are certainly (may be slowly) reducing as compared to the liabilities. When it comes to the surgeon, obstetricians and gynecologists, radiologist and pathologist same facts apply (may be slightly to greater extent). In this connection the stories not yet complete for obstetricians and gynecologists. This specialty is probably going to witness more stressful days in future. This is expected to be probably so in relation to the matters of assisted reproduction and cloning.

Suggestion and Recommendation:

1. The medical ethics, acts related to medical practice should be emphasized in post graduate curriculum and examinations.
2. The periodical CME programmes specially by involving forensic Medicine specialty and Integrated reorientation programmes should be made compulsory for all doctors in particular surgeon, obstetricians and gynecologists, radiologist and pathologists.
3. Doctor should know his Duties regarding general aspects of medical practice, Duty to Up-to-date his knowledge and skill, Duty to attend the patient, Duty to special attention to sick and patient of tender ages, Duty to proper investigations, Duty to proper prescription and instructions, Duty to issue the needful certificates, Duty to inform the concerned responsible authorities and Duty to act in accordance with the law.
4. Doctor should also know about need of proper information to the patient and proper informed consent and to maintain professional secrecy.
5. Doctor should well acquainted about Duties in relation of operative case that Not delegate duty to operate another doctor, Not to experiment without valid reason and without consent, Inform the patient about nature of operation and risk involved, Particular about site and extent of operation, Assistance by qualified and experienced anesthetist only, Use only properly sterilized instruments, Care not to leave any instrument or swab in body cavity, Proper post operative care, D.O.T. should be followed by PM examination.
6. Doctor should well acquainted about Duties while dealing with poisoning cases that utmost priority to save the life, give emergency treatment, if necessary refer to higher center if condition demands and permit the shift, Doctor should himself record full history, Collect and preserve the vomits, stool, urine, blood, clothes, doubtful container, Arrange reliable attendant for patient, Police information, Dying declaration if death is apprehend and Recommendation for PM Examination if death.
7. Doctor should well acquainted about when he has slightest doubt of Medico-legal cases then he should send police information (s.39 of Cr.P.C.), he should carefully examine and treat the patient, he should record date, time, place, brought by whom and examination finding, he should record dying deposition/declaration if there is eminent danger of death. He should not issue death certificates in death occurred in suspicious circumstances and recommend Postmortem examination for cause of death and police should be informed.
8. Doctor should well aware about Laws in relation to medical practices (Legal obligation). Those are as followings IPCs. Sec 118, Sec 176, Sec 177, Sec 182, Sec 191, Sec 192, Sec 193, Sec 194, Sec 195, Sec 197, Sec 201, Sec 203 and Sec 204. IPC section 312 to 316 are especially important for doctors who are in the practice of obstetrics and gynecology besides the above. Sec 39 Cr.P.C. public to give information of certain offence.

Doctor should understand the need of dedication and noble tradition of profession. Health of patient should be first and foremost consideration for him. The physician must know his legal and ethical duties to the patient. Proper informed consent and only the privileged communication of secrecy are the benchmark of his safety. No female patient should be examined, except in and actual emergency, unless a third person is present.

Consultation with colleagues should be encouraged. There need not to emphasize the importance of proper communication skill and vigilantly dealing of the medico legal cases. "Ideal" medical records should be kept in every case. Doctor should use the reasonable degree of skill, care, knowledge prudence in treatment of his patient.

Lastly he should never forget
"IGNORANCE OF LAW IS NOT AN EXCUSE"

References:

1. Dogra TD, Rudra A. Lyon's Medical Jurisprudence & Toxicology. 11th Ed. Delhi Law House. 2005:367.
2. Jayapalan VK. Practical Medico-Legal Manual. 1st Ed. Indian Academy of Forensic Medicine (Publisher). 1988: 26.
3. Parmananda Katara Vs Union of India. AIR 1986 SC 2039
4. Pattipati Venkaiah Vs State of Andhra Pradesh. 1985(2) Crimes 746 at pp 749.
5. Legal Medicine Annual 1978, pp 245-255.
6. S.D. Nanandkar, G.S.Chavan; Assessment of medico legal awareness of practicing Obstetrician and gynecologist; J Indian Acad Forensic

Med, 30(3); p136-140. The Medical Profession and Law 1992 pp 14.
7.The Consumer Protection Act, 1998.

8.The Medical Termination of Pregnancy act 1971.
9.The PC & PNDT act 1994 amd 2003.
10. The MCI Act 1956; Amended in 1997-2000 & 2002.

Table- 1: Awareness status regarding medico-legal Case Management

Sr. No.	Particular of subject matter/ issues	Awareness Response Total number of cases 119			
		Aware	Partly Aware	Not Aware	No response
1.	Medico-legal Cases	66 (55.46%)	49 (41.18%)	01 (0.84%)	03 (2.52%)
2.	Promptness in examination of victim of sexual assaults	45 (37.82%)	31 (26.05%)	33 (27.73%)	10 (8.40%)
3.	Death certification in MLC	43 (36.13%)	31 (26.05%)	37 (31.09%)	08 (6.72%)
4.	Evidence Preservation in MLC	39 (32.77%)	37 (31.09%)	24 (20.17%)	19 (15.97%)
5.	Medico-legal severity of injury	36 (30.25%)	43 (36.13%)	28 (23.53%)	12 (10.08%)
6.	Importance of Identity in MLC	33 (27.73%)	39 (32.77%)	31 (26.05%)	16 (13.45%)
7.	Criminal Abortion Cases	27 (22.69%)	31 (26.05%)	49 (41.18%)	12 (10.08%)
8.	Awareness of Law related to medical Practice	44 (36.97%)	23 (19.33%)	38 (31.93%)	14 (11.77%)
9.	Real causes of Negligence complaints	46 (38.66%)	39 (32.77%)	23 (19.33%)	11 (9.24%)
10.	Awareness regarding the provisions of PCPNDT Act	45 (37.82%)	37 (31.09%)	24 (20.17%)	13 (10.92%)
11.	Importance of good medical record	32 (26.89%)	42 (35.29%)	29 (24.37%)	16 (13.45%)
12.	Rights of the patients	25 (21.08%)	41 (34.45%)	39 (32.77%)	14 (11.77%)
	Average percentage	33.69%	31.02%	24.93%	10.36%

Table-2: Status of various medico-legal procedures of medico-legal Case Management

Sr. No.	Particular of subject matter/ issue	Awareness Response /Total number of cases 119			
		Aware	Partly Aware	Not Aware	No response
1.	Injury report/ Register/MLC Register	67 (56.30%)	36 (30.25%)	11 (9.24%)	05 (4.20%)
2.	Ideal Medico-legal record Keeping	25 (21.01%)	41 (34.45%)	34 (28.57%)	19 (15.97%)
3.	Recording of Dying Declaration/ Deposition.	34 (28.57%)	39 (32.77%)	35 (29.41%)	11 (9.24%)
4.	MLC Investigation	38 (31.93%)	44 (36.98%)	29 (24.37%)	08 (6.72%)
5.	Poisoning cases	37 (31.09%)	33 (27.73%)	36 (30.25%)	13 (10.92%)
6.	Negligence in MLC Cases	41 (34.45%)	29 (24.37%)	32 (26.89%)	17 (14.29%)
	Average percentage	33.89%	31.09%	24.79%	10.22%

Table-3: Awareness Status about various documentation proceude in MLC Management

Sr. No.	Particular of subject matter/ issue	Awareness Response Total number of cases 119			
		Aware	Partly Aware	Not Aware	No Response
1.	MLC Cases File?	36 (30.25%)	39 (32.77%)	29 (24.37%)	15 (12.61%)
2.	MLC Record Keeping?	25 (21.01%)	41 (34.45%)	34 (28.57%)	19 (15.97%)
3.	MLC Investigations?	38 (31.93%)	44 (36.98%)	29 (24.37%)	08 (6.72%)
4.	Asses of Medical Records?	34 (28.57%)	26 (21.85%)	46 (38.66%)	13 (10.92%)
5.	Safety of Medical records?	33 (27.73%)	29 (24.37%)	43 (36.13%)	14 (11.77%)
	Average percentage	27.90%	30.08%	30.42%	11.60%

Table-4: Status of specific problem medico-legal Case Management

Sr. No.	Particular of subject matter/ issue	Problemin (%)
1.	No significant History of MLC?	76%
2.	Household Accidents?	67%
3.	Illegal pregnancy/criminal abortion?	63%
4.	Patient of MLC case absconds?	59%
5.	Attendant absconds?	57%
6.	Cases in which Dying Declaration/Deposition required?	51%
7.	Financial Crisis of patient?	50%
8.	Non-cooperation of IO?	43%
9.	Problem related to preservation evidence material?	43%
10.	Attitude and behavior of IO/Agency?	41%
11.	Patient insisting/refusing for MLC Cases?	39%
12.	Forensic medicine/Autopsy?	29%
13.	Court/Witness?	27%
14.	MLC Patient died at higher center?	23%

Original Research Paper

Finger Print Pattern in Different Blood Groups

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Abstract:

Dermatoglyphics is study of pattern of fine ridges on fingers, palms and soles. The term dermatoglyphics was coined by Cummins. The type of finger print is unique and is based on genetic characters of each individual. They develop between 2nd and 3rd months of intra uterine life and remain unchanged in an individual through out life. Finger prints are regarded as the most reliable tool for personal identification. Due to their immense potential particularly in forensic medicine, the study of finger print pattern was carried out in relation to various ABO blood groups.

The study was carried out in the Department of Anatomy, NRI medical college, Chinakakani, Guntur. 506 students of known blood group were selected for the study. The finger prints were collected, studied and analyzed statistically. Thumbs presented high frequency of whorls in A+ves. Index and ring fingers were associated with high frequency of whorls in A-ves and AB+ves.

Key Words: Finger Print, Blood Group, Cummins, Intra Uterine Life

Introduction:

Dermatoglyphics is study of pattern of fine ridges on fingers, palms and soles. The term dermatoglyphics was coined by Cummins. [1] The type of finger print is unique and is based on genetic characters of each individual. They develop between 2nd and 3rd months of intra uterine life and remain unchanged in an individual through out life. They form the most reliable criteria for personal identification.

Forest reported that dermatoglyphics from a part of structural constitution [2]. Blotegrel and Blotegrel expressed the correlation between the physical characters and blood groups [2]. An attempt is made to study the distribution of finger print pattern in different ABO blood groups and to find the correlation between them.

Material and Methods:

The study was carried out in the department of Anatomy, NRI Medical College, Chinakakani, Guntur during the period of 2009-2011. 506 students of known blood group were randomly selected for the study. For taking the finger prints, Cummins ink method was used. Printer's ink was uniformly spread on a glass slab with the help of a roller. Finger prints were taken after washing the hands with soap water and after complete drying. The pattern of finger print, total and absolute ridge counts were observed with the help of hand lens.

The finger print patterns were classified into loops (ulnar and radial), whorls and arches according to Henry's system of classification.

According to Holt [3], the ridge count consists of number of ridges which touch the straight line running from the triradius to the centre of the pattern. Total and absolute finger ridge counts were studied. The distribution of finger print pattern in both hands of individuals with different ABO blood groups was evaluated and analyzed statistically.

Observations:

We studied 506 individuals with known blood groups. Male: Female ratio is 1.12: 1. Majority of individuals belongs to O group, followed by B, A and AB respectively.

Pattern: Loops are most common pattern (56.2%), followed by whorls (39.4%) and arches (4.4%) respectively. Frequency of loops and arches were more in females compared to males. Frequency of whorls is more in males.

Chi-Square is 15.3145 and P-value <0.001

Loops were of high in O gp (58.8%) & least in AB (50%). Whorls are highest in AB group (49.4%) & least in O (37.5%). Arches were of high in B (7%) & least in AB (0.6%).

Loops are highest in O-ves (59.1%) and least in AB-ves (45%). Ulnar loops were highest in A-ves (57.8%) and least in AB-ves (45%). Radial loops were highest in O-ves (5.8%) and AB+ves (4.6%) Whorls were of high frequency in AB-ves (55%) and least in A-ves (32.1%). Arches were of high frequency in A-ves (10%).

The frequency of finger print pattern in different ABO and Rh blood groups on all fingers is of the order that loops were of highest frequency followed by whorls and arches, except

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on ring fingers, the frequency of whorls is highest. But in A+ves, thumbs presented high frequency of whorls. In A-ves and AB+ves the index finger presented high frequency of whorls.

Total finger ridge count and absolute ridge count in different blood groups were tabulated as follows and analyzed statistically.

Loops are similar in Rh+ & Rh- gp. Arches were slightly more in Rh+ & whorls were more in Rh-

Table 1: Distribution of sex & blood groups

Blood group	Males	Females	Total
O group	101 (19.69%)	116 (22.9%)	217 (42.9%)
A group	47 (9.3%)	45 (8.9%)	92 (18.2%)
B group	98 (19.4%)	65 (12.8%)	163 (32.2%)
AB group	22 (4.3%)	12 (2.4%)	34 (6.7%)
Total	268 (53%)	238 (47%)	506 (100%)

Table 7: Pattern on all fingers of O group

	Loops		Whorl		Arches	
	O+ve	O-ve	O+ve	O-ve	O+ve	O-ve
RT	110 (53.6%)	7 (58.3%)	91 (44.4%)	5 (41.6%)	4 (1.9%)	-
RI	101 (49.2%)	6 (50%)	86 (41.9%)	6 (50%)	18 (8.7%)	-
RM	156 (76%)	12 (100%)	43 (21%)	-	6 (2.9%)	-
RR	80 (39%)	7 (58.3%)	121 (59%)	5 (41.6%)	4 (1.9%)	-
RL	154 (75.1%)	9 (75%)	49 (23.9%)	3 (25%)	2 (0.9%)	-
RT	111 (54.1%)	7 (58.3%)	88 (42.9%)	5 (41.6%)	6 (2.9%)	-
RL	116 (56.6%)	4 (33.3%)	67 (32.7%)	8 (66.6%)	22 (10.7%)	-
RM	137 (66.8%)	8 (66.6%)	53 (25.8%)	4 (33.3%)	15 (7.3%)	-
RR	81 (39.5%)	6 (50%)	120 (58.5%)	6 (50%)	4 (1.9%)	-
RL	158 (77%)	5 (41.6%)	47 (22.9%)	7 (58.3%)	-	-

Table 4: Fingerprint pattern

	Loops			Whorls	Arches
	Ulnar	Radial	Total		
O	1242 (57.3%)	33 (1.5%)	1275 (58.8%)	814 (37.5%)	81 (3.7%)
A	490 (53.3%)	18 (1.9%)	508 (55.2%)	389 (42.3%)	23 (2.5%)
B	851 (52.3%)	38 (2.3%)	889 (54.5%)	626 (38.4%)	115 (7.1%)
AB	156 (45.9%)	14 (4.1%)	170 (50%)	168 (49.4%)	02 (0.6%)

Table 11: Total finger ridge count

Blood groups	TFRC Mean \pm S.D	t - value	P -value
O+ve	138.64 \pm 48.2	41.26	<0.0001
O-ve	154.83 \pm 24.66	21.74	<0.0001
A+ve	160.1 \pm 36.28	39.04	<0.0001
A-ve	139.57 \pm 61.55	8.48	<0.0001
B+ve	136.78 \pm 53.85	31.01	<0.0001
B-ve	154.14 \pm 46.41	12.43	<0.0001
AB+ve	152 \pm 44.84	18.55	<0.0001
AB-ve	181 \pm 10.51	34.47	<0.0001
The mean TFRC is highest in AB-ves and least in B+ves			

Table 2: Distribution of Rh factor

Rh factor	O	A	B	AB
Rh+	205 (40.5%)	78 (15.4%)	149 (29.4%)	30 (6%)
Rh-	12 (2.3%)	14 (2.8%)	14 (2.8%)	4 (0.8%)

Table 5: Finger print pattern in Rh blood

	Loops			Whorls	Arches
	Ulnar	Radial	Total		
Rh+	2507 (54.2%)	96 (2.1%)	2603 (56.3%)	1815 (39.3%)	202 (4.4%)
Rh-	240 (54.5%)	7 (1.6%)	247 (56.1%)	179 (40.7%)	14 (3.2%)

Table 6: Fingerprint pattern in blood groups

	O group		A group		B group		AB group		Chi-sq.
	O+ve	O-ve	A+ve	A-ve	B+ve	B-ve	AB+	AB-	
Loops	1204 (58.7%)	71 (59.1%)	427 (54.8%)	81 (57.8%)	816 (54.8%)	73 (52.2%)	152 (50.7%)	18 (45%)	51.0663 <0.0001
Whorls	765 (37.4%)	49 (40.8%)	344 (44.1%)	45 (32.1%)	562 (37.7%)	64 (45.7%)	146 (48.7%)	22 (55%)	16.2771 <0.001
Arches	81 (3.9%)	-	9 (1.1%)	14 (10%)	112 (7.5%)	3 (2.1%)	2 (0.6%)	-	96.7561 <0.001

Table 8: Frequency of finger print pattern

	Loops		Whorls		Arches	
	A+ve	A-ve	A+ve	A-ve	A+ve	A-ve
RT	33 (42.3%)	6 (42.8%)	45 (57.7%)	5 (35.7%)	-	3 (21.4%)
RI	39 (50%)	5 (35.7%)	37 (47.4%)	7 (50%)	2 (2.5%)	2 (14.2%)
RM	49 (62.8%)	8 (57.1%)	27 (34.6%)	4 (28.5%)	2 (2.5%)	2 (14.2%)
RR	29 (37.1%)	8 (57.1%)	49 (62.8%)	6 (42.8%)	-	-
RL	53 (67.9%)	12 (85.7%)	25 (32%)	-	-	2 (14.2%)
RT	32 (41%)	12 (85.7%)	46 (58.9%)	2 (14.3%)	-	-
RI	40 (51.3%)	6 (42.8%)	35 (44.8%)	8 (57.1%)	3 (3.8%)	-
RM	51 (65.4%)	10 (71.4%)	27 (34.6%)	3 (21.4%)	-	1 (7.1%)
RR	39 (50%)	4 (28.5%)	39 (50%)	8 (57.1%)	-	2 (14.2%)
RL	62 (79.5%)	10 (71.4%)	14 (17.9%)	2 (14.3%)	2 (2.5%)	2 (14.2%)

Table 12: Absolute finger ridge count

Blood groups	AFRC Mean \pm S.D	t - value	P -value
O+ve	196.4 \pm 56.2	50.1	<0.0001
O-ve	197.83 \pm 39.96	17.14	<0.0001
A+ve	210.28 \pm 77.95	23.84	<0.0001
A-ve	181 \pm 94.01	7.20	<0.0001
B+ve	192.36 \pm 46.8	50.22	<0.0001
B-ve	189.57 \pm 81	8.72	<0.0001
AB+ve	213.8 \pm 101	11.58	<0.0001
AB-ve	206 \pm 47	8.76	=0.0031

Table 3: Finger print pattern sex-wise

	Males	Females	Total
	(2680)	(2380)	(5060)
Loops	1400	1442	2842
	(52.3%)	(60.5%)	(56.2%)
Whorls	1180	817	1997
	(44%)	(34.3%)	(39.4%)
Arches	100	121	221
	(3.7%)	(5.1%)	(4.4%)

Chi-Square = 50.989 and P-value <0.001.

Table 9: Frequency of finger print pattern

	Loops		Whorls		Arches	
	B+ve	B-ve	B+ve	B-ve	B+ve	B-ve
RT	82	6	59	8	8	-
	(55%)	(42.8%)	(39.6%)	(57.1%)	(5.3%)	
RI	66	7	58	7	25	-
	(44.3%)	(50%)	(38.9%)	(50%)	(16.7%)	
RM	102	8	39	6	8	-
	(68.4%)	(57.1%)	(26.1%)	(42.8%)	(5.3%)	
RR	55	7	86	7	8	-
	(36.9%)	(50%)	(57.7%)	(50%)	(5.3%)	
RL	107	10	38	4	4	-
	(71.8%)	(71.4%)	(25.5%)	(28.5%)	(2.6%)	
RT	74	8	69	6	6	-
	(49.6%)	(57.1%)	(46.3%)	(42.8%)	(4%)	
RI	65	8	57	6	27	-
	(43.6%)	(57.1%)	(38.2%)	(42.8%)	(18.1%)	
RM	90	7	45	5	14	2
	(60.4%)	(50%)	(30.2%)	(35.7%)	(9.4%)	(14.2%)
RR	71	4	72	9	6	1
	(47.6%)	(28.5%)	(48.3%)	(64.3%)	(4%)	(7.1%)
RL	104	8	40	5	6	-
	(69.8%)	(57.1%)	(26.8%)	(35.7%)	(4%)	

Table 10: Frequency of finger print pattern

	Loops		Whorls		Arches	
	AB+ve	AB-ve	AB+ve	AB-ve	AB+ve	AB-ve
RT	16	-	14	4	-	-
	(53.3%)		(46.6%)	(100%)		
RI	14	1	16	3	-	-
	(46.6%)	(25%)	(53.3%)	(75%)		
RM	18	4	12	-	-	-
	(60%)	(100%)	(40%)			
RR	10	2	20	2	-	-
	(33.3%)	(50%)	(66.6%)	(50%)		
RL	20	2	10	2	-	-
	(66.6%)	(50%)	(33.3%)	(50%)		
LT	14	-	16	4	-	-
	(46.6%)		(53.3%)	(100%)		
LI	10	-	18	4	2	-
	(33.3%)		(60%)	(100%)	(6.6%)	
LM	20	3	10	1	-	-
	(66.6%)	(75%)	(33.3%)	(25%)		
LR	10	3	20	1	-	-
	(33.3%)	(75%)	(66.6%)	(25%)		
LL	20	3	10	1	-	-
	(66.6%)	(75%)	(33.3%)	(25%)		

Mean AFRC is highest in AB+ve & least in A-ve.

Discussion:

The general distribution of finger print pattern in different blood groups was of the same order i.e., high frequency of loops, followed by whorls and arches. In the present study high frequency of loops was observed in O group (58.8%) which is consistent with the findings of Hahne [2]. But it differed from the observations of Herch [2] and Bharadwaja [2]

who stated that loops were more associated with A group. The frequency of whorls is highest in AB group (49.4%) which is consistent with the study of Bharadwaja [2]. But it differed from the study of Prateek [4] who stated that whorls were associated more with O-ve group.

In the present study, arches were of high frequency in B group and least in AB group. Loops were of high frequency in O-ves (59.1%) and least in AB-ves (45%). The frequency of whorls ranged from 32.1% (in A-ves) to 55% (in AB-ves). Arches were of high frequency in A-ves (10%). These observations were consistent with findings of Prateek [4] who reported high frequency of arches and low frequency of whorls in A-ves. The distribution of finger print pattern in different blood groups on all fingers followed the same order in that loops were of high frequency followed by whorls and arches, except on ring finger where whorls are of high frequency.

Arches were of high frequency on index finger. But in A+ves, thumbs presented high frequency of whorls. In A-ves and AB+ves, index finger and ring finger presented more frequency of whorls. These observations are in consistent with the findings of Bharadwaj. [2] Highest mean TFRC is observed in AB-ves (181±10.51) and least in B+ves (136.78 ± 53.85). The mean AFRC is highest in AB+ves (213.8 ± 101) and least in A-ves (181 ± 94.01). These findings differed from those of Bharadwaj [2], who reported high TFRC (not the mean) in B group.

Conclusion:

There is an association between distribution of finger print pattern and blood groups. In all blood groups, the frequency of finger print pattern observed is loops were highest followed by whorls and arches respectively. But loops were associated more with O group, whorls with AB group and arches with B group. Thumbs presented high frequency of whorls in A+ves. Index and ring fingers were associated with high frequency of whorls in A-ves and AB+ves. So prediction of blood group to some extent may be possible with the study of finger print pattern which may be of great value in forensic medicine, but influence regional variations, gender and genetic factors should not be overlooked.

References:

1. Cummins H. Palmar and plantar epidermal ridge configuration (Dermatoglyphics) in Europeans and Americans. Am J Phy Anthropol. 1926; 179: 741- 802.
2. Bharadwaja A, Saraswat PK, Agarwal SK, Banerji P, Bharadwaja S. Pattern of finger-prints in different ABO blood groups. Journal of Forensic Medicine and Toxicology. 2004; 21(2): 49-52.
3. Holt SB. The genetics of dermal ridges. Charles C. Thomas Springfield. 1968; 40- 42.
4. Prateek R, Keerthi R Pillai. A study of fingerprints in relation to gender and blood group. J Indian Acad Forensic Med. 2010; 32(1): 11- 14.

Original Research Paper

Trends of Maxillofacial Trauma at Adesh Institute of Medical Sciences and Research, Bathinda, Punjab

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Abstract

A four years retrospective study from April 1, 2007 to March 31, 2011, was conducted to analyze the pattern and magnitude of maxillofacial trauma in medico-legal cases coming to the casualty of Adesh Institute of Medical Sciences and Research, Bathinda, a rural area of Punjab. The study revealed that out of 1237 medico-legal cases 130 (10.5%) suffered maxillofacial trauma. The commonest age group prone to maxillofacial injury was between 16-30 years. Male preponderance was quite evident (6: 1). The commonest cause of such injuries was road traffic accident including 83.1% of the total cases. Soft tissue was the most common type of maxillofacial trauma (52.3%). Most common bones involved were nasal bone and mandible (18.5% each) and the commonest associated injury was involvement of limbs (30.0%). Most common weapon involved was blunt (90.8%). Drawing public attention and awareness towards the traffic rules especially use of helmets by the motorcyclists and separation of pedestrians from motor vehicles could possibly reduce the number of maxillofacial trauma cases.

Key Words: Medico-Legal Case, Maxillofacial Trauma, Road Traffic Accidents

Introduction:

Maxillofacial injuries occur in a significant proportion of medico-legal cases & pose a therapeutic challenges to trauma, maxillofacial and plastic surgeons practicing in developing countries. [1] Being most exposed part of the body face is particularly vulnerable to traumatic injuries. In rural area road traffic accidents are still the major cause of maxillofacial trauma. This may be due to the lack of enforcement of traffic laws by police and insufficient compliance of the population in obeying traffic rules. [2, 3]

The present study is aimed at determining trends of maxillofacial trauma to create public awareness & help guide the development of its preventive measures.

Material and Methods:

The study was retrospective analysis from Apr 1st, 2007 to Mar 31st, 2011 of maxillofacial trauma in all medico-legal cases admitted in the emergency department of AIMSR, Bathinda. The institute is situated in the rural area of South-West Punjab along the side of National Highway (NH-64).

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Information regarding gender, age, demography, mode of occurrence, type of injury was confirmed from the hospital records, victim's attendants and police.

The collected data were analyzed, observations discussed and compared with other studies.

Aims and Objectives:

1. To analyse causative agents & pattern of cases.
2. To draw public attention and awareness towards facial trauma.
3. To suggest preventive measures, this possibly reduce incidence of these cases.

Observations and Results:

Demographic profile: Maxillofacial trauma contributed for 10.5% (130/1237) of all MLC attending the emergency department of the institution during the study period of four years. The percentage of male victims (85.4%) was more than the females (14.6%), in the ratio of 6:1 and the commonest age group involved was between 16-30 years (54 cases; 44.6%) followed by 31-45 years (41 cases; 37.7%) (Table 1) Rural victims (57.7%) were more than the urban which comprised 42.3% of the total cases. (Table-2)

Cause of injury: The most common cause of facial trauma was road traffic accident (108 cases; 83.1%) followed by assault (10 cases; 7.7%) (Table 3) Motorcyclists formed the majority amongst road traffic accidents.

Type of Injury: Out of 130 patients, 68 cases (52.3%) had soft tissue injuries and 58 cases (44.6%) suffered from fracture of different facial

bones. There were 3 cases that had fracture or extraction of teeth and one case had dislocation of Temporomandibular Joint (Table 4). Mandible and nasal bone fractures were the most common types of bony injuries comprising 24 cases each (18.5%). (Table 5)

Associated Injuries: The most common associated injury was involvement of limbs (39 cases; 30.0%) followed by head (28 cases; 21.5%) (Table 5)

Table 1: Age & Gender Wise Distribution

	Male	Female	Total	Percentage
0-15	4	5	9	6.9
16-30	54	4	58	44.6
31-45	41	8	49	37.7
46-60	12	2	14	10.8
>60	0	0	0	0.0
Total	111	19	130	100.0

Table 2: Gender & Area Wise Distribution

Area	Male	Female	Total	%age
Rural	67	8	75	57.7
Urban	44	11	55	42.3
Total	111	19	130	100.0

Table 3 – Cause of Injury Wise Distribution

Cause of Injury	Number	%age
RTA	108	83.1
Assault	10	7.7
FFH	5	3.8
Electric Burns	4	3.1
Burns	2	1.5
Railway Accident	1	0.8
Total	130	100.0

Table 4: Type of Injury

Type of Injury	Number	%age
Soft Tissue	68	52.3
Facial Bones	58	44.6
Teeth	3	2.3
Joint	1	0.8
Total	130	100.0

Table 5: Type of Bone Involved

Type of Bone	Number	%age
Nasal	24	18.5
Mandible	24	18.5
Maxilla	11	8.5
Zygomatic	4	3.1
Orbit	3	2.3
Total	66	50.8

Table 5: Associated Site of Injury

Associated Site	Number	%age
Limbs	39	30.0
Head	28	21.5
Chest	14	10.8
Neck	5	3.8
Abdomen	1	0.8
Total	87	66.9

Table 6: Type of Weapon Involved

Weapon	Number	%ge
Blunt	118	90.8
Sharp	5	3.8
Electric Burns	4	3.1
Flame Burns	2	1.5
Firearm	1	0.8
Total	130	100.0

Weapon Used: Most common weapon involved was blunt (118 cases; 90.8%). (Table 6)

Discussion:

During the period of four years (April 1st, 2007 to March 31st, 2011) the present study revealed that out of total 1237 medico-legal cases admitted in the emergency department 130 (10.5%) cases presented with maxillofacial trauma. The higher prevalence of males in maxillofacial trauma (6: 1) is well documented [1, 2, 4-7]. It is due to greater male exposure on roads, active social life and drug use. Majority of the victims were between the age group of 16-30 year 54 (44.6%). This is possibly due to the fact that during this phase of life there is great personal independence, social excitement, intense mobility, careless driving and involvement in violence. [2, 8]

Rural victims also outnumbered the urban 1.4:1, which probably is due to less awareness towards the traffic rules. The most common cause of maxillofacial trauma was road traffic accident 108 (83.1%), consistent with other studies [1, 2, 7, 8] and amongst them motorcyclists formed the majority which again signifies the importance of traffic rules and use of protection measures. Most of the cases suffered from soft tissue injury 68 (52.3%) and fracture of facial bones 58 (44.6%) and the most common bones fractured were mandible and nasal bone 24 (18.5%) each. This is consistent with other studies. [1, 2, 7, 8] Maximum associated injuries were involvement of limbs and head 39 (30.0%) and 28 (21.5%) respectively. Most common weapon involved in maxillofacial trauma was blunt 118 (90.8%) as face is most exposed part and prone to injuries especially in road traffic accidents.

Conclusion:

Management of injured patient should also be aimed at reducing the incidences of maxillofacial injuries by using preventive and interventional programs. There is need to ensure strict compliance of traffic rules and regulations, implement improved safety devices in automobiles, use of helmets by motorcyclists, separation of pedestrians from motor vehicles and educating people to obey traffic rules especially at school level and in rural areas could reduce the number of maxillofacial trauma.

References:

- Chalya PL, McHembe M, Mabula JB, Kanumba ES and Gilyoma JM. Etiological Spectrum, Injury Characteristics and Treatment Outcome of Maxillofacial Injuries in a Tanzanian Teaching Hospital. J Trauma Manag Outcome. 2011; 5(1): 7.
- Lima Júnior SM, Santos SE, Kluppel LE, Asprino L, Moreira RW and de Moraes M. A Comparison of Motorcycle and Bicycle Accidents in Oral and Maxillofacial Trauma. J Oral Maxillofac Surg. 2011; Jun; 10. [Epub ahead of print]
- Chrcanovic BR. Factors Influencing the Incidence of Maxillofacial Fractures. Oral Maxillofac Surg. Jun 2011; 9. [Epub ahead of print]

4. **Gandhi S, Ranganathan LK, Solanki M, Mathew GC, Singh I and Bithar S.** Pattern of Maxillofacial Fractures at a Tertiary Hospital in Northern India: A 4-year Retrospective Study of 718 Patients. **Dent Traumatol.** Jun 2011; 3. doi: 10.1111/j.1600-9657.2011.00996.x. [Epub ahead of print]
5. **Mesgarzadeh AH, Shahamfar M, Azar SF and Shahamfar J.** Analysis of the Pattern of Maxillofacial Fractures in North Western of Iran: A Retrospective Study. **J Emerg Trauma Shock.** Jan 2011; 4(1): 48-52.
6. **Zix JA, Schaller B, Lieger O, Saulacic N, Thoren HA and Iizuka T.** Incidence, Aetiology and Pattern of Mandibular Fractures in Central

Switzerland. **Swiss Med Wkly.** 2011 May 27; 141:w13207. doi: 10.4414/sm.w.2011.13207.

9. **Agnihotri AK, Joshi HS and Tsmilshina N.** Study of Craniofacial Trauma in a Tertiary Care Hospital, West Nepal. **Medico-Legal Update.** 2005; 5(1): 1-3.
10. **Hussaini HM, Rahman NA, Rahman RA, Nor GM, Al Idrus SM and Ramli R.** Maxillofacial Trauma with Emphasis on Soft-tissue Injuries in Malaysia. **International Journal of Oral and Maxillofacial Surgery.** Sep 2007; 36(9): 797-801.

OBITUARY

Forensic Person Leaves us to settle in Heaven



Professor [Dr.] Baljeet Singh

[1956-2011]

MBBS : 1974 Batch from KGMC, Lucknow, U.P.

MD : Completed in 1983

Joined Department of Forensic Medicine & Toxicology, KGMC, Lucknow as Lecturer in 1984
promoted to Professor in 1999

He died on 9th September 2011 while working as Professor & Head, Forensic Medicine & Toxicology,
CSSMU, Lucknow, U.P.

***A simple noble soul whose life was full of love, sincerity, and ever smiling
We owe our today and tomorrow to noble thoughts and invaluable guidance***

Original Research Paper

Digital Dermatoglyphics in ABO, Rh Blood Groups

*Amit A. Mehta, **Anjulika A. Mehta, ***Vaibhav Sonar

Abstract

Dermatoglyphics, the study of fingerprints are constant and individualistic. The ridge pattern depends upon cornified layer of epidermis as well as dermal papillae. This study was conducted to correlate between digital dermatoglyphics patterns in ABO, Rh blood groups and evaluates their significance. A total of 200 first year MBBS students with known blood groups from 2004 and 2005 batch of IGGMC, Nagpur were included in the study. Fingerprints were obtained by printing method. Parameters studied were arches, whorls, loops.

It was concluded that, whorls were highest in B blood group and the difference was significant with O blood group. Loops were highest in O blood group and were significant with A, B, AB blood groups. Arches were highest in AB blood group and were statistically significant with B and O blood groups. Arches were higher in Rh negative blood group differing statistically with Rh positive blood group.

Key Words: Dermatoglyphics, Whorl, Loop, Arch, Head and Neck Malignancy

Introduction:

Dermatoglyphics is defined as scientific study of epidermal ridges and their configuration on the volar aspect of the palmar and plantar regions. [1] The ridge pattern depends upon cornified layer of epidermis as well as dermal papillae. The characteristics patterns of epidermal ridges are differentiated in their primitive forms during third and fourth month of fetal life. [2] Dermatoglyphics, the study of fingerprints are constant and individualistic. [3] Herschel used fingerprints for personal identification in India. [4]

Fingerprints are classified into three patterns. [5]

1. Loops (60-65%)
2. Whorls (30-35%)
3. Arches (5%)

Blood group system was discovered in 1901 by Karl Landsteiner. [5] So far 19 major groups have been identified of which "ABO" and "Rhesus" groups are of major importance. The genetics of blood groups is proved by the fact that specific diseases are common in particular blood group; for example, duodenal ulcers in "O" blood group; gastric cancer in "A" blood group. [7, 8]

Though extensive research work has been carried out regarding dermatoglyphics and blood group system independently; combined study correlating the two entities are few. So, to bring forth correlation between dermatoglyphics and blood groups and evaluate their significance, present study has been carried out.

Aims and Objectives

1. To evaluate the percentage distribution of ABO, Rh blood groups.
2. To study the correlation between ABO, Rh blood groups and dermatoglyphics patterns.
3. If any such correlation is observed, to evaluate the significance of such correlation by statistical methods.
4. To compare the results of the present study with that of previous workers.

Materials and Methods:

In the present study 200 students were taken, out of which 127 were males and 73 were females. The subjects taken for the study were first year MBBS students from 2004 and 2005 batch of Indira Gandhi Government Medical College, Nagpur. All the subjects were healthy with known blood groups and their age ranges from 17 to 22 years. Written informed consent was taken from the study subjects.

Two types of blood group system were used:

1. ABO blood group system – Subjects were grouped into four blood groups → A, B, AB and O.
2. Rh blood group system – Subjects were grouped into two blood groups → Rh positive and Rh negative.

Dermatoglyphics prints were taken by using Ink Method by "Cummins and Midlo." [1] The materials used were printers, duplicating ink from Kores, cardboard, roller, gauze pads and

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sheets of paper. Subjects were asked to wash and dry their hands. A small quantity of ink was applied over the palm with a gauze piece and smeared thoroughly and uniformly. A sheet of paper was kept at the edge of the table. The palm was placed on the sheet from proximal to distal end. Then it was lifted from the paper in the reverse order. The fingers were also printed by rolling them from radial to ulnar side to include all the patterns. The printed sheets were coded with name, age, sex, blood group. Prints were analysed with the help of magnifying hand glass. Parameters observed were loops, whorls, arches. The data obtained was tabulated and statistically analysed by using Chi-square test and 'Z test' for comparing digital dermatoglyphics between two blood groups separately.

Observations:

In the present study 200 students were taken, out of which 127 were males and 73 were females.

Table 1 shows that maximum (41.5%) of the study subjects belong to B blood group, whereas AB blood group contributes minimum (5.5%) of the study subjects.

Table 2 shows that maximum (95%) of the study subjects belong to Rh positive group, as compared to Rh negative group which contributes only 5% of the study subjects.

Table 3 shows frequency and percentage-wise distribution of various fingertip patterns in A, B, AB and O blood groups. It was observed that percentage of whorls was highest in B blood group (43.25%) and lowest in O blood group (29.02%). Also, percentage of arches in AB blood group was highest (15.46%) as compared to lowest in B blood group (6.15%). Similarly, percentage of loops was highest in O blood group (61.80%) and lowest in AB blood group (47.27%).

Table 4 shows frequency and percentage-wise distribution of various fingertip patterns in Rh positive and Rh negative blood groups. It was observed that in Rh positive blood group 38.37% were total whorls, 8% were total arches, 53.63% were total loops. Also, in Rh negative blood group it was observed that 35% were total whorls, 14% were total arches, 51% were total loops.

Discussion:

The present study reveals that there was an association between distribution of fingerprint (dermatoglyphic) pattern and blood groups. The general distribution pattern of the primary finger print was of the same order in individuals with A, B, AB and O blood group i.e. high frequency of loops, moderate of whorls and

low of arches. The same findings were seen in Rh-positive and Rh-negative individuals of ABO blood group. [9, 10, 11]

In our study, percentage of **whorls** were highest in B blood group (43.25%) and lowest in O blood group (29.02%) which was contrary to the findings of Mahajan et al (1986) and Kshirsagar et al (2001) who observed higher percentage of whorls in O blood group and lower percentage in AB blood group. Similarly, Bharadwaja et al (2004) observed higher percentage of whorls in AB blood group and lower percentage in A blood group.

Percentage of **arches** in AB blood group was highest (15.46%) in our study as compared to lowest in B blood group (6.15%) which correlates with the finding of Mahajan et al (1986) and Kshirsagar et al (2001) of lowest percentage of arches in B blood group. Contrary to our findings, Bharadwaja et al (2004) observed higher percentage of arches in B blood group and lower percentage in AB blood group.

In our study, percentage of **loops** were highest in O blood group (61.80%) and lowest in AB blood group (47.27%) which correlates with the finding of Bharadwaja et al (2004) of having lowest percentage in AB blood group. However, Mahajan et al (1986) and Kshirsagar et al (2001) observed higher percentage of loops in B and AB blood groups respectively; while lower percentage in O blood group.

Also in our study, percentage of **whorls** were highest in Rh +ve blood group (38.37%) and lowest in Rh -ve blood group (35%) which was contrary to the findings of Kshirsagar et al (2001) and Bharadwaja et al (2004).

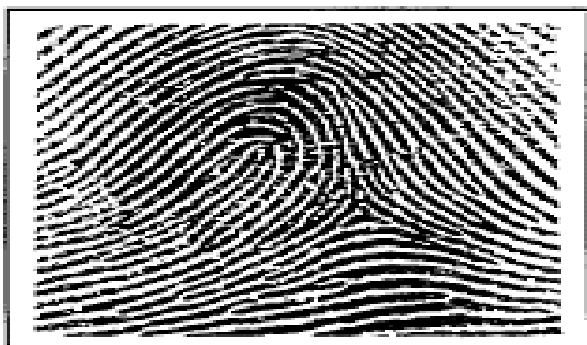
Percentage of **arches** in Rh -ve blood group was highest (14%) in our present study as compared to lowest in Rh +ve blood group (8%) which correlates with the findings of Kshirsagar et al (2001) and Bharadwaja et al (2004).

Also in our study, percentage of **loops** were highest in Rh +ve blood group (53.63%) and lowest in Rh -ve blood group (51%) which correlates with the findings of Kshirsagar et al (2001) and Bharadwaja et al (2004).

Conclusion:

- Whorls were highest in B blood group and the difference was statistically significant with O blood group.
- Arches were highest in AB blood group and the difference was statistically significant with B and O blood group.
- Loops were highest in O blood group and the difference was statistically significant with A, B, AB blood group.

- Arches were highest in Rh -ve blood group as compared to in Rh +ve blood group and the difference was statistically significant.



LOOP



ARCHES



WHORL

References:

- Cummins H. Palmar and Plantar Epidermal Ridge Configuration (Dermatoglyphics) in Europeans and Americans. Am. J. Phy. Anthropol. 1926; 179: 741-802.
- Purkinje JE. Physiological Examination of Visual Organ and of The Cutaneous System. Brilaree / Vratissial Typis Universities, 1823 (translated to English by Cummins H and Kennedy RW: Am. J. Crim Law. Criminal 1940; 31: 343-356.
- Faulds H. The Skin Furrows of the Hand. Nahest 1880; 22: 605.
- Herschel WJ. Skin Furrows of the Hand. Wahul 1880; 23: 76.
- Galton F. Finger Prints. London: Macmillan and Co. 1892.
- Bijlani RL. Textbook of Physiology, 2nd ed. Blood Groups: 93 – 94.
- Ian Aird et al. A relation between cancer of stomach and the ABO blood groups. British Medical Journal 1953; 799 – 801.
- Ian Aird et al. The blood groups in relation to peptic ulceration and carcinoma of colon, rectum, breast and bronchus. British Medical Journal 1969; II: 315 – 321.
- Kshirsagar SV, et al. Study of fingerprint patterns in ABO blood group. J Anat Soc India 2003; 52 (1) : 82-115.
- Mahajan AA. Dermatoglyphics and ABO blood group. Thesis submitted for MS Anatomy, Aurangabad, 1986.
- Bharadwaja A, et al. Pattern of fingerprints in different ABO blood groups. JIAFM, 2004; 26(1): 6 – 9.

Table 1: Distribution of A, B, AB and O blood groups

Blood group	Male		Female		Total	
	No.	%	No.	%	No.	%
A	25	19.69	20	27.40	45	22.50
B	54	42.51	29	39.63	83	41.50
AB	08	6.30	03	4.10	11	5.50
O	40	31.50	21	28.77	61	30.50
Total	127	100	73	100	200	100

Table 2: Distribution of Rh positive and Rh negative blood groups

Bld gp.	Male		Female		Total	
	No.	%	No.	%	No.	%
Rh +ve	121	95.28	69	94.52	190	95
Rh -ve	06	4.72	04	5.48	10	5
Total	127	100	73	100	200	100

Table 3: Distribution of various fingertip patterns in A, B, AB and O blood groups

Blood group	whorls (%)	Arches (%)	Loops (%)	Total (%)
A	187(41.56)	42(9.33)	221(49.11)	450(100)
B	359(43.25)	51(6.15)	420(50.60)	830(100)
AB	41(37.27)	17(15.46)	52(47.27)	110(100)
O	177(29.02)	56(9.18)	377(61.80)	610(100)

Table 4: Various fingertip patterns in Rh positive and Rh negative blood groups

Blood Group	Whorls (%)	Arches (%)	Loops (%)	Total (%)
Rh +ve	729 (38.37)	152 (8.0)	1019(53.63)	1900 (100.0)
Rh -ve	35 (35.0)	14 (14.0)	51 (51.0)	100 (100.0)

Original Research Paper

Pattern of Neck Findings in Suicidal Hanging

A Study in Manipur

*Th.Meera, **M. Bapin Kumar Singh

Abstract

Deaths due to hanging are common among suicides. In a study on 84 cases of suicidal hanging brought for autopsy to the mortuary of the Regional Institute of Medical Sciences, Imphal during 2004 to 2008, it was observed that 77.38% of the cases were males and 22.62% were females. The highest number of victims was in the age range of 21-40 years. 73.81% of the cases committed suicide indoors and 57.14% of them used ropes as ligature material. 85.75% of the victims had fixed knots with a single turn and 10.71% had slip knots. Complete atypical hanging constituted 88.10% of the cases. 23.81% of the cases had tear of the carotid artery and 3.57% had hyoid fractures. None of the cases had cricoid or trachea fractures. The neck findings vary depending upon the composition, multiplicity and tightness of the ligature material used, the suspension time, type of hanging, etc. Hence, the possible findings in a suspected case of hanging must be always anticipated so as to avoid any erroneous opinion.

Key Words: Suicidal Hanging, Ligature Mark, Hyoid Fracture, Carotid Artery Tear

Introduction:

Hanging is that form of asphyxia which is caused by suspension of the body by a ligature which encircles the neck, the constricting force being the weight of the body [1] It is a common method of committing suicide. In India, hanging is among the top five methods of choice for committing suicide, the other preferred methods being poisoning, drowning, burning and jumping from a tall structure, etc. [2] According to the NCRB (National crime reports bureau) report 2009, the incidence of suicide by hanging in India is 31.7% in 2007, 32.2% in 2008 and 31.5% in 2009. In medicolegal practice, a meticulous postmortem examination supplemented with a thorough crime scene examination often helps in coming to a concrete opinion in hanging cases.

Methods:

84 cases of suicidal hanging brought for autopsy to the mortuary of the Regional Institute of Medical Sciences, Imphal during 2004 to 2008 have been considered for this study. A detailed history along with the crime scene investigation findings and photographs were thoroughly studied before conducting the postmortem.

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A standard autopsy technique was adopted and a meticulous examination of the neck findings was carried out. The findings were recorded and analysis was done to find out the age and sex incidence of suicidal hanging, type of hanging, type of the ligature material used, number of turns of the ligature and type of the knot, contusion of neck tissues, fracture of hyoid and thyroid, tear of carotid artery, etc.

Results:

It was observed that that maximum number of cases was seen in the age group 21-30 years (25%) followed by 31 - 40 years (22.62%). Males accounted for 77.38% of the cases as compared to 22.62% in females in the ratio of 3: 1. (Table 1)

73.81% of the cases occurred indoors viz. bedroom, bathroom, toilet, etc. and the remaining occurred outdoors (26.19%) as shown in Table 2. Complete and atypical hanging was seen in 88.10% of the cases and partial hanging in only 8.33%. Typical hanging was seen in only 3 (3.57%) cases. (Table 3) 36 cases (57.14%) used cloth as a ligature material which were either scarf, towel, Khudei (Lungi worn by men in the local population), etc. and 42.86% used ropes - nylon or jute. (Table 4)

It is observed from Table 5 that single turn of the ligature with a fixed knot was seen in 72 cases (85.71%) and slip knot in 10.71% of the cases. 97.62% of cases showed pale, white, glistening tissue underneath the ligature mark and only 2.38% of the cases showed mild contusion of neck tissue. (Table 6) In 3 cases

(3.57%), there was fracture of the greater cornua of the hyoid bone and fracture of the thyroid cartilage in 2.38% of the cases (Table 7), and these cases were above 40 years of age. None of the cases had fracture of the cricoid or trachea. As shown in Table 8, transverse tear of the carotid artery was seen in 22 cases (26.81%) of the cases and 3 out of these 22 cases had bilateral carotid tear.

Discussion:

In the present study, the maximum number of cases was seen in the age group 21-40 years. These findings may be compared with the findings of Sharma BR et al [3] and Nikolic S et al. [4] Some of the causative factors in these age groups in the present study include drug abuse, mental illness, unemployment, poverty and family problems in males; and poverty and marital disharmony mostly in females.

26.19% of the cases committed suicide outdoors while the remaining 73.81% were found indoors. This may be compared with the observation of Ahmad and Hossain [5] in a study in Bangladesh who observed that 97.93% of the cases were recovered from inside the living rooms and 2.06% from outside. Charoonnate et al [6] observed higher number of incomplete hanging cases (55%) compared to complete hanging cases (45%) in a study at Thailand. This is in sharp contrast to the present study where complete hanging was seen in 91.67% of the cases.

This may be explained by the fact that most of the victims in the present study committed suicide by hanging indoors and when a victim attempts to commit suicide in a room, they usually use a chair or a stool for standing to reach the point of suspension which may be ceiling fans, beams, etc. and later on push them away by feet and hence most had complete suspension. This opinion is in concurrence with the explanation of Ahmad and Hossain. [5] Atypical ligature mark was observed in majority of cases in studies conducted by Simonson J [7] and Feigin G [8], which may be compared with the present study.

57.14% of the cases used cloth as a ligature material; this could be because of the fact that clothes are usually the most easily available ligature material in a household at the material moment. Similar findings were observed by Ahmad and Hossain. [5]

85.71% of the cases had single turn of the ligature with a fixed knot and 10.71% had single turn with a slip knot, and 3 cases (3.57%) had double ligature marks. Similar findings were observed in the studies conducted by Sarangi MP [9] and Sharma ASK. [10] The possible

explanation is that it could be because of the fact that in most of the cases the ligature materials were long, and strong enough to suspend the victim with a single turn.

In a study by Sharma BR et al, [3] contusions and lacerations of musculature were found in 34% of the cases. This is in sharp contrast to the findings of the present where only 2.38% of the cases showed contusion of the neck tissue, and this was observed in those victims with slip knots of the ligatures.

Green et al [11] did a prospective study of 40 cases of suicidal hanging in Australia and detected hyoid bone and/or thyroid cartilage fractures in 47.5%(17). Paparo and Siegel [12] found fractures of the hyoid bone and thyroid cartilage in 20% and 46% in a prospective study. In the present study, fractures of the hyoid bone and thyroid cartilage were detected in only 3.57% and 2.38% of the cases. Moreover, defining fractures only as ante-mortem fractures can cause a lower frequency of fractures than studies that do not rule out postmortem fractures. [11] In this study, hyoid bone and thyroid cartilage fractures were seen in those victims who were in the older age ranges i.e. above 40 years, the reason being ossification increasing with the age after 30 years. Similar findings were observed in the studies done by Sarangi MP [9], Betz P and Eisenmenger W. [13]

Further, fractures of the hyoid bone and thyroid cartilage were observed in the incomplete hanging group by Charoonnate et al [6], while the present study found no fracture in the partial hanging group. However, the present study may be compared with Sharma et al [14] who observed that fractures were more frequent in complete hanging cases. None of the cases had fracture of the trachea or cricoid cartilage. This is in agreement with the findings of Green H et al. [11]

In a study by Suárez-Peñaranda JM [15], vascular lesions are clearly more infrequent: intimal injuries were found in the carotid artery (9.1%) and ruptures of the carotid adventitial layer (21.7%). This could be partially associated with the use of a hard fixed noose and body weight. In the present study, 26.19% of the cases showed tear of the carotid artery and most of the victims used ropes with a fixed noose and there was involvement of drop from a relatively higher point of suspension.

Conclusion:

Neck findings in suicidal hanging cases vary depending upon the composition, multiplicity and tightness of the ligature material used, the suspension time, type of hanging, etc. Hence, the possible findings in a suspected case

of hanging must be always anticipated so as to avoid any erroneous opinion.

Table 1: Age and sex distribution

Age (in years)	Male		Female	
	No.	P.C (%)	No.	P.C
0 – 10	0	0	0	0
11 – 20	4	4.76	1	1.19
21 – 30	21	25.00	9	10.71
31 – 40	19	22.62	5	5.95
41 – 50	13	15.48	4	4.76
51 & above	8	9.52	0	0
Total	65	77.38	19	22.62

Table 2: Place of occurrence

Place	No.	P.C (%)
Indoors	62	73.81
Outdoors	22	26.19
Total	84	100

Table 3: The type of hanging

Type of hanging	Typical		Atypical	
	No.	P.C	No.	P.C (%)
Complete	3	3.57	74	88.10
Partial	0	0	7	8.33
Total	3	3.57	81	96.43

Table 4: Type of ligature material used

Ligature material	No.	P.C (%)
Cloth	48	57.14
Rope	36	42.86
Total	84	100

Table 5: Number of turns of ligature and type of knot

No. of turns	Fixed knot		Slip knot	
	No.	P.C	No.	P.C
One	72	85.71	9	10.71
Two	3	3.57	0	0
More than two	0	0	0	0
Total	75	89.28	9	10.71

Table 6: Injury to the neck tissue

Type	No.	P.C (%)
Without contusion	82	97.62
With contusion	2	2.38
Total	84	100

Table 7: Incidence of hyoid and thyroid fractures (n = 5)

Fracture	No.	P.C
Hyoid	3	3.57
Thyroid	2	2.38
Cricoid	0	0
Trachea	0	0

** All the cases were above 40 years

Table 8: Incidence of carotid artery tear (n=22; 26.19%)

Carotid tear	No.	P.C (%)
Without any other neck structure injury	20	23.81
With hyoid fracture	1	1.19
With thyroid fracture	1	1.19

Bilateral carotid tear: 3 cases

References:

- 1.Reddy KSN. Mechanical asphyxia. The essentials of Forensic Medicine and toxicology, 20th Edn. K. Suguna Devi, Hyderabad. 2001:286-293.
- 2.Pillay VV. Mechanical asphyxia, Text of Forensic Medicine and toxicology 15th Edn. Paras Medical Publishers, Hyderabad, New Delhi; 2010: 279 -286
- 3.Sharma BR, Singh VP, Harish D. Neck structure injuries in Hanging- comparing retrospective and prospective studies. Med Sci Law. 2005 Oct;45(4):321-30.
- 4.Nikolic S, Micic J, Atanasijevic T, Djokic V, Djonic D. "Analysis of Neck Injuries in Hanging" The American Journal of Forensic Medicine and Pathology 2003; 24(2): 179-182.
- 5.Ahmad M, Hossain MZ. Hanging as a method of suicide retrospective analysis of postmortem cases. JAFMC Bangladesh. 2010 Dec; Vol 6 No 2: 37-39
- 6.Charoonnate N, Narongchai P, Vongvaivet S. Fractures of the Hyoid Bone and Thyroid Cartilage in Suicidal Hanging. J Med Assoc Thai 2010; Vol. 93 No. 10:1211-1216
- 7.Simonsen J. "Patho-anatomic findings in neck structures in asphyxiation due to hanging: a survey of 80 cases". Forensic Science International 1988; 38:83-91.
- 8.Feigin G. "Frequency of neck organ fractures in hanging". American Journal of Forensic Medicine & Pathology 1999; 20(2): 128-130.
- 9.Sarangi M.P. "Ligature Mark/s- In Forensic Pathologist's Perspective." Journal of Forensic Medicine and Toxicology 1998; 15(1): 99-102.
- 10.Sharma ASK, Murthy OP, Dogra TD. "Study of ligature marks in asphyxial deaths of hanging and strangulation". International Journal of Medical Toxicology and Legal Medicine 2002; 4(2):21-24.
- 11.Green H., James R. A., Gilbert J. D. and Byard R. W. "Fractures of the hyoid bone and laryngeal cartilages in suicidal hanging". Journal of Clinical Forensic Medicine 2000; 7(3): 123-126.
- 12.Paparo GP, Siegel H. Neck markings and fractures in suicidal hangings. Forensic Sci Int. 1984 Jan;24(1):27-35.
- 13.Betz P and Eisenmenger W. "Frequency of throat-skeleton fractures in hanging". The American Journal of Forensic Medicine & Pathology 1996; 17(3): 191-193.
- 14.Sharma BR, Harish D, Sharma A, Sharma S, Singh H. Injuries to neck structures in deaths due to constriction of neck, with a special reference to hanging. J Forensic Leg Med 2008; 15: 298-305.
- 15.Suárez-Peñaranda JM, Alvarez T, Miguéns X, Rodríguez-Calvo MS, de Abajo BL, Cortesão M, Cordeiro C, Vieira DN, Muñoz JI. Characterization of lesions in hanging deaths. J Forensic Sci. 2008 May; 53(3): 720-3.

Original Research Paper

Suicidal Hanging: A Prospective Study

* N. Vijayakumari

Abstract

The objective of this study was to focus on various factors associated with suicide by hanging at Chennai, India; with a view to identify the areas of intervention. A prospective study was carried out on 65 cases of death due to suicide by hanging which was received by the Institute of Forensic Medicine, Madras Medical College, Chennai, India, during the period of August 2008- July 2009.

In the present study, 84.7%% of the cases were below the age of 40years, time of hanging in 50.8% of the cases was 3am-12noon, place of hanging in 95.5% of the cases was their residence, 92.3% were living with their family and 69.2% were married. Most frequent precipitating factors were marital unhappiness (33.8%), problems associated with organic disease (18.5%) and dowry harassment (16.8%). To reduce the incidence of suicides by hanging, there is urgent need to focus on these factors.

Key Words: Chennai; Suicide, Hanging, Precipitating Factor

Introduction:

Suicide is a major socioeconomic and public health issue worldwide. Hanging is one of the 10 leading causes of death in the world accounting more than a million deaths annually [1]. In India, hanging is second common method of committing suicide after poisoning. Over the past 30 years the incidence of suicide by hanging is on increase, especially among young adults [2]. The fact that 71% of suicides in India are by persons below the age of 44 years imposes a huge social, emotional and economic burden on our society [3]. Its prevention is still a challenging job for public health authorities. A detailed knowledge of various factors associated with suicidal hanging in that particular geographical area is very much necessary to prevent such suicides. Keeping this in mind we conducted a prospective study at Chennai, to focus on the various factors associated with suicidal hanging; with a view to identify the areas of intervention.

Material and Methods:

This prospective study was conducted during August 2008 to July 2009 at the Institute of Forensic Medicine, Madras Medical College, Chennai, India. During this period we received 65 cases of deaths due to suicide by hanging for autopsy.

We included cases in which the history and scene of crime examination report given by the investigating police officer and history given by the close relatives and friends who attended the inquest were suggestive of suicide by hanging.

Information regarding age, sex, marital status, living circumstances, place and time of hanging, ligature material and ligature points used, any history of alcoholism and drug addiction (details of toxicology report) were collected. We took a detailed history regarding the possible precipitating factors for committing suicide. We also collected information regarding previous illnesses and the treatment pattern.

Results:

In the present study, 65 cases of deaths due to suicide by hanging were studied. In that 52.3% were men and 47.7% were women. The commonest age involved was 21-30yrs, 38.5% of cases. We observed maximum number of suicidal hanging (84.7%) by the persons below the age of 40years. Majority of suicidal hanging by males was in the age group of 31-40 years (21.6%) but in females it was 21-30 years (24.6%) (Table1). At the time of committing suicide, 92.3% of cases were living with their family and 69.2% were married (Table 2). In 95.5% of cases, the place of hanging was at their own residence. Most of the cases (50.8%) hanged themselves during the early hours of the day around 3am-12noon. The most commonly used ligature materials were nylon materials (saree, dupatta, rope) and ligature points were ceiling fans, beams and window grills. The commonest reason for hanging was marital unhappiness (33.8%) followed by organic

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disease (18.5%), dowry harassment (16.8%), financial problems (7.7%), failure in exams (6.2%) and psychiatric illness (6.2%). Other rare causes were dispute with parents/children/lover (4.6%), infertility (3.1%) and unemployment (3.1%) (Table 3). Suicide note was left behind in only five cases. Post mortem blood investigation does not reveal alcohol intoxication or drug addiction in any of the cases.

Discussion:

In the present study of 65 cases of suicidal hanging, the incidence among males and females was almost equal. In Chennai, significant number of women too commits suicide by hanging. Majority (84.7%) of the victims were below the age of 40 years. The incidence among females below the age of 30 yrs was on higher side (38.5%) when compared to males (18.4%). High suicide rate among young adults, especially females impose a huge social, emotional and economic burden on our society. Both in developed and developing countries suicides among young seem to be on increase. [4, 5, 6, 7] Stresses associated with marriage, dependency, dowry related problems, interpersonal differences with spouse and his relatives were the major factors in Indian women. [8]

Time of hanging in 50.8% of cases was during the early hours of the day around 3am-12noon and 21.5% in the afternoon i.e., when most of them were either asleep or gone out to work. Very few people hanged themselves in the evening and night hours. This is in contrast to other studies where night time was commonly preferred [5].

The most commonly used ligature materials were nylon materials (saree, dupatta and rope) and ligature points were ceiling fans, beams and window grills. In another study done by B.R. Sharma et al. (2008) dupatta was the commonly used ligature material by females, whereas saree was used by males [5, 9]. Easy availability of these materials widely makes restriction very difficult. Hence to prevent suicides by hanging we should identify the various precipitating factors and focus on its prevention.

At the time of committing suicide, majority (92.3%) of cases was living with their family and the place of hanging was their residence. We observed that 69% of them were married and living together, 6% were either divorced or separated. The main precipitating factor in majority of the cases was marital unhappiness (34%). This correlates with the above fact. Similar observation has been reported in other studies as well [3, 6, 10, 11].

Competitive life, increased aspiration, financial instability, lack of meaningful relationships, inability to solve interpersonal problems was the main contributing factors. In India, breakdown of joint family system which provided emotional and social support system is also an important factor for family dysfunctions. [13] Conflicts relating to marriage like dowry harassment (16.8%) which is one of the major social evil in our country also had a crucial role. [6, 11]

Organic illness was also an important precipitating factor (18.5%) next to marital unhappiness. In our study, chronic abdominal pain, cardiac disease, epilepsy and cancer were frequently associated with suicidal hanging. This observation is consistent with other studies. [10, 11] Association with psychiatric illnesses was just 6.2%. One was a case of schizophrenia and other was a case of chronic depression. But in developed countries, psychiatric illnesses were the common precipitating factor. [6, 13, 14] Inability to take proper treatment due to financial problems, poor prognosis, concerns of debility, fear of posing a burden to loved ones were the reasons for committing suicide. Here the treating doctors, nurses, other health care professionals and family members have to play a crucial role. Identifying the depressed patients and treating them will prevent many suicides.

Among the 7 cases of suicidal hanging in the age group of 11-20 yrs, in 4 cases (6.2%) the precipitating factor was failure in school examinations. It is a tragic and preventable public health problem all over the world [5, 11]. High competition among school children, high expectation from parents and teachers, inability to attain their goals are the main reasons for such suicides. In contrast to other studies, the incidence of suicidal hanging due to financial problems (7.7%), unemployment (3.1%) and infertility (3.1%) were very less.

Conclusion:

The high incidence of suicidal hangings among young adults, especially females imposes a huge socioeconomic burden on our society. Private nature of hanging and easy availability of ligature materials and ligature points makes prevention of suicide by hanging a difficult task. Marital unhappiness, problems associated with organic illnesses and dowry harassment are the main causative factors for suicidal hangings at Chennai. Family members, friends, teachers, healthcare professionals especially psychiatrists have to play a major role in primary and secondary prevention of suicidal hangings. Also a change regarding social practices and perceptions in India will prevent most of the suicides.

References:

1. Mohanty S, Sagu H, Mohanty MK, Patnaik M. Suicide in India: A four year retrospective study. J Forensic Leg Med 2007; **14**(2):185-189.
2. David Gunnell, Olive Bennewith, Keith Hawton, Sue Simkin and Nav Kapur. The epidemiology and prevention of suicide by hanging: a systematic review. International Journal of Epidemiology 2005; **34**(2):433-442.
3. Vijaykumar L. Suicide and its prevention: The urgent need in India. Indian J Psychiatry 2007; **49**:81-4.
4. Bennewith Olive, Gunnell David, Kapur Navneet, Turnbull Pauline, Simkin Sue, Sutton Lesley, et al. British Journal of Psychiatry 2005 ;**186**(3):260-261.
5. Ahmad M, Hossain MZ. Hanging as a method of suicide-retrospective analysis of postmortem cases. JAFMC Bangladesh 2010; **6**(2):37-39.
6. Eddlesto M, Rezvi SMH, Hawton K. Deliberate Self Harm in Sri Lanka; an overlook tragedy in the developing world. BMJ 1998; **7151**:133-135.
7. Wassermann D, Cheng Q, Jiang GX. Global suicide rates among young people aged 15–19. World Psychiatry 2005; **4**:114–20.
8. Lalwani S, GASK Sharma, Rautji R, T Millo. Study of suicide among young and middle age adults in South Delhi. Indian J. Prev. Soc. Med. 2004; **35**:173-178.
9. Sharma BR, Harish D, Anup Sharma, Swati Sharma, Harshabad Singh. Injuries to neck structures in deaths due to constriction of neck, with a special reference to hanging. Journal of Forensic and Legal Medicine 2008; **15**:298-305.
10. Ravindra Fernando, Medhani Hewagama, Priyangika, Sonali Range, and Shashi Karunaratne. Study of suicides reported to the Coroner in Colombo, Sri Lanka. Medicine science and the law 2010; **50**(1):25-28.
11. Binaya K. Bastia, Nilamadhab Kar. A Psychological Autopsy Study of Suicidal Hanging from Cuttack, India: Focus on Stressful Life Situations. Archives of Suicide Research 2009; **13**(1):100-104.
12. De Leo D. The interface of schizophrenia, culture and suicide, Suicide Prevention-Meeting the challenge together. Vijayakumar L, editor. Orient Longman: 2003. P.11-41.
13. David N. Juurlink, Nathan Herrmann, John P. Szalai, Alexander Kopp and Donald A. Redelmeier. Medical Illness and the Risk of Suicide in the Elderly. Arch Intern Med. 2004; **164**:1179-1184.

14. Angst J, Angst F, Stassen HH. Suicide risk in patients with major depressive disorder. J Clin Psychiatry 1999 ;(60 suppl) 2:57-62.

Table 1: Distribution of Suicidal Hanging Cases by Gender and Age Groups

Age groups (yrs)	Gender				Total	
	Male		Female			
	No.	%	No.	%	No.	%
<20	3	4.5	9	13.9	12	18.4
21-30	9	13.9	16	24.6	25	38.5
31-40	14	21.6	4	6.2	18	27.8
41-50	4	6.2	1	1.5	5	7.7
51-60	2	3.1	1	1.5	3	4.6
61-70	1	1.5	-	-	1	1.5
>70	1	1.5	-	-	1	1.5
Total	34	52.3	21	47.7	65	100

Table 2: Marital Status of Victims of Suicidal Hanging

Marital status	No.	%
Married	45	69.2
Single	13	20.0
Widowed	03	4.6
Separated	02	3.1
Divorced	02	3.1
Total	65	100

Table 3: Reason Given at the Inquest for Committing Suicide

Reason for suicide	No.	%
Marital unhappiness	22	33.8
Organic disease	12	18.5
Dowry harassment	11	16.8
Financial problems	05	7.7
Psychiatric illness	04	6.2
Failure in school exams	04	6.2
Dispute wit parents/children/lover	03	4.6
Infertility	02	3.1
Unemployment	02	3.1
Total	65	100

Review Paper

Medicolegal Importance of Inca Bone in Forensic Identification

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Abstract

Skull is usually available human bone for establishing personal identity. Presence of Inca bone in human skull is one such feature that may be identified on radiological examination and if earlier recorded help in establishing the identity of deceased. Complete division of membranous and cartilaginous part of occipital bone by a transverse suture extending between the two lambdoid sutures at the level of highest nuchal line above the external occipital protuberance, results in rare cranial variation presenting as Inca bone. During medicolegal examination of one male skull at Madhya Pradesh Medicolegal Institute Bhopal, presence of Inca bone was found.

The interparietal bone is formed by a part of the squamous occipital bone bounded by two lambdoid sutures on two sides and additional longitudinal suture on both sides between lambdoid suture and external occipital protuberance forming diamond shaped Os Incae Centrale that can also be considered as intra-occipital bone. Such rare findings have significant anthropological and embryological basis. Specific anatomical feature if earlier documented in the clinico-radio-pathological reports of the deceased provides opportunity for establishing the identity.

Key Words: Inca Bone, Transverse Suture, Forensic Identification, Highest Nuchal Line, Lambdoid Suture

Introduction:

The identification of skeletal remains is usual problem faced by the forensic experts. Identification of specific osteological features in form of congenital or acquired malformations and its comparison with the antemortem clinico-radiological hospital records of the deceased help in establishment of the identity. Forensic experts may come across such rare congenital anomalies during the examination of skeletal remains. [1]

The interparietal part of occipital bone may be divided by a transverse suture at the level of highest nuchal line and squamous part of occipital bone above this suture is the Inca bone. It was first described by M.E. Rivero and S.J. Tschudy (1851) in cranium of Peruvian origin. The same variation was also described as Os interparietale.

Transverse suture extends between the two lambdoid sutures at the highest nuchal line above external occipital protuberance dividing the membranous and cartilaginous part of occipital bone.

The Inca bone may be subdivided by the presence of additional longitudinal and transverse suture leading to bipartite, tripartite and multipartite Inca bones. Os Incae centrale is diamond shaped and formed by additional longitudinal suture extending between external occipital protuberance and lambdoid suture of both sides. [2, 3, 4]

The frequency distribution of the Inca bone in modern populations has been studied by various observers in different populations. The incidence of Inca bone is very low in the western hemisphere of the old world except for sub-Saharan Africa. Among the modern population originally derived from eastern Asian population stock, the frequencies are highest in some of the marginal isolated groups. In Indian sub-continental population relatively low incidence of Inca bone was reported by Srivastava (1977) and Pal et al (1984) who have studied interparietal and pre interparietal bones. [5, 6, 7, 8, 9, 10, 11]

Purkait R. and Chandra H. (1989) had suggested nomenclature of Inca variants on the basis of ossification centres and described its medicolegal importance as corroborative evidence for identity of deceased. [12]

On the basis of application of this knowledge in forensic identification, a case of Inca bone is reported which was detected during the medicolegal examination of skull and other

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skeletal remains of an unknown burnt body that were recovered from Vidisha district in Madhya Pradesh. It is a rare anomaly reported in central India region. The clinico-radiological importance and forensic implications are discussed.

Case Report: An unknown burnt body of male, aged 50-55 years was recovered from farm at Jivajipur in Vidisha district of Madhya Pradesh. The burnt face of the body was wrapped in 2 plastic bags of fertilizers. All the body organs stomach, intestine, liver, spleen, urinary bladder and genital organs were burnt. Preliminary investigation had not established the identity of the deceased.

The dead burnt body was examined at Madhya Pradesh Medicolegal Institute at Bhopal, Madhya Pradesh. Examination revealed a burnt male body of average built aged 50-55 years having burns of 5 to 6 degree. Antemortem injury over occipital region was caused by hard and blunt heavy object along with fracture of 5th cervical vertebra. Periosteal echmyosis was present over the occipital region. Face and anterior aspect of neck were deeply burnt and charred. Post mortem burns were over face, neck, upper limbs, chest and abdomen and lower limbs. Death was homicide in nature and injury in the neck was sufficient to cause death. Duration of death was calculated to be in between 24-36 \pm 12 hours.

During skull examination Inca bone was found. The Os Incae Centrale is bounded by right and left superior-lateral border formed by part of lambdoid suture extending from lambda upto 3 cms on both sides and inferio-medial border formed by two right and left oblique suture of 4.5 cms extending from approximately mid of the lambdoid suture to external occipital protuberance encompassing the diamond shaped area. The investigating agency was provided with the information along with the postmortem report that can be used for the confirmation of the identity of the deceased if any comparable antemortem radiographic record of lost people in that region was made available during investigation.

Discussion:

Occipital bone forming the back and base of the cranium, is trapezoid and internally concave. It encloses the foramen magnum, expanded plate postero-superior to this is squama, and the massive quadrilateral part anterior to foramen magnum is basilar part. On each side of the foramen are lateral parts, Squama is convex externally with external occipital protuberance along with two curved lines extending laterally called as superior nuchal lines and above it is faintly perceptible

highest nuchal line. The superior angle at the squama summit meets the occipital angle of parietal bones. The lateral angles of the squama project between the parietal and temporal bones. The lambdoid borders extend from superior to lateral angles. Variety of ossicles may occur at or near the lambda known as interparietal. [1, 2, 11]

The formation of Inca bone has embryological and osteological basis. The portion of the occipital bone inferior to superior nuchal line ossified in cartilage whereas superior portion ossified in membrane. A common description of occipital ossification states that the highest nuchal lines the squama is developed in a fibrous membrane and ossified from two centers, one on each side from above the second fetal month; this part may remain separate as interparietal bone.

The rest is preformed in cartilage below the highest nuchal lines, the squama ossifies from two centers appearing in about the seventh week and soon uniting, these two regions of squama unite in the third post natal month but the line of union is recognizable at birth. To the cartilaginous supra occipital part, five endochondral centers, a pair each for right and left lateral segments and one for the central segment (Kerckring's Centre) appears.

The formation of Inca bone is caused because of failure of fusion of interparietal bones formed by primary ossification centres. Purkait R. and Chandra H. (1989) had described these primary ossification centres as elements and named them as 1, 2, 3 and 4. Various variant presentations of Inca bone were described on the basis of possible combinations of fusion and non fusion of these ossification centres or elements. [5, 9, 10, 12, 13] Inca bone being a part of occipital bone can also be considered as intraoccipital bone thus giving a novel dimension to existing understanding.

Srivastava (1977) after study of 620 human skulls for anomalies of occipital squama has proposed that the membranous or dermal part above the nuchal lines as compounded of interparietal and pre-interparietal parts, the interparietal consisting of two lateral plates and a central piece. The intra membranous centre's proposed for these are a pair for each lateral plate and two for the central piece, additionally a pair of centres for pre interparietal bone. [9,10] Pal et al (1984) have stated that the pre interparietal elements are sutural but it has to be considered that much uncertainty persists regarding the status of these accessory ossicles. Fusion may fail, partly or completely, between any of these elements. [6, 7]

Anthropologically, the occurrence of Inca bone in fossils of hominids such as Australopithecus, Homo erectus and early homosapiens was described by various authors. [11, 14, 15] Wu and Wu (1985) reported that presence of Inca bone was important primitive feature found in Chinese Homo erectus and early Homo sapiens. [15] Thus the Inca bone regarded as one of the character that forms the morphological basis of multiregional model of origin of modern human population in East Asian region. [16] Pedigree studies showed that the Inca bone is inherited as dominant trait with 50% penetrance and suggested genetic background for occurrence of Inca bone. [17] The earlier studies in central and south Asian region estimated the frequency of all types of Inca bone to be 0.0732, 0.0635, 0.0403, 0.0056, 0.0514, 0.0 in Tibetan and Nepalese, Assam and Sikimise, East Indian, South Indian, Northwest Indian and Kazakhs population respectively. [11]

Skull is an important bone in identification of an individual. The skull is implicated in the determination of gender, age and sex. Ossenbergl (1969) discussed that wormian bones are more common in skulls with Inca bones than those without it. [3] She had pointed that among modern population the frequency of Inca bone are highest in marginal isolates those have retained traits of early ancestral population. Inca bone is considered to be regional character of East-Asians providing evidence of regional continuity. Such occurrence of Inca bone has not only paleoanthropological, morphological, and evolutionary importance but plays important role in medicolegal cases for establishing identity.

Conclusion:

During medicolegal investigations, detection of congenital and osteological anomalies play vital role in identification of the deceased, especially where it can be compared with the available antemortem records. A person with Inca bone may have clinico- radiological records and there are chances of misdiagnosed fracture line in the skull. Thus there are chances of antemortem radiological reports that can be correlated with postmortem findings. So, from medicolegal perspective, it has implications for establishing identity of the deceased. Thus when skull as skeletal remains is bought in for medicolegal examination, identifying Inca bone can be helpful in conforming identity.

References:

1. Krogman WM. The human skeleton in Forensic Medicine: Chap-1 Introduction: General statement and scope of problems. Springfield: Charles C Thomas, 3rd Print, 1978, 3-17
2. Roger W Soames in Gray's Anatomy-Chapter 6 Skeletal system; Churchill Livingstone: 38th Ed., 2000, 582-585.
3. Ossenbergl N. The influence of artificial cranial deformation on discontinuous morphological traits. Am J of physical anthropology 1970;33,375-372.
4. Oetteking B . The jesup north pacific expedition XI, craniology of the north pacific coast. New York:GE steichert 1930,11:1-391
5. Bennett KA. The etiology and genetics of wormian bones. Am J phys Anthropol, 1965;23:255-260.
6. Pal GP, Tamankar BP, Routal RV, Bhagwat SS. The ossification of the membranous part of the squamous occipital bone in man. Journal of Anatomy 1984;138,259-266.
7. Pal GP: Variations of the interparietal bone in man. Jour. of Anatomy 1987;152,205-208.
8. Saxena SK, Chowdhary DS, Jain SP. Interpretable bones in Nigerian skulls. Journal of Anatomy 1986;144, 235-237.
9. Srivastava HC. Development of ossification centers in the squamous portion of the occipital bone in man. Jour. of Anatomy 1977;124,643-649.
10. Srivastava HC: Ossification of the membranous portion of the squamous part of the occipital bone in man. Jour. of Anatomy 1992;180, 219-224.
11. Hanihara T, Ishida H. Os Incae: Variation in frequency in major human population groups. Jour. Of Anatomy, 2001, 198,137-152.
12. Purkait R, Chandra H. The identity of INCA-Medicolegal importance and suggested nomenclature of variants. J Anat. Soc. Of India, 1989, Vol38, No.3, 162-171.
13. Gopinathan K. A rare anomaly of 5 ossicles in the preinterparietal part of the squamous occipital bone in north Indians. Jour. of Anatomy.1992: 180, 201-202.
14. Dart RA. The makapansgat proto human Australopithecus Prometheus. Am J of Phy. Anthropology 6,259-284.
15. Wu X, Wu M. Early Homo sapiens in China. In Palaeoanthropology and Palaeolithic Archaeology in the peoples of Republic of China. Ed. Wu R, Olsen JW New York: Academic Press.1985: 90-106.
16. Wolpoff MH : Multiregional evolution- The fossil alternative to eden, Behavioural and biological perspectives on the origins of modern humans: Ed Mellars P, Stringer CB, Edinburg Uni. Press 1989:62-108.
17. Torgersen JH . Hereditary factors in the sutural pattern of the skull. Acta Radiologica 1951;36,374-382.

Review Paper

Child abuse and its detection in the Dental Office

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Abstract

Child abuse is a major public health problem all over the world. There are four major types of abuse: physical abuse, sexual abuse, emotional abuse and neglect. Although the injuries of child abuse are many and varied, several types of injuries are common to abuse. Many of these injuries are within the scope of dentistry or easily observed by the dental professional in the course of routine dental treatment. It is important to realize that all members of the dental team have a unique opportunity and a legal obligation to assist in the struggle against child abuse. This requires clinical significance because a high proportion of abused children suffer injuries to the face and head, including the oral and perioral regions. These injuries may be observed during the course of dental treatment and in some cases even before the child is seated in the dental chair.

Key Words: Child Abuse, Causes, Public Health, Professional, Dental, Legal

Introduction:

In recent years, the community has become increasingly aware of the problem of child abuse in society. Child abuse is prevalent in every segment of society and is witnessed in all social, ethnic, religious and professional strata. [1] Child abuse is the physical, sexual, emotional mistreatment, or neglect of children. In the United States, the Centers for Disease Control and Prevention (CDC) define child maltreatment as any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child. [2]

Most child abuse occurs in a child's home, with a smaller amount occurring in the organizations, schools or communities the child interacts with. Different jurisdictions have developed their own definitions of child abuse for the purposes of removing a child from his/her family and/or prosecuting a criminal charge. According to *Journal of Child Abuse and Neglect*, child abuse is "any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation, an act or failure to act which presents an imminent risk of serious harm". [3]

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The indicators that may be noticeable to the dental professional include trauma to the teeth and injuries to the mouth, lips, tongue or cheeks that are not consistent with an accident. [4] Other common signs of child abuse include fractures of the maxilla and mandible and oral burns. Injuries to the upper lip and maxillary labial frenum may be a characteristic in severely abused young children. [5]

When an individual is attacked for whatever reason, the head, neck and facial areas are often involved. Dental professionals are in a unique position to identify possible cases of child abuse and neglect. Dental care providers are more likely to see evidence of physical abuse than are the other health care workers, as it has been reported that orofacial trauma is present in approximately 50-75% of all reported cases of physical child abuse.

Prevalence:

According to the American National Committee to Prevent Child Abuse, in 1997 neglect represented 54% of confirmed cases of child abuse out of which physical abuse 22%, sexual abuse 8%, emotional maltreatment 4%, and other forms of maltreatment 12%. [6]

A UNICEF report on child wellbeing [7] stated that the United States and the United Kingdom ranked lowest among industrial nations with respect to the wellbeing of children. It also found that child neglect and child abuse were far more common in single-parent families than in families where both parents are present.

In the USA, neglect is defined as the failure to meet the basic needs of children including housing, clothing, food and access to medical care. Researchers found over 91,000 cases of neglect in one year (from October 2005 to 30 September 2006) using information from a

database of cases verified by protective services agencies. [8]

Neglect could also take the form of financial abuse by not buying the child adequate materials for survival. [9] The U.S. Department of Health and Human Services reports that for each year between 2000 and 2005, "female parents acting alone" were most likely to be perpetrators of child abuse. [10]

Risk Factors:

Child abuse seldom results from one cause; rather, many risk factors usually interact. [11, 12] Factors such as child's disability or a parent with depression predispose children to maltreatment. [12, 13] Within a family, intimate partner violence increases children's risk of abuse. In communities, factors such as dangerous neighborhoods or poor recreational facilities increase risk. [14] Societal factors, such as poverty and associated burdens contribute substantially to risk of maltreatment. However, children in all social classes can be maltreated, and physicians need to guard against biases toward low-income families. [15]

Known risk factors for physical abuse are teenage pregnancy, unwanted pregnancy, prematurity, developmental disorders and/or chronic illness, twin pregnancy, substance abuse, poverty, lack of knowledge of parenting, child health and development. [16] Child characteristics are also important in child abuse including age, a previous history of abuse and comorbid conditions belonging to the child. About 71% of children are abused between the ages of 1 and 12. Children under the age of 4 are at the greatest risk of severe injury, and account for 79% of child maltreatment fatalities, with infants under 1 year accounting for 44% of deaths. Children with learning disabilities, conduct disorders, chronic illnesses, mental retardation, prematurity, or other handicaps are at increased risk of incurring abuse. [17]

Forms of Child Maltreatment:

Child maltreatment may occur either within or outside the family. The proportion of interfamilial to extra familial cases varies with the type of abuse as well as the gender and age of child. Each of the following conditions may exist as separate or concurrent diagnoses.

Physical Abuse:

Physical abuse of children is most often inflicted by a caregiver or family member but occasionally by a stranger. The most common manifestations include bruises, burns, fractures, head trauma, and abdominal injuries. A small but significant number of unexpected pediatric deaths, particularly in infants and very young

children (eg, sudden infant death syndrome), are related to physical abuse. [18]

Sexual Abuse:

Sexual abuse is defined as the engaging of dependent, developmentally immature children in sexual activities that they do not fully comprehend and to which they cannot give consent or activities that violate the laws and taboos of a society. It includes all forms of incest, sexual assault or rape, and pedophilia. This includes fondling, oral-genital-anal contact, all forms of intercourse or penetration, exhibitionism, voyeurism, exploitation or prostitution, and the involvement of children in the production of pornography. [18, 21]

Emotional Abuse:

Emotional or psychological abuse has been defined as the rejection, ignoring, criticizing, isolation, or terrorizing of children, all of which have the effect of eroding their self-esteem. The most common form is verbal abuse or denigration. Children who witness domestic violence should be considered emotionally abused. [19]

Physical Neglect:

Physical neglect is the failure to provide the necessary food, clothing, and shelter and a safe environment in which children can grow and develop. Although often associated with poverty or ignorance, physical neglect involves a more serious problem than just lack of resources. There is often a component of emotional neglect and either a failure or an inability, intentionally or otherwise, to recognize and respond to the needs of the child. [21]

Emotional Neglect:

The most common feature of emotional neglect is the absence of normal parent-child attachment and a subsequent inability to recognize and respond to an infant's or child's needs. A common manifestation of emotional neglect in infancy is nutritional (nonorganic) failure to thrive.

Medical Care Neglect

Medical care neglect is failure to provide the needed treatment to infants or children with life-threatening illness or other serious or chronic medical conditions. [19]

Munchausen Syndrome by Proxy:

Munchausen syndrome by proxy is a relatively unusual disorder in which a caregiver, usually the mother, either simulates or creates the symptoms or signs of illness in a child. The child can present with a long list of medical problems or often bizarre recurrent complaints. Fatal cases have been reported. [20]

Detecting Child abuse in the Dental Office:

When a child presents for examination, particularly if there is an injury involved, the history may alert the dental team to the possibility of child abuse. Indeed, the history may be the single most important source of information. [22] Because legal proceedings could follow, the history should be recorded in detail. While one should always realize that there are other possible explanations, the possibility of child abuse or neglect should be considered.

General Physical Findings:

Before examining the mouth, alert members of the dental team may note general physical findings that are consistent with child abuse or neglect:

1. The child's nutritional state is poor and growth is subnormal.
2. Extraoral injuries are noted. They may be in various stages of healing, indicating the possibility of repeated trauma
3. There may be bruises or abrasions that reflect the shape of the offending object, e.g., belt buckle, strap, hand.
4. Cigarette burns or friction burns may be noted, e.g., from ligatures on wrists, gag on mouth.
5. There may be bite marks, bald patches (where hair has been pulled out), injuries on extremities or on the face, eyes, ears, or around the mouth.

As always, the examiner must remember that there may be explanations other than child abuse for some of these findings.

Findings on Dental Examination:

Examination of dental injuries includes thorough visual observation, radiographic studies, manipulation of the jaws, pulp vitality tests, and percussion. Transillumination may also be helpful.

Typical Oral Lesions:

Both oral and facial injuries of child abuse may occur alone or in conjunction with injuries to other parts of the body. The oral lesions associated with child abuse are usually bruises, lacerations, abrasions, or fractures. Suspicion of child abuse should be particularly strong when new injuries are present along with older injuries.

Thus scars, particularly on the lips, are evidence of previous trauma and should alert the investigator to the possibility of child abuse. As noted earlier, further investigation is required when the explanation for the injuries does not justify the clinical findings.

Tearing of the labial or lingual frenum:

Tears of the frenula, particularly the labial frenum, are frequently seen in child abuse

cases. These injuries may result from blunt force trauma. For example, the labial frenum may be torn when a hand or other blunt object is forcibly applied to the upper lip to silence the child. Injuries of this type may also occur in forced feeding, as a result of the bottle being forced into the mouth. [23]

Oral mucosa torn from gingival:

Blunt force trauma to the lower face may also cause the mucosal lining of the inner surface of the lip to be torn away from the gingiva. A forceful slap, for example, may have this effect. The location and extent of the injury will depend on the magnitude of force and the location and direction of the blow.

Loosened, fractured, or avulsed teeth:

Severe trauma to the lower face may loosen teeth, completely displace them from their alveolar sockets, and/or cause dental fractures. It is not uncommon for root fractures to occur, but this finding may be missed unless the radiographs are examined carefully. These injuries, as well as most other traumatic injuries, may be accidental rather than abusive.

Therefore, one must always determine whether the injury is compatible with the explanation given. If the dental injuries resulted from a fall, for example, one would expect to also find bruised or abraded knees, hands, or elbows. When these additional injuries are not present, further inquiry is required. [24]

Previously missing teeth:

In examining a child who has experienced recent trauma, it may be noted that one or more teeth has been lost prior to the present incident. The etiology of this earlier tooth loss should be investigated. If it was due to "an accident", a pattern of repeated trauma has been established. This pattern needs to be evaluated, and child abuse is one of the possibilities to be considered.

Trauma to the lip:

It is not uncommon to find contusions, lacerations, burns, or scars on the lips of abused children. Bruises to the lip may result from forced feeding. Burns on the lip, as well as burns on the face or tongue, may be signs of physical punishment. [23] Bruises at the angles of the mouth may result from efforts to gag or silence a child.

Trauma to the tongue:

The tongue of an abused child may exhibit abnormal anatomy or function due to scarring. [27] This may result from a burn or other trauma.

Other soft tissue injuries:

Trauma to the mouth may also cause ulceration of the palate or uvula. Additionally, lacerations are sometimes found in the floor of

the mouth, which may be caused by forced bottle feeding.

Fractures of jaws and associated structures:

Fractures of the maxilla, mandible, and other cranial bones may be found in cases of child abuse. If the radiologic study shows signs of old as well as new fractures, a pattern of repeated trauma has been found, and needs to be investigated with reference to possible child abuse. The examination for maxillofacial fractures is performed within the concept of overall patient care, including airway maintenance, control of hemorrhage, and neurologic examination.

In a significant number of jaw fractures there is also damage to associated structures, including the cribriform plate, nasal, and zygomatic bones. Intracranial lesions and skull fractures may also be present. [28] The clinical examination includes both extraoral and intraoral palpation. Bilateral palpation is helpful to detect asymmetry. Swelling or ecchymosis in the lower face is suggestive of fractures of the mandible.

Fractures should also be suspected if there is an abrupt change in the occlusal level of the teeth. This may be associated with open bite, difficulty in opening the mouth, and facial asymmetry. Other signs and symptoms include abnormal mobility of bony structures, or the ability to move the mandible beyond its normal excursion in any direction.

Dingman and Natvig suggested supporting the angle of the mandible and pressing the anterior mandibular region up and down to detect fractures of the body of the mandible. [28] Crepitation and deviation of the midline on closing may be diagnostic signs, as well. Pain in the area of the temporomandibular joints may suggest fractures in this region.

General neglect of the mouth:

A child with rampant, untreated dental decay and poor oral hygiene is suffering from significant neglect. The consequences may be pain, infection, and a threat to the child's general health and well-being. The medical or dental practitioner who observes this condition, particularly if it continues after having been brought to the attention of the parents, should realize that the situation is no different than having parents neglect any other important medical condition. Moreover, this may be a sign of a more generalized problem in caring for the child. Blain reports that a preliminary study supports the high correlation between dental neglect and CAN (child abuse and neglect). [29]

As reported by Blain, the following conditions should be considered reasons for reporting if the caretaker consciously fails to

follow treatment recommendations in potentially life-threatening situations:

1. Failure to provide prescribed antibiotics.
2. Failure to seek treatment for cellulitis and its associated infections.
3. Failure to seek treatment for any acute or chronic infection, including dental caries, when underlying life-threatening system conditions are present such as subacute bacterial endocarditis, glomerulonephritis, or juvenile-onset diabetes.

Consideration should be given to reporting the following conditions. If the dental situation is deteriorating to the point where irreversible harm will be done, leading to pain, discomfort, or a decrease in health or welfare:

1. Diagnosed caries or periodontal diseases which have been referred for treatment and caretakers have failed to keep appointments.
2. Presence of untreated traumatic injuries as indicated by nonvital teeth, avulsed permanent teeth, and injuries to soft tissues, including signs of scarring.
3. Failure to seek recommended treatment for diagnosed severe malrelationships of the maxilla and mandible, including craniofacial anomalies, which may result in deficient speech, esthetic deformities, and psychological disturbances.

Associated Facial Lesions:

Becker et al. found that in their series of facial injuries in abused children, 66% of the injuries were contusions and ecchymoses, 28% were abrasions and lacerations, 3% were burns, 2% were fractures, and 1% were bites. [30] Knowledge of the color changes associated with bruising may be important in determining when the injury occurred, and in determining whether other injuries occurred during the same event or at different times.

Kessler and Hyden point out that after the injury occurs, the area is usually tender and swollen, but the bruise may not be visible as a contusion or ecchymosis for 24 to 72 hours. A reddish-blue or purple color may be visible immediately or within the first 5 days. This initial color may change to green in 5 to 7 days, then to yellow in 7 to 10 days, then to brown in 10 to 14+ days, before clearing in 2 to 4 weeks. [22]

Injuries to the face may include trauma to the eyes, ears, and nose, as well as to the oral cavity. Blunt force trauma to the eye may cause periorbital bruises (black eyes), acute hyphema (blood in the anterior chamber of the eye), retinal and subconjunctival hemorrhage, ruptured globe, dislocated lens, optic atrophy, traumatic cataract, and detached retina. [22]

Direct trauma to the nose may cause deviated septum due to cartilage injury or hematoma formation. Such trauma may also cause nasal fractures, with accompanying bilateral periorbital ecchymosis. Injuries to the ear may be associated with twisting and bruising, while repeated blows may eventually result in a "cauliflower ear".

Blows to the ear can also rupture the tympanic membrane or cause hemorrhage and hematoma formation. [23] Bruises from hand slapping are not uncommon. In such cases the bruise may reproduce the outline of the hand in startling detail. Other cutaneous injuries may also take the shape of the object used to inflict the injury, such as a belt buckle or looped electric cord. [23] It has been suggested that whenever bruises occur on both sides of the mouth or face at once, or if there is scarring of the lips, abuse should be suspected. Also, the presence of injuries on multiple body surfaces suggests abuse. McNeese and Hebeler point out that such multiplanar injuries would occur accidentally only as a result of tumbling falls (e.g., falling down stairs) or trauma incurred during automobile accidents. [23]

Lips and corners of the mouth may show contusions, lacerations, burns, or scars due to the frequency of attack to the mouth in abused children. Bite marks on the face of children are most commonly found on or around the cheeks. However, they may occur on the ear, nose, chin, or elsewhere.

Conclusion:

As most of the abuse injuries occur in the head and neck, dentists can easily diagnose them and as a oral care professional it is our duty to detect such abuses at an early stage to prevent further harm to the child and counseling of abusive caretaker. Reported cases of child abuse and corporal punishment, both new and under management and treatment, require continual monitoring. It is becoming increasingly important for dentists to recognize some of the more obvious manifestations of physical abuse.

The involvement of dentists in child protection teams would be beneficial in two ways: dentists would become aware of their role and would assist in the training of physicians and other professionals. In turn, non-dental practitioners would benefit from consultations with dentists in the evaluation of physical and sexual abuse or neglect, especially those dentists who have experience or expertise with children.

References:

1. Naidoo S. A profile of the oro-facial injuries in child physical abuse at a children's hospital. *Child Abuse Negl* 2000;24:521-34
2. Leeb, R.T.; Paulozzi, L.J.; Melanson, C.; Simon, T.R.; Arias, I. (1 January 2008). "Child Maltreatment Surveillance: Uniform Definitions for Public Health and Recommended Data Elements". Centers for Disease Control and Prevention. Retrieved 20 October 2008.
3. Herrenkohl, R.C. (2005). "The definition of child maltreatment: from case study to construct". *Child Abuse and Neglect* 29 (5): 413.
4. Carpenter RF. The prevalence and distribution of bruising in babies. *Arch Dis Child* 1999; 80: 363-6.
5. Cavalcanti AL. Child abuse: Oral manifestations and their recognition by dentists. *Rev Odontol UNICID* 2003; 1: 123-8.
6. "Child Abuse and Neglect Statistics". National Committee to Prevent Child Abuse. 1998. Archived from the original on 1998-05-15.
7. Child Poverty in Perspective: An Overview of Child Wellbeing in Rich Countries. UNICEF: Innocenti Research Center, Report Card 7.
8. "Sometimes They Can't Afford to Leave their Abusers", *Santa Ynez Valley Journal*, California, 22 October 2009.
9. Stats for 2000; Stats for 2001; Stats for 2002; Stats for 2003; Stats for 2004; Stats for 2005.
10. Svedin CG, Wadsby M, Sydsj  G. Mental health, behaviour problems and incidence of child abuse at the age of 16 years. A prospective longitudinal study of children born at psychosocial risk. *Eur Child Adolesc Psychiatry* 2005; 14: 386-96.
11. Wu SS, Ma CX, Carter RL, Ariet M, Feaver EA, Resnick MB, et al. Risk factors for infant maltreatment: a population-based study. *Child Abuse Negl* 2004; 28: 1253-64.
12. Kendall-Tackett K, Lyon T, Taliaferro G, Little L. Why child maltreatment researchers should include children's disability status in their maltreatment studies. *Child Abuse Negl* 2005; 29: 147-51.
13. Wilson SL, Kuebli JE, Hughes HM. Patterns of maternal behavior among neglectful families: implications for research and intervention. *Child Abuse Negl* 2005; 29: 985-1001.
14. Korbin JE. Neighborhood and community connectedness in child maltreatment research. *Child Abuse Negl* 2003; 27: 137-40.
15. Lane WG, Rubin DM, Monteith R, Christian CW. Racial differences in the evaluation of pediatric fractures for physical abuse. *JAMA* 2002; 288: 1603-9.
16. Rivara FP, DiGiuseppi C, Thompson RS, Calonge N. Risk of injury to children less than 5 years of age in day care versus home care settings. *Pediatrics* 1989; 84: 1011-6.
17. Swerdlin A, Berkowitz C, Craft N. Cutaneous signs of child abuse. *J Am Acad Dermatol* 2007; 57: 371-92.
18. American Academy of Pediatrics: Distinguishing sudden infant death syndrome from child abuse fatalities. *Pediatrics* 2001; 107(2): 437.
19. American Academy of Pediatrics: *Visual Diagnosis of Child Abuse*. [CD ROM], 2nd ed, 2002.
20. American Academy of Pediatrics: *Visual Diagnosis of Child Sexual Abuse*. [Slide Set Atlas] American Academy Pediatrics, 2002.
21. American Academy of Pediatrics: Diagnostic imaging of children abuse. *Pediatrics* 2000; 105(6): 1345.
22. Kessler, D. B. and Hyden, P. Physical, sexual, and emotional abuse of children. *Clin. Symp.* 43(1), 4, 1991.
23. McNeese, M. C. and Hebeler, J. R., The abused child: a clinical approach to identification and management *Clin. Symp.*, 29(5), 1, 1977.
24. Andreasen, J. O. *Traumatic Injuries of the Teeth*, W. B. Saunders, Philadelphia, 1981, chap. 1.
25. Finn, S. B., *Clinical Pedodontics*, W. B. Saunders, Philadelphia, 1973, chap. 11.
26. Hamilton, J. Child abuse: the dentist's responsibility, *Chicago Dent. Soc. Rev.*, 83 (9), 19, 1990.
27. Blain, S. M. Child abuse, *Pediatric Dentistry: Scientific Foundations and Clinical Practice*, Stewart, R. E. et al., C. V. Mosby, St. Louis, 1981, chap. 64.
28. Dingman, R.O. and Natvig, P., *Surgery of Facial Fractures*, W. B. Saunders, Philadelphia, 1964, chap 3.
29. Blain, S. M., Abuse and neglect as a component of pediatric treatment planning *J. Calif. Dent. Assoc.*, 19(9), 1991.
30. Becker, D. B. et al., Child abuse and dentistry: orofacial trauma and its recognition by dentists, *J. Am. Dent. Assoc.*, 97(7) 24, 1978.

Case Report

Female Infanticide

*S. Praveen

Abstract

Killing infant girls is something most of us cannot imagine. As shocking and disturbing as this behavior is, however, we must look at it within its cultural context. In some Indian communities there is a preference for male children. This attitude is rooted in a complex set of social, cultural and economic factors. Daughters will require a sizable financial dowry in order to marry. This dowry system, lack of economic independence, social customs and traditions has relegated the female to a secondary status. Because daughters leave their families of origin, they are often regarded as temporary members of their families and a drain on its wealth.

There is an expression in India that "bringing up a daughter is like watering a neighbor's plant". In most of such cases of female infanticide the perpetrator is the mother of the infant. Here we are highlighting a case where a new born female was suspected to have been brutally killed by her parent.

Key Words: Female, Infanticide, Autopsy, Manual Strangulation, Head Injury

Introduction:

In our country on one side woman is regarded as the epitome of life, she is revered and worshipped as exemplified by the river names which are named after female goddesses, and in the same breath she is ostracized and burnt in the name of dowry and the situation is far more pathetic in certain male dominated communities of northern India, where the birth of a female child is regarded as a curse and that of male child as a boon.

This is an age old scourge of our society- which led to the widening of male female ratio and further to the introduction of PNDT act so also Infanticide is defined as the deliberate, unlawful, destruction of the child under the age of one year, by act of omission or by act of commission. [1]

The term is applied technically to those cases in which the mother kills her child at or soon after its birth. It's reported that female infanticide existed in India since 1789 in several districts of Rajasthan and Gujarat. The female infanticide was so widespread in Jadeja (Rajput) families of Kutch and Saurashtra, that only five of such families were found who had not killed their newborn daughters. [2]

There were alarming reports of the baby girls being murdered even in the areas where the practice did not exist earlier.

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Poverty, ignorance of family planning, cost of dowry etc.... [3] have been reported as the possible causes for this crime. Son preference has become daughter hatred in recent decades due to widespread legitimization of this form of violence against newborn female infants.

The census fig. for overall sex ratio and child population in the 0-6 age group revealed girls were subjected to double whammy. Females were not only aborted before birth but also victims of prejudice after birth. Girls are discriminated against with regard to nutrition, medical attention and general care as compared to male children. [4] we are discussing death of an alive full term female baby delivered in government hospital which was found dead after 4 hours under mysterious circumstances.

History furnished by police:

On 6/5/2011 Mrs. Seetha was admitted in government maternity hospital where she gave birth to a female child at 5.43 pm. On the same day between 9.30 pm and 10 pm the baby was found dead. The treating Obstetrician, Dr Shobha Nagesh complained to the Peenya police about the suspicious death of the baby. A case was booked U/S 174 'C' Crpc and the requisition for autopsy was given by police.

Autopsy Findings:

External examination:

The dead body of female baby measuring 51 cms in length and weighing 3 Kgs, fair in complexion. Postmortem staining faintly present over the back of the body and fixed. Rigor mortis appreciated all over the body. Dried meconium stains present over the anal region and at places over both lower limbs. Scalp hairs are black in colour measuring 2-3 cms in length,

anterior and posterior fontanelle present. Eyelashes present measuring 0.2-0.3 cms. Eyes closed, pupils dilated and fixed. Subconjunctival hemorrhage present over both eyes. Lanugo hair present over the top of both shoulders. Palmar and sole creases are present. Fingernail projects beyond the tip of fingers.

Measurements:

- Length of the baby : 51 cms.
- Head circumference : 33 cms.
- Chest circumference : 29 cms.
- Abdominal circumference: 28 cms.

Umbilical cord stump: 2cm in length, clamped with a blue clip.

Ossification centers:

Center for manubrium sterni, upper 3 segments of body of sternum, calcaneum, talus and lower end of femur have appeared.

Injuries:

1. Multiple contused abrasions sizes varying from 3 x 2 cm and 0.5 x 0.5 cm present all over the face.
2. Contusion 3 x 3 cms present over right side of forehead.
3. Multiple contusions size varying from 5 x 5 cm and 3 x 3 cms present over front of neck, chest and abdomen. On dissection of the neck, blood extravagated into the layers of the skin, strap muscles and into thyroid gland.

Internal examination:

- **Scalp:** On reflection shows extravasations all over.
- **Skull:** shows sutural separation of the posterior and lamdoid fontalelle's.
- **Brain and Meninges:** Meninges lacerated irregularly and brain covered with blood and blood clots.
- **Larynx and trachea:** Shows contusion.
- **Diaphragm:** Situated at the level of 6th and 7th rib.
- **Lungs:** Both lungs are congested and edematous.
- **Heart:** Intact and pale.
- **Peritoneal cavity:** contains about 400 ml of blood and blood clots.
- **Liver:** lacerated irregularly.
- **Kidneys:** Both kidneys contused, blood extravasations seen in perinephric tissues.

Histopathological report:

- **Brain:** Subarachnoid haemorrhage
- **Thymus:** Congestion
- **Lung:** Pulmonary haemorrhage with congestion
- **Myocardium:** Haemorrhage
- **Trachea, thyroid:** Haemorrhage with congestion

- **Liver:** congestion
- **Bilateral kidneys, suprarenal's:** Congestion and adrenal haemorrhage
- **Spleen:** Congestion
- **Pancreas:** Congestion



Photograph 1: The multiple injuries on face, neck and chest



Photograph 2: The diffuse extravasations of the neck muscles



Photograph 3: The irregularly lacerated right lobe of the liver



Photograph 4: The diffuse extravasation in the scalp and also sutural separation of the posterior and lambdoid fontanelles

Hospital case records:

Government Maternity Hospital, Mallasandra
Admission no: 4/42

Full term normal delivered female baby born on 06/05/2011 at 5:43 PM. Normal anthropometry and APGAR score. Baby was found dead under mysterious condition and police informed.

Opinion (Cause of Death):

On perusal of history, hospital case records, autopsy findings and histopathological report, cause of death was opined as **"Death is due to combined effect of manual strangulation and blunt injuries to the head, chest and abdomen sustained (Homicidal in manner)"**.

Discussion:

Infanticide, or the murder of a new-born child, is not treated as a specific crime, but is tried by the same rules as in cases of felonious homicide. The term is applied technically to those cases in which the mother kills her child at, or soon after, its birth. She is often in such a condition of mental anxiety as not to be responsible for her actions. The child must have had a separate existence. To constitute 'live birth,' the child must have been alive after its body was entirely born--that is, entirely outside the maternal passages--and it must have had an independent circulation, though this does not imply the severance of the umbilical cord. Every child is held in law to be born dead until it has been shown to have been born alive. Killing a child in the act of birth and before it is fully born is not infanticide, but if before birth injuries are inflicted which result in death after birth, it is murder. Medical evidence will be called to show that the child was born alive. [5] The methods of death usually employed are:

1. Suffocation by the hand or a cloth.
2. Strangulation with the hands, by a tape or ribbon, or by the umbilical cord itself.

3. Blows on the head, or dashing the child against the wall.
 4. Drowning by putting it in the privy or in a bucket of water.
 5. Omission: by neglecting to do what is absolutely necessary for the newly-born child--e.g., not separating the cord; allowing it to lie under the bed-clothes and be suffocated.
- In our case, the manner was found to be manual strangulation, blows on the head and dashing of child against wall which was due to infanticide due to act of commission.

It is unfortunate that the parents also view her as a liability. This attitude is rooted in a complex set of social, cultural, and economic factors. It is the dowry system, lack of economic independence, social customs and traditions that have relegated the female to a secondary status. The degree may vary but the neglect of the girl child and discrimination goes hand-in-hand. Poverty, ignorance of family planning, cost of dowry, etc. have been reported as the possible causes for this crime (Tandon, 1999: 46-57). [3]

A study conducted by Premi and Raju (1996) in Behind district in Madhya Pradesh and Barmer and Jaisalmer districts in Rajasthan found that female infanticide was community specific. [7]

Villages that were inhabited entirely or predominantly by Gujars, Yadavs (Ahir) and the Rajputs had the lowest sex ratio. Incidentally, the parents in our case belonged to *Gujars* community. In multi-caste villages the chances of female infanticide reduced very substantially. The twin process of 'elimination of unborn daughters' and the 'slow killing' through neglect and discrimination of those that are born has become a matter of concern. Most of the women reported that they killed their babies under pressure from their husbands which was evident in our case.

Many a time the husbands would beat up their wives and force them to kill the female child because she is an economic burden. The girls are devalued not only because of the economic considerations but also because of socio-cultural factors, such as, the belief that son extends the lineage, enlarges the family tree, provides protection safety and security to the family and is necessary for salvation as he alone can light the funeral pyre and perform other death related rites and rituals. Such situations occur more so among poverty stricken and orthodox families. [8]

Legally infanticide amounts to homicide and all legal provisions applicable to the offence

of homicide are applicable to infanticide (Section 318 concealment of birth by secret disposal of the dead body amounts to culpable homicide). Public opinion about neonaticide (the killing of a newborn within the first 24 hours of life) has varied across time and cultures. Some nations have passed legislation on behalf of maternal offenders with the assumption that childbirth, a time of unique biological change, may lead to mental disturbance.

1. The perception that an offender's emotional and physical turmoil during the birth and homicide reduces her culpability.
2. The sentiment that neonaticide offenders are more "redeemable" than other offenders.
3. The uncertainty about the personhood of a fetus or newborn. [9]

Neonaticides were most often committed by poor, relatively young, single women who lacked prenatal care. Efforts to better prevent these tragedies should include improved sex education and contraceptive access. Two legal responses to the problem of neonaticide: [10]

- The prevailing public view on women who kill their babies is that they are either monsters or psychotic, or both. [11]
- The psychiatric and legal communities recognize that the issue is not as simply dichotomous as this. Evidence suggests that there are important distinctions to be drawn between different types of baby deaths and that this may have implications for identification, punishment, and/or treatment of potential and actual perpetrators. According to a recent report by the United Nations Children's Fund (UNICEF) up to 50 million girls and women are missing from India's population as a result of systematic gender discrimination in India.
- In most countries in the world, there are approximately 105 female births for every 100 males.

- In India, there are less than 93 women for every 100 men in the population.
- Increasing female feticide in India could spark a demographic crisis where fewer women in society will result in a rise in sexual violence and child abuse as well as wife-sharing, the United Nations warned. This in turn will deteriorate the social value system and can cause crisis situation.

The government has initiated many steps and to bring an end to this social evil, and to bring a change in the attitudes of the people in society. It is in this direction that many laws, Acts and schemes have been initiated, like:

- The Laws favoring Girl Education.
- The Laws favoring Women's right.
- The Laws favoring Equal Property Share for a daughter.
- Other schemes for girl child.

References:

1. **Nagesh Kumar Rao. G.** "Text book of Forensic Medicine and Toxicology". 2nd edn. New Delhi: Jaypee brothers, Medical publishers (p) Ltd; 2010. p. 382.
2. **Desai, N. (1988).** Born to die. The Indian Post, 7th October, 1988, Bombay.
3. **Tandon S. L.** "Penal Sanctions on Violence against Women: An Appraisal, In: Centre for Social Research, Violence against Women in Delhi: Determinants and Remedies New Delhi".1999; Centre for Social Research p. 46-57.
4. **Sneh Lata Tandon and Renu Sharma.** "Female Foeticide and infanticide in India: An analysis of crimes against girl children". 2006 vol 1(1). International Journal of Criminal Justice Sciences.
5. **WWW.forensicmedicine.Ca/forensics/infanticide.** cited on 25/5/11
6. **Narayan Reddy.K.S.** "Essentials of Forensic Medicine and Toxicology". 29th edn. Hyderabad: Om Sai graphics; 2010. P.396-397
7. **Premi M. K. and S. Raju.** "Imbalance of Child Sex Ratio in Madhya Pradesh and Rajasthan. Unpublished report of the study sponsored by Department of Women and Child Development, Ministry of Human Resource Development, Govt of India. New Delhi".1996. Centre for the Study of Regional Development, Jawaharlal Nehru University.
8. **Srivastava, S.P.** "The Perils of Pre-Birth Murder – A Sociological Analysis of Female Foeticide". 2001 Vol.47 (10). Journal of Social Welfare.p.7-12.
9. **Shelton JL, Muirhead Y, Canning KE.** "Ambivalence toward mothers who kill: An examination of 45 U.S. cases of maternal neonaticide". 2010, vol 28 (6). Behav Sci Law .p.812-31
10. **Friedman SH, Resnick PJ.** "Neonaticide Phenomenology and considerations for Prevention". 2008 .Int J Law Psychiatry.
11. **Porter T, Gavin H.** "Infanticide and neonaticide: a review of 40 years of research literature on incidence and causes". 2010, vol 11(3).Trauma Violence Abuse. P. 99-112

Case Report

Fatal Hemorrhage Following Extraction of First Molar

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Abstract

A case involving extraction of right upper 1st molar leading to massive hemorrhage and death in an undiagnosed case of Arteriovenous Venous Malformation of maxilla is presented along with the relevant investigations, standard treatment to be given and the related medicolegal issues. A 16 year old male presented to a dentist with history of Grade III mobility of right upper 1st molar without any known etiology. The dentist extracted the tooth without properly assessing the patient clinically and advising any relevant investigations thereby leading to massive hemorrhage and death of the patient. Proper clinical assessment, relevant investigations adequate treatment is to be given or the surgeon faces the risk of legal action for medical negligence under the provisions of Sec.304A of IPC. History taking, proper clinical examination, relevant investigations and adequate treatment are imperative in treating any case and in case of complications, the patient must be shifted to the ED of the nearest hospital without any delay.

Key Words: Tooth Extraction, Negligence, Precautions

Introduction:

List of complications related to tooth extraction is too long & varies from simple to severe. The life threatening intraoperative or postoperative hemorrhage is one of the few complications for which a dentist has to actively initiate a life saving treatment. A case of life threatening hemorrhage leading to death after extraction of first molar, the treatment initiated and the subsequent autopsy findings are presented along with the investigations to be done and the standard treatment to be given along with the medicolegal issues related to it.

Case report:

A 16 year old male presented to a dentist with history of pain and swelling on right side of face. On examination it was found that there was Grade III mobility of the right upper 1st molar (tooth number 16). There was no history of any past or present significant illness like coagulation disorders, liver disorders, prolonged hospitalization or medications. He was put on antibiotics and pain killers to reduce inflammation and swelling with instructions to report back after 5 days for tooth extraction.

Patient reported after 3 days with no decrease in the size of the swelling and was sent back with advice to continue medications for 2 more days.

Patient reported back after 2 days for extraction of the right 1st upper molar. Routine preoperative investigations were not done and the dentist planned to extract the tooth under LA. Local anesthesia with Inj. Adrenaline (1:80,000) was administered. A jet of blood started gushing out as soon as the tooth was out of the socket. The concerned dental surgeon tried to achieve hemostasis by compression followed by ice pack along with Inj. Ethamsylate 0.5 mg IM with no desired effect. The case was referred to the ED of a large tertiary level hospital and diagnosed as Arterio Venous Malformation. Bone wax and barrel bandaging along with blood transfusion was tried. However hemostasis could not be achieved and the patient was declared dead due to shock consequent upon blood loss.

The case was brought to mortuary. On general examination, it was seen that there were dried blood stains all over the body. The body looked pale. Gauze and wax packing along with antemortem blood clots were recovered from number 16 alveolar space. Size of the alveolar cavity was 1.5 cms in length, 1 cm broad and 3.5 cms in depth. Visceral organs were pale and no other abnormality was observed.

Discussion:

Though patients with tooth extraction may present with various post – extraction complications but death following extraction is rare. It is imperative on the part of the doctor to take maximum precautions before, after and during any dental procedure.

Most cases of dental diseases are diagnosed by a proper clinical history and physical examination. [1] Radiological investigations are relevant in most dental

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diseases and the dentist is expected to advise as needed. However in an Indian scenario due to lack of infrastructure, there is limited access to radiological equipments like CT scan, MRI etc. Under such conditions, the importance of having a proper clinical history and thorough medical examination can never be undermined. In the above mentioned case, the concerned dentist neither took a proper clinical history or did a thorough clinical examination nor advised any routine investigation even though the patient presented with Grade III mobility of the tooth without any known etiology. Dental x-rays along with blood investigations like Hb%, BT, CT are important screening tests to detect hematological disorders and should have been advised before starting the dental extraction.

In view of history, examination & investigations for proper diagnosis & treatment of patient, several authors have devised various protocols that can be followed before starting any dental procedure. The advantage of having a definite standard protocol is that the whole process of diagnosis and treatment becomes systematized resulting in better patient care and less errors on the part of the doctor. Peterson et al had devised a protocol that may be followed before tooth extraction: [2]

1. Biographic Data: Name, Address, Age, Sex, Occupation & marital status etc are obtained.
2. Chief complaint and history:
3. Medical History: Any history of relevant diseases [Rheumatic heart disease, heart abnormalities, diabetes, liver diseases, tuberculosis, kidney trouble] are elicited.
4. Social and family medical histories: Prevalence of relevant diseases in the family, their socio economic status, any health related habits or addictions etc are to be investigated.
5. Review of systems: Different systems of body are to be examined to reveal undiagnosed medical conditions unknown to patient.
6. Physical examination of oral cavity & entire maxillofacial region is to be done.
7. Laboratory and radiographic examinations.

In this case, radiological study have shown little or no change, but CT scan may show the shape, extent & boundaries of lytic expansion of intraosseous AVM. [1, 3] MR study would have been best employed for characteristics of the lesion. [4] Angiography is currently the gold standard for determination of location and flow characteristics of vascular lesions. [5]

For management of small AVMs, surgeons advocate embolization of feeder

vessels in combination with intraosseous inj. of embolizing agents to permanently obliterate the lesion [6]. For large AVM, maxillectomy or mandibulectomy is the treatment of choice even though it is associated with significant disfigurement of the face. [7] If the patient presents with massive bleeding during extraction or post – extraction, local measures like digital pressure with gauze, bone wax etc are applied. If bleeding fails to stop, surgical ligation of the main feeder vessel (lingual, facial, internal maxillary or external carotid artery) is done.

Legal issues pertaining to such kind of cases:

In this case, doctor could be charged for negligence under Sec 304A IPC, in case of complaint. Sec 304A IPC states "Whoever causes the death of any person by doing any rash or negligent act not amounting to culpable homicide, shall be punished with imprisonment of either description for a term which may extend to two years, or with fine, or with both" [8].

Conclusion:

Though dental extraction is considered to be a minor surgical procedure, a few cases may present with life threatening complications including hemorrhage. Careful & relevant history taking, physical and dental examinations prior to dental procedures are a must to avoid intraoperative and post operative complications.

Oral & maxillofacial surgeon plays a crucial role in diagnosing & managing these emergencies in ED. Active bleeding which cannot be controlled by local measures in the dental office should be referred to the nearest hospital ED so that the airway can be secured and the hemorrhage managed appropriately.

References:

1. Niimi Y, Song JK, Berenstein A. Current Endovascular Management of Maxillofacial Vascular Malformations. *Neuroimag Clin N Am* 2007; 17: 223 – 237.
2. Peterson LJ, Ellis Edward, Hupp JR et al. Preoperative Health Status Evaluation. *Contemporary Oral and Maxillofacial Surgery*. 4th Ed, pp 2 – 10. Elsevier India, 2003.
3. Sakkas N, Schramm A, Metzger MC et al. Arteriovenous malformation of the mandible: A life – threatening situation. *Ann Hematol* 2007; 86: 409-13.
4. Remonda L, Schroth G, Ozdoba C et al. Facial Intraosseous Arteriovenous Malformations: CT and MR features. *J. Comput. Assist. Tomogr.* 1995; 19(2): 277 – 81.
5. Kadmani D, Costello BJ, Ditty D et al. An alternative approach to Maxillofacial Arteriovenous Malformations with transosseous Direct Puncture Embolization. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004; 97: 701 – 6.
6. Siu WW, Weill A, Gariepy JL et al. Arteriovenous Malformation of the Mandible: Embolization and Direct Injection Therapy. *J Vasc Interv Radiol* 2006; 12(9): 1095 – 98.
7. Kacker A, Heier L, Jones J. Large Intraosseous Arteriovenous Malformation of the Maxilla – A case report with review of literature. *Int J Pediatr Otorhinolaryngol* 2000; 52: 89 – 92.
8. Mallick M. *Criminal Manual*. pp 137. New Delhi: Professional Book Publications, 2004.

Case Report

Importance of Crime Scene Visit: A Case Study

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Abstract

Crime Scene visit, is so necessary in coming to a conclusion in some of mysterious cases is a must, in Identifying the dead, time since death & cause of Death. Visit of crime scene, considering that the examination of the Locus of a crime is the duty of I.O. and also the Forensic Expert, when he views the body in situ. Thus, if a dead body is seen directly by Forensic expert without explanation by I.O in the P.M. Room, he may come to quite erroneous opinions about the origin of various injuries.

But when he sees the body in situ, with various surrounding objects, goes a long way towards avoiding such mistakes. However there are some occasions when preservation of the scene for the expert is waste of time in situations like, Deaths due to Accident, Assault, Stabbing, and Railway Track Deaths. These can be well recorded by photographs itself is enough in such conditions.

Key Words: Crime Scene, Visit, Forensic Expert, Accident, Assault

Introduction:

Crime Scene visiting is so necessary for coming to a conclusion in some of the mysterious cases is a must, in Identifying a dead person, time since death & cause of Death.

During the course of the practice of Forensic Medicine a Forensic expert will visit crime scene considering that the examination of the Locus of a crime is the duty of I.O and also the Forensic expert, when he views the body in situ. Thus, if a dead body is seen directly by Forensic expert without explanation by I.O in the P.M. Room, he may come to quite erroneous opinions about the origin of various injuries.

But when he sees the body in situ, with various surrounding objects, goes a long way towards avoiding such mistakes. Even some times viewing the scene of crime, after completing the autopsy may be of considerable value.

Personal duties in scene crime:

The function of an experienced forensic expert at the scene of death is generally to assess the environment, the local circumstances and the position of the body in relation to the near by objects, the condition of the body. In many instances crime can rapidly be excluded in favor of accidents, suicides or even natural causes. This is most useful and cost effective function as a spurious murder investigation involving expensive public facilities like police force, vehicles in investigation process.

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**Prof. & HOD

The Forensic Expert should always have appropriate equipments like camera, hand lens, papers, pencils, pens.

A sketch or photo graph is some times useful for instant recording of scene of crime.

1. Observe scene do not be hasty to handle it.
2. Photographer, Sketch preparer, Evidence recovery personal should be there.
3. Draw a simple sketch or Diagram of the Position of the body with location of blood stains, which gives much information. Measure the distances between body and the surrounding article or objects. Forms part of the experts original notes, when he attends the court, he can refresh his memory after seeing original records.
4. Protect the scene.
5. Photographs in all angles, close, and near pictures should be taken by a professional photographer or by forensic expert itself.
6. Conduct final survey.
7. Release crime scene.

P.M. Report:

- A case where we attended to see after information by I.O, to be strange, a person hanging over the middle of a window.

External Findings:

Aged about 30 yrs.Height of the person is 159 cms, scalp Hair – Black, Easily Detachable wearing blue coloured Half Shorts with some stains & Discharge. Body was in a stage Advanced putrefactive changes. Face bloated, eyes protruded & collapsed.Scrotum

Distended, Skin is peeling over many places. Maggots of 1cm Size crawling over the body.P.M. Lividity present in Lower Limbs.

Injuries:

1. Transverse pressure abrasion (Horizontal) present over the Front of the Neck above the level of thyroid cartilage measuring 6 X 2.5 cms, and 4 X 2.5 cms with a gap of 4 cms on Right side 6 cms below the Right ear and over left side it is 4 cms lower end of mandible.
2. Two Transverse (Horizontal) pressure abrasions present over the back of the chest with gap of the 9 cms to the level of Lower part of shoulder blades measuring Left side of 10 X2.5 cms, Right side is 9X2.5 cms.
3. Pressure Abrasion over the inner side of the left wrist of 2X2.5 cms.

Internal Findings:

Skull intact & Hyoid, Thyroid cartilages are intact, no fracture
 Ribs & Chest cage - No Fracture
 Lungs - Softened, became Black mass
 Heart - Flabby
 Intestines - Distended due to putrefactive gases
 Liver - Softened, became black mass.
 Pancreas, Genital Organs, spleen, Adrenals - N.P.

Kidneys - Softened

Observation Findings in Crime:

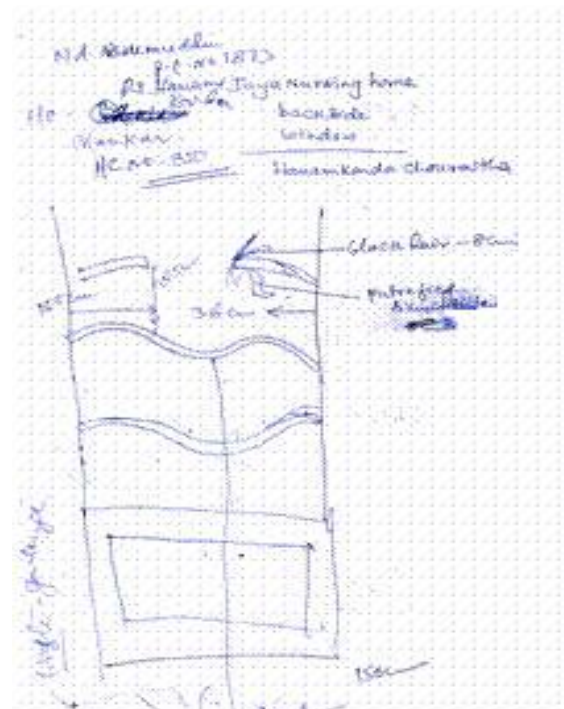
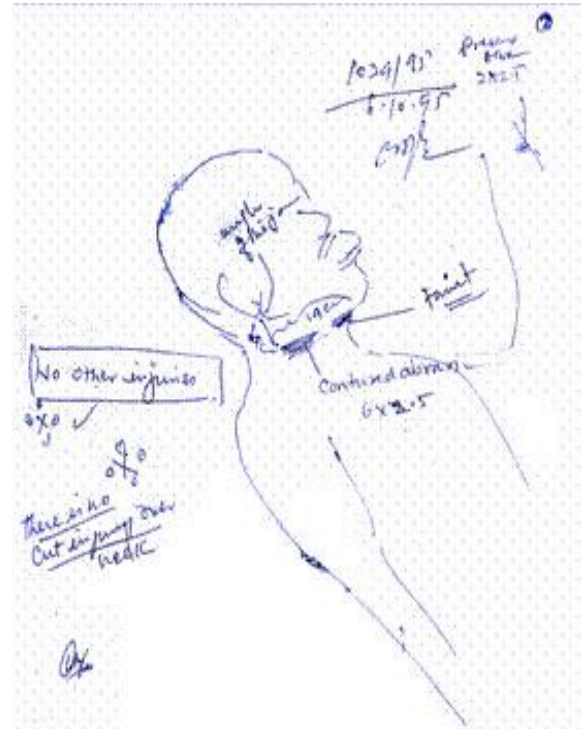
1. As the crime scene helped the forensic personal for coming to a conclusion in the cause of death. In this case media wrote that the building owners killed a person and the placed him in a window.
2. He is a scrap lifter on the roads.
3. He tried to lift the scrap present inside the room where the waste material is placed in a room door locked from outside.
4. He tried for safe landing through window, his body, lower limbs easily passed into the room and feet failed to touch the hard ground, where the floor inside is lower than outside.
5. Injuries correspond with the patterned pressure abrasions of the window rods.
6. Clothes, bag, foot wear of the person present out side the window in situ.
7. The expert came to a conclusion as An Accidental Hanging.

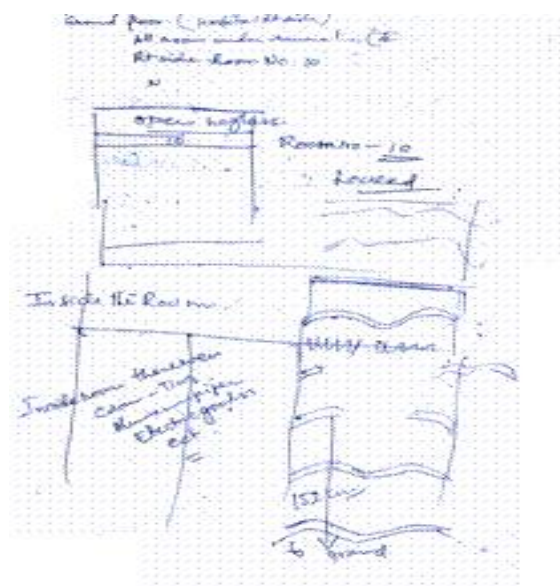
Opinion:

- Approximate time of death as about 3 to 4 days prior to the post mortem.
- The cause of death -ACCIDENTAL HANGING

My main aim and objective of this article is – how a Forensic Expert did his efforts, In drawing Rough Sketches, taking pictures in different

views, nothing is left for imagination. Everything on paper speaks better than his memory and observation. What I want to stress upon through this article is that, we the young Forensic Experts should cultivate and develop a habit - to keep everything on paper whether it is mortuary or out side, for like this for better management of cases, without giving a chance to anybody. To follow in foot steps of the previous generations of stalwarts use to do.





Note: These are all original documents; portraits noted, by the author at the time of crime scene visit.



View From out side room

References:

- 1) **Knights Forensic Pathology**, 3rd edition, by pekka saukko, Bernard knight
- 2) **Modis Medical Jurisprudence**, 23rd edition. Edited by Mathiwaran Reddy KSN. **Essentials of Forensic Medicine and toxicology**, 28th edition

News and Views

Imran Sabri, Webmaster www.forensicindia.com

33rd National Conference of Indian Academy of Forensic Medicine

33rd National Conference of Indian Academy of Forensic Medicine is scheduled to be held at Pt.J.N.M. Medical College, Raipur, the capital city of State Chhattisgarh on February 12-14 2012. This National conference provides an opportunity to leading forensic experts and young generation, to enrich their experience of academic excellence and better serve the administration of justice.

Dr. R. K. Singh

21st International Symposium on the Forensic Sciences of the ANZFSS:

The 21st International Symposium on the Forensic Sciences of the Australian and New Zealand Forensic Science Society (ANZFSS) will be held in Hobart from 23 to 27 September 2012 at The Hotel Grand Chancellor, Hobart, Tasmania, Australia. For more information, visit anzfss2012.com.au

www.vifm.org

22nd Congress of International Academy of Legal Medicine:

The 22nd IALM Congress, will be held in Istanbul from 5 to 8 July 2012. The congress will be an excellent opportunity to learn about the latest doctrinal, scientific, and technological advances in legal medicine and forensic sciences with its workshops, advanced courses, seminars, panels and lectures as well as oral and poster presentations.

Dr. Mete Korkut Gulmen, IALM 2012 Congress President

Inclusion of JIAFM in SCOPUS

Journal of Indian Academy of Forensic Medicine has been evaluated for inclusion in Scopus by the Content Selection & Advisory Board (CSAB). The review of this title is now complete and the CSAB has advised that the title will be accepted for inclusion in Scopus. The editors are to be commended on their efforts.

Journal of Indian Academy of Forensic Medicine now start getting recognition and wide accessibility by global scientific community. Many article are asked by the scientific research bodies for indexing in their data base.

The Scopus Team, Quality of Medical Education, Message #4145 of 4498

Forensic Scientists Use Postmortem Imaging-Guided Biopsy to Determine Natural Causes of Death

Researchers found that the combination of computed tomography (CT), postmortem CT angiography (CTA) and biopsy can serve as a minimally invasive option for determining natural causes of death such as cardiac arrest, according to a study in the November issue of the American Journal of Roentgenology. In the last decade, postmortem imaging, especially CT, has gained increasing acceptance in the forensic field. However, CT has certain limitations in the assessment of natural death.

"Vascular and organ pathologic abnormalities, for example, generally cannot be visualized accurately using native CT scans. To address the problem of these abnormalities, postmortem angiography has been implemented with great success," said Stephan A. Bolliger, MD, lead author of the study.

Researchers from the Institute of Forensic Medicine, Centre for Forensic Imaging and Virtopsy, at the University of Bern in Bern, Switzerland, examined 20 bodies in a minimally invasive fashion using CT, CTA and biopsy and compared the results to those obtained at subsequent autopsy. Results showed that the minimally invasive examination showed almost identical results in 18 of 20 cases.

"The combination of CT, postmortem CTA and biopsy is a valid tool to examine bodies in a minimally invasive fashion. However, a close collaboration between pathologists and radiologists is imperative for the correct sampling and diagnostic assessment and, therefore, for the success of such an undertaking," said Bolliger.

-*ScienceDaily* (Oct. 21, 2010)

Online Training Courses

The Faculty of Law and Criminal Sciences of the University of Lausanne (Switzerland) offers 3 online trainings allowing the latest knowledge and expertise to be brought directly to one's workplace without consideration of distances, travel expenses or time schedules. The three courses are offered in English, but exercises can be submitted in German, French or English (as well as personal discussion in individual tutorials). The course is directed by Prof. Taroni and Prof. Champod, with Prof. Aitken and Dr. Evett as consultants

www.isfg.org/News;186 accessed on Nov. 1. 2011

Guidelines to Authors / Contributors

CORRESPONDENCE: All correspondence and submissions shall be addressed to **Dr. Mukesh Yadav, Editor, Journal of Indian Academy of Forensic Medicine (JIAFM).**

Submission of the Manuscripts:

Hard copies shall be sent to Professor & Head, Department of Forensic Medicine & Toxicology, School of Medical Sciences & Research, Sharda University, Plot No. 32, 34, Knowledge Park-III, Greater Noida Dist. Gautam Budhha Nagar-206308 (U.P.)

Electronic Submission: The Document [Word format, DOC or DOCX] file is be mailed as attachment to drmukesh65@yahoo.co.in or drmukesh65@gmail.com

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- Yadav M, Kushwaha V. Issue of failed Sterilization, Medical Negligence & Compensation: A Global Review. J Indian Acad Forensic Med. 2009; 29(3): 23-27.

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Indian Academy of Forensic Medicine

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(To be submitted in **Triplicate**)

LM/IAFM: _____/_____/_____, 2010-2012

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Indian Academy of Forensic Medicine
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