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From Editor's Desk

I am thankful to all the members of Indian Academy of Forensic Medicine for their continuous support to this journal. Now all your article of the journals of 2004 are fully online at this address (jiafm.com). Abstracts of your papers can also be seen on the site of Indianjournals.com. This step I hope will give a big boost to the spread of research work being done in India to the whole of the world. I convey my thanks to Dr. Akashdeep Aggarwal for putting many days of hard work with me in bringing this issue to you. I thank the advertisers for their continued support.

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LEGAL ASPECTS OF GENERAL PRACTICE

General Practitioners usually are afraid of dealing with medicolegal work and find a lot of problems in their day to day to practice. In our country forensic medicine is taught at the undergraduate level and all the registered medical practitioners are supposed to follow the law of the country. Ignorance of law is not an excuse. Here I am going to highlight the legal aspects of the general practice briefly.

For treatment of the patient there is a Supreme Court ruling that medicolegal aspects are secondary to life of patient. Treatment should never be withheld due to reason that medicolegal examination has not been done. Every effort should be made to save the life of patient. To fix the responsibility even in nursing homes and small hospitals, duty roster and attendance registers should be maintained.

Prescription should be on proper slip with name, age, sex and address. It should be in legible handwriting. All the prescribed medicines should have proper doses & instruction. All the investigations requested should be mentioned on it along with their results so that noncompliance by the patient if any comes to the notice immediately. Follow-up date should be clearly mentioned. It should always bear the signature, name, seal & registration number of the doctor. It will be a very good practice to have the thumb impression of the patient over it so that if later on there is any problem of identification of the patient it could be solved satisfactorily.

While issuing the certificates there should be no carelessness. A false certificate should never be issued. Copy of the certificate must be kept for record so that if doctor is called in the court to testify the correctness of the certificate, he will not be afraid that what for he is being called in the court. Identification marks, signatures or thumb impression of the patient must be on it. If called by court must attend court to certify the issued certificate. Always mention self name and registration number. It should also bear the seal.

All the records of the patient must be kept for at least 3 years. It is a must to provide copy of the records within 3 days of asking. All copies should be duly attested before giving it to the patient. Maintain confidentiality of the records by keeping in safe custody. Professional secrecy must be maintained while issuing the copies of records.

Legal aspects of patient care are also very important. There are very high expectations of the patient due to growing consumerism. Ignorance and lack of knowledge of the doctors lead to unnecessary legal problems. All the doctors must know their responsibilities to patient, state & law. All the doctors who are practicing must be qualified medical practitioner and registered and should practice their own system. It is very important for the general practitioners to know what they should not do as these are the professional misconducts. They should not associate with unqualified persons by assisting or employing them or by giving them some certificate so that they can practice. There should be no advertising of the profession whether it is direct advertisements e.g. in the form of large name plate, advertisement in telephone directory or in the press. Indirect advertisement is also prohibited like giving of articles in press which are of not general public interest and which gives the impression of advertisements or appearing on the television for publicity. There should be no canvassing by using agents or touts. They should not be involved in adultery; they should not help or do pre natal determination of sex and do illegal abortions. They should not consume liquor or drugs and be intoxicated on duty. Consultations whenever required should never be avoided.

One should not write prescriptions in secret formulae. No doctor should sell schedule poisons or run open shop for sale of medicines and should never contravene provisions of Drugs Acts. There should be no commercializing of secret remedy.

Patient of another doctor should not be attended. One should never refuse service on religious grounds. A doctor should always be ready to help during emergency.

Receiving or giving commission (dichotomy) is a bad practice and should not indulge in it. Talking disparagingly about colleagues is a bad habit and should be avoided. Whenever a doctor agrees to treat a patient there is a doctor patient contract of care. This is an implied contract to treat a patient with reasonable care & skill. This is true even if it is a voluntary service without fees. Medical practitioners should never disclose professional secrets of the patients except under privileged communications.

One should do duty towards patient carefully and should avoid acts of omission and acts of commission which may be considered as professional negligence. There is concept of corporate negligence or institutional negligence as well as vicarious responsibility. The superior person is responsible for the negligent action of the staff working under him.

Compulsory duties towards the state like notification of births, deaths, infectious diseases and food poisoning should always be done with care and responsibility, though he may not be paid for these services. He should always report homicidal poisonings & unnatural deaths. Doctor should always respond to the emergency military service and should always be willing to attend the accidents.

Though doctor has the right to choose patient, charge professional fee but patient has also the right to choose & change doctor. Patient has the right of information to his records, privacy & confidentiality and redressal of his grievances.

Consent should always be taken while examining and treating a patient. For examination there is an implied consent. But for more than examination, there should be informed (preferable) and expressed (for procedure) consent. Consent can be oral or written. Written consent is much better as it is easy to reproduce it if trouble arises. But there should not be blanket consent as it is invalid. For research & publications ICMR Code should be followed. Identity of the patient should never be revealed in publications and proper records should be maintained.

One should be aware of the relevant acts while doing general practice so that he does not come in conflict with the laws. He should be aware of the CPA 1986, Rules 1987, MTP Act 1971, Rules 1975, PNDT Act 1994, Rules 1996, Transplantation of Human Organs Act 1994, Mental Health Act 1987, Registration of Births & Deaths Act 1969, Motor Vehicles Act 1988, NDPS Act 1985, Drugs & Cosmetics Act 1940, and Protection of Human Rights Act 1993.

One should know that there are important laws of the land like IPC 1860, CrPC 1973 and IEA 1872.

Important medico-legal cases during general practice are roadside accidents, factory accidents, unnatural mishaps, urn injuries, injury case likely to die and Injury case with foul play. Cases may be brought conscious, unconsciousness or dead. They are sometimes referred by courts. There may be suspected or evident suicides, homicides, poisoning cases or cases of sexual offences and criminal abortions. While dealing with such cases it is very important to inform the police, treat the case and do medicolegal examination. It is important to record dying declaration in serious cases.

In general practice we commonly see Injury cases, Burns cases and Poisoning Cases.

In injury cases always inform the police and after taking consent do medicolegal examination. Keep injuries under observation, if necessary and issue medicolegal certificate as early as possible. After observation send supplementary report as early as possible. Arrange for getting recorded dying declaration, if necessary.

In burns cases inform the police, If patient serious, arrange recording dying declaration. If patient gives consent, medicolegal examination of the patient should be done and his report sent as early as possible to police.

In poisoning cases inform police; give treatment, record signs/symptoms carefully. If patient is serious, arrange for recording his dying declaration. Samples of gastric lavage, vomited matter, urine, blood samples should be preserved, seal & send to police under proper receipt.

In such medicolegal cases death certificate should not be issued and police should be informed.

so that police may take the possession of the dead body. After the inquest is conducted, postmortem examination should be conducted by the authorized doctor. For conducting the medicolegal postmortem examination doctors are authorized by the state.

It is a case of dowry death if age of lady is less than 30 years or if she is married within 7 years prior to her death. In such cases postmortem examination should be done by a board of doctors

In case of custodial deaths if death of prisoner or death of a person in custody of police occurs in hospital then magistrate should be informed through police. Postmortem examination should be done by a board of doctors (within 24 hours). If magistrate wants video recording of postmortem examination, it should be done.

In rape cases there is now CrPC 2005 Amendment. According to this there are some mandatory points for examination e.g. examined within 24 hours after take proper consent. Always examine in presence of female and note time of start and end and always state reasons for all conclusions. It is necessary to keep samples for examination of blood, stains, semen, swabs, sweat, hair, nails, DNA, etc. as required. One should remember that as per section 176 IPC, omission to give information to public servant by person legally bound to give it as such intentionally omits to give such information in the manner and at the time required by law shall be punished with simple imprisonment for a term which may extend to one month or with fine which may extend to five hundred rupees or with both. If information is required to be given in respect of the commission of the crime or is required for the purpose of preventing the commission of the crime or in order to the apprehension of the offender with simple imprisonment for a term which may extend to six months or with fine which may extend to one thousand rupees or both.

As per section 177 IPC, whoever being legally bound to furnish information on any subject to any public servant as such furnishes, as true, information on the subject which he knows or has reason to believe to be false shall be imprisoned for a term which may extend to six months or with fine which may extend to one thousand rupees or with both.

As per section 201 IEA, causing disappearance of evidence of offence, or giving false information to screen offender the punishment is 1/4th of the longest term which can be given for that particular offence and which may extend to seven years and also shall be liable to be fined if punishment is capital punishment

In government hospitals fee for doing the medicolegal examination is charged if offence is non-cognizable. No fee is charged if offence is cognizable or case is brought by police. In private set up fee is charged as per institution's instructions under proper receipt

Dying declaration should be got recorded in all serious medicolegal cases. It is better to get it recorded from magistrate. In case there is likely to be delay, doctor should himself record dying declaration. Doctor should certify *compos mentis* in both the situations

On head ticket or indoor file, in medicolegal cases identification is rarely established. Ideally two scar marks should be noted. Otherwise thumb impression should be taken. Witnessed signatures of the patient can help in identification. All the entries should be made promptly and correctly. If death occurs in such cases death certificate should not be issued. But police should be informed so that postmortem examination should be carried out to find out the exact cause of death.

Summons is issued in civil cases and in criminal cases. In civil cases summons is usually accompanied by conduct money. If not, can request a judge for conduct money. If still judge sends back summons without such conduct money or it is criminal case, should go to the court but before giving evidence can request the judge for conduct money. If in govt. service govt. usually pays TA/DA. One should not refuse to give testimony for want of conduct money as court will give it after deposition in court. Court may issue bailable warrants or non-bailable warrants if summons are not complied with.

Punishment for non-attendance by a witness in obedience of summons is as per under 350 CrPC. After summary trial and giving an opportunity to be heard magistrate can fine him not exceeding 100

rupees.

Punishment for false evidence as per section 193 IPC. Whoever intentionally gives false evidence in any stage of judicial proceedings, or fabricates false evidence for the purpose of its being used in any stage of judicial proceeding shall be punished with imprisonment of either description for a term which may extend to seven years, and shall also be liable to be fined.

There is a summary procedure for trial for giving false evidence as per section 344 CrPC. After a summary trial, person can be sentenced to imprisonment for a term which may extend to three months, or to fine which may extend to five hundred rupees or both.

According to PNDT Act there is prohibition of sex selection, before or after conception. This act is for regulation of pre-natal diagnostic techniques for the purposes of detecting genetic abnormalities or metabolic disorders or chromosomal abnormalities. There is advertisement prohibition. There is permission of use of such techniques only under certain conditions by the registered Institutions and there is punishment for violation of the provision of the legislation. As per PNDT Act there is punishment for first offence of fine Rs. 10,000 and punishment up to 3 years and erasure of name for 5 years from register. For second offence to the doctors, there is fine of Rs. 50,000, punishment up to 5 years and professional death sentence.

One should be aware of the latest MCI guidelines that 30 hours of CME must be attended in five years which has been enhanced to 50 hours by Punjab Medical Council and records must be kept for three years.

Records should be provided within 3 days when a request is made. Information Officer, on receipt of a request shall, as expeditiously as possible, and in any case within thirty days of the receipt of the request, either provides the information on payment of such fee prescribed or reject the request for any of the reasons. Where the information sought for concerns the life or liberty of a person, the same shall be provided within forty-eight hours of the receipt of the request.

Without any reasonable cause, refusal to receive an application for information or has not furnished information within the time specified under sub-section or malafidely denied the request for information or knowingly given incorrect, incomplete or misleading information or destroyed information which was the subject of the request or obstructed in any manner in furnishing the information, it shall impose a penalty of two hundred and fifty rupees each day after application is received or information is furnished, so however, the total amount of such penalty shall not exceed twenty-five thousand rupees: Person shall be given a reasonable opportunity of being heard before any penalty is imposed on him.

This information should not be given in cases of where information would impede the process of investigation or apprehension or prosecution of offenders and the information which relates to personal information the disclosure of which has no relationship to any public activity or interest, or which would cause unwarranted invasion of the privacy of the individual unless the Central Public Information Officer or the State Public Information Officer or the appellate authority, as the case may be, is satisfied that the larger public interest justifies disclosure of such information: Provided that the information which cannot be denied to the Parliament or a State Legislature shall not be denied to any person.

To deal with these circumstances the doctor's must have indemnity insurance which may be professional indemnity policy or Medical establishment, professional negligence, errors & omissions insurance policy. There are groups with increasing premiums from Physicians, Radiologists, and Pathologists to Specialists Non-Surgical to Specialists Surgical. Most costly is for the Super Specialists and anesthetists.

I hope all this information will make general practitioners more knowledgeable, careful and will help them to practice fearlessly.

Prof. R.K. Gorea

FATAL ROAD TRAFFIC ACCIDENTS, STUDY OF DISTRIBUTION, NATURE AND TYPE OF INJURY.

Dr. Archana Kual, Deptt. Of F.M.T. M.L.N. Medical College, Alld.

Dr. U.S. Sinha Professor & Head, Deptt. Of F.M.T. M.L.N. Medical College, Alld.

Dr. Y. K. Pathak, Asstt. Professor, Deptt. Of F.M.T. M.L.N. Medical College, Alld.

Dr. Aparajita Singh, Jolly Grant Dehradun.

Dr. A. K. Kapoor, Professor & Head, Deptt. Of Pharmacology M.L.N. Medical College, Alld.

Dr. Susheel Sharma, IInd Year Resident, Deptt. Of F.M.T. M.L.N. Medical College, Alld.

Dr. Sanju Singh, AIIMS, New Delhi

ABSTRACT

During one year study period medico legal autopsies were conducted on 950 cases of fatal road traffic accidents at the mortuary of SRN Hospital, MLN Medical College, Allahabad. M/F ratio 3:1. 33.68% of cases were in the age group of 25-44 years. Pedestrians were most vulnerable accounting for 35.79% of total fatalities followed by motorized two wheelers 30.53%. Heavy Vehicles were found to be mostly involved 58.52% of cases and most accidents 83.05% occurred on highways. Majority of cases sustained multiple injuries. Primary impact injuries were recorded in 455 cases and pedestrians 36.26% were mostly affected followed by pedal cyclists 20.88%. 505 cases sustained secondary impact injuries and pedestrians and motor cyclists were primarily involved. Of 697 secondary injuries, 29.99% were sustained by motorcyclists followed by pedestrians 22.67%. Mostly lower extremities 27.39% and pelvis 25.99% received the primary impacts; the head and neck 55.62% the secondary impacts, while secondary injuries were mostly located in the lower extremities 28.38%. Largest number of injuries were recorded in lower extremities 804 number, followed by head & neck 748 number. Vehicle occupants mostly sustained thoracic injuries. In majority of cases, the site of initial impact of the responsible vehicle was frontal (45.14%) followed by rear (25.83%) and side (7.01%). In 179 cases (22.02%) site of responsible vehicle were not known.

Key Words : Accidents, Head Injury.

INTRODUCTION

Amongst all traffic accidents, road traffic accidents claim largest toll of human life and tend to be the most serious problem world over. Worldwide, the number of people killed in road traffic accidents (RTA) each year is estimated at almost 1.2 million, while the number of injured could be as high as 50 million [1]. The Americas bear 11% of the burden of road traffic injury mortality [2]. Currently motor vehicle accidents rank 9th in order of disease burden and are projected to be ranked third in the year 2020. Nearly three quarter of deaths resulting from motor vehicle crashes occur in developing country[3]. In India, over 80000 persons die in the traffic crashes annually, over 1.2 million injured seriously and about 3,00,000 disabled permanently. In India, for individuals more

than 4 years of age, more life years are lost due to traffic crashes than due to cardiovascular diseases or neoplasm [4,5]. The problem appears to be increasing rapidly in developing countries [6].

Injuries due to RTA depend upon a number of factors-human, vehicle and environmental factors play vital roles before, during and after a serious RTA. The important factors are human errors, driver fatigue, poor traffic sense, mechanical fault of vehicle, speeding and overtaking violation of traffic rules, poor road conditions, traffic congestion, road encroachment etc.

The primary role of autopsy surgeon is to find out the cause of automobile deaths may it be accident, sheer ill luck, rash or negligent driving, suicide or homicide. Recording of injuries at post mortem may facilitate not only in the award of

compensation by the court but also in apprehending the defaulting drivers.

The present study has been carried out to study the distribution, nature and types of injuries received during fatal RTAs, and to suggest possible preventive measures.

MATERIAL AND METHODS

The present study was conducted at SRN Hospital mortuary attached to MLN Medical College, Allahabad, U.P. The study period was December 2003 to November 2004. The material for the present study included all dead bodies of fatal road traffic accidents brought to SRN Hospital mortuary. For the purpose of the present study, only those cases where proper records were available, were considered.

In the present study, a road traffic accident was defined as accident which took place on the road between two or more objects, one of which must be any kind of a moving vehicle[7]. Others were excluded. Only RTA victims dying within 21 days of accidents were included in the study.

A pretested proforma specially designed for this purpose was used to extract informations by interrogating police personnel accompanying the victims, as well as friends, relatives, neighbours and others who accompanied victim or where the victim was alive by interrogating him, if the condition permitted. The history as regards the circumstances of the accidents and other relevant data about injuries to the victims, the site of impact etc were also collected. Data concerning the vehicles involved in the accident, their types etc were noted. Besides, paper sent by the police eg. inquest reports and FIR were also studied.

All 950 dead bodies were examined in depth at postmortem for the presence of external injuries, internal injuries including bone and joints and finally characteristics of injuries were analysed regarding their nature, type, area of the body injured and distribution of injuries. Additionally, place of death of RTA victims, nature of treatment provided if any, and period of survival following accidents were also recorded.

RESULT

Table 1
Showing Age, gender and Types of Road-Users involved in Fatal RTA

S.No.	Age group Years	Victims		Cases		Type of Road Users	Cases	
		Male	Female	No.	%		No.	%
1	<10	30	21	51	5.38	Pedestrian	340	35.79
2	10-14	59	46	105	11.05	Motorized	290	30.53
3	15-24	165	54	219	23.05	2-Wheeler		
4	25-44	270	50	320	33.68	Vehicle Occupants	214	22.53
5	45-64	150	35	85	19.47	Pedal Cyclists	52	5.47
6	65 & Above	39	31	70	7.37	Others	40	4.21
	Total	713	237	950	100	Unknown	13	1.37
						Total	950	99.9

Table 2
Showing different types of vehicles involved in fatal RTA, sites of accidents in relation to roads and number of vehicles involved

Vehicle Type	Cases		Types of Road	Cases		Vehicle Involved	Cases	
	No.	%		No.	%		No.	%
Heavy Vehicle			Highways	789	83.05	Single Vehicle	790	83.15
a) Truck, Oil Tanker	375	39.47						
b) Motor Bus	181	19.05						
Light Vehicles Taxi, Car, Jeep	205	21.58	Roads	150	15.58	Double Vehicle	140	14.74
Motorized 2-wheelers	157	16.53	Lane	6	0.63	Triple Vehicle	3	0.31
Other Vehicles	25	2.63	Other Places	2	0.21			
Unknown	7	0.74	Unknown	5	0.53	Unknown	18	1.89
Total	950	100	Total	950	100	Total	950	100

Table 3
Distribution of External injuries amongst different types of road users

Nature of Ext. Injury	Pedestrians		Pedal Cyclist		Motor Cyclist		Other		Unknown		Total Cases	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Primary Impact Injury	165	36.26	95	20.88	82	18.02	50	10.99	63	13.85	455	100
Secondary Impact Injury	176	34.85	103	20.40	121	23.96	47	9.31	58	11.49	505	100
Tertiary Impact Injury	158	22.67	183	26.26	209	29.99	77	11.04	70	10.04	697	100

Table 4
Distribution of Primary and Secondary Impact-Injuries and secondary injuries on different parts of the body

Part of Body Injured	Primary Impact Injury		Secondary Impact Injury		Secondary Injury	
	No.	%	No.	%	No.	%
Head & Neck	37	4.71	396	55.62	315	19.18
Upper Extremities	123	15.67	102	14.33	301	18.33
Thorax	97	12.36	52	7.30	136	8.29
Abdomen	34	4.33	14	1.97	82	4.99
Back	75	9.55	10	1.40	192	11.69
Pelvis	204	25.99	45	6.32	150	9.14
Lower Extremities	215	27.39	93	13.06	496	28.38
Total	785	100	712	100	1642	100

Table 5
Showing crushing Injury amongst different types of road users and parts of body injured

Types of Road User	Crushing Injuries		Part of Body Injured	Cases	
	No.	%		No.	%
Pedestrian	149	42.20	Head & Neck	138	19.86
Pedal Cyclist	12	3.40	Thorax	98	14.10
Motor Cyclist	105	29.75	Abdomen	103	14.82
Vehicle Occupant	71	20.11	Back	17	2.45
Other	11	3.12	Pelvis & Buttocks	115	16.54
Unknown	5	1.42	Upper Extremities	18	2.59
			Lower Extremities	206	29.64
Total	353	100	Total	695	100

Table 6
Distribution of Avulsion (Degloving) and contre-coup Injuries amongst different types of Road users.

S.No.	Type of Road User	Avulsion Injury		Contre-coup Injury	
		No.	%	No.	%
1.	Pedestrian	50	34.01	61	71.77
2.	Pedal Cyclist	2	1.36	5	5.88
3.	Motor Cyclist	61	41.50	2	2.35
4.	Vehicle Occupant	33	22.45	15	17.65
5.	Other	—	—	2	2.35
6.	Unknown	1	0.68	—	—
	Total	147	100	85	100

Table 7
Showing Distribution of Visceral Injuries

Visceral Injures	No.	%
Brain	295	22.92
Heart & Vessels	123	9.56
Lungs	199	15.46
Liver	255	19.81
Spleen	146	11.34
Kidney	109	8.47
Stomach	45	3.50
Intestine	50	3.89
Urinary Bladder	65	5.05
Total	1287	100

Table 8
Showing Place of Death and treatment received by the victims

Place of Death	Cases		Types of Treatment	Cases	
	No.	%		No.	%
Spot	250	26.32	Specific Management	106	21.37
On way to Hospital	204	21.47			
Hospital	496	52.21	General Management	390	78.63
Total	950	100	Total	496	100

DISCUSSION

Road traffic accidents (RTAs) are increasing with rapid pace and presently these are one of the leading causes of death in developing countries. Vander sluis et.al [8] has reported that traffic is the most important cause of severe injuries and three quarters of severely injured cases who died during hospitalization are victims of traffic accidents.

In the present study, a total of 950 cases of fatal road traffic accidents (RTA) have been studied in respect to distribution, nature and type of injuries. The actual time of occurrence of the accident has not been recorded in most of the fatal RTA's hence no comment on the time of occurrence of accident in the present study. A majority of fatal RTA have sustained multiple injuries. EKe N et. al.,[9] have also reported occurrence of multiple injuries in 93.5% of the victims.

In the present study, a preponderance of males over females M/F ratio 3:1 have been observed. This is in contrast to ratio of 9:1 as has been observed by Singh and Dhatarwal [10] Highest incidence of fatalities have occurred in the age group of 25-44 years (33.68%) followed by the age group 15-24 years (23.05%). Children below 10 years of age are least involved so also is the case with persons beyond 65 years of age. Our findings are in general agreement with those of other workers in the field [9,10] Kochar et. al.,[11] have reported that maximal fatal accidents have occurred in the age group of 31-40 years and a preponderance of males 85% and more incidences on Fridays. Whereas Singh & Dhatarwal [10] has observed that the commonest age group involved 21-30 years (27.3%) followed by 31-40 years (20.6%).

Pedestrians have been mostly involved followed by motorized 2 wheelers. Pedestrians being the common victims can be explained by the fact that there is a lack of proper footpath and presence of vendors and other commercial installations by the side of the roads. Moreover, majority of road users are pedestrians thus are comparatively more exposed to the risk of accidents, and are of low or lower middle socio-economic status, are illiterate and lack traffic sense. Our findings are in general agreement with those of other [9,10,11]. Mohan D4 has noted that in India, pedestrians, cyclists and motorcyclists are

the most vulnerable road users constituting over 70-80% of all road traffic deaths, and car occupants only about 5%. The author has also recorded that the patterns of traffic and crashes in India are very different from those in high-income countries. Eke Net.al.,[9] have observed that females constituted 41% of pedestrians and 21% of pedestrians are under 15 years of age and that female pedestrians below 15 years of age are more susceptible to death in RTA. Studies from developed countries have reported lesser involvement of pedestrians probably due to the fact that in developed countries motorization is to that extent that pedestrians are scarce on the road. In the present study motorized 2-wheelers are the second most commonly involved road user owing to less stability, higher speed, restless driving and thrill seeking habit.

In the present study, heavy vehicles (truck, oil tanker, motor bus etc.) are more commonly involved in fatal RTA followed by light vehicles (taxi, car, jeep, van etc.). This can be attributed to their high speed, greater momentum, presence of single space roads, overtaking, volume of traffic etc. The finding are in conformity with Singh & Dhatarwal[10]. Our findings are in variance with EkeN et.al.,[9] who have observed that car and buses are commonly involved in the casualties followed by motorcycles, lorries etc. Gerberich et.al.,[11] has noted that farm vehicle fatalities being a significant problem in U.S. During 1988-1993, in rural areas, 444 farm-vehicle occupants are killed, in addition, 238 occupants of other vehicles or pedestrians are killed in collisions with farm-vehicles. However, in the present study, minimal involvement of farm vehicles (tractor tractor trolleys, thrasher etc.) have been observed even in rural area. In our study, involvement of oil tankers is a notable feature. Moreover a larger involvement of heavy vehicles in our study may be due to the fact that G.T. road (highway) is passing through this region. Our findings are in agreement with those of others[10] who have also reported that heavy vehicles are responsible for maximum fatalities.

Our study has not explored the role of contributing factors like alcohol in fatal RTA, although role of alcohol in impairing driving ability is well documented. Kochar et.al.[11] have reported 28.3% of fatal RTA has a history of having consumed alcohol within 6 hours before the accident. Soderstrom [13] has observed that there

is etiological relation between alcohol use and the causation of vehicular crashes (both fatal and non-fatal) and it is well established. However, EkeN et.al.[9] have observed that contribution of alcohol in fatal RTA is relatively uncertain as only 6 cases have been documented. Drivers fatigue or sleepiness owing to prolonged hours at wheels in hostile environmental conditions can be an important contributing factor. Garbarino et.al.,[14] has attributed more than 20% of road accidents to driver sleepiness, and that drivers with obstructive sleep apnoea show 2-7 times increased risk of motor vehicle accidents.[15] Further, literature on road traffic, suicides (pedestrian or drivers suicide) and natural deaths is quite scarce. Routley et.al.,[16] have noted that driver suicides and natural driver deaths are relatively minor components of road traffic fatalities. Other workers have reported that cellular telephones are important contributing factor for RTA since their use can affect both cognitive and motor skills involved in driving.

In the present study, largest number (83.05%) fatal RTA have occurred on highways and very few have occurred in lanes and other places. This can be explained on the basis that highways are most busy roads with heavy traffic loads especially by heavy vehicles, whereas in lanes volume of traffic is fairly low and very few heavy vehicles can pass through. Our finding are in agreement with others[10,17]. Further, in great majority of fatal RTA (83.15%) only one vehicle is involved and in 0.31% of cases three vehicles are involved simultaneously. In 1.89% of cases no clues are available for number of vehicles involved in RTA.

A great majority of fatal RTA victims have received multiple external injuries. Singh & Dhatarwal have also recorded involvement of multiple body parts in each case. Abrasion, laceration, fractures, dislocation, head and visceral injuries were more commonly observed in fatal RTA. Our finding are in general agreement with those of other.[10] As far as the distribution of impact injuries amongst different types of road users is concerned, primary impact injuries are noted in 455 cases, secondary impact injuries in 505 cases where as secondary injuries are recorded in 697 cases. Pedestrians are mainly involved in primary and secondary impacts; whereas motorcyclists are mainly involved in secondary injuries, followed by pedal cyclist and pedestrian. More incidence of

secondary injuries amongst motor-cyclists and pedal cyclist may be attributed to a greater distance of fall in them.

Since a single crash may lead to multiple primary impacts in a victim hence, in the present study out of 455 cases of primary impacts a total of 785 primary impact injuries have been recorded on the different parts of the body. Lower extremities and pelvis, are mostly involved followed by upper extremities and shoulder, whereas abdomen, head and neck are least involved. In contrast, in secondary impact injuries head and neck are mostly involved followed by upper extremities and lower extremities. Least involvement of back and abdomen is observed. Out of 1642 secondary injuries, maximum injuries are recorded in lower extremities, followed by head and neck and upper extremities. It is observed that number of secondary injuries is fairly high in fatal RTAs. Crushing injuries are responsible for more incidences of secondary injuries.

In majority of cases front of the vehicle is found responsible for initial impact followed by rear of vehicle and then side of vehicle. Involvement of front of the vehicle may be due to heavy traffic volume, overtaking, and violation of traffic rules. It appears that road users are at fault in majority of cases. This is in contrast to Singh & Dhatarwal [10] who have noted that drivers are at fault in majority of case (55.6%) compared to others.

A total of 353 cases of crushing injuries are recorded. As far as, distribution of crushing (run-over) injuries amongst different types of road-users is concerned, pedestrians and motorcyclist are primarily involved. Lower extremities, head and neck, pelvis and abdomen in the descending order bear the maximum brunt. The possible mode of crushing injury is being ejected out of the vehicle and then run over or coming under wheels or crushed by an overturned vehicle. Our observation that heavy vehicles are more frequently responsible for crushing injuries hence this may justify a higher incidence of crushing injuries in our study. Moreover, heavy vehicles have six or more wheels, it is quite natural that more than one body areas of the victim are injured in run over injuries. Other workers have also observed that lower extremities are mostly involved in run over injuries.

As regards degloving or avulsion injuries, it

has been noted that motorcyclists followed by pedestrians and vehicle occupants are primarily involved. Distribution of contre-coup injuries again have shown the maximal involvement of pedestrians. Literature on these aspects is fairly limited.

Multiple visceral injuries (internal injuries) are quite common following fatal RTA. Table-8 has depicted various visceral organs involved in an accident. In majority of cases, brain has been chiefly injured followed by liver, lungs and spleen respectively. Traumatic intra-cerebral hemorrhages are not infrequent in fatal injuries sustained in traffic accidents. Front impact is responsible for brain injury followed by lung and liver injuries. Rear impact too has caused a lot of brain injuries. Thus, in front or rear impact vulnerability of brain is well established. A higher incidence of brain injury has also been reported by other workers [8, 9, 10].

In our series, head injury alone is the cause of death in 29.16% of cases whereas head injury together with thoraco-abdominal injury is responsible for 13.68% of cases. Injury to non-vital part is responsible for only 7 cases 0.74%. Our finding pertaining to head injury is at variance to those of Singh & Dhatarwal [10] who have reported an incidence of 50.4% of head injury. Severe brain injury is the most important cause of death, is held by vander sluis [8] as well. In this study, all 950 cases have sustained injuries, this is in contrast to the findings of Eke N et.al., [9] who have observed that as many as 100 RTA victims had no evidence of violence on them on physical examination and on autopsy 37 victims had no physical injuries. The authors have opined that they may have died from natural causes; existing disease especially in elderly may be the cause of death in a RTA.

In the present study, we have observed that 250 cases (26.32%) died on spot. This is in contrast to Singh & Dhatarwal [10] who have reported a lower incidence of 15.4% died on the spot. Our study reveals that a total of 52.21% of RTA victims have been admitted in the hospital whereas 21.47% have died on way to hospital. Of the 496 admitted victims only 106 have received specific treatment including major surgeries. This emphasizes the need for setting up specialized trauma centres in all big cities of the country and proper faster transportation of RTA victims to save the precious

lives.

Regarding period of survival of fatal RTA victims, we have noted that a great majority of victims have died within 24 hours hence first 24 hours are quite crucial for RTA victims. 308 cases survived beyond 24 hours but they too later succumbed to injuries within a period of 21 days. Our findings are in general agreement with those of Singh & Dhatarwal[10].

It may be concluded that there is a urgent need to address the epidemic of carnage on the roads. In many cases fatal RTAs are caused by human errors and are therefore preventable. A strict licensing policy especially for four wheelers, a greater awareness about traffic rules, cultivation of road traffic sense, curbing drug abuse, and a proper road network conforming to the volume of traffic will go a long way in curbing the incidence of fatal RTAs. Moreover, the recommendations from the world report on Road Traffic Injury Prevention should be considered and promptly implemented.

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TRAUMA SCORE: A VALUABLE TOOL FOR DOCUMENTATION OF AUTOPSY REPORTS OF TRAUMA VICTIMS

Dr. B. R. Sharma, Reader,

Dr. D. Harish, Reader,

Dr. Sumedha Bangar, Demonstrator,

Dr. Virendar Pal Singh, Demonstrator,

Dept. of Forensic Medicine and Toxicology, Govt. Medical College & Hospital, Chandigarh - 160030, India

ABSTRACT

Trauma related morbidity and mortality is an age old reality, however, with the passage of time, advances in medical science and technology, man has succeeded to control / minimize the extent of damage caused by trauma. Vehicular accidents continue to be the commonest presentation of trauma related mortality and morbidity, the other causes being mechanical violence, industrial accidents, etc. According to the World Health Organization, accident is an event, independent of human will power, caused by an external force that acts rapidly and results in bodily or mental damage. Objective of the present study was to analyze the suitability of Anatomic Injury Scoring system particularly Injury Severity Score (ISS) on autopsy among the cases of road traffic accidents with the aim of improving the autopsy data in trauma related deaths, thus assisting policy planning for better trauma care systems.

Key Words: Trauma Score, ISS.

INTRODUCTION

Vehicular accidents and accidental deaths have taken an epidemic form the world-over, due to modernization and a rapid increase in transportation. They have become the major cause of trauma death among people below 50 years of age. [1] India, the former USSR and the USA have reported the largest number of traffic related fatalities among all nations.[2] Estimates suggest that there are 60 fatal accidents per 10,000 vehicles per year in India, compared to 2-3 fatal accidents per 10,000 vehicles per year in the developed countries.[3] According to the reports, Road Traffic Accidents account for 33.2% of total accidental deaths in India. Goa (71%) tops the list of accident rate, followed by Daman and Diu (69%), Maharashtra (64%) and Delhi (61%).[4] National Crime Record Bureau Report (1999)[3] shows that one accidental death is reported in India every 1.9 minutes, with total figure at more than 2.7 Lac per year (Table-1). Chandigarh area has its own place in recording the ratio of deaths by vehicular accidents (Table-2).

Characterization and documentation of injury severity are requirements for the evaluation of

Table 1
Accidental Deaths in India from 1995-1999

Year	Number of accidental deaths			Rate of accident to death
	Male	Female	Total	
1995	1,57,219	65,268	2,22,487	24.29
1996	1,56,106	63,988	2,20,094	23.62
1997	1,64,876	69,027	2,33,908	24.62
1998	1,85,520	72,889	2,58,407	26.62
1999	1,93,652	98,266	2,71,918	27.56

trauma systems and development of initiative in injury control. Assessment of survival period among the trauma victims in general and those likely to have a short survival is also an important issue for the following reasons: (a) to plan issues related to death such as 'will', (b) to optimally utilize the scarce ICU and other critical care medical facilities, (c) to make the relatives mentally prepared to the ultimate eventuality and (d) To assess the quality of care provided by an institution.

The development of valid and useful quality-improvement methods, comparisons of therapeutic modalities with the outcomes of trauma patients, collection of basic epidemiologic trauma data and effective use of pre-hospital and inter-hospital triage

Table 2
Road Traffic Accidents in & around Chandigarh

Year	Total No.	No. of Fatal Accidents		No. of Accidents causing disability			Others*	
		%	No.	%	No.	%	No.	%
2000	10559	22.92	2040	19.32	3612	34.21	4907	46.47
2001	9221	20.02	1919	20.81	2439	26.45	4863	52.74
2002	7895	17.14	1778	22.52	2130	26.98	3987	50.50
2003	8962	19.45	2689	30.04	2236	24.95	4037	45.05
2004	9432	20.47	3018	32.00	2169	23.00	2405	25.50
Total	46069	100	11444	24.84	12586	27.32	20199	43.85

Source: The Tribune & The Times of India.

Others* include non-fatal, non-disability causing accidents.

are major needs in the trauma care system [5]. A prerequisite to meet these needs is the uniform application of severity scales to the trauma patients[6]. Current commonly used scales can be grouped according to the type of patient information on which they are based, such as:

Physiologic Scores that include vital signs such as pulse, blood pressure, respiratory rate and level of consciousness. Glasgow Coma Scale (GCS), Revised Trauma Scale (RTS), for patients with serious head injuries, Circulation, Respiration, Abdominal/Thoracic, Motor, Speech Scale (CRAMS), Acute Physiology and Chronic Health Evaluation (APACHE), etc.

Anatomic Scores

The first attempt to classify injuries on the basis of severity was perhaps, made by DeHaven in early 1950s, when he created a scale to study light plane crash injuries. Development of the Abbreviated Injury Scale (AIS) began in 1969 with an emphasis on blunt trauma associated with motor vehicle accidents. The AIS has been revised at least six times since the original 1971 version to introduce the severity value of different injuries. The 1985 version, AIS - 85, introduced severity values for penetrating injuries and clinical terminology to describe thoracic, abdominal and vascular injuries and these severity values has been assigned to ICD-9-CM injury rubrics. The latest revisions of AIS were made in 1990 (AIS - 90).

The Injury Severity Score (ISS) is virtually the only anatomical scoring system in use and correlates linearly with mortality, morbidity, hospital

stay and other measures of severity. But, it has been criticized for its failure to account for multiple severe injuries in the same body region. It has been documented that any error in AIS scoring increases the ISS error, many different injury patterns can yield the same ISS score and injuries to different body regions are not weighted. To overcome this criticism a New Injury Severity Score (NISS) was proposed by Osler et al in 1997.

Combined Scores that combine both anatomic and physiologic measures of injury severity (ISS and RTS, respectively) and patient age in order to predict survival from trauma. However, due to obvious reasons the physiologic and combined scoring system cannot be applied at autopsy and as such it is the anatomic scoring system that has to be used for the assessment of antemortem injury severity.

MATERIALS & METHODS

The study was conducted at Department of Forensic Medicine and Toxicology, Govt. Medical College & Hospital Chandigarh, India in correlation with the relevant clinical records and the reports from investigating agencies. Duration of the study was five years, from January 2000 to December 2004. Victims of road- traffic accidents subjected to medicolegal autopsy, during this period and whose detailed history and case records were available, were the subjects of study.

The Abbreviated Injury Scale (AIS) of each injury was determined using Association for Advancement of Automobile Medicine 1990 protocol. Each case was examined in detail and

ISS calculated based on the AIS. Other relevant parameters like age, sex, survival time, date & time of injury and medical interventions done were also recorded. The results were analyzed to find out the correlation between AIS, ISS and survival period by regression analysis.

To study the relationship between survival period and the trauma scoring by AIS & ISS, the cases were divided into 4 categories: (I) Survival period of 1 to 6 hours, (II) Survival period more than 6 hours and upto 12 hours, (III) Survival period ranging between 12 to 24 hours and (IV) Survival period more than 1 day

RESULTS

Out of a total 14390 victims of Road Traffic Accidents reporting to the Emergency Wing at Government Medical College Hospital, Chandigarh, 552 (4%) had a fatal outcome; whereas 304 (2%) sustained permanent disability of variable extent (Table 3).

Table 3

Road Traffic Accidents reporting to the Govt. Medical College Hospital Chandigarh

Year	No. of Accident cases reporting to casualty				No. of Fatal Accidents			
	No. of Accidents causing disability		Others*		No. of Accidents causing disability		Others*	
	No.	%	No.	%	No.	%	No.	%
2000	2569	17.85	113	04.40	61	02.38	2395	93.23
2001	3012	20.93	94	03.12	63	02.09	2855	94.79
2002	2738	19.03	111	04.05	53	01.94	2574	94.01
2003	2954	20.53	108	03.66	62	02.10	2784	94.25
2004	3117	21.66	126	04.04	65	02.09	2926	93.87
Total	14390	100	552	03.84	304	02.11	13534	94.05

Others* include non-fatal, non-disability causing accidents.

Table 4

Annual Breakup of Fatal Accident Cases

Year	Total autopsies	No. of RTA		% of RTA		Males	Females
	No.	No.	%	No.	%		
2000	352	113	32.10	75	66.37	38	33.63
2001	372	94	25.27	63	67.02	31	32.98
2002	338	111	32.84	84	75.68	27	24.32
2003	288	108	37.50	69	63.89	39	36.11
2004	369	126	34.15	86	68.25	40	31.75
Total	1718	552	32.13	377	68.30	175	31.70

Table 5

Age and Gender distribution of cases

Age Group (In years)			Males		Females		Total	
	No.	%	No.	%	No.	%	No.	%
0-10	03	60.00	02	40.00	05	00.91		
11-20	26	68.42	12	31.58	38	06.88		
21-30	119	67.23	58	32.77	177	32.07		
31-40	106	74.12	37	25.87	143	25.91		
41-50	55	51.89	51	48.11	106	19.20		
51-60	28	54.90	23	45.10	51	09.24		
> 61	19	59.38	13	40.63	32	05.80		
Total	356	64.49	196	35.51	552	100		

Table 6

Survival Period

Survival Period	No.	%
S.D*/B.D.**/< 1 Hour	149	26.99
1-6 hrs.	133	24.09
6-12 hrs.	19	03.44
12 - 24 hrs.	39	07.07
1-3 days	76	13.77
3 days - 1 wk.	88	15.94
> 1 wk.	48	08.70
Total	552	100

* S.D: Spot Death ** B.D: Brought Dead

Table 7

Injury Severity Score vis-à-vis survival period

No. of cases	AIS	ISS	Survival period
124	5 to 6	36 to 75	1 to 6 hours
28	3 to 5	16 to 65	6 to 12 hours
39	2 to 4	< 16	12 to 24 hours
43	2 to 4	<16	1 to 3 days

Among the offending vehicles, motorcycles outnumbered all other categories of vehicles claiming 25% victims of fatal accidents (Table 6) whereas pedestrians (41%) constituted the majority among the victims.

DISCUSSION

Road traffic accidents (RTA) among trauma related mortality and morbidity exceed any other

lethal causes and take first place for loss of work years of potential and the life[7]. Autopsy still remains the "Gold Standard" by which the physician's clinical diagnosis is either confirmed, amended or refuted. It is the most reliable and accurate instrument for investigation of injuries.

Over all, 282 (51%) victims died within 6 hours of the accident, of which 149 (27%) died either on the spot or were declared brought dead to the hospital. These figure are lower than the study by Steenberg[8] and were significantly higher in comparison to the study by McAnena et al [9]. The higher figure of early mortality may be due to inadequate infrastructure for early transport and management of trauma patients and involvement of heavy vehicles as well as traffic congestion on the highway. The age and gender distribution of the cases was found in tune with other similar studies [10] [11].

Baker et al introduced the ISS in 1974 as a means of summarizing multiple injuries in a single patient. The ISS is defined as the sum of squares of the highest AIS grade in the 3 most severely injured body regions and ranges from 1-75. An ISS of 75 is assigned to anyone with AIS of 6, as all the AIS 6 injuries are inherently fatal [12].

Fundamentally, trauma outcome prediction is a multivariate problem. Researchers use multiple independent variables (e.g., age, and injury severity) to predict the dependent variable (or outcome). The simplest form of regression analysis is linear regression, which describes the linear relationship between 2 variables. Multiple regression is an extension of this technique, in which more than one independent variable is used to describe a single, continuous dependent variable. Multiple regression is advantageous because it allows one to measure the association between a predictor variable and an outcome variable while controlling for other modifying factors[13].

Although several methods are available, multiple logistic regression is the most popular approach when the outcome of interest is dichotomous because of some unique advantages of multiple logistic regression. Logistic regression is mathematically convenient in that one can easily convert the coefficients of the equation into estimates of the risk of developing a disease or

outcome given the presence of a particular risk factor. However, outcome prediction never will be perfect, in part because injury severity is difficult to quantify. Perhaps more important is that the patient's response to injury is complex and difficult to model adequately; therefore, multiple scoring systems emerged. Anyhow, practitioners should be able to assess the predictive performance of each system in order to compare them. Measures of predictive performance include explanatory power, discrimination, and calibration.

Explanatory power is that proportion of the prediction outcome that can be explained by the model rather than by variation. Discrimination is the ability of the model to separate the patients into two groups; for example, those who survive and those who die. This involves sensitivity, specificity, and accuracy, which are concepts well understood by most physicians. However, when applied to predictive models, these concepts can be problematic. A trauma survival predictive model yields a probability of survival; while in reality, patients can only live or die. Therefore, a prediction rule must be established. Calibration is the ability of the model to correctly predict outcome over the entire range of risk. Calibration can be assessed graphically by plotting the actual outcome against the predicted outcome.

The scarcity of injury data on the estimated 50% of fatally injured persons who die at the scene of accident or in transit continues to represent a real information gap. Demographics and injury information on these victims, if it exists, is found only in autopsy reports. Lack of uniform system of death investigation sometimes renders this data incomplete and not easily accessible.

Every trauma service should review the process and outcome of patient care on monthly basis as recommended by the Joint Commission on Accreditation of Healthcare Organization's (JCAHO) mandated reviews of quality improvement and utilization. Indices of severity and audit criteria are of value in identifying aberrant outcomes or potential problems in patient care, and in prompting remedial action. Strategies for quality improvement in trauma care should involve the policy or process of managing the major trauma victim[14].

Many hospitals have found that a trauma registry is an efficient method for storing and

analyzing data on trauma patients. Basic data elements in the registry should include demographics (patient's age, sex, injury cause and injury type), information on pre-hospital care, data on the process of acute care (treatment, major surgical procedures, identification of the attending service, response time), clinical items (sequential measurements of RTS and blood alcohol level), final anatomic diagnosis (from examination, x-rays/CT, surgery or autopsy), and outcome data (discharge status, hospital and ICU length of stay, complications and functional disability at discharge). Trauma registries must be founded on complete, accurate data that includes explicit and accurate descriptions of physiologic derangement and injuries as well as accurate injury coding based on ICD-9-CM codes, by the clinicians in medical record.

CONCLUSION

Many workers have felt the importance of relationship between injury scores and survival period. This information can help in giving priority in treatment, especially in countries where resources are limited. Again, this information can serve as a yardstick to measure the quality of care being provided by an institution for these types of cases. It has been argued that outcome prediction never will be perfect, however, despite their limitations, anatomical scoring systems are readily applicable in coding autopsy findings and provide a powerful tool for the physician and for trauma research. We recommend that they should become a standard part of trauma autopsies and of the quality assurance system in trauma care systems.

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A POSTMORTEM STUDY OF BLUNT CARDIAC INJURIES

Dr T.H. Meera, Senior Tutor,

Dr H. Nabachandra, Professor,

Department of Forensic Medicine, Regional Institute of Medical Sciences, Imphal - 795004.

ABSTRACT

35 cases of blunt cardiac trauma following vehicular accidents brought for autopsy to the morgue of Regional Institute of Medical Sciences, Imphal have been studied to find out types of cardiac injuries, their association with sternal and rib fractures, mechanism of causation, risk factors, etc. It was observed that 48.57% of the cases with blunt cardiac trauma had associated sternal and rib fractures. Maximum number (60%) of the cardiac rupture was seen in run-over cases. 40% of the cases had injury to the right ventricle. All the injuries were located on the anterior surface of the heart. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was observed. In assessing blunt cardiac trauma victims in vehicular accidents, knowledge about the commonest sites, types and degrees of injuries as has been highlighted in the present study will be of great help in a timely intervention.

Key Words: Vehicular accident, rib fracture, sternal fracture, blunt cardiac trauma etc.

INTRODUCTION

Blunt thoracic trauma may be produced by low velocity as well as high velocity blunt force injuries. The low velocity blunt injuries such as blow with a club or fist may lead to soft tissue contusions with or without any internal injuries, whereas high velocity blunt force as seen in vehicular accidents may produce a wide variety of external as well as internal injuries. Following blunt trauma, the chest wall may show superficial injuries to its soft tissues such as abrasions, bruises, lacerations, hematoma, etc.

Depending on the mechanism and severity of the trauma, the cardiac injury ranges from a mild contusion to rupture of the cardiac wall [1]. Though rupture of the heart is rare, it is the commonest form of deadly cardiac injury from blunt trauma [2,3]. Interestingly, the cardiac ruptures are usually discovered at autopsy. According to Getz B.S., et al. [4], the mechanisms of cardiac injury in blunt trauma may be summarized as (1) direct blow to the anterior chest (most common cause of ventricular rupture); (2) indirect injury that causes a sudden increase in preload, resulting in atrial rupture; (3) compression of the heart between the sternum and vertebral bodies; (4) acceleration/deceleration of the heart and great vessels; (5) blast injury and (6) penetrating injury of a cardiac

chamber by a fractured rib or the sternum. The heart may be ruptured by compression or from a blow or a fall, usually on its right side and towards its base [5]. Contusions or lacerations of the heart may also be produced by blows from a blunt weapon or by compression of the chest even without fracturing any bone of the thorax or showing marks of external injury [6]. Therefore, there is always a possibility of fatal cardiac injuries to be unnoticed leading to a fatal outcome.

MATERIAL AND METHODS

35 cases of blunt cardiac trauma following vehicular accidents brought for autopsy to the morgue of the Regional Institute of Medical Sciences, Imphal have been considered for this study. The cases were studied to analyze the types of cardiac injuries, their association with sternal and rib fractures, mechanism of causation, risk factors, etc.

RESULTS

All the victims were males within the range age of 21-40 years, and all of them were involved in vehicular accidents. Out of these 35 cases of blunt cardiac trauma, 17 cases (48.57%) had associated sternal and rib fractures. 40% of the

cases had only associated rib injuries. Only two cases (5.71%) had no associated sternal or rib fractures (Table-1).

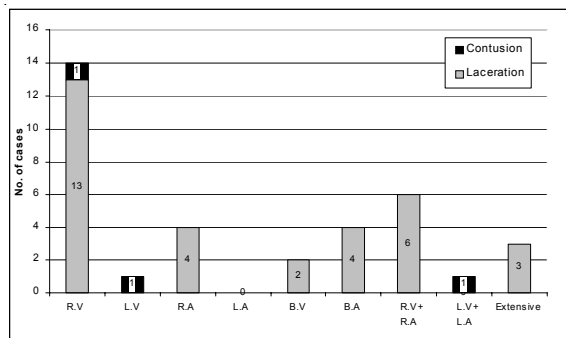
Table 1
Showing Incidence of Cardiac Injuries and Association with sternal and rib fractures

Sl. No.	Cardiac Injuries	No.	P.C.
1	With sternal fracture	2	5.71%
2	With rib fracture	14	40.00%
3	With both sternal and rib fractures	17	48.57%
4	Without sternal or rib fractures	2	5.71%
	Total	35	100

Table 2
Type of vehicular accident and cardiac injuries

Sl.No.	Type of Vehicular accident	No.	P.C
1	Run-over	21	60.00
2	Knocked-down	5	14.29
3	Collisions	4	11.42
4	Self	5	14.29
	Total	35	100.00

Diagram 1.
Showing the details of bluntheart injuries (Total no. of cases = 35)



(R.A = Right Atrium; R.V = Right ventricle; L.A = Left Atrium; L.V= Left Ventricle; B.V= Both Ventricles and B.A = Both Atria)

Diagram-1 shows that the right ventricle of the heart was involved in 14 (40%) cases. It was lacerated in 13 (92.86%) of these 14 cases, while the remaining one (7.14%) had contusion. The right atrium was lacerated in four (11.42%) cases. Both atria were lacerated in four (11.42%) cases, while

both the ventricles were lacerated in two (5.71%) cases. The right ventricle and right atrium combined were lacerated in six (17.14%) cases. Extensive lacerations of the heart involving both the ventricles and both the atria were seen in three (8.57%) of the cases. The left ventricle and the left atrium combined were contused in one (2.86%) case each. The lacerations in all these cases were located on the anterior surface of the heart. Contusion of the heart was also located on the anterior surface. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was seen and it was observed in a motorcyclist knocked down by a truck.

DISCUSSION

Waele J.J.D. et al.[7]observed that blunt cardiac injury was common after sternal trauma and the severity of the fracture was an indicator of possible myo or pericardial damage. This holds true in the present study as cardiac injuries were associated with sternal and rib fractures in 48.57% of the cases. In the run-over cases, the mechanism of injury could be attributed to compression of the heart between the sternum and vertebral bodies or penetration by a fractured rib or sternum. A direct blow to the anterior chest or penetration by a fractured rib or sternum could be the cause in the remaining cases. Bright E.F., Beck C.S.,[2] and Parmley L.F. et al[3]. observed that while all the four chambers of the heart are susceptible to rupture in non-penetrating trauma, ventricular ruptures are preponderant. This is in concurrence with the present study. The findings of the present study were also comparable to the findings observed by Brathwaite C.E. et al [8] except for the fact that they observed a higher right atrial involvement (40.6%). The common sites of traumatic cardiac rupture in order of diminishing frequency are: right auricle, right ventricle, left ventricle, left auricle, ventricular septum and valves [3]. The preponderance of right ventricular injury over the left in blunt trauma can be explained by the fact that the sternocostal surface of the heart is mainly formed by the right ventricle, so the major brunt of the trauma is borne by the right ventricle ultimately leading its rupture. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was seen in the present study. The laceration of the right atrium without any

external injuries of the chest region signifies that serious cardiac injuries may be present in absence of any visible external injuries.

CONCLUSION

In assessing blunt cardiac trauma victims in vehicular accidents, knowledge about the commonest sites, types and degrees of injuries sustained by them is often required. Patients with cardiac rupture who reach the hospital alive can often be saved by prompt diagnosis and immediate surgical treatment[9]. Interestingly, survival is more common with right-sided injuries, especially right atrial lacerations[10]. Moreover, as most of the cardiac injuries have associated rib and sternal fractures, proper monitoring of the victims with rib and sternal fractures is desired in blunt thoracic trauma cases. The presence of fatal cardiac trauma in head on collision cases emphasizes the utility of safety belts while driving.

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SUICIDES IN IMPHAL

Dr. Kh. Pradipkumar Singh, PG Student

Dr. Fremingston K. Marak, PG Student

Dr. Kikameren Longkumer, PG Student

Prof. A. Momonchand, Professor & Head

Department of Forensic Medicine, Regional Institute of Medical Sciences, Imphal.

ABSTRACT

Out of 4169 cases brought for medicolegal postmortem examination in the Department of Forensic Medicine, Regional Institute of Medical Sciences, Imphal during the period of 1993 to 2002 only 296 (7.10%) were of suicide.

Male predominate female and the most commonly adopted method of suicide is hanging (52.03%) followed by poisoning (23.98%). Suicide by firearm was the method of choice among the security personnel. The highest number of suicidal deaths was seen in the age groups of 21-30 yrs (36.48%) and followed by 30-41 years age group (27.36%).

Key words: Suicide, Law and Health.

INTRODUCTION

The history of suicide is almost as old as human society itself. The act of suicide is illegal in India under section 309 and 306 IPC, though in the historical times some states approved of suicide under certain circumstances e.g.: Sati and Johar etc. Suicidal death is emerging as major health problem worldwide and is attracting increasing attention from the medical profession and the public health agencies as well. Suicide is a leading cause of premature death especially among the young adults.

For prevention of crimes and maintenance of law and order, the Law Enforcement Agencies require the data of various crime incidences, common nature of death prevalent in the community etc.

Suicide being a criminal act as well as an indirect indicator of Mental Health of a community, this study was taken up to establish the incidence of gender, age and commonly adopted means of suicide in Imphal.

According to WHO statistics, the annual worldwide incidence of suicidal deaths was 16 per lakhs persons in 1995. In India, the prevalence is 10 per lakhs contributing 0.5% to 1 % of all deaths as per National Crime Records Bureau, 1993.

Besides being an indirect indicator of mental health of a community, it may be committed with an ulterior motive e.g. to avenge someone by planning his own death in a manner that resembles homicide.

MATERIALS & METHODS

In the present study a total number of 296 suicidal deaths brought for autopsy in the department of Forensic Medicine, RIMS, Imphal during 1993-2002 were studied. The particulars of the deceased such as age, sex and caste were collected from near relatives and investigating officers. The method of suicide was determined from the history and P.M. findings in consideration with circumstantial and physical evidences. The data thus obtained were analyzed and the findings are presented in this paper.

RESULTS

Out of 4169 medicolegal autopsies conducted during 1993-2002, 296 cases (7.1%) were of suicide. The year-wise incidences of suicide are shown in Table No. I. Though, the yearly percentage of suicide was highest in the year 1994, the highest number of suicidal deaths was seen in the year 2001. The lowest number of suicide was seen in the year 1998.

Table 1
Year-wise incidence of suicides.

Year	Total P M E	Total Suicidal Deaths
1993	363	32 (8.81%)
1994	391	39 (9.97%)
1995	412	41 (9.95%)
1996	363	25 (6.89%)
1997	438	20 (4.57%)
1998	413	16 (3.87%)
1999	399	25 (6.27%)
2000	499	27 (5.41%)
2001	458	44 (9.60%)
2002	433	27 (6.24%)

Male (197 cases) predominated female (99 cases) with a ratio of 1.98:1. The most commonly adopted method of suicide is hanging (52.03%) followed by poisoning (23.98%) as shown in Table No. II. Suicide by firearm is the method of choice among the security personnel.

Table 2
Modes of Suicides and Sex Distribution.

Mode of Suicide	Male	Female	Total	(%)
Hanging	93	61	154	52.03
Poisoning	41	30	71	23.98
Firearm	25	0	25	8.45
Others**	38	8	46	15.54
Total:	197	99	296	

(%: 66.55) (33.45) (100)

** Burning, Jumping from a Height, Self-Inflicted Wounds & Drowning.

Table 3
Modes of Suicide and Age Incidence.

Mode of Suicide	Age Range in years						Total
	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	> 50	
Hanging	0	33	53	43	19	6	154
Poisoning	0	19	32	12	4	4	71
Firearm	0	2	7	12	4	0	25
Others	0	7	16	14	8	1	46
Total	0	61	108	81	35	11	296
% (20.61) (36.48) (27.36) (11.82) (3.72) (100)							

DISCUSSION

The incidence of suicide was 7.10%, which is lower than that of other studies [1, 2 & 3]. This can be due to

under report of the incident. The sex incidence of male predominance over female in all modes of suicide is in agreement with the findings of other workers[1, 2, 3 & 4].

The highest number of suicidal deaths was seen in the age groups of 21-30 years (36.48%) followed by 30-41 years (27.36%) which is consistent with the findings of other studies[1, 2, 3 & 4]. This particular age group is the most active and explosive group. Instead of facing defeat, they might have preferred to end their life.

Hanging was the commonest method of choice, which is in sharp contrast to some other studies, where the most preferred method is poisoning [1, 2 & 3]. It may be attributed to: simplicity of the act, easy availability of the materials needed for the act, guaranteed fatality and the belief of a prompt and painless death.

Suicide by firearm was the method of choice among the security personnel, which is in agreement with Fimate et al [4]. Incidence of suicidal deaths by firearm and cut throat has been observed in this study which is not observed in the study conducted by Sahoo et al .

The common causes of suicide are alcohol and drug addiction, failure in career, unemployment, disappointed love, marital problems, family quarrels and poverty etc.

CONCLUSION

The present study reveals a comparatively decreasing tendency of suicidal deaths from 1996 onwards, the lowest been in 1998 (3.87%). Hanging is the commonest method of suicide. Suicide is highest among the age group of 21-30 and 31-40 years, which incidentally represent the most active and productive section of the community. If the trend of suicide is left unchecked the loss will be invariably insurmountable both economically and socially. Suicide is a major health problem and the medical profession has to take a role in the management of this health problem.

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HUMAN NAIL GROWTH PATTERN AND MEDICOLEGAL ASPECT

Dr. Gita Rani Gupta, Medical Officer (Medical), Medicolegal Institute, M.P. Bhopal

Dr. V.K. Dhruw, Medical Officer, Pt. Jawahar Lal Nehru Memorial Medical College, Raipur, Chhattisgarh.

Dr. B.K. Athawal, Associate Prof. Deptt. of Forensic Medicine & Toxicology, Gandhi Medical College, Bhopal

Dr. Parveen Siddiqui, Asstt. Prof.,

Dr. Yousuf, Asstt. Prof.,

Dr. Harendra K. Agrawal, Asstt. Prof.,

Department of Physiology) Gandhi Medical College, Bhopal

Late Prof. Dr. Heeresh Chandra, Formerly Founder Director, Medicolegal Institute, Govt. of M.P. Bhopal, Medicolegal Advisor Govt. of Madhya Pradesh & Prof. & H.O.D., Forensic Medicine & Toxicology, G.M.C., Bhopal

ABSTRACT

Among the body tissues nails are known to resist decomposition and disintegration. As such the study undertaken on the nails pattern and growth are presented. The idea came from the ink mark applied during the election voting. In 153 cases the growth rate in different fingers was recorded and statistically analyzed. The results are tabulated. It is possible that identity of the person can be established by growth pattern, unusual marks and history of trimming the nails etc. During the study it was observed that cutting of the nails encourages the growth. If allowed to grow the growth is retarded proportionately. Study was done from March 2000 to June 2000.

Key Words : Human Nail, Nail growth

INTRODUCTION

Average nail growth rate has been quoted by different author between 2-3 mm per month. It is usually considered to be 1/3rd of average hair growth rate. Growth is somewhat slower in winter than summer and slower in infants and old people than in young adults. It requires approximately 3 to 6 months for a whole nail to replace itself.

Habitual nail biting speeds up growth, more the frequency of cutting more is the nail growth. People have grown their nails to the sizes which run in meters and their names have been entered in Guinness book of records. A number of factors can alter normal growth among these are age, trauma, poisons and organic disorders etc [1].

Nail growth involves considerable protein synthesis, as a result of which nonspecific changes occur in the nails in response to various local and systemic disturbances. White spot indicate incomplete keratinization [2].

REVIEW OF LITERATURE ON NAIL GROWTH RATES

Nail growth rates by different authors are presented here in tabulated form.

S.No.	Author's Name	Year	Growth Rate of the Nails	Growth Rate per 10 Days
1.	Clark and Buxton	1938	3mm per month	1mm.
2.	Gilchrist and Buxton	1939	3mm per month	1mm
3.	Horder	1955	0.08 mm on the toes in 24 hrs.	0.8mm in fingers & 0.4 in toes
4.	Sibinga	1959	2 to 4.5 mm /mth	0.67 to 1.5mm
5.	Crouch	1965	About 1mm per week	1.428mm
6.	Anson	1966	Approximately 1mm in the Course of a week	1.428mm
7.	Basmajian	1974	0.1mm a day or month (i.e. about 1.5" a year)	1mm 3mm a
8.	New Encycl Britan(21)	1985	0.1mm per day	1mm
9.	Tortora	2003	1 mm per week	1.428 mm

Rate of nail growth fingers/ toes wise, age wise & sex wise is not being quoted in detail, relevant selected findings are discussed.

AIMS AND OBJECTS

- (1) To determine the growth rate of nails of the fingers and toes.
- (2) To compare the growth rate of nails of fingers and toes.
- (3) To compare growth rate of nails of different fingers of hands.
- (4) To determine the growth rate of nails in relation to age & sex.

MATERIAL & METHODS

- (1) In our study indelible ink was obtained from Election Commission, Bhopal on written request and applied on nail and eponychium of all fingers of both hands great toe and second toe of each foot. Written consent of volunteers in whom ink was applied, was taken.
- (2) Growth was recorded by sticking a micropore strip over the nail and marked by pointed pencil at two places, at the level of distal end of eponychium and proximal border of mark of indelible ink over nail and this was transferred over proforma and readings/measurements were taken with the help of 200 mm. length and 0.02 mm least count Dial calliper.
- (3) These readings were then converted in to a unit of growth rate per 10 days because of availability of the persons at 16 to 78 days interval to record the growth.

OBSERVATIONS

The indelible ink was applied over nails of the different fingers and great toe and second toe of both sides in 174 human being. Out of them 80 (45.98%) were males and 94 (54.02%) females. Out of them in 153 (87.93%) subject 68 (44.44%) males and 85 (55.56%) females readings of nails growth were taken. The readings could not be taken due to non- availability of the remaining 21 (12.07%) subjects in which 12 (57.14%) were males and 09 (42.86%) were females. (Table No.1).

Table No. 1

Sample size

S.No.	Growth Recording	Males	Females	Total
1.	Taken	68 44.44%	85 55.56%	153 100.00%
2.	Not Taken	12 57.14%	9 42.86%	21 100.00%
	Grand Total	80 45.98%	94 54.02%	174 100.00%

The table No. 2 shows that the average growth rate differs from minimum of 0.74mm/10 days in left little finger to maximum of 0.94mm/10 days in right middle finger. The average growth rate of all the fingers is 0.856mm/10 days. Middle fingers show fastest average nail growth, while the little fingers show minimum growth in both the hands.

The growth rate of toes are significantly lesser than fingers. Average growth rate of first two toes on both the side is 0.43mm/10 days.

The Table No. 2 also shows number & percentage of cases in which the ink was washed out from different digits or readings were not otherwise recorded.

Table No. 3 shows findings for males. The average growth rate for all the fingers in male is 0.75mm/10 days. The average growth rate for toes is 0.445mm/10 days. It also shows percentages and number of cases in which the ink was washed out, the readings were not readable or ink could not be applied due to deformity .

The maximum average growth is recorded in right middle and left index fingers of males i.e. 0.93mm and 0.85mm/10 days respectively. The average growth rates for all the fingers are higher on the right side, while it is more on the left sides in the toes.

Table No. 4 shows findings for females. The average growth rate for all the fingers for female is 0.87mm/10 days. It is higher than males i.e. 0.75mm/10 days. For all toes the average growth rate is 0.417mm/10 days i.e. lesser than males i.e. 0.445mm/10 days.

The maximum growth rates are recorded for female subjects in both the middle fingers. They are 0.96 and 0.90mm/10 days for right and left respectively. Growth rates for toes are higher in females on right side.

Table 2
Growthrate of Nail Per 10 days mms Fingerwise in 153 Human being s

TABLE NO. 2 : GROWTH RATE OF NAIL PER 10 DAYS MILLIMETERS FINGERWISE IN 153 HUMAN BEINGS

ITEM	Rt.T	Rt.I	Rt.M.	Rt.R.	Rt.L.	Lt.T.	Lt.I.	Lt.M.	Lt.R.	Lt.L.	Rt.Gr.T	Rt.2T.	Lt.Gr.T.	Lt.2T.
W.O.	7.00	15.00	20.00	15.00	15.00	6.00	10.00	14.00	9.00	4.00	3.00	10.00	3.00	7.00
W.O.%	4.58%	9.80%	13.07%	9.80%	9.80%	3.92%	6.54%	9.15%	5.88%	2.61%	1.96%	6.54%	1.96%	4.58%
N.A.		1.00												
N.A.%		0.65%												
N.R.							1.00		1.00		13.00	19.00	12.00	21.00
N.R.%							0.65%		0.65%		8.50%	12.42%	7.84%	13.73%
Average	0.88	0.89	0.94	0.92	0.79	0.84	0.86	0.87	0.83	0.74	0.48	0.39	0.48	0.38
STD	0.26	0.28	0.28	0.26	0.24	0.27	0.27	0.28	0.27	0.25	0.20	0.16	.21	0.18
Dev.														
Median	0.84	0.84	0.92	0.91	0.77	0.82	0.83	0.84	0.78	0.72	0.46	0.37	0.45	0.35
Mode	1.05	0.94	0.9	1.22	0.62	0.89	0.91	0.83	0.78	0.62	0.46	0.47	0.41	0.3
Range														
Min	0.29	0.31	0.37	0.44	0.33	0.28	0.31	0.20	0.35	0.25	0.11	0.07	0.13	0.05
Max	1.53	1.68	2.20	1.81	1.62	1.86	1.78	1.68	1.64	1.76	1.15	1.04	1.56	1.20

Index : RT. = Right, Lt. = Left, T= Thumb, I = Index, M=Middle, R=Ring, L=Little, Gr. T. +Great toe, 2T = Second toe, W.O. = Ink washed out, NA.= Ink not applied, N.R. = Growth of nail not readable.

TABLE NO. 3 : GROWTH RATE OF NAIL PER 10 DAYS IN MILLIMETERS FINGERWISE IN 68 MALES

ITEM	Rt.T	Rt.I	Rt.M.	Rt.R.	Rt.L.	Lt.T.	Lt.I.	Lt.M.	Lt.R.	Lt.L.	Rt.Gr.T	Rt.2T.	Lt.Gr.T.	Lt.2T.
W.O.	2.00	5.00	6.00	5.00	6.00	2.00	2.00	5.00	4.00	2.00	2.00	5.00	1.00	4.00
W.O.%	2.94%	7.35%	8.82%	7.35%	8.82%	2.94%	2.94%	7.35%	5.88%	2.94%	2.94%	7.35%	1.47%	5.88%
N.A.		1.00										1.00		
N.A.%		1.47%										1.47%		
N.R.											2.00	5.00	2.00	5.00
N.R.%											2.94%	7.35%	2.94%	7.35%
Average	0.86	0.88	0.93	0.91	0.72	0.81	0.85	0.84	0.84	0.70	0.49	0.39	0.50	0.40
STD	0.24	0.30	0.29	0.28	0.23	0.29	0.28	0.32	0.25	0.26	0.21	0.15	0.23	0.19
Dev.														
Median	0.84	0.83	0.92	0.86	0.67	0.76	0.81	0.82	0.78	0.67	0.48	0.37	0.44	0.37
Mode	0.99	0.78	0.96	1.22	0.62	0.62	1.09	0.5	0.78	0.62	0.6	0.22	0.29	0.31
Range														
Min	0.29	0.31	0.37	0.44	0.33	0.29	0.35	0.20	0.40	0.25	0.11	0.13	0.18	0.12
Max	1.45	1.68	1.77	1.81	1.56	1.86	1.78	1.68	1.64	1.76	1.05	0.79	1.56	1.20

Index : RT. = Right, Lt. = Left, T= Thumb, I = Index, M=Middle, R=Ring, L=Little, Gr. T. +Great toe, 2T = Second toe, W.O. = Ink washed out, NA.= Ink not applied, N.R. = Growth of nail not readable.

Table No. 4

ITEM	Rt.T	Rt.I	Rt.M.	Rt.R.	Rt.L.	Lt.T.	Lt.I.	Lt.M.	Lt.R.	Lt.L.	Rt.Gr.T	Rt.2T.	Lt.Gr.T.	Lt.2T.
W.O.	5.00	10.00	14.00	10.00	9.00	4.00	8.00	9.00	5.00	2.00	1.00	5.00	2.00	3.00
W.O.%	5.88%	11.76%	14.47%	11.76%	10.59%	4.71%	9.41%	10.59%	5.88%	2.35%	1.18%	5.88%	2.35%	3.53%
N.A.														
N.A.%														
N.R.							1.00		1.00		11.00	14.00	10.00	16.00
N.R.%							1.18%		1.18%		12.94%	16.47%	11.76%	18.82
Average	0.89	0.90	0.96	0.93	0.84	0.86	0.86	0.90	0.83	0.77	0.47	0.38	0.46	0.36

Index : RT. = Right, Lt. = Left, T= Thumb, I = Index, M=Middle, R=Ring, L=Little, Gr. T. +Great toe, 2T = Second toe, W.O. = Ink washed out, N.A.= Ink not applied, N.R. = Growth of nail not readable.

TABLE NO. 5 : AVERAGE GROWTH OF NAIL IN MILLIMETERS AGE GROUP WISE IN DIFFERENT FINGERS OF 153 HUMAN BEINGS

Item	No. of Cases	Rt.T	Rt.I	Rt.M.	Rt.R.	Rt.L.	Lt.T.	Lt.I.	Lt.M.	Lt.R.	Lt.L.	Rt.Gr.T	Rt.2T.	Lt.Gr.T.	Lt.2T.
Age Group	153	0.88	0.89	0.94	0.92	0.79	0.84	0.86	0.87	0.83	0.74	0.48	0.39	0.48	0.38
1 to 10 yrs	14	0.91	0.82	0.83	0.80	0.67	0.91	0.74	0.71	0.70	0.60	0.54	0.38	0.45	0.42
11 to 20 yrs	68	0.96	0.85	1.01	1.00	0.83	0.91	0.93	0.95	0.87	0.80	0.49	0.40	0.50	0.38
21 to 30 yrs	30	0.81	0.86	0.93	0.86	0.78	0.74	0.83	0.89	0.84	0.74	0.52	0.36	0.46	0.36
31 to 50 yrs	26	0.85	0.84	0.93	0.94	0.77	0.80	0.81	0.78	0.89	0.73	0.41	0.35	0.45	0.34
51 onwards	15	0.65	0.81	0.78	0.72	0.75	0.66	0.77	0.74	0.68	0.62	0.43	0.40	0.50	0.44

Index : RT. = Right, Lt. = Left, T= Thumb, I = Index, M=Middle, R=Ring, L=Little, Gr. T. +Great toe, 2T = Second toe, W.O. = Ink washed out, N.A.= Ink not applied, N.R. = Growth of nail not readable.

Table No. 5 depicts average growth rates age group wise in all the digits of both the hands and first two digit of feet. The maximum growth is recorded in 11 to 20 years age group for all the fingers. Pattern of growth in toes does not follow this rule.

DISCUSSION

The rate of growth of nails are not similar in all the fingers and finger nails growth more rapidly than toes. These findings are consistent with the observation of the Hamilton (1978).

The rate of growth is maximum in middle finger of both hands i.e. 0.94 mm for right and 0.87mm per 10 days and minimum in little finger of both the hands i.e. 0.79mm per 10 days and 0.74mm for left hand respectively. These readings are similar with the observations of Clark & Buxton (1938), Gilchrist & Buxton (1939), The Book of Popular Science (1958), Basmajian (1974) and findings in millimeters are nearly similar with the findings of the Williams (1995).

The average growth of thumb nail in right hand is 0.88mm/10 days and in left hand 0.84mm/10 days are not similar with the findings of Sinclair (1975) i.e. 1.09mm/10 days.

The findings are similar with the Hamilton (1978) and Horder (1955) that finger nails are grow 0.856mm/10 days. Average growth rate of toes is 0.435mm/10 days which is also nearly same. Findings are lesser than all other authors on nail except Sibinga (1959). See table of Review of Literature on nail growth.

The average rate of growth of finger nails are not similar in all age groups and it is consistent with the study of Hamilton (1978). The rate is highest in 2nd decade & findings are similar with the Williams (1995) who states that the growth of the nails is faster in young than old.

The growth of nails is more in females than males in all the fingers except left ring finger and it is not consistent with the study of Clark & Buxton (1938) and Gilchrist & Buxton (1939).

CONCLUSION

This study was conducted on growth of nails in 153 subjects including 68 males (44.44%) and 85 females during the month of March to May 2000 by the application of indelible ink. The findings revealed relatively lesser growth rates than those

quoted in the literature except few authors. The nails growths were found relatively more in females than males. These findings are not consistent with those in the literature. Similarly comparing the growth rates of different digit's nails it was found out that the pattern of the nail growth is same as quoted in the literature with the exception of right index of males. Reasons for higher growth rates in the females, higher growth rates in the index of males and higher growth rates in the toes of males as compared to females remain obscure. The growth rate were highest during second decades in all the fingers, which is similar with the literature.

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STUDY OF PATTERN OF INJURIES IN HOMICIDAL FIREARM INJURY CASES

Dr. A.J. Patowary, Assistant Professor,

Deptt. of Forensic Medicine, Gauhati Medical College. Guwahati 781032. Assam.

ABSTRACT

Invention of fire has brought about a turning point to Human civilisation, but, invention of the firearm has come as a curse to human civilisation. Firearm is fast becoming a major killing apparatus and taking away innumerable valuable human life day by day. This study was aimed to find out the pattern of injury in homicidal firearm injury cases of different motives and also to find out the most vulnerable portion of the body so as to minimise the loss of human life.

In this study a total of 108 cases of homicidal firearm injury were studied. Extremist violence and encounters accounts for 81.5% of the cases and in 13 (12.0%) cases the motive behind the killings could not be determined. Most of the victims were males having bullet injuries in their chest (59 cases), caused by rifled firearm weapons, and died because of haemorrhage and shock.

Key Words: Homicidal Firearm Injury.

INTRODUCTION

Invention of fire was the greatest invention for the human civilisation but the invention of firearm has come as a curse to this world, it has become the most dreaded killing tool used by human being to kill themselves. It has been improving day by day from the primitive Matchlock system of firearm to the present day's semi automatic and automatic weapons. Though in western countries, suicidal fatal firearm injury is very common, in this region of the world, it is mostly used in the homicide cases only.

Many workers have studied the different aspect of the firearm injuries in different part of the world, but here in Assam, not a single study was carried out in this subject. So, this study was carried out to find out the pattern of firearm injuries along with the vulnerable parts of the body involved and the cause of death, in the fatal firearm injury cases, to help the all concerned to take the protective measures.

MATERIAL AND METHOD

The firearm injury cases for this study were selected from among the cases brought for Medico-legal postmortem examination to Gauhati Medical College and Hospital during the period from 1st of January 1998 to 31st of December 1998. Particulars of the cases were collected from

- Inquests & Dead Body Challans
- From Police
- Accompanying relatives
- Autopsy findings.

OBSERVATIONS

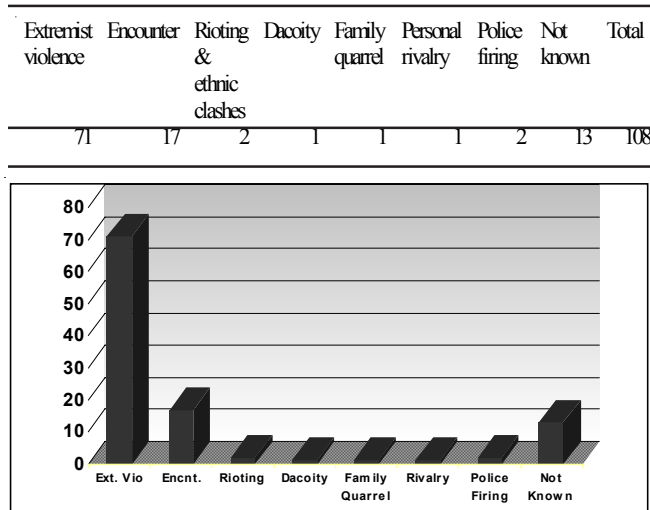
A total of 1468 autopsies were conducted during the period of 1st of January 1998 to 31st of December 1998 and out of this, 108 number (7.36%) of the cases were death due to homicidal firearm injury.

1. AGE & SEX WISE DISTRIBUTION

Age in years	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
0-9	1	0.9	1	0.9	2	1.9
10-19	13	12.0	3	2.8	16	14.8
20-29	39	36.1	3	2.8	42	38.9
30-39	28	25.9	2	1.9	30	27.8
40-49	9	8.3	0	0.0	9	8.3
50-59	3	2.8	3	2.8	6	5.6
60 & above	3	2.8	0	0.0	3	2.8
Total	96	88.9	12	11.1	108	100.0

Out of the total 108 cases of the homicide cases, most of the victims were in the age group of (20-29) and (30-39), the percentage of cases being, 38.9 and 27.8 respectively. Male

2. Motive of the Cases



Of the 108 cases studied, the most common motive was the death due to extremist violence (71 cases), followed by the encounters by the security forces (17 cases). In 13 numbers of cases, the actual motive of killing was not known.

3. Regional distribution of the injuries

Chest was the most popular target, in 59 cases, the bullets hit the chest with 48 exit wounds in the chest and 7 bullets were recovered during autopsy from the chest. The next common site being the head and face region with 36 cases followed closely by the bullet hit on the abdomen and the lower limbs, (31 cases each).

Region involved	Entry Wound	Exit Wound	Bullet Found
Head & Face	36	30	0
Neck	13	13	1
Chest	59	48	7
Abdomen	31	25	5
Upper limb	27	31	0
Lower limb	31	24	2

predominate the list with a total of 96 cases (88.9%), the total number of the female being 12 (11.1%).

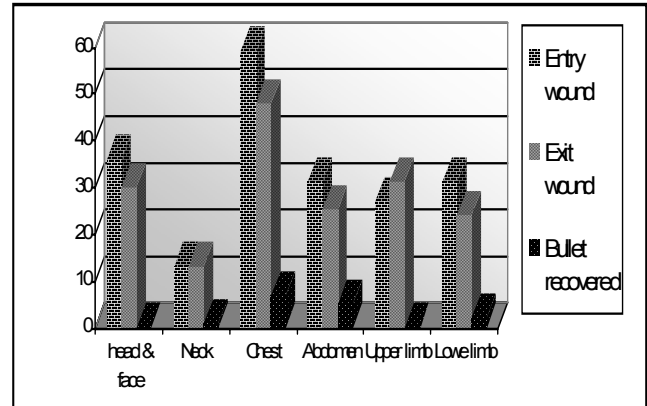


Diagram showing the anatomical regions involved

4 Number of anatomical region involved

Involvement of two anatomical regions was the most commonest with 40 number (31.48%) amongst the total 108 cases. In 31.48% (34 number) of the cases, there was involvement of a single anatomical region and out of these, head and face area topped the list with 13.89% (15 number) of the total cases.

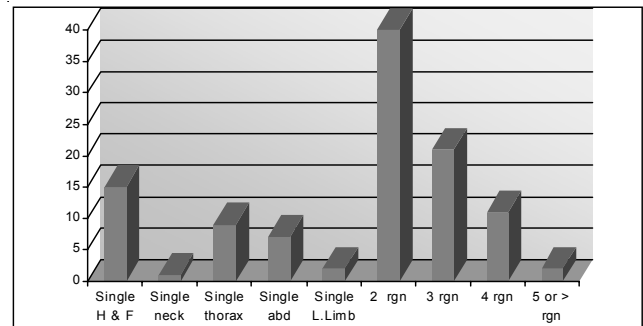


Diagram showing involvement of number anatomical regions

Anatomical regions involved		No. of cases	Percentage	
Individual regions	Number of cases	Percentage		
Involvement of single anatomical regions	Head & Face	15	13.89	34 31.48
	Neck	1	0.92	
	Thorax	9	8.33	
	Abdomen	7	6.48	
	Lower limbs	2	1.85	
Involvement of two anatomical regions		40	37.04	108 100.00
Involvement of three anatomical regions		21	19.44	
Involvement of four anatomical regions		11	10.19	
Involvement of five or more anatomical regions		2	1.85	
Total		108	100.00	

5. Entry wounds in the body in different motives

Among all the motives studied, in all the deaths due to encounters and the extremist violence, the chest was the most common target, in 38 cases of extremist violence and 15 cases of encounters, chest was the target, except in the case of the not known group, where, the head and face were the most common targets with 10 cases having bullet injury on the head and face.

	Extremist violence	En-counter	Rioting & ethnic clashes	Dacoity	Family quarrel	Personal rivalry	Police firing	Not known
Head&Face	19	5	0	0	0	1	1	10
Neck	9	2	0	0	0	0	0	2
Chest	38	15	0	0	0	0	0	6
Abdomen	20	7	1	1	1	0	0	1
Upper limb	19	6	0	0	0	0	0	2
Lower limb	18	8	1	0	1	0	1	2

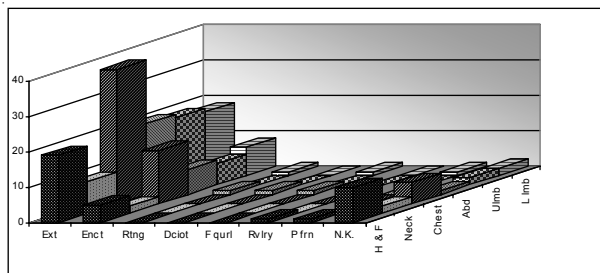


Diagram showing entry wounds in the body in different motives

5. Causes of death

Cause of death	Number of case	Percentage
Haemorrhage & shock	74	68.5
Instantaneous	25	23.1
Coma	6	5.6
Septicaemia	3	2.8

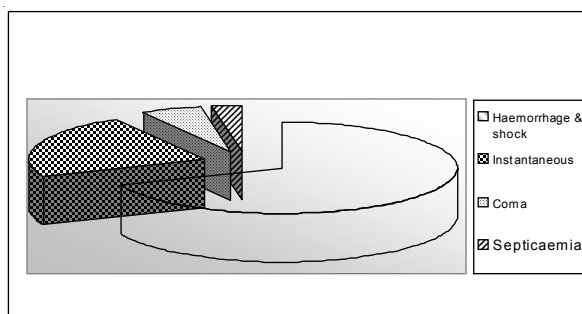


Diagram showing the cause of death of the cases

In 74 number (68.5%) of the cases, haemorrhage and shock was the cause of death, 25 cases (23.1%) died instantaneously after getting the bullet injury, in 6 cases the victim died due to coma followed by the septicaemia in 3 cases.

DISCUSSION

In this study, the most of the victims were the males in their twenties and thirties. This finding is consistent with most of the studies in regards of homicide as a whole.

Again of the different motives of killing of the victims, extremist violence tops the list with 71 cases, i.e. 65.7% of the cases died because of extremist violence, followed by 17 cases of death in encounters. This finding is far from the findings of the other studies in this field, where the most common motive of the killings were due to robbery or the politically motivated murders. This variation is because of the fact that, extremist violence was at its peak during the study period.

Of the different anatomical regions involved, Chest was the most common target irrespective of the motive of the killing, 54.6% of the cases died due to bullet injury in their chest, followed by the head and neck with 33.3% of the total cases. In 31.48% of the cases, there was only single entry wound in the body. In this group, head tops the list with 13.89% of the total cases, followed closely by thorax with 8.33% and abdomen with 6.48% of the total 108 cases.

There was another group of the victim comprising of 13 cases where the actual motive of the killing was not known. All these cases were found by the side of the road with blind folded, hands tied towards the back and head and face was the most common target in this group.

68.5% of the cases died because of haemorrhage and shock and in 23.1% of the cases, victims died instantaneously.

CONCLUSION

To prevent such killings, there should be combined effort from all sections of the society. Following steps should be of help in its prevention

Appropriate steps for control of the extremism

All round socio-economical development of the area.

Proper employment facility for the youth.

Social stability and creation of proper political environment.

Strong and effective measure to control the unlicensed arms.

Proper protective gear for the police and defense personals.

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FIXATION OF 16 YEARS OF AGE BY RADIOLOGICAL STUDY OF SHOULDER JOINT (A JAIPUR BASED STUDY)

Dr. Saini O.P., Senior Demonstrator,

Dr. Saini P.K., Senior Demonstrator,

Department of Forensic Medicine & Toxicology, S.P. Medical College, Bikaner.

Dr. Gupta B.M., Professor & Head,

Department of Forensic Medicine & Toxicology, S.M.S. Medical College, Jaipur

ABSTRACT

Estimation of reasonably accurate age, plays a pivotal role in civil/criminal cases like personal identification, fixing of criminal responsibility, judicial punishment. The present study has been undertaken to explore the pattern of diaphysis-epiphyseal union in the bones of shoulder joint in growing population of Jaipur region.

Keywords :- Age Estimation

INTRODUCTION

There is variation in the timing of union of the epiphysis of bones & it has been attributed to factors like climate, heredity, race, nutrition, dietary habits, gender and socio-economic status of population for study. Survey Committee appointed by Central Government recommended for a Zone wise Study. (1) Keeping in view the above statement and great medicolegal importance of 16 years of age along with difficulty in estimating the 16 years age particularly in girls and also that no study what so ever done in Rajasthan where mixed population resides. The present study has been undertaken to explore the pattern of diaphysis-epiphyseal union in the bones of shoulder joint in growing population of Jaipur region.

AIMS AND OBJECTIVES

(1) To assess the general maturity for a known chronological age in either gender. (2) Study of average age of appearance of ossification centers around shoulder joint. (3) Comparative study of appearance and fusion of ossification centers on shoulder joint in boys and girls. (4) Comparative study of appearance and fusion of ossification centers in boys and girls with available data of previous work carried out in India. (5) Comparative study of appearance and fusion in boys and girls of present study with previously available foreign

data. (6) Comparative study of appearance of third molar, secondary sexual characters and various demographical determinants with radiological process of fusion around shoulder joint.

MATERIAL AND METHODS

This study is carried out in the Department of Forensic Medicine and Toxicology of S.M.S. Medical College and Hospital, Jaipur. The subjects are selected randomly from various schools, from neighborhood of various faculty members and staff as well as cases attending the OPD of the Forensic Medicine Department of S.M.S. Hospital, Jaipur.

Selection Criteria for inclusion of person in present study.

For selection of subjects, following facts were recorded and considered:

(1) They should be living in Jaipur region for more than 5 years. (2) They should be free from any physical disability or endocrinal anomaly. (3) Person should have accurate record of their date of birth. (4) Informed expressed verbal consent of the subjects was taken before proceeding to their physical dental and radiological examinations.

The persons selected for study were grouped as per their stated age, viz.: 13-14 years, 14-15 years, 15-16 years, 16-17 years, 17-18 years, 18-19 years, 19-20 years and 20-21 years.

Age, as stated by them is further confirmed by birth certificate or entry in their school record.

The persons belonging to the age group selected for the study of either gender are included in the study irrespective of their socioeconomic, religious and educational status, each person so chosen on the basis of criteria as mentioned above are evaluated clinically in details as per performa annexed.

After obtaining informed expressed verbal consent for their radiological and clinical examination each person is x-rayed for shoulder joint and subsequently the skiagrams are studied in detail in reference to various ossification centers, their appearance, process of fusion and post fusion scarring.

Radiological Criteria for epiphyseal fusion

The union is taken as complete when the:

- Diaphyseo-apiphyseal space is completely obliterated and become bony in architecture and density.
- There is continuity of the periosteum between epiphysis and diaphysis with no notching at the periphery of epiphyseal line.
- Presence or absence of epiphyseal scar (a white, transverse line) has been disregarded in this connection and considered as recent complete union.

For generalization, fusion in more than 75%

cases is relied upon as complete fusion.

In the present study, the following points were noted with reference to each epiphysis in either of the gender separately:

- * Age of the youngest subjects showing fusion of epiphysis with diaphysis.
- * Age of oldest subject not showing fusion of epiphysis with diaphysis.
- * The range of fusion with its relation to each epiphysis covering the upper and lower ages.
- * Age at which at least 75% or more of the cases have shown fusion.

Data Collection

Radiological data of appearance and fusion of various ossification centers were reduced to tables of various age groups along with other physical data noted previously. These data were once again, examined and tallied by experts in Forensic Medicine and Radio-diagnosis. Data thus obtained finally, were analyzed and compared with the published work of various Indian and foreign works.

OBSERVATION & DISCUSSION

The present study has been conducted on 130 subjects (65 girls and 65 boys). In school going

Table -1

Progress of epiphyseal union in different bony components of shoulder joint in boys

Name of Epiphysis	Different age groups Showing % Fusion							
	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
Head of humerus	-	14.28	30.00	50.00	78.57	100	100	100
Acromion Process	-	14.28	40.00	71.42	78.57	100	100	100
Coracoid Process	-	14.28	40.00	64.78	78.57	100	100	100

Table 2

Progress of Epiphyseal union in Different Bony Components of shoulder joint in Girls

Name of Epiphysis	Different age groups Showing % Fusion							
	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
Head of humerus	12.5	41.66	83.33	90.00	100	100	100	100
Acromion Process	12.5	41/66	83.33	90.00	100	100	100	100
Coracoid Process	12.5	41.66	93.33	100	100	100	100	100

subjects, date of birth was confirmed from the verbal statement, record of school, secondary school certificates etc. all the subjects were bonafide residents of Rajasthan and are residing in Jaipur for more than 5 years and were free from physical and mental illness, disability and long lasting disease.

Physical including dental and radiological examination was conducted in the Department of Forensic Medicine and Toxicology of S.M.S. Medical College Hospital, Jaipur. Informations and parameters thus deduced are recorded in the Master Chart.

In Case of boys findings of Head of humerus in present study are in accordance with the L.A. Waddell [2], Galastaun [3], T.A. Gonzales [4], J.V. Basmajian [5] and not in accordance with Lall and Nat [6], Pillai [7], S.N. Sahana [8], K.S. Narayan Reddy [9], Chaurassia B.D. [10], F.E. Camps [11], Peter L. Williams [12], S. Cochrane Shanks [13], Flecker [14], Davies and Parson [15], Bernard Knight [16] and Kragman [17].

In case of girls above cited findings of present study are in accordance with Galastaun, Pillai and Basu & Basu [18].

In the study conducted by Lall and Nut, S.N. Sharma, Chaurasia B.D., K.S. Narayan Reddy and T.A. Gonzales, Peter L. Williams and Flecker fusion occurs in later age group than the present study (15-16 years).

In case of boys findings of present study for Acromian Process corresponds with Pillai, Galastaun, KS Narayan Reddy, JV. Basmajian, Flecker, Bernard Knight and Krogman and not in accordance with C.K. parikh" Chaurassia B.D., T.A. Gonzales, F.E. Camps, Peter L. Williams, S.C. Shanks.

In case of girls the findings of present study are consistent with Galastaun and F.E. Camps and not consistent With Pillai, C.K. Parikh, K.S.N. Reddy, Chaurassia B.D., T.A. Gonzalis, Peter L. Williams, J.V. Basmarijians, S.C. Shanks, Bernard Knight and Krogman.

In case of boys findings of present study for coracoid process are consistent with Galastaun, Chaurassia B.D., T.A. Gonzales, Peter L. Williams and SC Shanks and in consistent with L.A. Waddae, C.K. Parikh, K.S. Narayan Reddy, F.E. Camps, J.V.

Basmajian and Krogman.

In case of girls the findings of present study corresponds with L.A. Waddell, Galastaun, KS Narayan Reddy, Chaurassia B.D., F.E. Camps, J.V. Basmajian, S.C. Shanks and Krogman and not corresponds with T.A. Gonzales and Peter L. Williams.

In the study conducted by T.A. Gonzales fusion of coracoid process occurs at a later age than present study and in the study by Peter L. Williams fusion occurs at an earlier age than present study 15-16 years.

DEVELOPMENT OF SECONDARY SEXUAL CHARACTER

It is observed that in boys of present series pubic, axillary and facial hair grow at the age of 14,15,16 year respectively in majority of the cases in their age group respectively. The voice of the majority of cases in boys was found to be man like or low pitched at the age of 16-17 years onwards and the adams apple become prominent at the age of 16 years onwards.

These findings are consistent with reported findings of Modi (Textbook of Medical Jurisprudence and Toxicology, 1988).

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REVIEW OF SUICIDAL CASES, A RETROSPECTIVE STUDY

DR. A. Behera, Asst. Prof.,

Dr. J.K. Balabantray, PG Student,

Forensic Medicine, VSS Meidcal College, Burla,

Dr. S. R. Nayak, Professor & H.O.D,

Forensic Medicine, M.K.C.G.M.C., Berhampur,

INTRODUCTION

Suicide is a major cause of death in the present world. In every country the rate for a particular figure of population is increasing day by day.

According to Durham, the French biologist, suicide is death resulting directly or indirectly from a positive or negative act of the victim himself, which he knows will produce this result. Suicide from a existential point of view reflects a behavior that seeks and finds the solution to an existential problem by making an attempt on life of the subject. Suicide is applicable to all acts terminating fatally.

Suicide is a worldwide phenomenon, though its rate varies from place to place. According to Kuruvilla & Venkoba Rao the rate is very high in Australia and Germany. In Nigeria and Gulf countries it is low. India ranks 10th in the figure. It is 6-7 cases/1,00000 population [1]. Out of 1000 suicides in a day in world over 100 occur in Indian Subcontinent.

MATERIALS & METHODS

Total no. of suicidal cases coming for PM examination in 2 years period (2003 -2004) were taken into consideration.

Detailed study with respect to age, sex, time of committing suicide, socioeconomic status, education, visible causes were taken up. After the yrs study the datas were analyzed, tabulated and inference was drawn. The doubtful cases regarding suicide or homicide or accident were excluded in the series. Previous attempt prior to completed suicide, history of psychiatric treatment were sought from their relatives. Suicidal notes whenever

available were studied and compared with history given by relatives.

OBSERVATION

Fig. 1 AGE AND SEX COMPOSITION OF SUICIDE VICTIMS

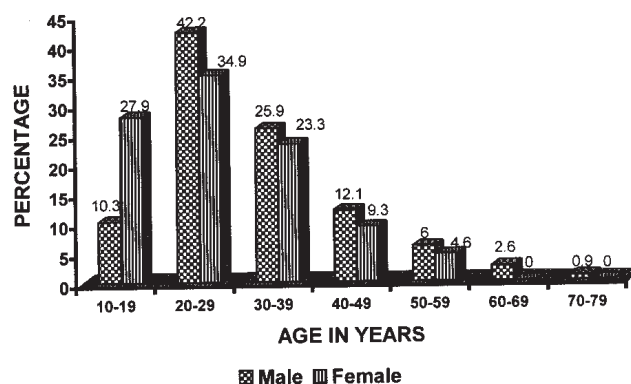


Fig. 2

EDUCATIONAL STATUS OF THE VICTIMS OF SUICIDE

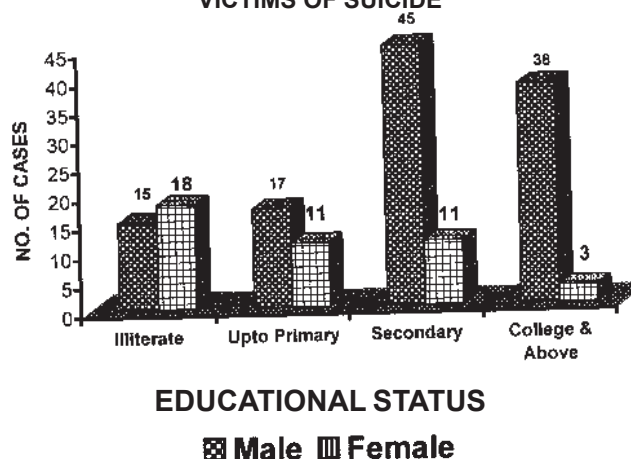
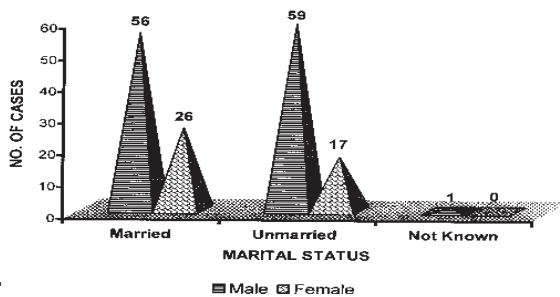
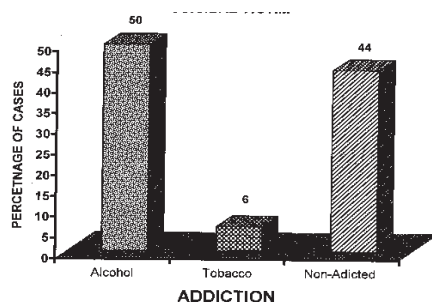
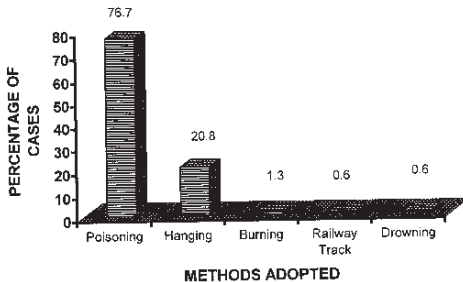
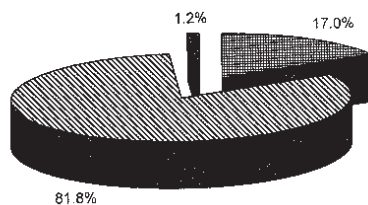
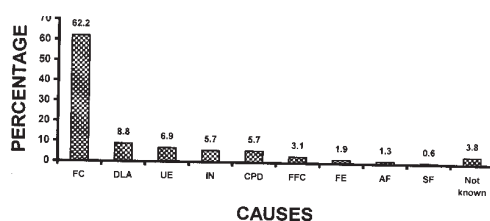


Fig. 3**MARITAL STATUS OF THE VICTIMS OF SUICIDE****Fig. 4****TYPE OF ADDICTION AMONG MALE SUICIDAL VICTIM****Fig. 5****METHOD ADOPTED BY SUICIDAL VICTIMS****Fig. 6****TIME OF COMMITTING SUICIDE****Fig. 7****Day time Night Not known****CAUSES THAT LEAD TO SUICIDE**

FC-Family Conflic, UE-Unemployment, DLA-Dispute in love affair, IN- Insanity, CPD-Chronic and painful disease, FFC-Frustration for not able to conceive, FE-Failure in Examination, F- Abused by Father, SF-Social Frustration

DISCUSSION

Total no of cases studied was 159 during the period of 2 years (2003-2004). The following inference was drawn out of the study.

In sexual variation male sex are very prone to take extreme decision (2.7 times more than female sex). In teen age group suicide is more prevalent during 20 to 40 years of age. The educational status denotes that the literate group commit suicide more often than the counterpart. Marital status study reflects that married people take this decision more frequently than unmarried ones. Unemployed group. takes this path easily than the busy employed group. In the low socioeconomic status the rate is more prevalent. From total cases of suicide, 34% of cases were suffering from any form of mental disease and depressive psychosis is more common in this series. 16.4% of cases were having some form of chronic painful disorder at the time of committing suicides.

In the study of the female age group 30% of cases were in the period of menstruation and 3% cases were at last trimester of pregnancy. In diurnal variation, the time of suicide is more during night than day. Again in the moonless phase the case is more compared to that of moon phase. More people commit suicide during first 4 days of Krishna Pakhsya.

Regarding the cases of suicide the psychosocial factor like family dispute plays a great role as compared to mental illness or physical illness.

This shows clearly that disharmony existing between family members trigger to take the fatal decision. The commonest method of committing suicide is poisoning than any other methods.

Out of 159 case, suicidal pacts written by 3 victims, out of them 2 were expressing frustration in their daily life, one expressing excessive passion for the other partner. 4 cases out of all have tried double methods of suicide to ensure death e.g., committed hanging after taking poison.

CONCLUSION

Today, the figures of suicides, if at all these are an index of the increasing incidence of this menace also pose a challenge for psychiatrists, social workers, public health personnel, sociologist and psychologist. It is not possible to bring back those lives which often lost in such tragic manner but identifying the underlying factors in the social system which promote suicidal tendencies and improving the mental health of the community can certainly prevents such incidence further. It is said that man must choose between, certainty and wider understanding. In suicide, the choice is the former. When one's cognitive abilities are completely masked beclouded by confusion, death may appear to be the only immediate certainty which he can lay hands. The present study exposes a wide range of frustrations and family tensions which may will be due to series of socioeconomic, psychosocial and cultural practices. Though such type of study cannot be the only solution for those human

tragedies, the concept of "suicide as a preventable disease" should be well understood and demands thorough and detailed investigations.

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A STUDY OF THE PATTERN OF HEAD INJURY IN DISTRICT ALIGARH. U.P.. INDIA

Dr. Mohammad Zafar Equabal, Former P. G. Student, Department of Forensic Medicine,

Dr. Shameem Jahan Rizvi, Professor, Department of Forensic Medicine,

Dr. Munawwar Husain, Reader, Department of Forensic Medicine,

Dr. V.K. Srivastava, Reader, Department of Surgery,

J.N. Medical College A.M.U., Aligarh 202002

ABSTRACT

Trauma as a general rule carries medicolegal implication. Head injury adds complexity to the problem as it adversely affects the complete evaluation of trauma until some time has elapsed after a particular injury. The often ill-defined clinical manifestation, the impact of claim settlements, and malingering further add to the problem of fair decision.

Key words : Accident, Head Trauma.

INTRODUCTION

The city of Aligarh in Uttar Pradesh is growing up in every conceivable way; in educational establishments, roads, buildings, business, energy infrastructure and, of course population. It has a huge international residential Central University housing 28,000 students within its sprawling campus. 1/4th are female students. The city in-dwellers population stood at 8 Y2 lakhs (census 2000) not counting another 1800,000 liberally spread in adjoining rural areas. The rural and urban areas combine to constitute an electoral constituency. To be a district a town must have administrative offices, local governing bodies, tehsils and municipality. The land mass is not taken into account, population is. On the basis of population electoral constituencies are carved out. Because of these interacting demographic forces accentuated by fast growing economy some unpleasant dynamics have been introduced in the form of violence, accidents and intentional negligence. These were the reasons the authors selected Aligarh for the study of head injury in different perspective. The objectives laid down were:

1. To determine the pattern of head injury.
2. To study the mechanism of head injury.
3. To demonstrate the mode or causation of head injury.

4. To study the incidence of head injury in relation to age, sex and aetiology.
5. To correlate the injury with lesions produced in the head.
6. To know the different types of intracranial lesions, their frequency and relation with the mode of injury.

MATERIAL AND METHODS

A total of 100 cases with documented antecedent head trauma were selected for the study. Gender and age differentiation was not of paramount importance. Patients reporting to the Emergency Section of J.N. Medical College Hospital, A.M. U., Aligarh, within 24 hours of receiving trauma were included in the study; those beyond 24 hours were excluded. It was not taken into consideration whether they had received treatment elsewhere before reporting to this hospital.

The clinical presentation of the traumatized patient & diagnostic CT scan formed the basis of the study.

The CT scan was read and commented upon by qualified radiologist in conjunction with neurosurgeon, both of the rank of Reader. The CT Machine used was SOMATOM-ARC manufactured by SIEMENS. This is a third generation whole body CT scan with a continuously rotating tube detector

system. The matrix size was 256X256. CT scans were performed as early as was feasible; however, delayed/repeat contrast scans were also carried out, if indicated.

To infuse uniformity all CT scans were evaluated according to the following aspects:

1. The presence or absence of visible lesion.
2. The depth of the lesion.
3. The degree of attenuation in the lesion as compared to that of normal brain tissue on the Hounsfield scale (Fig. 1) 1.
4. The presence or absence of mid line shift.
5. Ventricular or subarachnoid abnormality.
6. Any body abnormality i.e. fracture or pre existing body abnormality contributing to the lesion.

OBSERVATION & DISCUSSION

Age & Sex Pattern

n=100, 33% were below 10 years of age (male=27; 81%; female=6; 18.1%) constituted maximum chunk. In 11-20 years age group n=21 (male=19; 90.4%; female=2; 9.5%) and in 21-30 years age group n=21, (males=17; 80.9%; females=4; 19% constituted the subjects.

As is evident from table-I, n=100, the maximum number of casualty occurred in age group of 0-10 years, both in males and females.

Mode of injury of the victims

Fall from variable height (n=40,) road traffic accidents, n=40 (pedestrians=18, 45%; motor vehicle occupants=22, 55%); assaults (hit) (n=14) and gun shot injury (n=2) [Table 2(a)]. However in Table 2(b) the mode of injuries are depicted in relation to age slabs 0-10 years age group was found to be most vulnerable as falls constituted, 84.8% (n=28) out of total n=44.

Various computerized tomographic finding in head injury

Out of total n=100, positive CT scans were obtained in 73; 42 (57.5%) were adults i.e. above 18 years of age; 31 (42.4%) were in subjects less than 18 years of age. Negative CT scans were in n=27; 11 (40.2%), <18 years=16 (59.2%) and >18

years n=16 (59.2%) [Table 3(a)].

Table 3(b) depicts different lesions observable in positive CT scans in n=73. As expected scalp haematoma constituted 86.3% of injury followed by intracranial lesion i.e. cerebral contusion 56.1% haemorrhages 35.5% (subdural 16.4%, extradural 10.9%, & subarachnoid 8.2%) and cranial fracture 46.5%.

For the sake of precision, the head injuries were observed in the perspective of small age groups. This was done with the objective to find out which of the group had suffered which type of injury and what precautionary measures could be recommended [Table 4 (a)].

Another important aspect this study covered were different types of lesions, produced by various mode of injury [Table 4(a)] and location of these lesions in CT picture [Table 4(b)]. As is evident from these tables, subdural hemorrhage was found maximally in victim assault (42.8%) predominantly found in frontal (66.6%) and parietal regions (33.3%). This was followed by cerebral contusions found in cases of unspecified fall (50%), road traffic accidents (37.5) and assault on head (21.4). Cerebral contusions were parietal) and temporal (14.6%) regions.. Please refer to tables 4(a) and (b) for further elucidation of other types of lesions.

Mortality

Six patients (6%) died in the series of 100 patients of head injury forming the present study admitted to J.N. Medical College Hospital, Aligarh. All were males 5 out of 6 (83.3%) were above 18 years of age (mean age :f:22.5); 1 person was less 18 years (17.5 years). Two showed subdural haemorrhage (33.3%); 4 cerebral oedema and the probable cause of death was asphyxiation pneumonitis. Four of the total 6 patients had hospital stay of less than 24 hours prior to succumbing while two survived for 5 days dying ultimately.

CONCLUSION

A total of 100 cases with documented history of head trauma were evaluated clinically in the Emergency and Neurosurgery OPD of J.N.M.C. Hospital and scanned by computerized tomography in this series.

Of the 100 patients 47 were below 18 years of age and 53 were adults. Male predominated, constituting 83 of the total of 100 patients (83%). Fall accounted for most of the casualties especially in children below 10 years of age for whose fall from an unspecified height again was a predominant aetiological factor (81.8%).

In this series 76% cases were scanned within 8 hours of injury, while remaining were taken up for computerized tomography thereafter. Positive computerized tomographic picture was seen in 73 patients. A negative scan for head injury was observed in (27%).

Of the 76 patients who underwent emergency computerized tomography 60 patients (78.9%) showed varying abnormalities. However, of the 24 patients who underwent delayed scanning only 13 patients (54%) showed positive lesions.

Scalp swelling or haematoma was observed in (86.3%) of the cases and was the most common CT finding. Of the patients who showed abnormality on scan 02 had intracerebral haematoma, while contusions were seen in 41 patients (56.1%) followed by subdural haematoma in 12 cases (16.4%).

Cerebral edema was a common intra-cranial finding. A majority of the epidural, subdural and intracerebral haematoma were found in adults. Of the 34 (46.5%) skull fracture cases, 23 were in adults. The commonest site for subdural and extradural haematoma was found to be the frontal region followed by the parietal in subdural haematoma, temporal for extradural haematoma, respectively. Most of the contusions and subarachnoid haematoma were seen in the frontal region followed by the parietal region. computerized tomographic examination was done whenever required.

By rapidly and accurately depicting the spectrum of various gross neuropathological lesions resulting from trauma to brain helps in prompt and effective management of head injury patients. The neurosurgeon can quickly decide whether to institute conservative therapy or opt for definitive surgery, thereby decreasing the amount of surgical intervention and its allied complications in patients suffering from head injury.

Assessment of prognostic value cannot be

under-rated in head injury patients. As regards accuracy of CT interpretation, timing is important. A CT scan taken in the immediate post injury period is ideal compared to long time after the injury that may lead to erroneous interpretations and hence decreased accuracy.

It was noted that the overall lack of awareness among the pedestrians and the carelessness for traffic rules by the motorists were important reasons for most of the accidents. Almost no use of helmets, though mandated by law, use of seat belts sparingly by the vehicle occupants, poor conditions of roads and increased social violence are recognized factors to which attention should be paid.

Table 1
Age and Sex Pattern of 100 Patients Included in the Study

Age Group (Years)	Male	Female	Total
0-10	27 (81.8%)	06 (18.1%)	33
11-20	19 (90.4%)	02 (9.5%)	21
21-30	17 (80.9%)	04 (19%)	21
31-40	09	02	11
41-50	07 (70%)	03 (30%)	10
51-60	04 (100%)	-	04
Total 83	17	100	

Table 1-A
Mode of Injury

Mode of Injury	Numbers
I	Road Traffic Accidents 40
	Pedestrians 18 (45%)
	Motor Vehicle Occupation 22 (55%)
II	Fall 44
III	Assaults (Hit) 14
IV)	Gunshot Injury 02
	Total 100

Table 2
Mode of injury in different age groups

Mode of Injury	Years					
	0-10	10-20	20-30	30-40	40-50	50-60
Fall	28 (84.8%)	10 (47.6%)	03 14.2%	01 09%	01 10%	01 (25%)
RTA	05 15.1%	08 (38%)	12 (57.1%)	07 (63.6%)	07	01
(70%)		25%)				
Hit Assault	-	03 14.2%	06 28.4%	03 14.2%	01 10%	01 25%
Gun Shot	-	-	-	-	01 10%	01 25%
Total	33%	21%	21%	11%	10%	04%

Table 3
Positive and negative CT scans in relation to age pattern of patients n=73

Positive C.T. Scan (73)		Nagatie C.T. Scan (27)	
>18years	<years	>18years	<18years
42 (57.5%)	31 (42.4%)	11 16 40.7%	16 (59.2%)
10.	Intracerebral	02 (02.7%)	

Table 4
Various lesions in C.T. scan in head injury

S.No.	C.T. Diagnosis	No.of Patients with positive findings
n=73		
1.	Scalp/subdural swelling/haematoma	63(86.3%)
2.	Cranial Fracture	34 (46.5%)
3.	Cerebral Oedema (Isolated)	24 (32.8%)
4.	Cerebral Contusion	41(56.1%)
5.	Subdural Haematoma	
	Hge	12 (16.4%)
6.	Extradural haemorrhage	08 (08.2%)
7.	Sub-Arachnoid Hae.	06 (08.2%)
8.	Intraventricular haemorrhage	01 (01.3%)
9.	Pneumocephalous	06 (08.2%)

Table 5
Distribution of C.T. Finding in Various Age Groups

S.No.	C.T. Diagnosis	Age in years					Total
		0-5	06-10	11-15	16-20	>20	
1	Cerebral oedema	09 37.5%	03 12.5%	02 8.3%	02 8.3%	08 33.3%	24
2	Subdural haemorrhage/haematoma	02 16.6%	02 16.6%	-	04 33.3%	04 33.3%	12
3	Extradural haemorrhage/haematoma	01	-	- 12.5%	04 50%	03 37%	08
4	Subarachnoid haemorrhage	-	-	-	03 50%	03 50%	06
5	Cerebral contusion	10 24.3%	01 24.4%	04 9.7%	05 12.1%	21 51.2%	41
6	Fracture skull	10 29.4%	06 8.8%	03 20.5%	07 23.5%	08 23.5%	34
7	Intraventricular haemorrhage	-	-	-	-	100%	01
8	Intracerebral haematoma	-	-	-	01 50%	01 50%	02

Table 6
Mode of Injury in conjunction or alone producing various types of lesions

Mode of Injury	SDH	EDH	SAH	Cerebral contusion	Cerebral oedema
Fall	04 9%	05 (11.3%)	01 (2.2%)	02 50%	16 (33.3%)
Road traffca accident	02 (5%)	01 (2.5%)	04 10%	15 (37.5%)	05 (12.5%)
Hit assaults)	05 (42.8%)	02 (14.2%)	01 7.1%)	03 (21.4%)	02 (14.2%)
Gunshot	-	-	-	01 (50%)	01 (50%)
Total	12	08	06	41	24

SDH = Subdural haemorrhage ; EDH = Extradural haemorrhage ;

SAH = Subarachnoid haemorrhage

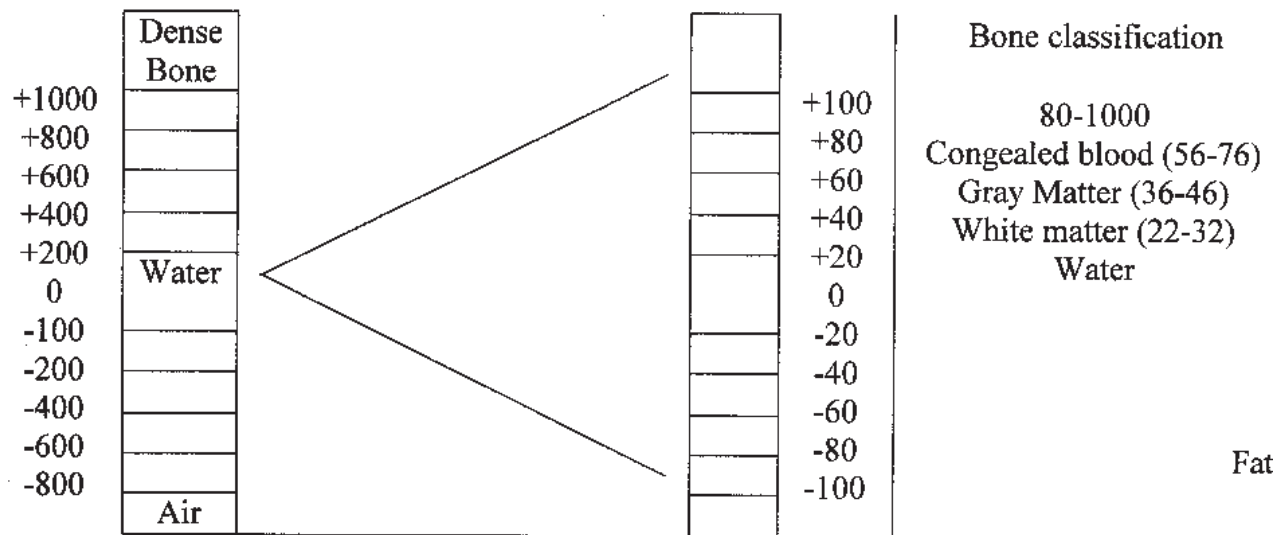


Fig. 1 The Hounsfield CT Scan, the full scale on the left extends over 2000 units. The expanded scale on the right extends over 200 units and includes all body tissues head scans are usually done routinely at a window level (L) of 34-40 and a window (W) covering 0-75.

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IS ATTEMPTED SUICIDE AN OFFENCE ?

Dr. B.S.Yadwad, Professor & Head

Dr. Hareesh.S.Gouda, Post Graduate student

Dept. of Forensic Medicine, Jawaharlal Nehru Medical College, Belgaum, Karnataka State.

ABSTRACT

Life is a stage with one entrance but many exits. Among those, suicide is one exit having a long ancestry. In 1968, the World Health Organisation defined suicidal act as "the injury with varying degree of lethal intent" and that suicide may be defined as "a suicidal act with fatal outcome". Suicidal acts with non fatal outcome are labeled by World Health Organisation as "attempted suicide." Suicide has been an act of condemnation as well as commendation through the ages. The act of suicide is forbidden in Khoran and the Holy Bible. The common belief among Hindus is that a person who commits suicide will not attain "Moksha" and his Soul will wander around, haunting and tormenting people. In recent times, attempted suicide, though a failed act has gained more importance (than the suicide, a successful act) since it is considered as an offence and is punishable under Section 309 of Indian Penal Code. A lot of conflicting opinions have generated on the desirability of retaining or deleting Section 309 of Indian Penal Code because of some contrasting judgments given by our Courts. Article 21 of the Constitution of India is a provision guaranteeing protection of life and personal liberty and by no stretch of the imagination can extinction of life be read to be included in protection of life. By declaring an attempt to commit suicide a crime, the Indian Penal Code upholds the dignity of human life, because human life is as precious to the State as it is, to its holder and the State can not turn a blind eye to a person in attempting to kill himself. Another set of people are of the opinion that the Section 309 of Indian Penal Code is cruel and irrational because it provides double punishment for a troubled individual whose deep unhappiness had caused him to try and end his life. It is cruel to inflict additional legal punishment on a person who has already suffered agony and ignominy in his failure to commit suicide. And also, what is the legal status of individuals who, by virtue of their religion refuse food and fast unto death? In India there are innumerable cases wherein religious ascetics fast to death without State intervening and are not punished though such acts amount to attempt to suicide.

Key words: Suicide, attempted suicide, Section 306 & 309 of Indian Penal Code, legal anomaly

INTRODUCTION

Life is a stage with one entrance but many exits. Among those, suicide is one exit having a long ancestry. The word "Suicide" literally means, "to kill oneself" (Sui-of oneself and Caedre - to kill) [1]. In 1968, the World Health Organisation defined suicidal act as "the injury with varying degrees of lethal intent" and suicide is defined as "a suicidal act with fatal outcome" [2]. But as per definition it is difficult to determine whether a particular death was a suicide since it requires the injuries leading to death to be self inflicted. This may be obvious in most cases, but in many others it is impossible to ascertain. Legally suicide is defined as "the intentional act of self destruction committed by someone knowing what he is doing and knowing

the probable consequences of his action." Suicidal acts with non fatal outcome are labeled by World Health Organisation as "attempted suicide" [2]. The "attempt to suicide" terminology is now recommended to be used only to denote events in which there has been a failure of conscious efforts to end life. These are the people who commit to end their life through suicide but somehow survive.

Suicide has been an act of condemnation as well as commendation through the ages. The philosopher's approach considering sacredness of life, its quality as well as quantity hinges on the central query - Can a man decide to blow out the flame? Can he choose death over life? People have been killing themselves from the beginning of recorded history. Ramayana and Mahabharata

have recorded instances of suicide. When Lord Shri Rama relinquished his life, there was an epidemic of suicide in Ayodhya. Bhagvad Gita is against self torture and self killing. During Vedic and Upanishadic times, apart from "Sati", death from drowning at the confluence of rivers to achieve "Punya" (salvation in the next life) , the self destruction for incurable diseases, ascetics undertaking a great journey towards the terminal years of life (Mahaprasthan) , were allowed, but suicide in general was penalised with the above exceptions [2] A verse from the Isavaya Upanishad declares: "He who takes himself (his life) reaches after death, Sunless regions, covered with darkness". The Holy Bible contains no law forbidding man to kill himself, but the taboo that is tagged on to suicide, coupled with denial of a decent burial was a deterrent to self destruction by suicide [3]. Islam asks man and woman to wait for his/her destiny rather than snatching it from the hands of Allah. If he does not, he will be depicted as an unfaithful wretch [2]. The common belief among Hindus is that a person who commits suicide will not attain "Moksha" and his soul will wander around, haunting and tormenting people.

Attempted suicide, though a failed act has gained more importance (than the suicide which is a successful act) since it is considered as an offence and is punishable under Section 309 of Indian Penal Code. According to this Section, "whoever attempts to commit suicide or any act towards the commission of such offence shall be punished with simple imprisonment for a term which may extend to one year or fine or both [4]. It is because, our legislature makes an offence dependent on proof of intention. Legally, an act is INTENTIONAL if it exists in idea before it exists in fact, the idea realising in itself is the fact because of the desire it is accompanied with.

A lot of conflicting opinions have generated on the desirability of retaining or abolishing section 309 of Indian Penal Code because of some contrasting judgements given by our courts. In 1981, the Delhi High Court condemned the penal provision (Section 309 of Indian Penal Code) as "unworthy of human society" and its Bombay Counterpart, in 1986, held it to be ultravires-on the ground that it violates Articles 14 and 21 of Indian Constitution [3]. The Andhra High Court, on the contrary held that Section 309 of Indian Penal Code

is valid, as it "does not offend" Articles 14 and 21 of the Constitution [5]. In April 1994, a two judge bench of Supreme Court (Justice R M Sahai and Justice B L Hansaria) had declared the Section 309 of Indian Penal Code void. They observed that "the right to live (under Article 21 of the Constitution of India) can be said to bring in its trial the right not to live a forced life". They declared section 309 of Indian Penal Code as irrational and cruel. However, in March 1996, a five judge constitution bench of the Supreme Court setting aside the earlier judgement, held that attempted suicide is an offence under the Indian Penal Code. So, now the Section 309 of Indian Penal Code continues to be valid [4]. These judgements opened the door for a good debate on whether the offence of attempt to commit suicide under Section 309 Indian Penal Code should be retained or abolished.

DISCUSSION

Ordinary law makes no provision for the situation which is considered instinctively natural for human beings. If some individuals create some situations, which usually human beings do not create, the Society has a tendency to look down upon them as being uncommon or unnatural and this attitude is reflected in laws. Law presupposes a society of normal individuals with certain general instincts. Self preservation is the most general instinct of human beings. In fact, the urge to attempt to commit suicide runs contrary to the instinctive urge of the normal individuals who constitute a majority in the society. Those who attempt to commit suicide is a minority. It is the instincts of majority segment of society that give rise to ethics and morality which lead to uniform norms. So, attempt to commit suicide is against the generally accepted norm. Such general norms usually do not vary from society to society in as much as human life is the same in every society. And every civilized society in the world may develop legal norms against breaches of uniform social norms. Viewed in this perspective, individual autonomy can never be granted to the extent of permitting the individual to take away his life. This is because it is unnatural and so against the moral stand points of normal individuals who constitute the society [6]. And also it is not correct to say that the individual has complete authority over his body and life. His spouse and children do have claims on his body

and life. Even if the person is not interested to keep himself alive, the society, because of its embedded love for sanctity of life, may have an interest in the body and life of that individual.

The Supreme Court in 1994 in Rathinam case, not only declared Section 309 of Indian Penal Code as being violative of Article 21 and thus unconstitutional but also conceded constitutional right to die. In doing so, the Supreme Court seemed to have relied heavily on the Bombay High Court decision in Dubal case. The Bombay High Court argument was plain: the right to one's life also includes the right to take it away. But on closer scrutiny, several sub questions of substantial law surface. The right to buy property implies the right to sell also. In the same vein, does the right to one's life also imply the right to dispose off one's life? Also, do parents "create" the life of their children? No civilized country would subscribe to the theory that parents have a right to dispose off the life of their children because they have created them.[3]

The right to life is the supreme right from which no derogation is permitted even in time of public emergency which threatens survival of the nation. Article 21 of the Constitution is a provision guaranteeing protection of life and personal liberty and by no stretch of the imagination can extinction of life be read to be included in protection of life. The right to life is a natural right embodied in this Article but suicide is an unnatural termination or extinction of life and, therefore, incompatible and inconsistent with the concept of right to life.

Thus, by declaring attempt to commit suicide a crime, the Indian Penal Code uphold the dignity of human life because human life is as precious to the State as it is to its holder and the State can not turn a blind eye to a person's attempt to kill himself.

Another set of people are of the opinion that the Section 309 of Indian Penal Code is cruel and irrational because it provides double punishment for a troubled individual whose deep unhappiness had caused him to try and end his life. It is cruel to inflict additional legal punishment on a person who has already suffered agony and ignominy in his failure to commit suicide. According to this school of thought, suicide attempt is very often a cry for help. The Society owes responsibility towards those

who scream out against life because of personal reasons. They need sympathy and psychiatric help rather than criminal prosecution.

The Supreme Court judgement of 1996 occasioned unhappiness amongst mental health professionals across the country. Would any court decree that vomiting is a criminal offence? Vomiting is a symptom of an underlying physical illness. In like manner, an attempted suicide or a completed suicide is almost invariably a symptom of underlying psychiatric disorders. Should it then be viewed as an illegal act? Depression is the commonest diagnosis associated with suicidal attempt like other common diagnoses such as alcoholism, drug abuse, Schizophrenia, etc.[7] All these disorders require medical and/or psychological therapy. Mc Naughten's rule can be invoked in the interpretation of the criminality of an attempted suicide. This rule represented by Section 84 of Indian Penal Code, specify that, "Nothing is an offence which is done by a person who at the time of doing it, by reason of unsoundness of mind, is incapable of knowing the nature of the act, or that he is doing what is either wrong or contrary to Law." [8] Therefore attempted suicide is not an offence if the person at the time of committing it, by reason of mental illness, did not know what he was doing or what he was doing was either wrong or contrary to Law. And also a mentally ill person or a person experiencing intense psychological distress is not likely to consider legal issues when he contemplates suicide; and, if he does think of the law on the subject, he is likely to take precautions to ensure that his act is successful. Eitherway, the law on suicide fails to serve as deterrent.

The Supreme Court judgement of 1994 stated that the right to live also implies the right not to live a forced life.⁴ In many cases the cause behind desperate shortcut to death is poverty, feeling of burden on the family or of the family. Such people may commit/attempt to commit suicide in order to relieve themselves of the unbearable burden of life which may be greater torture than the pain of death. Supporters of this theory ask "Does the State today have a right to force a person to stay alive, when the state itself can not provide him means of a decent livelihood?

Persons who attempt suicide therefore require assistance in their physical and

psychological life and not punishment by fine and/or imprisonment. Penal deterrents are better suited to criminal act, not acts of distress. Hence the Section 309 of Indian Penal Code deserves to be effaced from the statute book to "humanise our penal laws". In this connection, in 1971, the Law Commission recommended the abolition of Section 309 of Indian Penal Code. The then Government of India accepted the recommendation but could not pass the bill in the Lok Sabha in 1979 as the elected body was dissolved and the bill elapsed.[2]

Some are of the view that if attempt to suicide is not an offence then the section 306 of Indian Penal Code becomes unconstitutional. Section 306 of Indian Penal Code defines abetment of suicide and punishment for the same. But offences defined under both these Sections are distinct offences and Section 306 of Indian Penal Code can survive independent of Section 309 of Indian Penal Code.

What is the legal status of individuals who by virtue of their religion refuse food and fast to death? In India there are innumerable cases wherein religious ascetics fast to death without the State intervening and are not punished though such acts amount to attempt to suicide. For example, in February 1988, a 82 years old Jain ascetic starved himself to death in Sonapat in Haryana. In April 1993, a female Jain monk starved herself to death in Kutch District. In April 1993, Bangalore Police registered a case of attempted suicide against a Bollywood actress. Cases were similarly registered against some of the 22 youths who attempted self-immolation during the anti Mandal Stir in 1991.5 Seeing the different State responses to these cases, a simple question leaps up the mind. Why an actress is charged with attempted suicide but not Jain monks starving themselves to death? Does this double standard mean that the State condones a slow suicide but not a quick one?

CONCLUSION

Therefore it is, however, not to say that the Indian Penal Code is a modern code in every sense of the term. It requires change to meet the aims and aspirations of contemporary society. Ultimately the endeavour should be to evolve a consensual and conceptual model effectively tackling the evils, without sacrificing human rights.

Social problems cannot be solved by applying

technological solutions. As long as medicine depends on science and science promises hope, there is always hope for mankind and people who make decision should make them judiciously.

In democracy, law making is a public exercise. Resultantly, a legislative empowerment in contrast to an executive aggrandizement of power can not occur without public scrutiny. The Constitution, however, does not just require a legislative procedure but the one, which is just fair, reasonable and acceptable to the society at large.

It is said that Suicide is a legal anomaly wherein an attempted act is punishable while an accomplished act is not!

Should we, today, in the ever changing trends of the Society continue with and adhere to this anomaly?

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MICROBIAL FORENSICS: A NEW FORENSIC DISCIPLINE

**Sharad Jain,
Ashish Kumar,
Pratima Gupta,
Ramjee Prasad,**

Dept. of Microbiology, Himalayan Institute of Medical Sciences, Dehradun

ABSTRACT

In microbial forensics, researchers work to track down the source of a microbe, whether in a criminal investigation of bioterrorism attacks or a study of naturally occurring disease outbreak. It is interplay of classical microbiology, microbial genomics, phylogenetics and bioinformatics. Although microbes have been used as weapons for centuries, the anthrax letter attacks of 2001 generated great terror in the public and revealed the need to establish "attribution." The benefit is that it might deter at least some potential terrorists and also help in tracing natural outbreaks of disease. Microbial forensic data must hold up not only to the scrutiny of scientists in the health care community, but also to the scrutiny of judges and juries and national policy and decision makers. It poses a great challenge to develop newer techniques as the present techniques like gene sequencing, hybridization, microarray, spectrophotometry, PCR etc. are inadequate. A national microbial forensics plan needs to be developed.

Key Words: Microbial forensics.

INTRODUCTION

As early as 1995, it was suggested that the investigation and solution of bioterrorism events would rely heavily on forensic science. It was predicted because of the view that such events could be readily perpetrated without the availability of eyewitnesses, concerned citizen reporting, records available for review and analysis, or serendipitous or purposeful intelligence or evidence. It is from these sources of information that law enforcement usually conducts investigations, makes arrests, and disrupts, prevents, or deters crime. The prediction was also based on the expectation that someday one or a small number of skilled individuals would succeed in such an operation, by possessing knowledge and materials, employing tight operational security, and using subtle means during the preparation and dissemination of a biological agent[1].

Definition

Microbial forensics is a scientific discipline dedicated to analyzing evidence from a bioterrorist attack, biocrime or inadvertent microorganism/toxin release for attribution purposes (who was responsible for the crime) [2] or It can be defined

as the detection of reliably measured molecular variations between related strains and their use to infer the origin, relationships, or transmission route of a particular isolate or forensic sample[3]. The definition of microbial forensics is critical to its success and the speed and effectiveness of its critical path from concept to mature capability. The word forensics itself has many lay meanings and interpretations, which are often encountered in discussions with and writings of "experts. The founders of this new field have a unique opportunity to state clearly what the field is and what it is not. The definition of forensic science provided earlier in this article may aid in this matter. Additionally, the "boundary conditions" should be firmly established as to how it will be practised and explored and what "rules of engagement" and expertise will be expected and required to do so. The new discipline of microbial forensics is in the process of being founded from an array of established and emerging fields, such as classical microbiology, microbial genomics, phylogenetics, and informatics, and it should embrace lessons learned from human DNA forensics and forensic informatics. The large body of knowledge and experience in forensic science itself should be accessed and applied as well.

Bioterrorism Agents

The concept of employing disease as a weapon has existed for centuries. The low cost, minimal barriers to acquisition, and potential impact of biological agents as weapons have influenced a number of countries to pursue biological warfare (BW) throughout the 20th century. International agreements, such as the Biological Weapons and Toxins Convention (BWC), have arguably done little to deter BW programs[4].

Biotechnology has had a profound effect on biological warfare.

Conventional Agents; Historically, biological warfare agents of concern have included a relatively select group of pathogens and toxins, referred to as traditional BW agents. Traditional BW agents are all naturally occurring organisms or their toxic products. From the perspective of a biological warfare scientist, traditional BW agents have serendipitously evolved a select group of traits: toxicity, stability, and ease of production. However, until recent decades, the serendipity that aided researchers in choosing select organisms also limited BW applications to the characteristics of available agents. For example, environmental stability, infectious dose, time to effect, clinical progression, and lethality are all properties intrinsic to candidate traditional agents that may limit their utility for biological warfare. Most potential agents are the *Anthrax bacillus*, *Yersinia pestis*, *Botulinum toxin*, *Variola* (small pox) virus.

Genetically modified agents; with the advent of recombinant DNA technology, researchers have developed standard methodologies for altering an organism's genetic makeup. Application of this technology to enhance traditional biological warfare agents has led to the classification of genetically modified BW agents as a separate category of BW agents. Examples of potential modifications include antibiotic resistance, increased aerosol stability, or heightened pathogenesis. Importantly, genetic modifications may alter epitopes or sequences used for detection and diagnostics, necessitating that multiple points of reference be incorporated into these systems and highlighting the need for security regarding biodetection strategies. However, genetically modified BW agents will remain closely related to the parent agent at the

genetic level and should be generally identifiable using traditional diagnostics.

Advanced biological warfare agents (ABW); Technologies developed across multiple disciplines in the biological sciences will have a profound global impact and concurrently have the potential to revolutionize biological warfare by facilitating an entirely new class of fully engineered agents referred to as advanced biological warfare (ABW) agents. Emerging biotechnologies likely will lead to a paradigm shift in BW agent development; future biological agents could be rationally engineered to target specific human biological systems at the molecular level. This is a departure from the traditional model of BW agent development, which is focused on the naturally occurring agent, not the target organism. Biological science trends hold promise to change this, allowing BW agent developers to identify biochemical pathways critical for physiological processes and engineer specific ABW agents to exploit vulnerabilities. These future developments do not mitigate threats from traditional BW advances. In addition, biotechnology will have applications supporting ABW weaponization, dissemination, and delivery. Such new agents and delivery systems would provide a variety of new use options, expanding the BW paradigm.

Impact of biotechnology on BW

The effect that biotechnology may have on biological warfare threats facing both military and civilian populations is graphically represented in the Figure. The threat presented by traditional agents has been increasing since the early 20th century but eventually will level off because of two major factors: (1) development of targeted medical countermeasures probably will reduce threats posed by current biological warfare agents, and (2) the number of natural pathogens and toxins that contain properties suitable for biological warfare is finite. Like traditional agents, the threat posed by genetically modified traditional agents eventually will plateau partly because, ultimately, only a finite number of properties and genetic modifications can be used to enhance a traditional agent without altering it beyond recognition of the parental strain or serotype. Importantly, the large, yet finite, number of potential genetic modifications may well

represent a multiplicative threat relative to that posed by the traditional agents; Unlike threats posed by traditional and genetically modified traditional agents, the capability-based threat posed by ABW agents will continue to expand indefinitely in parallel with advances in biotechnology.

Recent cases

Anthrax attack of 2001, in which spores of the bacterium *Bacillus anthracis*, the cause of anthrax, were disseminated via the mail. Microbial forensics has led to some high-profile discoveries. For example, sequencing of amplified viral fragments from the dentist and the infected patients supported the alleged transmission of HIV from a Florida dentist to several patients[5]. Recently, using multiple-locus variable number tandem repeat (VNTR) analysis, the Aum Shinrikyo B. anthracis bioterror strain was identified as the veterinary vaccine strain, Sterne 34F26. Both criminal investigation of bioterrorism attacks and studies of naturally occurring disease outbreaks will continue to be important applications of this technology. In fact, in some cases, it is difficult at the outset to distinguish mother nature from man as the perpetrator: The investigation of the West Nile virus outbreak in the northeastern United States in 1999 eventually revealed a single strain from birds and humans in New York with greatest similarity to a strain originally isolated from a dead goose in Israel, leading to the conclusion that the outbreak was of natural origin[7, 8].

Why is it important?

- It will help law enforcement to identify the source of the evidence sample. Evidence can stand to the scrutiny of judges in the courtroom as well as national decision and policy makers.
- Identifies perpetrators
- Prevents and deters biocrime
- One possible benefit is that having a well-prepared response plan in place might deter at least some potential terrorists.
- There have been cases in which infected people have intentionally infected others and such cases may well end up in court.
- A major benefit, however, is that much of the outcome would also be applicable to tracing natural

outbreaks of disease.

Identification of key challenges and recommendations for finding solutions[9]

Challenge #1: Collecting specimens at the attack site

The first challenge is proper collection of evidence at a site where the release of an infectious microbe is suspected.

Challenge #2: Recognizing that an attack is occurring and diagnosing the disease

In the case of the anthrax bioattack, the agent responsible was identified almost immediately. In other cases of intentional disease transmission, the identity of the microbe being used in the attack may not be apparent so quickly. This is where physicians and other health care workers come in. The physicians are the ones who will recognize, diagnose and treat infected patients.

Challenge #3: Analysis of specimens

The next challenge is the analysis of the specimens collected by first responders and by microbiologists subsequently sent to the site.

Challenge #4: Validation -- quality assurance and control

The next challenge is, in some ways, the most formidable one, rigorously validating each analytical method by establishing its limitations, its sensitivity, and its reliability. Also important is the robustness of a method

-- the assurance that the method can be used successfully in many different laboratories and field conditions, always giving the same results. The credibility of analytical results relies absolutely on proof that the analytical procedure has been thoroughly vetted by experts.

Comparison with Forensic Human DNA analysis practices

Similarities

The molecular biology technology that could be used in microbial forensic applications (e.g., extraction of DNA/RNA materials from the microbes, polymerase chain reaction (PCR)-based methods of amplifying target regions of the

genome, genotyping specific loci, or sequencing a specific fragment of DNA/RNA, etc.) are similar to that practiced in the human DNA forensics field. Both the human forensic and microbial forensic DNA analysis practices also have other features in common, including the use of population databases, the use of qualitative conclusions of test results, and the application of Quality Assurance/Quality Control practices.

Differences

However, there are several major differences, particularly in the context of data interpretation that should be noted before considering the application of statistical approaches to microbial forensic DNA cases. These differences may make database structures and statistical methods used in human DNA forensics applications inappropriate in the context of microbe analysis. Budowle and Chakraborty[10] described some of these differences, which include: database size and composition, statistical interpretation methods, and confidence/ uncertainty in the outcome of an interpretation. Because most bacteria and viruses are haploid, the statistical approaches based on diploid organisms, such as humans, do not apply. Microbes primarily reproduce asexually and, thus, are clonal in nature. Just like identical twins, clonal samples may be genetically indistinguishable. Therefore, it may not be possible to uniquely identify a source based on genetics alone. Identifying the mutation/ variant site that may have arisen in a subsequent passage is not easily accomplished without a costly whole genome sequence analysis.

Lineage based approach

Microbial forensic genetic evidence will more likely be analyzed using a lineage-based approach. In other words, sequence similarity and/or genotypic match with microbes may only infer common lineage instead of identity.

Ancillary evidence

Ancillary evidence, not quantifiable by means of genetic principles, will likely be needed to determine a unique source for the evidence (such as chemical analysis of the sample matrix, isotope analysis, morphology, traditional forensic analyses, etc.). Horizontal gene transfer also occurs and gene

conversion approaches may be applicable. Effective horizontal gene transfer and vertical gene transfer statistical models, general and specific genome site stability studies, near neighbour analyses, and diversity studies[11 - 14] will enhance capabilities to quantitatively assess the significance of lineage-based comparisons.

The road ahead

A database needs to be created of all the potential BW agents. This database must be relational and fully secure. Additionally, this database would have significant value for avoiding duplicative research efforts, and for making current information available on sequencing efforts and typing methods [21].

Establish a National Program for Forensics of Biological Weapons and Terrorism (NPFJWT) and assign responsibility to a lead agency; assign subordinate programs to performing agencies and organizations.

Build an educated constituency for microbial forensics with leading policy makers, senior agency managers, key national scientific institutions and organizations, and experts.

Assess current capabilities, gaps, and needs, and use the report as a basis for the national investment strategy.

Develop and publish a national strategy and plan for the NPFJWT, which will be shepherded by a single cabinet-level agency, and resource the program for success over a sustained period.

Organize independent, or loosely connected, laboratories that have relevant capabilities into a coherent Biological Warfare and Terrorism Forensics Consortium, using policies and standards developed by the assigned lead agency, and key stakeholders.

Determine the potential impact and value of microbial forensics and the NPFJWT on global nonproliferation, counterproliferation, and deterrence of biological weapons and bioterrorism.

Execute a national summit on microbial forensics, in conjunction with the NPFJWT, for key scientists, agencies, organizations, and stakeholders to initiate national focus and direction.

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FORENSIC ENTOMOLOGY ANALYSIS PROFESSIONAL HELP IN KARNATAKA CASE

Dr. Pankaj Kulshrestha, Junior Forensic Specialist & Asst. Chemical Examiner

Dr. D.K. Satpathy, Director

Medico-Legal Institute, Govt. of Madhya Pradesh Home (Police) Deptt., Gandhi Medical College Bldg. Bhopal

ABSTRACT

In a sensational case, one ex-minister of Karnataka Government was kidnapped in the month of August 2002 by the notorious forest brigand and was held as hostage. The deceased body of the said hostage was found in the month of December 2002 in the forest area near Changadi village of district, Karnataka.

The autopsy on deceased body was conducted and during autopsy the entomological evidence was collected which was referred to Karnataka FSL for analysis. Since the expertise and facilities were not available, the Karnataka FSL further referred the samples to the Medico-legal Institute, Bhopal for professional Help.

The present paper is enumerating the valuable entomological analysis about PMI estimation drawn by us, certainly providing the scientific assistance in the forensic entomology. Thus the awareness among the forensic experts to use this Institute as a prime reference center on the subject should be well understood.

Key Words: Forensic Entomology, Karnataka case.

INTRODUCTION

In a sensational case, one ex-minister of Karnataka Government Shri H. Nagappa was kidnapped on 25th August 2002 by the notorious forest brigand Veerappan and was held as hostage. The deceased body of Shri Nagappa was found on 8th December 2002 in a forest area near Changadi village of district Mysore, Karnataka. Now Veerappan is no more, as he was being killed during encounter on 18th October night 2004 by the Special Task Force (STF) comprising policemen from Karnataka and Tamilnadu. However, it is worthwhile to mention that this case had acquired high order of gravity and became most sensational one, during the past time.

The autopsy on deceased body was conducted on 9th December 2002 and during the autopsy the entomological evidence was collected. The autopsy surgeon referred this evidence so collected to the FSL, Bangalore for analysis. Since the expertise and facilities of forensic entomology were not available, the FSL Bangalore further referred the samples to Medico-legal Institute,

Bhopal for professional help. The sample was sent to us for entomological analysis with two main queries Viz: (1) Elucidation of time of death (2) Causes for the death of maggots.

The present paper is enumerating the valuable entomological analysis about PMI estimation drawn by us, certainly providing the scientific assistance in the forensic entomology. Thus the awareness among forensic experts to use this Institute as the only reference center on the subject should be well exploited.

ENTOMOLOGICAL EVIDENCE

- (1) Fly Eggs : 90% of sample observed as eggs of flies (2 mm).
- (2) Some freshly hatched eggs : first instar maggots (2mm).
- (3) Few second instar maggots (5mm).

ENTOMOLOGICAL ANALYSIS AND DISCUSSION

1. Examination of Evidence:

When the whole sample mass was studied and microscopically examined, it was found that 90%

of sample mass were fly eggs which were non motile. Thus we have explained the false impression gathered by the autopsy surgeon that "95% of maggots collected were assumed to be dead" but in reality they all were fly eggs which were non motile, while very few (2-3 number) were second instar tiny maggots(measuring 5mm) because the microscopic examination of posterior spiracle of these tiny maggots were bearing two slits and few of them were freshly hatched eggs the first instar maggots.

As regard to query about cause of death of maggots, the literature suggests that if the food is plenty the maggots may die from drowning in an excess of the moisture but this condition was not found in this case. However, the non motile eggs were misrepresented as dead maggots.

2. Identification

It was not possible to identify the immature stages like fly eggs, first and second instar maggots because the authentic identification is only possible where third instar maggots or adults being recovered as evidence. However, the slit structure of second instar maggots posterior spiracle resembles with that of Calliphoridae pattern but it is not confirmed.

We have suggested that it would have been more fruitful if the autopsy surgeon could collect some live samples of fly eggs and tiny maggots, by putting them on the liver tissue of same infested body as a food substrate for further breeding/rearing purposes. By doing so, if these eggs/maggots could have successfully reared into pupae and adults then species identification could be possible and PMI estimation may have been done with more accuracy.

Although Lie & Greenberg [1] have described about the identification of some immature stages of some flies of forensic importance but they have mentioned characteristics observed in Scanning Electron Microscope (SEM), which is not available with us. So it was not possible to corroborate and appreciate the identification of immature stages found in the present case with that of Lie & Greenberg valuable work.

Recently RAPD (random amplified polymorphic DNA) typing technique [2] is also available as a quick and reliable tool for

identification but we do not know whether these specimens were useful for any DNA typing because these were not the fresh and being preserved since long.

3.Environmental factors

The temperature and humidity data of the site where body is being recovered plays an important role while estimating the PMI by the entomological study.

We have specially requested the Director Metrological center, Central Observatory Bangalore to provide us these data of District Mysore for the relevant period. We are thankful to them as they have promptly supplied the data about temperature only of Mysore district but could not give the humidity data as well. The daily maximum-minimum average temperature of Mysore district was 23 degree centigrade for the relevant period (i.e. from 6th December to 10th December 2002).

4.Autopsy findings

The autopsy surgeon has mentioned that body was in a state of moderate to high decomposition, hairs on head were gray and 9 cms long, frontally bald face bloated but features could be recognized. Eyes open, eye balls slightly protruding, marbling seen over limb and shoulder, rupture PM blisters seen all over the body. Head hairs could be peeled off easily. Fecal discharge present.

The duration of death was given as 4 to 5 days since postmortem.

CONCLUSION

On the basis of entomological study and going through all the documents the minimum post mortem interval or time since death estimated as about 48 to 72 Hours (2-3 days) since the date of postmortem(i.e.9th December 2002) in the environment of average temperature 23 degree C.

As per available literature and our experience the description of the decomposition do indicate the duration of death is within 3 to 5 days what the autopsy surgeon has also drawn the duration of death 4 to 5 days.

The peeling of skin, bloating of face, marbling effect, rupture blister, fecal discharge, spongy liver, liquefaction of spleen and brain also giving the additive support to above duration.

If colour photographs of deceased body could have been available then the stage of decomposition could have better been calculated.

After consideration of above facts, the duration of death could have been approximately 4 days.

The entomological study revealed the minimum duration of death is 48 hours since 90% of sample mass are fly eggs but since the 10% specimens are in hatched condition and very few have developed two slits in posterior spiracle of maggot indicating second instar thus giving allowance of 24 hours more. As such the total entomological estimation about duration of death is 72 hours in prevailing environment.

Now the question remains if the duration of death as per decomposition and autopsy is 4 days and entomological estimation is 3 days. This fact

does indicate that in initial 24 hours after death the body could not have been available to flies for egg deposition, thus it was likely that body may be kept or remain in such a place where fly were not assessable and after that period the body was available for flies.

The above point is much more important to analyse the case and allowance of 12 hours plus minus can be easily added.

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SUSPECTED SNAKE BITE TURNING OUT TO BE DEATH DUE TO CHOKING ROUND WORM INFESTATION) - A CASE REPORT

Dr. V.K. Dhruv, Medical Officer,

Dr U. Gonnade, Demonstrator,

Dr. S.P. Garg, Asstt. Professor,

Department of Forensic Medicine & Toxicology, Pt. J.N.M. Medical College, Raipur (C.G.)

ABSTRACT

A six years old female child was brought to the casualty department of Dr. B.R. Ambedkar Hospital and associated Pt. J.N.M. Medical College, Raipur (C.G.) with the history of snake bite. On autopsy signs of asphyxia and one large round worm was found in lower respiratory tract. No animal bite mark could be found as alleged by relatives and police. Later on it was revealed by relatives of the deceased that the girl had passed four round worms in stool three year back. For which she was given some medications. The small intestine was studded with multiple round worms most of which were live. The intestine contained very little amount of digested food material. The social, ethical and medico legal issues involved in sudden suspicious deaths in the state of Chhattisgarh and too frequent history of snake bite in most of them is discussed in the paper.

Key Words: Choking, worm infestation, asphyxia, roundworm.

INTRODUCTION

Dead body of a Mohammadan female child aged about 6 years was brought for medicolegal autopsy with the history that the child was playing with kids near her house in the evening of the day before the date of autopsy, when she was bitten by some unidentified poisonous insect over 2nd toe of right foot which turned black. She was admitted in Medical College Hospital, Raipur (C.G.) approximately one and half hours after alleged insect bite, where she died after half an hour of admission.

The deceased was a thin built female child. Clothings were intact and insitu. White frothy fluid was present over nostrils and on compression of chest became more pronounced. Intravenous prick mark was present on dorsum of left hand. The whole of the body particularly feet and hands were closely inspected and examined for presence of any puncture wounds / bite marks with underlying echymoses / edema but none could be found as alleged by police and relatives.

Trachea was found full of white froth mixed with mucoid fluid. A 13 cm long round worm was

found lying in the respiratory tract with the lower end present in secondary bronchiole of lower lobe of left lung. The mucosa of the respiratory tract was congested and slightly soft. Both lungs were heavy and voluminous. On cut they were markedly congested and edematous.

Heart was found normal in size, both chambers were full of blood, valves & appendages, cavities and myocardium were normal. One 11 cm long roundworm was also found lying in the lumen of esophagus. Small intestinal lumen was studded with numerous (counted to be 36) round worms, at three places they were found to be intertwined with each other forming a bunch overdistending the bowel. Only scanty amount of greyish brown digested material was found in the ileum at places, otherwise it was empty. Stomach contained about 80 g. brownish pasty partially digested food material, mucosa was normal and healthy. Small amount of faecal matter was present in large intestine. Liver was congested, spleen and kidney were normal and healthy. Brain was congested and healthy. A piece of skin and underlying subcutaneous tissue was excised,

preserved, sealed and labelled surrounding the alleged bite site and handed over to police constable concerned .

The relatives were again enquired after completion of autopsy. The father of the deceased was specifically and assertively asked about past history of worm infestation. He admitted that the child has passed four round worms three years back when they had consulted a medical practitioner and he had given single tablet of some medicine and as per him self she never had any problem except for mild pain in abdomen off & on and unsatisfactory weight gain.

On the day of incidence he told that while playing she suddenly was reported to develop inability to speak, made gestures indicating choking in the neck, was desperately opening mouth as if was hungry for air. Then she turned blue, fainted and had fits (as per him self) for one to two minutes. She was immediately shifted to hospital where she died in half an hour. The hospital record mentioned that child was brought in asphyxiated and gasping condition and could not be saved despite all the heroic cardiorespiratory resuscitative efforts there was no past history of epileptic fits.

DISCUSSION

It is relevant in the present case to note that large number of unnatural deaths due to snake bite and wild animal attacks are annually reported in the state of Chhattisgarh. Taking strong note of this fact, the state government has decided to compensate monetarily, the family of deceased dying due to animal bites. Owing to this fact it is felt and substantiated by investigative agencies & physicians dealing with such medicolegal cases also, that claims of death due to animal bite with false history regarding the same have become quite common. As in few cases of death due to insect bite the bite mark may not be detected inspite of very sincere efforts to locate it. False and misleading history of snake/ insect bite in such cases is very common. In the present case however the death clearly and unquestionably was due to choking of lower respiratory passage with round worm. The basic principle of not relying too heavily on history provided by police & relatives in medicolegal cases and importance of meticulous autopsy therefore gets all the more substantiated.

SITUS INVERSUS vis-à-vis SUDDEN DEATH

Dr. Adarsh Kumar, Senior Lecturer,

Dr. Virendar Pal Singh, Demonstrator,

Dr. Krishan Vij, Professor & Head,

Department of Forensic Medicine, Government Medical College, Sector 32, Chandigarh-160030.

ABSTRACT

Situs Inversus, a rare congenital anatomical abnormality although is not directly related to Sudden Death. However, 3-5% of people with Situs Inversus have associated functional heart defect & 25% have an underlying condition i.e. Primary Ciliary Dyskinesia presenting as Kartagener's Syndrome; are prone to Sudden Death.

Two cases of Situs Inversus on which medico-legal autopsy was conducted are reported. In first case, death was attributed to cardiac component (massive cardiomegaly, narrowing of coronaries and an old, healed apical scar) and in the second, due to respiratory complications (infection of lungs with areas of pus formation) with Blood Alcohol Concentration as 241.50 mg % ; being another significant finding.

Apart from discussing the various aspects of the condition, vital medico-legal issues varying from 'Negligence' to 'Assessment for Insurance purpose' are being discussed.

Key Words: Situs Inversus, Sudden Cardiac Death, Primary Ciliary Dyskinesia, Medicolegal Issues.

INTRODUCTION

Situs Inversus is a rare congenital anomaly in which there occurs reversal placement of various thoracic and abdominal organs to their normal anatomical location. In Situs Inversus totalis, which is a recessively inherited condition, there, occurs mirror image of the anatomic location of all the viscera while in Dextrocardia only the apex of the heart points to right and is present in the right hemithorax. Sometimes, when Situs Inversus is accompanied by sinusitis and bronchiectasis, it constitutes Kartagener Syndrome[1]. In all these conditions, person is apparently normal and average life spans have been reported. However, owing to susceptibility of these individuals to catch various infections, it contributes to morbidity and mortality in a person having pre-existing cardiovascular or respiratory lesions. Thus, the individuals having these lesions are prone to sudden death.

Sudden Death can be defined as one, which is not preceded or only preceded for a short time by morbid symptoms[2]. The WHO defines it as someone who dies within 24 hours of appearance of symptoms while currently it is defined as "Unexpected Death occurring within one hour of

new symptoms" [3]. The incidence of Sudden Death is about 10% of all causes of death and of these, almost half are due to cardiovascular causes and 15-23% is due to respiratory involvement[2,4]. Before the age of 35 years, the congenital and hereditary cardiovascular diseases are main causative factor for Sudden Death[3].

Sudden Cardiac Death (SCD) is defined as "death as a result of cardiac cause within 6 hours of onset of symptoms[5]". In 5-10% of SCD, hearts are apparently normal. Cardiomegaly is a frequent finding in cases that died suddenly from cardiovascular pathology[3]. 3-5% of people with SITUS INVERSUS have associated functional heart defect & 25% have primary ciliary dyskinesia presenting as Kartagener Syndrome.

Two such cases of SITUS INVERSUS on whom medico-legal autopsy was conducted owing to suspicious circumstances are being reported and

Case Report No. 1

An apparently healthy, 56 years old, male allegedly died suddenly on 1st January. Earlier, about 4 months back, he met with a road traffic accident, treated and later developed loss of memory for which he was diagnosed as having

chronic subdural hematoma on 31st December and further advised CT scan. However, he died the next day. On further investigation, it was revealed that in the month of June, he was clinically diagnosed as a case of Situs Inversus with Dextrocardia with global hypokinesia, Left Ventricular systolic and Left Ventricular diastolic dysfunction with hypertension.

Autopsy findings

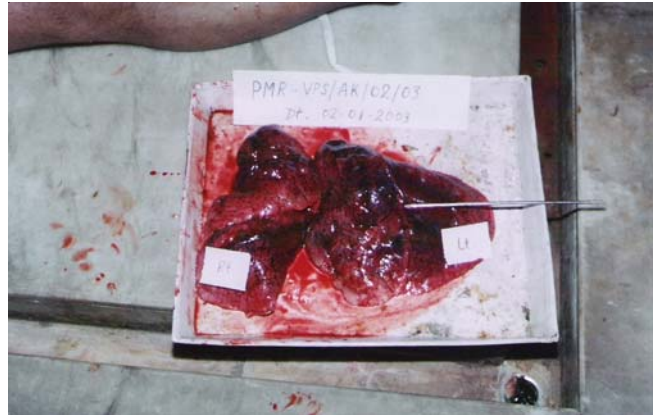
Average built and nourished dead body of an old male without any marks of external injury. On opening the body cavities, right lung weighed 400 gms and had two lobes while left lung had three lobes and weighed 550 gms. Heart was present on right side of chest cavity with apex pointing towards right side i.e. dextrocardia (photograph No. 1 & 2). The heart weighed 740 gms and had measurements as 17x14x7.5 cms (Photograph No. 3). Stomach was present on right side and contained 50 cc of whitish fluid without any suspicious smell and having normal mucosa. Liver and caecum were present on left side of abdominal cavity while spleen was present on right side.

Photograph 1: Showing reverse anatomical placement of various viscera. Heart present on the right side and apex pointing towards right side. Liver is present on left side.

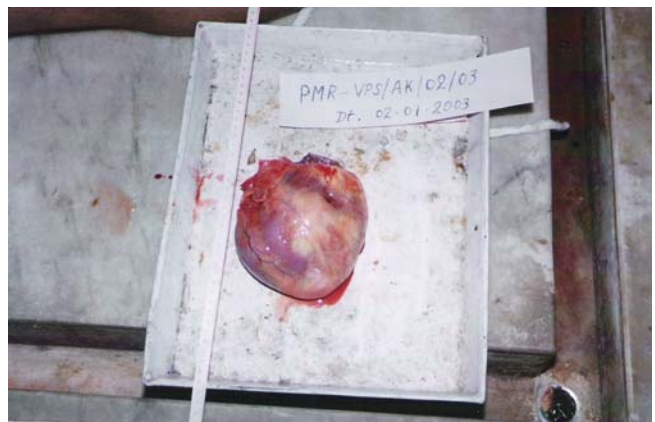


On histopathological examination of heart, right and left ventricular walls measured 0.3cm and 0.8 cm respectively. A grey white area of 0.5x0.4cm was found at apex of heart corresponding to old, healed myocardial infarct. Cut section of coronaries showed atheromatous plaque causing narrowing of lumen. (Right coronary artery - 50%, Left anterior descending - 50%, Left circumflex - 25-30%). Chronic venous congestion was found in both liver and lungs, while no pathological change was found in brain.

Photograph 2: Right lung showing two lobes instead of three. Left lung showing three lobes instead of two.



Photograph 3: Enlarged heart (cardiomegaly) weight 740 grams. Measuring 17 x 14 x 7.5 cms.



Case Report No. 2

A middle-aged rickshaw puller was found dead under mysterious circumstances in his hut (jhuggi). Alleged history as given by nephew of the deceased was: the deceased, a known smoker & alcoholic, married but issueless; was seen alive last on 9th January, 1999 at about 9 P.M. He used to carry passengers to and from a lodge on his rickshaw and meet his nephew and other relatives in night after finishing this work. On the night of 10th January, he did not meet them. In the morning of 11th January, when his nephew went to see at his residence, he saw the door of jhuggi was not locked. As he pushed the door, it opened and he saw a dead body lying on cot with disfigured face. With the help of clothing, body structure and configuration, he recognized the body as of his uncle. He informed other relatives and police and

it was alleged that his uncle has been killed by his neighbour due to an old enmity. Also, he narrated an incidence of his uncle having a scuffle with the same neighbour 3-4 years back in which he suffered a fracture of right arm. Further, he correlated the statement of neighbour when that same neighbour threatened to eliminate his uncle, by killing and throwing against dogs. Autopsy could only be conducted after 3 days of recovery of dead body due to political intervention, owing to sensitive nature and constitution of 'Board of Doctors' for conducting postmortem examination.

Autopsy Findings

Average built and poorly nourished dead body of a middle aged male having put on a lot of clothing like shirt, jersey, pullover and covered with quilt and blanket. A 17x15 cm, U-shaped tissue defect with irregular margins involving front of neck and upper part of chest and without any vital reaction. Face was devoid of skin and underlying tissue, had crenated margins but without any evidence of antemortem hemorrhage (Photograph 4). Trachea absent, all fingernails showed bluish discoloration and body was in a state of advanced decomposition.

Photograph 4: Tissue defect in form of crenated margins evident over forehead without any signs of antemortem hemorrhage.



Entire body was subjected for radiological examination. Chest x-ray revealed the heart shadow and gas shadow of fundus of stomach on right side, but it was reported as normal by radiologist. The 'marker' for left side was not properly placed and in fact, it was placed almost in

the middle (Roentgenogram). On opening the chest cavity, the heart was present on right side but apex pointed towards left. An anomalous placement of aorta in form of origin i.e. anterior to pulmonary trunk was observed. Left lung had three lobes while right lung had two lobes and on cut section, foci of pus were present in both lungs. All other abdominal viscera were placed opposite to their normal anatomical location. Toxicological examination revealed a Blood Alcohol Concentration of 241.50 mg% while autolytic changes were found on histopathological examination of various viscera.

Photograph 5: X-ray chest AP view. Heart shadow on right side, gas shadow of stomach on right side. Note the presence of 'marker', which is almost in the middle.



DISCUSSION

The exact incidence of Situs Inversus is not known because persons remain asymptomatic; however, an incidence of 6-8 per 1000 live births is reported for congenital anomalies of heart⁶. The incidence of Kartagener Syndrome is about 1:20,000. 3-5% of people with Situs Inversus have associated functional heart defect, which is higher than rate of heart defect in general, population. Although Situs Inversus alone does not increase the risk of cardiovascular disease but in cases with associated cardiac anomaly, it may lead to Sudden Death.

In case report I, the weight of heart, which was taken after removing, blood and clots from chambers, was 740 gms. According to Reddy, the persons having their heart weight in excess of 420 gms, are prone to Sudden Death^[4]. Durigaon in

his study on 77 cases has stated that persons dying due to cardiovascular disease had a mean heart weight as 452gms[3]. There is a definite relationship between Body Mass i.e. both body height, weight, and heart mass and must be considered before labeling any heart as abnormal. Hitosugi et al has devised a simplified normal heart weight scale after taking into consideration Body Mass Index⁷. Kitzman et al devised formula for estimating heart mass from body mass based on sex and found it to be a better predictor of normal heart mass than either body surface area or body height⁸. Also the individuals with large heart weight are at risk for developing a dysarrhythmia and hence die unexpectedly^[8]. Heart weight in normal subject is also said to increase with age and physical activity, hypertension and alcoholism as well as cocaine abuse [8,9].

In the instant case, the body was of an average built and nourished old male, having a length of 5'3"; heart weight of 740 gms is definitely higher than normal expected weight. In addition, various coronary arteries showed 30-50% narrowing of their lumen, which collectively had their affect over the heart.

More than 75% stenosis of at least one segment of a major epicardial coronary artery without any other cardiac lesion can cause sudden death^[3]. In older adults i.e. age >45 yrs, 80-90% of sudden cardiac death have significant coronary artery disease while it is associated with 58-70% of sudden cardiac death in young adult population⁵. Congenital conditions comprise about 14% of structurally abnormal heart and next in occurrence to coronary artery disease i.e. about 65% cases^[5]. Congenital and hereditary cardiovascular diseases are main etiologies of Sudden Death before age of 35 years^[3]. Both obesity and epilepsy are co-morbid conditions in sudden cardiac death with structurally normal hearts.

No evidence of any gross or microscopic finding in brain was found which could substantiate the clinical diagnosis of subdural hemorrhage and supplemented the charge of Road Traffic Accident as cause for sudden death of this individual. Thus, due to presence of abovementioned findings with diagnosed hypertension during lifetime, it was opined that person was prone for Sudden Death and declared as a case of Sudden Cardiac Death.

In case Report 2, the external findings were declared as Postmortem Injuries. The presence of pus foci in lungs on gross examination favored the diagnosis of bronchiectasis although no histological comment was possible due to autolysis of viscera including lungs. As reported by Kartagener there occur Situs Inversus with chronic otitis media, chronic sinusitis and abnormalities leading to bronchiectasis due to loss of cilia in various cells leading to abnormal muco-ciliary clearance from middle ears, sinus cavities and airways. It is also seen in men with infertility secondary to sperm immobility due to same reason. Since blood alcohol concentration was 241.50 mg%, the person was prone to develop aspiration; also because of absence of ciliary movements in such a case. On further investigation, it was revealed that deceased was childless thereby favoring the diagnosis of Kartagener Syndrome. Thus in the absence of any antemortem traumatic pathology, taking due consideration of all findings; cause of death was opined as respiratory complications in presence of alcohol in a case of Situs Inversus/ Kartagener Syndrome.

CONCLUSION

If any case of Situs Inversus is encountered at autopsy, the family of deceased should be counseled and first-degree relatives may be advised by autopsy surgeon to undergo a possible screening, as they are prone to have various cardiac abnormalities^[3].

If it is diagnosed during lifetime, as these persons are extra-susceptible to catch various respiratory infections; the dangers of smoking and exposure to industrial fumes should be explained by treating physician. An appropriate vocational guidance may also be supplied to them.

Failure to diagnose these cases by Physicians, Anesthetists and Radiologists may lead to charge of negligence against them^[10]. The inattention to proper labeling of side i.e. Right or Left on X-ray films can lead to non-recognition or missed diagnosis of Situs Inversus. If the condition is missed by Anesthetist during pre-anesthetic check-up, surgical mishaps may result.

Situs Inversus with cardiac abnormality or respiratory complications decreases the life span and thus increases risk for sudden death. This

requires focusing while assessing these individuals for insurance purposes.

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