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Stature estimation from the length of head in living adults

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Abstract

In this study an attempt has been made to derive a linear regression equation for estimation of stature from the length of head. The stature (i.e., crown heel length) was measured with the help of an anthropometer. Length of head was measured between Glabella and inion (point of maximum convexity on external occipital protuberance) with the spreading caliper. The study was carried out on 300 males and 300 females. The observed data was subjected to statistical analysis like ‘t’ test for correlation coefficient. The value of ‘r’ was found to be statistically significant. Simple linear regression equation derived can be used for estimation of height. However if multiple regression equations are used, the height can be better estimated.

Key words

Stature estimation, length of head.

Introduction

The anthropometric study of bones conveys information regarding race, sex, age and height of a person. This information is of an interest to the anatomist in academic field as well as in medico-legal work. Many of the previous authors have worked on the cadavers received in the anatomy department. Opinions differ as to whether the cadaveric length is same or more than the height in the living. But as these studies have been done on cadavers, they do not give correct information, as it is well known that the total height of an individual is apparently more after death. The material in the anatomy department consists largely of persons who are aged and have been ailing since long. Moreover, person suffering from chronic debilitating disease is likely to have been lying in an abnormal posture during the last illness and it may not be possible to straighten the body to get the accurate stature measurement. According to Trotter and Gleser (1952) the increase in height after death is 2.5 cm. when the measurement is taken in the recumbent posture. Because of all these shortcomings in the cadaveric material, in the present study, the measurements are taken in the living. Various workers have shown significant correlation between height and different parts of the body. Limited data is available in the literature regarding the estimation of stature from the head length. Taking into consideration this scenario the present study aims to estimate stature from the head length in living adults of the age group taken is 18 to 30 years.

Material and methods

The study stature estimation from head length in living adult was carried out in Indira Gandhi government medical college, Nagpur, Maharashtra on a total of 600 subjects. The subjects taken for the study were medical students nursing students and students of other faculties. The age group taken was 18 to 30 years. Their height and length of head were recorded. The subjects with any obvious congenital or acquired deformity of spine were not included. For measuring the length of subject an anthropometer fixed against wall was used. The subject was asked to stand against the wall with feet together and bare, trunk braced, eyes forwards and lateral palpebral commissure and the tip of auricle in the same horizontal plane. The reading thus obtained was taken as the standing height (crown heel length) of an individual. For measuring the length of head two landmarks were taken. The anterior point is the point on the Glabella obtained by drawing horizontal line between the eyebrow ridges intersected by mid sagittal plane. The posterior point is on the inion which is the point of maximum convexity on external occipital protuberance. The subjects were asked to sit on a low stool with the head in a eye-ear plane (Frankfurts plane) the chin was placed on the chin rest so that the head gets fixed. The head length was measured with the help of spreading caliper. After collection of data it was subjected to statistical analysis.

Observations

The various parameters obtained after statistical analysis were tabulated in table 1 & 2.

The correlation coefficient (r) of height and length of head is 0.9167 for males and 0.9027 for females. The value of r indicates that there is positive correlation.

Discussion

Telekka (1950) has opined that each racial group will need a different formula. Jadhav H R, Shah G V (2004) showed a definite correlation between head length and height of an individual and stated that inspite of the racial and ethnical variation the formula may be applicable to other regions and races, more or less effectively. In the present study the average height for males is 169.81 cm while for female it is 155.27 cm. average length of head comes out to be 18.01 cm and 16.48 for females. Jadhav H. R, Shah G. V studied head length in Gujarat population (2004). The correlation coefficient between height and head length was found to be 0.53. Standard error was not calculated. While in the present study standard error was found to be ±5.7 for males and ±5.19 for females. The study of cephalic index in student of Gujarat (Shah G V, Jadhav H R (2004)) showed that in male the head length varies from 16.5 cm to 20.1 cm the mean head length being 18.26 cm. In the female the head length varies from 14.1 cm to 18.9 cm with the mean head length 16.5 cm. These findings nearly coincides with the present study. In 1981 Saxena et al derived a regression equation between head length and height in Agra (U.P) population. The correlation coefficient between height and head length was found to be 0.2048. According to Glaiser (1957), Nasion-inion length (head length) is 1/8 of total length of an individual. Earlier workers used multiplication factor method for estimation of stature but this method was not found to be very accurate. Few workers studied cadaveric material and derived simple regression formulae for calculating stature.

The data was subjected to statistical analysis and put to 1) ‘t’ test for correlation coefficient and regression coefficient

![Diagram](Image)
2) ‘Z’ transformation as the population parameters are unknown and statistically n (no. of observations is very large.

Conclusion

By virtue of this study formulae were derived to estimate the height (stature) from length of head in living males and females.

For males: estimation of height from length of head
Est y = 7.75 + 9X ± 5.7

For females: estimation of height from length of head
Est y = 17.18 + 8.37X ± 5.19

The value of ‘t’ for correlation coefficient was statistically significant. This implies that height of an individual is related to length of head. The height is more if length of head is more. This is true for sample size taken.

The population parameters are unknown and value of Calculated ‘t’ was found to be large. The observed data was subjected to ‘Z’ transformation to obtain the population correlation coefficient. Further statistical analysis signifies that height of an individual may be dependent on other bones at the same time. Simple linear regression equation derived can be used for estimation of height. However if multiple regression equations are used height can be better estimated.

References

Strange cases of hydrogen sulphide poisoning: Case report with review on effects of $H_2S$ and precautions

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Abstract

Hydrogen sulphide commonly referred as sewer gas is known to be neurotoxic leading to olfactory nerve paralysis and loss of consciousness at a relatively low dose. We report a quadruple fatalities involved in cleaning of big drums used for preparing 'Pickle' in a pickle industry. All lost consciousness after entering the drums one after another and later on died at different intervals. We also compared the postmortem finding and their viscera were sent for chemical analysis. The water sample present in the drum was also sent for analysis to confirm any dissolved gas which was on testing found to be hydrogen sulphide.

Key words

Hydrogen sulphide; Sewer gas; $H_2S$ poisoning; Pickle industry workers; Sulphate producing bacterias.

Introduction

$H_2S$ is a colorless, toxic and flammable gas is responsible for the foul odour of rotten eggs and flatulence. It often results from the bacterial break down of organic matter in the absence of oxygen, such as in swamps and sewers (anaerobic digestion). Sulfate-reducing bacteria obtain energy by oxidizing organic matter or hydrogen with sulfates, producing $H_2S$. These microorganisms are prevalent in low-oxygen environments, such as in swamps and standing waters. Sulfur-reducing bacteria (such as Salmonella) and some archaea obtain their energy by oxidizing organic matter or hydrogen with elemental sulfur, also producing $H_2S$. Other anaerobic bacteria liberate hydrogen sulfide when they digest sulfur-containing amino acids, for instance during the decay of organic matter. $H_2S$ arises from virtually anywhere where elemental sulfur comes into contact with organic material, especially at high temperatures. Hydrogen sulfide can be present naturally in well water.

Hydrogen sulfide is a highly toxic and flammable gas. Being heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces. Although very pungent at first, it quickly deadens the sense of smell, so potential victims may be unaware of its presence until it is too late. The toxicity of $H_2S$ is comparable with that of hydrogen cyanide. It forms a complex bond with iron in the mitochondrial cytochrome enzymes, thereby blocking oxygen from binding and stopping cellular respiration. Since hydrogen sulfide occurs naturally in the environment and the gut, enzymes exist in the body capable of detoxifying it by oxidation (to harmless sulfate)

The low levels of sulfide may be tolerated indefinitely. However, at some threshold level (believed to average around 300-350 ppm), the oxidative enzymes will be overwhelmed. Exposure to lower concentrations can result in eye irritation, a sore throat and cough, nausea, shortness of breath, and fluid in the lungs. These symptoms usually go away in a few weeks. Long-term, low-level exposure may result in fatigue, loss of appetite, headaches, irritability, poor memory, and dizziness. Chronic exposures to low level $H_2S$ (around 2 ppm) has been implicated in increased miscarriage and reproductive health issues. Effect of $H_2S$ depends upon its concentration in air:

- 0.0047 ppm is the recognition threshold, the concentration at which 50% of humans can detect the characteristic odor of hydrogen sulfide, normally described as resembling “a rotten egg”.
- 10-20 ppm is the borderline concentration for eye irritation.
- 50-100 ppm leads to eye damage.
- At 150-250 ppm the olfactory nerve is paralyzed after a few inhalations, and the sense of smell disappears, often together with awareness of danger,
- 320-530 ppm leads to pulmonary edema with the possibility of death.
- 530-1000 ppm causes strong stimulation of the central nervous system and rapid breathing, leading to loss of breathing,
- >800 ppm is the lethal concentration for 50% of humans for 5 minutes exposure(LC50).
- Concentrations over 1000 ppm cause immediate collapse with loss of breathing, even after inhalation of a single breath.

A high proportion of patients had other neurologic signs and symptoms when first seen in an emergency room. Hence it appears that the central nervous system takes the brunt of exposure to $H_2S$.

Investigations in case of suspected $H_2S$ poisoning:

Laboratory studies are generally not of help in making the rapid diagnosis of $H_2S$ poisoning. Urine thiosulfate and serum sulfoximemoglobin levels can be determined, but the results are generally not rapidly available. Chest radiography may show pulmonary edema; computed tomography of the brain may show lesions in the basal ganglia. Copper or silver metal, such as coins or jewelry, exposed to a high concentration of $H_2S$ often turn a black color, providing a clue to the nature of the injury. At autopsy, the brain may have a striking, black discoloration with findings like petechiae of the palpebral conjunctiva and the mucous membrane of the mouth and erosion of the respiratory tract).

Case Report

During preparation of a big feast there was requirement of large tanks for water storage and for this there were few tanks available which were used for making pickle in some pickle industry. Four to five worker of that industry were given job to clean these tanks so that be used for storing water. When the first worker entered he found small amount of water mixed with the remnant of pickle in that tank and to clean that he tried to go down into the tank. He slipped and fell into the tank and became unconscious. When other person accompanying him saw that he was not coming out and lying in the tank, he shouted for help. He also entered the tank to pull him out. The moment he entered he also became unconscious and was trapped in the tank. Two other workers working nearby who had come on hearing his cry for help entered one after other to help these but they themselves became unconscious.

Later they were fished out by their coworkers and all the four were admitted in the hospital. All were conservatively treated in the emergency but they expired one after the other within 24 to 36 hours. On autopsies internal viscera was found to be congested and the routine viscera was sent for chemical analysis to CFSL Chandigarh. Chemical analysis showed the presence of $H_2S$ poisoning.

Precautions to be taken:

1. Workers in industries in which $H_2S$ exists should be taught about the nature of the hazard.
2. Workers should be trained frequently for the use of detection equipment, protective gear, and safety procedures.
3. Proper warning signs at places which are found or considered to
be hazardous and entry to such places only after following the protocol set.

4. Availability of protective devices at working place that help in early detection of H2S concentration in air. Many personal safety gas detectors are available that go into high alarm at concentration of 15 PPM.

5. Provide equipment for monitoring, ventilation, communication, personal protection, and means of egress.

6. Proper transportation available in places where such type of work in sewerage, etc is going for early transportation in case of any untoward incidence.

7. Oxygen cylinder should be readily available as inhalation of hyperbaric oxygen is the best treatment after exposure to high H2S atmosphere.

8. Inspection of facilities and enforcement of compliance with regulations already on the books may be necessary to prevent additional incidents.

References


A case report of anesthetic and operative death due to negligence of doctor

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Abstract
Anaesthetic deaths are very rare. Anaesthetic deaths may be divided into two groups.
A. Deaths which occur during the administration of an anaesthetic but which are not due to anaesthetic.
B. Deaths which are the direct results of the administration of an anaesthetic.

The effects of anaesthetic agents are to relieve pain and cause progressive cerebral depression.

In the present case a female patient aged about 28 years posted for L.S.C.S on 09-11-2009 without anesthetist. The surgeon administered Spinal anesthesia and do caesarian section. Patient was shifted to postoperative ward and examine the surgeon, she has not recovered from anesthesia, not responding any stimuli, immediately patient was shifted to private hospital at Kadapa and then shifted to CMC Velure. There the specialists examine the patient and gave their opinion. On 18.11.2009 they were admitted the patient in RIMS Hospital, Kadapa. Patient was in deep coma. On 21-11-2009 at 4:45 A.M. patient was died. Postmortem conducted on 22-11-2009 at 1:30P.M. E No: 479/09, Cr No: 176/09 U/s 304(A) IPC S.I of Police, Proddatur II town P.S.

Key words
Anaesthetic agents, Local, Spinal, General Anaesthesia, Complications of Anaesthesia

Introduction
Anaesthetic deaths are very rare. Only one in ten thousand persons die totally as a result of anesthetic. Deaths during diagnostic and operative procedures for into 5 categories.
1. Deaths due to under laying disease
The first group includes deaths occurring because of an under lying diseases process that necessitated the operative/diagnostic procedures.
2. Disruption of a vital organ during a procedure
The second group of deaths are due to in advertent mechanical disruption of a vital organ during a procedure e.g. the surgeon while going through the sternum, in advertently punctures the heart.
3. Air embolism occurring during surgery
This occurs most commonly in surgery of the
A. Central nervous system or
B. During laminectomy procedure
4. Anesthetic related deaths
Examples of such deaths are
A. Intubation of the oesophagus
B. Administering the wrong gases.

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Case history
In the present case a female patient aged about 28 years posted for L.S.C.S on 09-11-2009 without anesthetist. The surgeon administered Spinal anesthesia and do caesarian section. Patient was shifted to postoperative ward and examine the surgeon, she has not recovered from anesthesia, not responding any stimuli, immediately patient was shifted to private hospital at Kadapa and then shifted to CMC Velure. There the specialists examine the patient and gave their opinion. On 18.11.2009 they were admitted the patient in RIMS Hospital, Kadapa. Patient was in deep coma. On 21-11-2009 at 4:45 A.M. patient was died. Postmortem conducted on 22-11-2009 at 1:30P.M. E No: 479/09, Cr No: 176/09 U/s 304(A) IPC S.I of Police, Proddatur II town P.S.

Autopsy findings

Anti mortem Injuries
1. A healed operated sutured wound on front of middle of level abdomen transverse in position (wound of cesarean section operation) 15 cm in length with 9 intact suture abdominal wall depth. No evidence of any pus or infection.
2. Internally on opening the abdomen lower part of uterus is bulky measuring 13x13cm with transfers suture 6 in number in it’s lower part no pus. Blood clots present in the uterine cavity.

Cause of death
Hypoxia and other complications followed by anaesthesia and surgery.

Discussion
Anaesthetic agents-They relive pain and cause progressive cerebral depression.

Factors prispitate anaesthetic deaths
1. Physiological factors – Insufficient O2 supply, blood supply.
2. Pharmacological factors – Toxic or unto words effects of anaesthetic agents and anesthetic techniques.
4. Malfunctioning – Defective / faulty the instruments, appliances etc..

Causes of death due to general anaesthesia
1. Overdose of anaesthetic agents – particularly in case of combination therapy.
2. Giving anaesthesia to wrong patients.
3. wrong connection in the gas machine – may cause undesirable dangerous mixing of gases.
Anaesthetic deaths are categorized stage-wise:

A. Death occurring during administration of anaesthetic agents but not due to the anaesthetic agents -
   1. Death from the disease or the injuries for which the operation was being undertaken, through anaesthetic agent precipitated it. At times it becomes difficult to isolate the percentage of combination of the disease or injury and the anaesthetic agent to death.
   2. Death from the disease other than that for which the operation was being undertaken – existence of some disease was known before head but surgical procedure had to be undertaken for some other disease or injury, however operation or anaesthetic agent has precipitated death.
   3. Death from some undiagnosed pre-existing condition other than that for which operation was undertaken – pre-existing undiagnosed disease could have been a contributory factor in causation of death.
   4. Surgical shock and exhaustion – due to under prolonged procedure poor pre-operative condition etc.
   5. Surgical mishaps – during administration of anaesthesia, error or incompetence in the heart of the surgeon causing injury to bigger blood vessels, rupture of aneurysm etc., due to failure of equipments etc.
   6. Death due to direct effect of administration of anaesthetic agents.
      a) During anaesthetic procedure:
         i) From deficiency in technical skin – mishaps during intubation, bronchoscopy etc.
         ii) From technical mishaps from poor designing of equipments faulty mixing of O2 and anaesthetic – explosion or fire from electric spark from diathermy electrode, faulty electric appliances, static electricity, X-Ray apparatus etc.
   b) From improper judgement – wrong decision due to lack in decision making skill or lapses in the training.
   c) Failure to appreciate or recognize impending danger from the monitor and failure to respond accordingly.
   2. Due to anaesthetic over dose: Particularly when used in combination.
   3. Due to inadequate supply of O2.
   4. Due to acute nurogenic cardio-vascular failure.
   5. Hypovolaemia.
   6. Cardiac arrest.
   7. Cardiac arrhythmias.
   8. Dimension myocardial contractibility.

What exhibits should be preserved during autopsy for further examination in a case of suspected/alleged anaesthetic deaths

1. For toxicological examination -
   a) One full lung – immediately sealed in a container.
   b) Fat from mesentery.
   c) Skeletal muscle.
   d) Brain at least 100 gms
   e) Liver – at least 100 gms.
   f) Kidney – at least 100 gms.
   g) Urine – After collection immediately refrigerated.
   h) Alveolar air – collected under water with a larynge and needle puncturing the lungs before – opening the thoracic cavity.
   i) Gaseous from heart, blood vessels before cutting themes open under water.

2. For grouping and cross matching – blood.
3. For bacteriological examination – blood, exudate if any
4. For histological examination – samples from all organs.

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Euthanasia – an overview
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Abstract
Euthanasia also called as mercy killing is producing painless death of an individual suffering from hopelessly incurable and painful disease. The question of euthanasia arises on three occasions that is at the beginning of life in severely handicapped children, at the end of natural life and when a person is severely impaired as a result of brain damage. The present paper deals with concept, types, reasons for opting euthanasia as well as arguments in favour and against euthanasia, history of euthanasia, its legalization both international and in Indian scenario will be discussed along with its ethical consideration in relation to Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations 2002.

Key words
Persistent vegetative state, physician assisted suicide, living will, brain death.

Introduction
Most people are concerned about what the last phase of their lives will be like, not merely because of fears that their dying might involve them in great suffering, but also because of the desire to retain their dignity and as much control over their lives as possible during this phase. The technological interventions of modern medicine have had an effect on how drawn out the dying phase may be.

The concept of euthanasia is based on a philosophy which embraces humanism and compassion, and one which recognises the autonomy of the individual and his freedom of choice, along with recognition of his dignity as much in the process of dying as in that of living. The word euthanasia originated from the Greek language ‘Eu’ means “Good” and thanatos means “death”¹². A complete and precise definition was given by Declaration on Euthanasia ‘Iura et bona’, issued by the congregation for the doctrine of the Faith on May 5, 1980. By euthanasia is understood an action or omission which by itself or by intention causes death, in order that all suffering may be eliminated¹⁴.

Some qualifying clauses to the definition².
1. The decision has to be made by a mature adult.
2. He/she should be in full possession of his/her decision making capacity (compos mentis).
3. The decision should be made after careful consideration and due deliberation.
4. There should be no element of duress or coercion.
5. The condition of ill health must be such as to qualify as irreversible illness which is causing undue pain and suffering and where the terminal event of death is probable in a relatively short period of time.

The question of euthanasia arises on three occasions.
1. At the beginning of life (birth) in severely handicapped children.
2. At the end of natural life.
3. When a person is severely impaired as a result of brain damage (persistent vegetative state).

Types of euthanasia
1. Voluntary euthanasia

It is defined as a means chosen by an individual making a request on the basis of voluntary decision not to have his life prolonged under specific circumstances of ill health.

2. Non voluntary euthanasia
In this type, the person who is killed does not give consent or make a request.

3. Involuntary euthanasia
When a person who is killed makes an expressed wish to the contrary.

4. Physician assisted suicide
A physician provides the individual with the information, guidance and means to take his or her own life with the intention that they will be used for this purpose. It is also known as ‘ to kevork ’ which is derived from the name of Dr. Kevorkian who assisted in the deaths of hundreds of patients. He hooked his patient’s upto a machine that delivered measured doses of medications, but only after the patient pushed the button to initiate the sequence. More recently he provided carbon monoxide and a face mask so that his patients could initiate the gas flow¹⁵.

5. Euthanasia by action/ active euthanasia
It is defined as intentionally causing a persons death by performing an action such as by giving a lethal injection.

6. Euthanasia by omission/passive euthanasia
It is intentionally causing death by not providing necessary and ordinary care by altering some form of support and letting nature take its course, e.g. not delivering cardio pulmonary resuscitation and allowing a person, whose heart has stopped to die.

Reasons why people opt for euthanasia
1. Most individuals fear the process of dying rather than the terminal event of death which they realize as inevitable end of life.
2. They fear the indignity of being hooked onto life support machines and other forms of treatment when all such treatment is futile and death is inevitable.
3. Some due to poverty or lack of health care coverage cannot afford pain killing medication.
4. Others have terminal illness and do not want to diminish their assets by incurring large medical costs as their death approaches.
5. A serious disorder or disease has adversely affected their quality of life to the point where they no longer wish to continue living.
6. They have lost their independence and must be cared for continually. Some feel that this causes an unacceptable loss of personal dignity.
7. They realise that they will be dying in the near future and simply want to have total control over the process.

Conditions necessary for voluntary euthanasia
1. Suffering from a terminal illness.
2. Unlikely to benefit from the discovery of a cure for that illness during what remains of the person’s life.
3. As a direct result of the illness, either suffering intolerable pain or only has available a life that is unacceptably burdensome.
4. Has an enduring, voluntary and competent wish to die.
5. Unable to commit suicide without assistance.

Living will or advanced health directives

They are legally useful instruments for giving voice to people’s wishes while they are capable of giving competent, enduring and voluntary consent including their wanting help to die\(^2\).
1. The directive establishes the individual legal rights to refusal of any form of treatment offered to him.
2. The declaration outlines certain conditions under which he would not like life or rather the process of dying prolonged when all treatment is deemed futile.
3. The directive is applicable even when at the critical time, the individual may not have decision making capacity. It specifies that under such circumstances the directive may be taken as the final expression of his wishes.
4. The family and personal physician should be made aware of the existence of the declaration.
5. The individual has the right to withdraw the declaration at any time.

Reasons for euthanasia

1. People should not be forced to stay alive
   A lot of people think that euthanasia or assisted suicide is needed so that patients won’t be forced to remain alive by being ‘hooked up’ to machines\(^3\). Insistence against the patient’s wishes, that death be postponed by every means available is contrary to law and practice. It is also cruel and inhumane.
2. Unbearable pain
   With modern advances in pain control, no patient should ever be in excruciating pain. There are board certified specialists in pain management who can not only help alleviate physical pain, but are also skilled in providing necessary support to deal with emotional suffering and depression that often accompany physical pain. But to achieve this, ‘no pain’ state, people are dragged into this ‘no pain’ state which is not dignified and hence makes it a reason for euthanasia.
3. Demanding a right to commit suicide
   Right to die with dignity at the end of life should not be confused or equated with ‘right to die’ an unnatural death curtailing the natural span of life. In many countries all over the world, suicide and attempted suicide are not criminalized. Each and every year in the United States there are 1.6 times as many suicides as there are homicides\(^6\).

Arguments against euthanasia

1. Euthanasia would not only be for people who are terminally ill
   Jack Kevekian, who participated in the deaths of more than 130 people before he was convicted, defines terminal illness as ‘any disease that curtails death even for a day’\(^7\). Oregon’s assisted suicide law defined ‘terminal’ as a condition which will ‘within a reasonable medical judgement produce death within 6 months or less’\(^8\).
   In the Netherlands, unbearable suffering of either physical or mental nature is the factor that qualifies one for induced death.
   According to the ‘Dignity in Dying Bill 2001’ of South Australia, ‘A person is hopelessly ill if the person has an injury or illness’\(^9\).
   a) That will result or has resulted in serious mental impairment or permanent deprivation of consciousness.
   b) That seriously and irreversibly impairs the person’s quality of life so that life has become intolerable to that person.
2. Euthanasia can become a means of health care cost containment

In the United States, millions of people have no medical insurance and the elderly, the poor and the minorities are often denied access to the needed care\(^10,11,12\). The Oregon Medicaid program pays for assisted suicide for poor residents as a means of ‘comfort care’ as the drugs for assisted suicide are far less expensive than providing medical care\(^13\). Similarly in Great Britain, doctors and nurses believe that the only way to secure the future of National Health Service is to make more treatment available only to those who can pay privately for them\(^14\).
3. Euthanasia will become non voluntary
   If society allows voluntary euthanasia, foot will be on a slippery slope which will lead to an inevitable support of other forms of euthanasia especially non voluntary.
4. Euthanasia is a rejection of the importance and value of human life
   A woman is suffering from depression and asks to be helped to commit suicide. One doctor sets up a practice to ‘help’ such people’. She and anyone who wants to die knows he will approve of any such request. He does thousands a year for $200 each. This example glaringly portrays that stark reality of consequences of legalization of euthanasia and disrespect for life.

History of euthanasia and its legalization

The ancient Greeks and Romans did not consider life needed to be preserved at any cost and were in consequence tolerant of suicide in cases where no relief could be offered to the dying.
In October 1939, amid the turmoil of the outbreak of war, Hitler ordered widespread ‘mercy killing’ of the sick and disabled. Code named ‘Aktion T4’, the Nazi euthanasia program to eliminate ‘life unworthy of life’ at first focused on newborns and very young children. Midwives and doctors were required to register children up to 3 years of age who showed symptoms of mental retardation, physical deformities and other symptoms included on a questionnaire from the Reich Health Ministry. The Nazi euthanasia program quickly expanded to include older, disabled children and adults. Hitler’s decree of October 1939, typed on his personal stationery and dated back to September 1 enlarged the authority of certain physician to be designated by name in such a manner that persons who according to human judgement are incurable, can, upon a most careful diagnosis of their condition of sickness, be accorded a mercy death\(^15\).
In the 1970’s and 80’s, a series of court cases in the Netherlands culminated in agreement being reached between the legal and medical authorities to ensure that no physician would be prosecuted for assisting a patient to die, as long as certain guidelines were adhered to\(^16\).
Physicians were permitted to practice voluntary euthanasia in instances where
1. A competent patient had made a voluntary and informed decision to die.
2. The patients suffering was unbearable.
3. There was no way of making that suffering bearable which was acceptable to the patient.
4. The physician’s judgement as to diagnosis and prognosis is to be confirmed after consultation with another physician\(^17\).

The euthanasia action has to be documented by a written record demonstrating that the patient was affected by a terminal disease. It has also to include the clinical record of the patient and the tools utilized for euthanasia. It is then to be notified to the coroner.
In June 1995, the ‘Rights of the Terminally Ill Act’ legalizing euthanasia became effective in the northern territory of the Australian Federation\(^17\). The Australian law claims the existence of ‘Right to Die’ considering euthanasia an action in defense of the person. According to this law, even other people may sign a request for euthanasia on behalf of the incapacitated patient and in the presence of witnesses\(^3\).
It went into effect in 1996 but was overturned by the Australian Parliament in 199718.

In Oregon in the United States, legalisation was introduced in 1997 to permit physician assisted suicide. Later the Supreme Court of the United States ruled that there is no constitutional right to patient assisted suicide, however the court did not preclude individual states from legalisation in the favour of patient assisted suicide19.

On April 11, 2001, the Dutch Senate approved the law on euthanasia and assisted suicide. This law oficialized the factual impunity enjoyed till then by the physicians who ended the life of seriously ill or terminal patients by administering lethal doses of medicines or by stopping the ordinary treatments necessary to life. The legal age limit to choose euthanasia is 16 years, while a patient’s judiciary guardian’s consent is requested from 12 to 16 years and for mentally disabled persons. This law acknowledges living will2. On May 28, 2002, a law on voluntary euthanasia has been approved in Belgium2. In November 2008, Washington Initiative 1000 made Washington the second U.S. state to legalize physician-assisted suicide20.

Indian Scenario

Hinduism advocates the doctrine of rebirth and reincarnation. Both voluntary and involuntary euthanasia has been indirectly prevalent and rampant in India for centuries. Saints and sages used to take up Samadhi. Sati, where a wife used to jump into the funeral pyre of her husband before it was legally banned. (Forced Euthanasia) Prayoshevan is voluntary cessation of nutrition which has religious sanctity. Currently under Indian Law; all forms of euthanasia are illegal and outlawed. The key question which revolves around euthanasia is the patient’s right to autonomy and choosing a dignified death and physician’s moral and medical duties especially at the end of life.

Euthanasia is unethical in India

Practicing euthanasia constitutes an unethical conduct. However on specific occasion, the question of withdrawing supporting devices to sustain cardio pulmonary function even after brain stem death shall be decided only by a team of doctors and not merely by the treating physician alone. A team of doctors shall declare withdrawal of support system. Such team shall consist of the doctor incharge of the patient, Chief Medical Officer/ Medical Officer incharge of the hospital and a doctor nominated by the incharge of the hospital from the hospital staff or in accordance with the Provisions of the Transplantation of Human Organ Act, 199421.

In India, euthanasia is undoubtedly not only unethical but illegal also. Since in cases of euthanasia or mercy killing there is an intention on the part of the doctor to kill the patient, such cases would clearly fall under clause first of Section 300 of the Indian Penal Code, 1860. However, as in such cases there is the valid consent of the deceased. Exception 5 to the said Section would be attracted and the doctor or mercy killer would be punishable under Section 304 for culpable homicide not amounting to murder. But it is only cases of voluntary euthanasia (where the patient consents to death) that would attract Exception 5 to Section 300. Cases of non-voluntary and involuntary euthanasia would be struck by provision one to Section 92 of the IPC and thus be rendered illegal22.

In India the contention whether the ‘right to live’ includes within its ambit the ‘right to die’ came for consideration for the first time in the year 1987. It was in the case of State of Maharashtra v. Maruti Shripati Dubal, wherein the Bombay High Court held that, “Everyone should have the freedom to dispose of his life as and when he desires.” The said decision of the Bombay High Court was upheld by the Supreme Court of India in the Case of P. Rathinam v. Union of India, where the supreme Court held, “ A person cannot be forced to enjoy life to his detriment, disadvantage or disliking.” However, the Supreme Court rejected the plea that euthanasia (mercy killing) should be permitted by law, because in euthanasia, a third person is either actively or passively involved; about whom it may be said that he aids or abets the killing of another person.

It was in Gian Kaur’s case, that a five Judge Bench of the Supreme Court overruled P. Rathinam’s case, and held, “The ‘right to life’ under Article 21 of the Constitution of India does not include the ‘right to die’ or ‘right to be killed’… the right to life would mean the existence of such a right up to the end of natural life. This also includes the right to a dignified life up to the point of death including a dignified procedure of death. The Supreme Court also held that Article 21 of the Constitution of India does not include therein, the right to curtail the natural span of life.

The stringent guidelines laid down abroad do not find much application in India. An apprehension still hangs that legalization to that effect may be misused by those standing to gain from the patients death. The dilemma exists not only for the law makers and the physicians but also for the individual concerned and his relatives in a country like ours where the family ties and social support systems are still very strong and birth and death are considered as acts of God. In the latest judgement of Supreme Court declaring ‘Right to Die’ not included in the ‘Right to Life’, it was stated that when a man commits suicide, he has to undertake certain positive overt acts and the genesis of those acts cannot be traced to or be included within the protections of the ‘ Right to Life ‘ under Article 21. Article 21 is a provision guaranteeing protection of life and personal liberty and by no stretch of imagination can imply ‘ extinction of life’23.

Ethical contradiction

The ill demands pain relief and that is the physician’s responsibility. His duty is to keep close to the patients and alleviate his physical and spiritual suffering and not to have power of life and death over him. Such a limit was quite clear in the Oath of Hippocrates stating, “ I will give no deadly medicine to anyone if asked, nor suggest any such counsel” 21. The Hippocratic Oath and the International Code of Medical Ethics pose ethical contradiction for the doctors. According to the oath and ethics, the doctor is to relieve the pain of his patient in one hand and protect and prolong his life on the other. The first can be used in favour of the doctrine of euthanasia but the second counters the doctrine.

Should doctors take part in the practice?

The proper administration of medical care is not at odds with an understanding of medical care that both promotes patients welfare interest and respects their self determination. It is these twin values which should guide medical care and not a commitment to preserving life at all cost without regard to whether patients want their lives prolonged when they judge that life is no longer of benefit or value to themselves.

Conclusion

The promise to accept the justness and legality of euthanasia is the assertion of any omnipotent and irresponsible right of man to dispose of his own life and to ask for its suppression when it is worthless.

The issues of right to a dignified death and euthanasia are not the concern of the medical profession alone and it should not be so if the society has to keep a watch over the abuse of the concept. All sections of society must be vitally involved as the issue transcends any philosophical, moral, legal or theological considerations. It is an issue of humanism and compassion. Society will need to change its value systems in the context of the changing medical scenario, of socio economic environment, of increasing cost of medical services and their cost effectiveness.

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Abstract
Usual presentation of the Cases is common. This paper deals with presentation of peculiar cases which are not described in the books. Here a lady died with burns but presence of gagging and tying a cloth around the mouth is suggestive of homicidal burns. But circumstances are suggesting suicide. In another case mother and daughter died by hanging. But the house is locked from outside which suggests homicidal in nature. But as per the circumstances they are suicidal hangings.

The above types of cases are useful to future generations and give guidance to juniors and these cases show the importance of circumstances in deciding the manner of death.

Unusual presentation of medico-legal cases
Medico-Legal cases brought to the Mortuary with unusual presentation will create problems to Forensic experts and Investigation Officers, which needs broad discussion among us basing on the facts which will give guidance for future generations to come.
Here I am presenting two unusual cases.

Case no.1
History: A 23 years female dead body brought to the Mortuary with 100% mixed burns. The brief facts of the case are as follows: The deceased was married to a person 2 years back by the consent of parents. Parents had given some amount as dowry. There is a history of harassment by mother-in-law and husband to bring more money from her parents. Recently about 3 months back she delivered twins, both are female. Few days back she came to the in-laws house. At about 2.00 A.M on that particular day the Police got a telephonic message about the death of the lady due to burns. Immediately Police went to the house and saw the scene of offence. Next day morning inquest was conducted by the Mandal Revenue Officer on the Spot and shifted the body to the Mortuary. As per the blood relatives version it is a murder by mother-in-law and husband.

Postmortem examination
was conducted on the body. Body was wrapped in 5 bed sheets. After removing the wrappings white thin cloth with multiple folds partially burnt was present on the face covering the mouth. Nostrils were not covered. After removing this cloth another cloth was present in the oral cavity. Partially burnt pieces of bra, blouse were present on chest and arms. Burnt pieces of saree and petticoat were present around the waist. All the hair were burnt. Mixed burns are present all over the body. Kerosene smell present, parts of the burnt areas are cherry red in colour. Some parts were black.

Internal examination
Black soot was present in the laryngeal part of the trachea. Mucosa of trachea, oesophages were congested internal organs were congested and cherry red in colour. Stomach contained the 75 ml semi digested food. No suspicious smell. Uterus was normal in size, non menstruating.

Based on the findings of postmortem examination and the presence of cloth in the oral cavity and also another cloth tied around the mouth, I have concluded that the death was due to 100% burns. The nature of the death was homicidal.

The investigating Officer after interrogation of the family members said it was only suicide with history of mental torture. As per the investigating Officer on the day of incidence apart from deceased, her husband, and father-in-law, co-sister-in-law) brother-in-law, were present. Mother-in-law was away from house, Brother-in-law elder brother of husband was not present on that night. No history of serious quarrel but she was harassed to bring gold which was kept in fathers house. On the day of incidence husband slept by 10.00 PM deceased and her co-sister were seeing the T.V. up to 1.00 AM, father-in-law lunatic was sleeping. After 1.00 AM they went to sleep in respective rooms. At 2.00 A.M co-sister heard a sound and woke up suspecting a thief but through ventilator she saw flames light, she woke up her brother-in-law, both came out to the sight. There the deceased was burning they did not tried to put off the burns. They phoned to police who came immediately and saw scene of offence. I along with the Professor went to the scene of offence. We too enquired about the facts.

After all these police says it is in favour of suicide.

Discussion
This case was thoroughly discussed in the college among the colleagues. Most of them were in favour of homicidal burns but few disagreed. Because there was cloth in mouth and another cloth on the face covering mouth, accidental burns are excluded totally. The cloth tied around mouth and cloth present in the mouth suggest homicidal in nature.

As there are no boney injuries, no fractures of hyoid and thyroid and anti mortem nature of burns no poison in the stomach and not tying of hands and legs. It is in favour of suicide but still 100% homicide cannot be ruled out.

Conclusion
But the circumstances and scene of offence and inmates their personality and behavior and Police version it is more in favour of suicide, the cloths in the mouth was may be due to not to cry and firm decision to die. In my knowledge so far no such case was described in the books.

Case no.2
History
Two female dead bodies were brought to the Mortuary. Mother aged about 35 years and daughter aged about 16 years found dead in the bed room of their own house. As per the inquest and their blood relatives and parents, Wife and husband and their only one daughter live. In the side portion of the house is deceased sisters house. Deceased husband is an employ involving tours. Daughter passed 10th class with good percentage of marks and she is a classical dancer. Deceased sister and brother-in-law are employees. No known disputes or financial problems in the family. One day evening as usual husband came to the house, but it was locked. He enquired about the keys to their neighbours but not given to anybody. He went to the known houses they were not found. In the night he went to in-laws house and enquired about them but they had no information. He slept in their house. In the
morning along with brother-in-law he came to the house they broken
the lock and opened the doors. They found the wife was hanging
and daughter on the floor. white chunny was tied to mother, other
chunny black was also there both to one fan hooks. No disturbance
in house or no property loss. They found the three suicide notes.

Post mortem examination: on the mother’s neck typical ligature
mark showing hanging present. No other injuries on the body. On
daughter’s neck interrupted ligature marks on the upper part of the
neck with a contusion on left frontal area and an abration, frontal
area right side and nail marks on throat along ligature marks.
Postmortem staining on the front side of the body. In both the cases
no other injuries found no poisonous substance found in stomach,
no sexual assault findings. Uterus normal in size, no pregnancy or
non menstruating.

Discussion

As per the postmortem findings cause of death is due to asphyxia
as a result of hanging. The nature of the death is in dispute weather
homicidal or suicidal.
Points in favour for homicidal are:
1. Locking from outside.
2. As there is no reason for suicide.
3. Adult grown up daughter co-operation.
4. Choosing hanging as a method by both. generally people will
use poisons if more than one person is in suicidal pact.
Points in favour of suicidal hanging are:
1. Typical ligature marks.
2. Presence of two hanging material to fan hooks.
3. No suspicion by family members or by police for foul play.
4. Three suicide’ notes describing minute details of the family matters.
   Handwritten on the suicide note was confirmed by family members
   as a mother writing.
5. No theft.
6. No sexual assault.
7. No other injuries.
8. No disturbance at the site.

Conclusion

These cases were discussed in the department among the expert
colleagues and came to conclusion that both died due to hanging.
Nature is suicidal the locking of the house from outside is peculiar. In
this case which is more in favour of homicidal nature as described in
the books.

But after thorough investigation by the Police after visit to scene
offence the daughter who is Young might have locked from out side
to prevent disturbance by others which may save their lives. She climbed
the stairs of side house and came inside by jumping the compound
wall. The suicide pact was made by both of them and hanged by them.
But due to breaking of the ligature material, daughter fallen on the
ground sustaining injuries on forehead.

More in favour of suicidal hanging rather than homicidal but with
peculiar history of locking the house from outside.
Establishing correlation of left bare foot print length while walking and stature in females—forensic aspects

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Abstract

Foot impressions can provide vital evidences and clues in a crime scene investigation by careful examination and collecting footprints at crime scene. Determination of stature is an important parameter of personal identification along with others like age, sex, race, etc. The present study is an attempt to examine the relationship between stature and left bare footprint length while walking of 500 females, in Karnataka of South India, population, age ranging from 18 to 21 years. Linear and multiple regression equations for stature estimation were computed using the aforementioned variables and multiplication factors were computed. The correlation coefficients between stature and left bare footprint length while walking were found to be positive and statistically highly significant (p<0.001). The highest co-relation, co-efficient is (+ 0.69). The regression of formulae was checked for their accuracy and reliability.

Key words

Forensic Anthropology; Forensic science; stature; walking bare foot print; South India Population

Introduction

Morphology of human feet is greatly influenced by the combined effects of heredity and life style of man1. Apart from giving idea about the bare foot morphology and individualistic characteristics, the footprints are also indicative of the height of the individual. Foot length displays a biological correlation with height that suggests the latter might be estimated from footprints when such evidence provides an investigator the best or only opportunity to gauge that aspect of a suspect’s physical description. Previous utilization of percentages and linear regressions of foot length to make height estimates is reviewed2,3,4. The foot print reflects the internal structure of the feet1 they can yield the information about the size and shape of bones in the feet. Determination of stature forms a major domain of medico-legal investigation used in the identification of unknown, fragmentary, and mutilated remains2. Like other parts of the body such as head, trunk, lengths of upper and lower limb, and the footprints also displays a definite biologic correlation with stature3,5. On the basis of this relationship, it is possible to predict the stature from footprints. The personal identification from footprints becomes more important in case of mass disasters, where there is always likelihood of recovering feet often enclosed in shoes, separated from the body6. Various anthropometric studies have been conducted on foot7 in relation to growth and development, ergonomics, evolution, orthopedics, and other medical sciences however, there are a few investigations that focus on the forensic importance of foot. Some studies have been conducted on the individuality and uniqueness of foot and footprints so as to draw conclusions regarding personal identification and stature of an individual in forensic examinations8. We considered taking left bare footprint length for the present study because of rare availability of study done in Karnataka, of south India, because left foot bears the maximum weight of the body7. Analysis of footprints can reveal very important clues which can be used as forensic evidence in crime scene investigation. There is a scarcity of literature on the estimation of stature from left bare footprint length among various Indian populations, including the indigenous populations found in the southern part of India.

Materials and method

Materials

Glass plate, Printer black ink, Manual Roller, Pencil, Measuring scale, Vertical steel scale, proforma, and calculator.

Methods

The study was conducted in the Department of Forensic Medicine, J.J.M.Medical College, Davanagere, Karnataka, of India. Among randomly selected 500 females between the age group of 18-21 years from Karnataka of South Indian population. Subjects from Eastern, Western and Northern India were excluded along with Non-residents of India. Informed consent was taken prior to the procedure. All the subjects included in the present study were healthy and free from any apparent symptomatic deformity of the foot. Present study the length of left bare footprint was measured by parallel axis thus the recording of separate measurements5,7 and the development of regression for left bare footprint length of females were shown.

Procedure

The aim and objectives of the intended study were properly explained to the subjects and informed consent was taken on the Performa sheet. Subjects were asked to wash foot with soap and dry their foot to remove dirt. A plain glass plate of about 24 X 24 inches was cleaned and uniformly smeared with a thin layer of black printer ink by using the manual roller. The subjects were then asked to walk casually on the smear glass plate. So that print of left foot will be transferred to the duly prepared foot print Performa, keeping in the mind the need to minimized possible technical source of dimensional artifact. This way each and every individual’s walking left bare footprint collected and recorded.

Recording of the height

The height of the each subject was recorded by asking them to
stand erect with bare foot on the ground, plate attached to the vertical steel scale of two meters. (Vertical anthrop meter) Then the subjects were asked to stand without support. The arms on the side, head in steady position then height was measured on the vertical distance from the standing surface to the highest point of the head (vertex) with the head orientated in the Frankfurt plane. The height of individual was measured in centimeters to the nearest millimeter.

**Measurements of left bare footprint length**

The length of left bare footprint measured from the heel to the tip of the extension of longest toe in the footprint which was recorded in centimeters to the nearest millimeter. As shown in fig-1. This length was taken as the walking left bare footprint length of that particular individual. All unclear footprints and deformed footprints were discarded. The calculated height was determined and compared with the actual height.

**Observations and result**

The present study highlights bare footprint length while walking to estimate the stature and creation of a walking print involves a complex interaction of foot upon surface, the heel strikes first and subsequently the axis through which weight is transferred through the ball of the foot to toe, where the big toe leaves the surface, this was noticed.

As the footprint is an impressed representation of the morphological or shape fleshed foot, the weight bearing pressure of the body imprints the shape of the foot on whatever surface it touches. A footprint may be normal, flat, curved or one of the infinite variation in between the main types. Pointed toes, flat toes, wide heel, narrow heel and many intermediate variations are seen in the present population. Even though there are existences of variables in the foot prints, they are also considered for the present study, because the length doesn’t vary in any of the variables motioned above.

Present study aims to assess the relationship between left bare footprint length while walking and stature among female healthy subjects. The data was analyzed from 500 subjects, measuring the length of left bare footprint and height. Correlation and regression analysis, were applied to measure the relationship and prediction of length of left bare footprint and height. Correlation and regression analysis were developed. Regression equation for female, were developed. Stature could be predicted from left bare footprint length in females by using regression equation. Ht = 70.2 + 4.11 (FPL) **

Table 3: Prediction of height for given left bare footprint length in females for different levels of walking left bare footprint length; predicted stature and probable range of height are tabulated. And Regression equation for female, were developed.

**Discussion**

Pearson was the first to set regression equations to estimate stature from long bone measurements and he concluded that these formulae are population specific and should not be applied to individuals of different population groups. “General formulae” was developed by Dupertuis and Hadden, Trotter and Gleser. Made a contribution to setting and improving mathematical methods for determining stature. Others gave an idea how foot bones like calcareous, talus, and metatarsals can be useful in estimation of stature in forensic examination. Some researchers have conducted radiographic examination of the foot to identify these deceased in forensic cases.

<table>
<thead>
<tr>
<th>Left bare Footprint length (Cm)</th>
<th>No. of subjects</th>
<th>Height in Cm</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-22</td>
<td>104</td>
<td>159.5</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>22-23</td>
<td>124</td>
<td>163.0</td>
<td>3.0</td>
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<tr>
<td>23-24</td>
<td>120</td>
<td>164.4</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
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<td>25-26</td>
<td>42</td>
<td>170.7</td>
<td>2.8</td>
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</tr>
<tr>
<td>26-27</td>
<td>46</td>
<td>186.7</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

Mean + SD = 159.54, S.D Reg: + 4.11

| Table 1: Left bare footprint length and actual height of the female subjects (n=500). |
|-----------------------------------|-----------------|--------------|------|----|
| Left bare footprint length (Cm)  | No. of subjects | Height in Cm | Mean | SD |
| 21-22                            | 104             | 159.5        | 4.3  |    |
| 22-23                            | 124             | 163.0        | 3.0  |    |
| 23-24                            | 120             | 164.4        | 7.1  |    |
| 24-25                            | 64              | 164.0        | 7.3  |    |
| 25-26                            | 42              | 170.7        | 2.8  |    |
| 26-27                            | 46              | 186.7        | 1.0  |    |

Mean + SD = 159.54, S.D Reg: + 4.11

| Table 2: Correlation between left bare footprint length and height among female subject. |
|-------------------------------------|-----------------|--------------|------|----|
| Variable (cm)                      | N               | Mean ± Sd    | Range | Corr. Coeff. ‘r-value’ | Reg. Coeff. ‘b-value’ | Reg.equation (Prediction of HT) |
| Left bare footprint length         | 500             | 23.27 ± 1.53 | 21.0-26.4 | + 0.69               | 4.11               | Ht = 70.2 + 4.11(FPL)** |
| actual height                      | 500             | 165.87 ± 9.05| 149-188 |                   |                   |                   |

* Difference in Correlation. Co-efficient. Statistically significant. ** FPL – Footprint Length
There are various ways to estimate the stature of an individual from skeletal remains. Some authors have successfully examined correlation of stature with various measurements of foot by regression analysis and multiplication factors. Lundy in general, the anatomical method takes into account the individual and population-based differences in body proportions which appear mainly in trunk height and long bone lengths. Individual variations in trunk height and long bone lengths can be retained in the estimated stature when the anatomical method is applied. It is assumed that the loss of muscle tone changes the normal positions of body parts and especially flattens the curves of the vertebral column.

As the foot skeleton attains its adult proportions, a sexual differentiation also occurs in the bone structure of the feet. Evan from his work concluded that, male bones bear stronger tensile and compression strength than the female bones. The male bones thus have a robustness brought about by the stress of larger muscles and ligament masses. This robustness presents as an increase in the size of the bones in the male. The bones in the feet of the female do not show these robust traits. The size differences in these bones are thus reflected in the length and width dimensions for feet/foot prints. The bones of the foot alter in position during gait with different ligaments and muscles becoming taut at different times during the gait cycle. The osseous alignment, and thus the footprint made during locomotion, is dynamic and difficult to model because it is not a static model.

Robbins showed a method as to how these ratio indices could be used for estimation of stature. Martin was probably the first to have developed a ratio index of foot length to estimate stature, concluded that, foot length relative to stature shows no great variation within the human races, on an average amounting to 15%. Chamalal too developed ratio indices for various subgroups.

The application of the Stature Footsize Ratio Index Value for estimation of stature was suggested by Robbins as an alternative to whole body measurement. It is assumed that the feet are subject to smaller variations in proportions and the use of a ratio index representing foot length on stature as a possible alternative method. “Rule of Thumb” formulae were developed by some authors and regression equations were developed by a few others. The regression equations developed in those studies were for the fleshed foot and not for the bare footprints. The footprints represent the weight bearing part of a foot in actual contact with the ground. One’s vertical height must have an adequate support base in the foot. Footprints also register the plantar surface of the sole, which may not necessarily reflect the true size of the foot or the entire prominence as well.

If carefully examined, footprints can be collected from almost every kind of crime scene. They can be utilized as a kind of evidence for estimation of stature, individualistic characteristics and foot morphology of the criminals. It is well known that there is a definite relationship between stature and bare footprints of an individual, more often in an aircraft accident. It is the feet which are recovered more intact than any other parts of the body, as they are often shoe clad. However, the study of human bare footprints has received scant attention from the forensic experts. Excellent monograph by Gwayer, published in 1904, constitute some of the pioneering efforts, giving information on the science of footprints, published in India. There has been an increase in the frequency of various mass distress (air and train crash, bombing, mass suicide, flooding, powerful storm.) To the list one should add the more recent tragedies such as the Haiti, (Carr bin Island) Marmara, earthquake, Turkey and attached other country. World trade Center and pentagon in the US a where thousands of people were killed. Appropriate criteria are critical in developing the age, sex, race, and stature profiles that form the beginning point of a successful identification.

People in India often walk with bare feet, which necessitate an imperative and intensive study on bare footprints. The individual morphology of a foot is a result of heredity and environment. It should come as no surprise that there is a strong positive correlation between one’s stature and walking left barefoot print length of females.

Barefoot impressions are usually found in soil in which there is a considerable diversity of that medium’s ability to capture and retain an accurate representation of the foot. The data and results obtained from the analysis of human feet and their impressions have yielded a tremendous amount of information regarding the physical characteristics of human feet.

According to Philip, estimating stature from footsize by using regression method. These equations were used to predict stature of a known foot size. In present study regression equations were created to predict stature of walking left bare footprint length for females.

According to Jasuja, estimated the stature from stride length while walking fast. Here the female subjects was not used and their correlation co-efficient is + 0.249 for normal walking. In present study for normal walking in females correlation coefficient is +0.69.

Chamalal has established in his study that there is high correlation between foot length and foot breadth and is statistically. (+0.63) Correlation between foot length and stature is smaller (+0.46) but for females estimation of stature is not mentioned even measuring the foot length. Present study, correlation between left bare footprint lengths is significant, value for left bare footprint length (+0.69).

Philip, estimated stature from footprints and foot outlines by standing. Present study is estimating the stature left bare footprint length while walking. The walking left bare footprints is elongated beyond the actual length of the foot, once a bare footprint length has been obtained while walking then by applying the regression equations the stature can be determined. The minimum, maximum mean values of the bare footprint length are obtained from present study and compared to those obtained in previous studies. The previous studies had not measured the walking bare foot print length, to estimate stature.

Kewal, estimation of stature from footprint and foot outline dimensions in Gujar North India. Here the female subjects were not used. The highest correlation coefficients were shown by the toe length measurement (+0.82-0.87) present study shows (+0.69) walking left bare footprint length. The statistical analysis of bare footprint length shows that a walking barefoot length in female’s population, more correlates with actual height. The results of the study are quite encouraging and this ultimately would help as a useful tool for footprint experts either in the field of forensic science or in law enforcement field. In fact, the aim of taking the study was to help the authorities concerned to minimum or restrict their field of investigation and concentrate on a particular footprint to estimate stature and eventually identify the suspect and help the judiciary. Police officers many a times depend on the eye witness to get rough idea about the height of the person, which is not reliable. If bare footprint are more common which would provide an opportunity for estimating height as one of the tools in helping to identify or eliminate a suspect. The results of the present study indicate that a strong relationship exists between bare footprint length while walking and stature and one can successfully estimate stature.

Conclusion

The present study has been taken to fix the actual height of a female person by measuring left bare footprint length while walking, which shows that females of Indian origin in the southern part of India do have significant correlation with actual height from walking bare footprint.

Moreover the estimation of stature from walking bare footprint length is easy, economical and convenient no specialized equipment or training is required to use this method. Anthropologists, forensic experts and investigating officers should be able to use this method to their
added advantage. Thus this study has been able to add another method to estimate stature from bare footprint length while walking.

Present study shows significant correlation of height with left bare footprint length while walking has been observed. The confirmation of validity of linear regression equations to reconstruct stature from bare footprint length while walking on a fresh sample provides excellent norm grams for the population of this area. Present study would be helpful in interpretation and analysis of footprints in criminal cases pertaining to rivalries, homicides, sexual offences especially robberies, thefts, shoplifting, dacoits, etc. Researchers are encouraged to use variety of medium (like mud, sand, blood, dust, liquid, etc.). An overall assessment of the result that stature is positively and strongly correlated with left bare footprint length while walking.

Reference

Saving the hopeless tooth-A Case Report

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Abstract

Intralveolar root fractures of anterior teeth are the most common outcome of a traumatic episode. The traumatized tooth can get fractured at various levels viz. coronal, middle or apical third of the root. Such traumatized teeth often get complicated with the involvement of the periodontal tissues. A similar horizontal root fracture associated with a periodontal abscess in a mandibular central incisor of an adult female has been reported in this case presentation. This fracture was discovered radiographically. A distinct radiolucent line separated fractured pieces with regular margins. The tooth was associated with a mild pain; there was no discoloration of the crown, grade I mobility, no tenderness to percussion or palpation but a distinct periodontal abscess was present. Although the tooth had a hopeless prognosis, it was attempted to save by reinforcing extra and intra coronal splints along with the apical curettage to treat the periodontal defect.

Keywords

traumatic injuries, horizontal root fractures, rigid intra coronal splint, apicectomy.

Introduction

Modern dentistry presents high scientific and technological standards, and, in most cases, it is capable of reestablishing esthetics and function to patients. Nevertheless, traumatic dental injuries are still a great challenge in as much as they usually injure teeth and their supporting tissues in a precocious phase and frequently with an unfavorable prognosis that can lead to tooth loss.

Prognosis of middle and coronal third root fracture remains questionable. Teeth fractured at the middle one third of the root, with grade I mobility and periapical involvement are considered as “Hopeless teeth” and the treatment of choice is extraction. But in today’s era of dentistry where we are focusing on taking the conservative multidisciplinary approach, we try changing “hopeless” into “hopeful”. That’s exactly what was attempted to do in this case with middle third fracture of the lower anterior tooth and large periapical pathology associated with the same. Some clinicians advocate use of rigid intra-canal implant while others believe that it would lead to resorption, and favour extra-coronal resin splint for stabilization of fragments.

Case report

A 28 year old female reported to the Department of Periodontics, Sardar Patel Post Graduate Institute of Medical and Dental Sciences with chief complaint of a small gingival swelling in the lower front teeth region from last 20 days. The swelling was associated with mild pain. On clinical examination, no extraoral abnormalities were found. The intraoral examination revealed a small periodontal abscess in relation to lower central incisors. The teeth were non tender on percussion; there was good gingival support without any pocket formation. There was Grade I mobility in the mandibular left central incisor and the right one being stable.

Investigations

Intraoral periapical radiograph of 31,32,41,42 region, complete blood count, Differential count, bleeding and clotting time.

Reports

The intra oral periapical radiograph revealed a periapical radiolucency in relation to both the teeth. The radiolucency was larger in relation to the left mandibular tooth as compared to the right one. There was angular bone defect in the interdental region. The most important finding was the horizontal root fracture in relation to the mandibular left central incisor (Fig. 1). The fracture line was in the coronal third of

Fig.1: Pre operative radiograph with arrow showing the fracture line.

Fig.2: Grooves made for wire.

Fig.3: Surface etched with etchant.

Fig.4: Composite being cured.
the root. The blood picture was within normal range.

The treatment was planned for the patient. The surgical technique was explained to the patient and informed consent was obtained. Thorough scaling, root planning and curettage was performed in the lower anterior sextant. Oral hygiene instructions were given to the patient.

**Surgical technique**

The root canal access opening was performed on both the teeth and the canal was prepared to size 40 (K-flexo file). The incisal edges of both the incisors were grinded to relieve them from any kind of trauma from occlusion. The patient was recalled the next day to stabilize the teeth before surgery. The anterior four teeth were splinted with the help of orthodontic wire and composite. For splinting, first a groove was formed (Fig. 2) at the level of the cingulum, with the help of the round bur. The groove was then etched (Fig. 3) and a bonding agent was applied. A small piece of 21 gauge wire was given the arch form and adapted into the groove. Composite was then condensed over the wire in the groove and cured for specified time (Fig. 4). It was then finished with the finishing discs (Soflex) and splinting was complete (Fig. 5). A radiograph was taken immediately after splinting (Fig. 6).

![Fig.5: Wire and composite splinting done.](image1)

Patient was advised to get the complete blood investigation done and the surgery was scheduled. On the day of surgery the patient was prepared and the procedure started by giving the bilateral mental and infiltration anesthesia. The crevicular incision was given with the help of no.15 blade (Fig. 7). The incision line extended from the mandibular left canine to the mandibular right canine.

A full thickness flap was then raised with the help of the periosteal elevator (Fig. 8). The flap was reflected beyond the mucogingival junction, so as to expose the bone up to the apical region of the teeth. To gain sufficient access to the root the bone in that region was cut with the help of the round carbide bur. Once the root tip was visible the periapical region was thoroughly debrided of all the infected tissue, with the help of the surgical curettes (Fig. 9). The last few millimetres of the root tip were also removed and beveled at a 45° angle. A 40 number K-file was then inserted in the canal of the left central incisor so as to splint the fractured parts of the tooth. The file was cut at the coronal end and sealed with the GIC at the apical end. The right incisor was obturated with gutta-percha points and sealed apically with GIC. A temporary restoration was given in both the teeth. The flap was then sutured with the help of non-resorbable suture material (Fig. 10). The post-operative radiograph was taken and patient was recalled after one week. (Fig. 11).

**Discussion**

Root fracture involves the pulp, dentin, cementum, and the periodontal ligament. Usually, the anterior teeth are involved in dental injuries with the maxillary central incisors being the most frequently injured. Clinically the fractured roots present with mobility of the involved teeth as well as pain on biting. Often a periodontal defect or a sinus tract is associated with the fractured root. The initial treatment when feasible, consists of repositioning the coronal segment and then stabilizing the tooth to allow healing of the periodontal tissue.

![Fig.9: Apicectomy and apical curettage done.](image2)

![Fig.10: Sutures placed.](image3)

![Fig.11: Post operative radiograph showing the rigid intracoronal splint used to stabilize the fractured parts.](image4)
ligament supporting the coronal segment\textsuperscript{5}. In cases involving horizontal root fracture, endodontic treatment should be delayed until signs of pulp necrosis are evident and in those cases requiring endodontic therapy, treatment should be limited to the coronal segment\textsuperscript{4}. A flexible extracoronal splint using orthodontic or nylon wire and acid-etched resin used for the period of upto 12 weeks will enhance pulpal and periodontal repair. Apart from the extracoronal splint the rigid intracoronal splints are given to stabilize the fractured parts\textsuperscript{6}. Treatment of traumatic dental injuries also varies with the type of involvement, i.e. whether it is a pure endodontic involvement or a combined endo-perio involvement\textsuperscript{7}. Apicectomy is one good treatment modality for these kind of combined lesions and therefore should be considered in an attempt to save such hopeless teeth\textsuperscript{8}.

**Conclusion**

Traumatic injuries of teeth are the main cause of emergency treatment in dental practice\textsuperscript{5}. The treatment plans varied according to the type of dental traumatism. Treatment of fractures below the alveolar crest consists of reduction and rigid fixation as soon as possible. The splint is usually left in position for at least a month\textsuperscript{10}. The fracture associated with periodontal involvement can be successfully treated with apicectomy and apical curettage.

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2. A.M. BRUSETH, H. SÆTERVOLD, D. ØRSTAVIK, and H. PREUS, University of Oslo, Norway, University of Oslo, & NIOM, Haslum, Norway Prognosis of endodontic therapy in combined endo-perio lesions
Cadaveric organ transplantation—life after death

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Abstract
The Rs 1000 Crore kidney Racket unearthed at Gurgaon has brought to light the growing Asian organ market that source kidney from poor and ignorant donor to recipient in middle east Europe & north America. The trade shifts from one city to another as if in planned rotation, making Indian public life riddled with scandals of the “Kidney bazaar”. A few years back it was Noida, Amritsar, Mumbai, Delhi and the latest expose comes from Gurgaon.

The organ transplantation scams distinguish themselves by the way they repeat themselves with amazing regularity and hit head lines every few years. To understand the issues surrounding this trade, it is essential to look at the concept and the back ground of organ transplantation alongwith its legal aspects.

Key Words
Organ transplantation, Cadaveric organ donation, Brain death

Introduction
Organ transplantation is surgical removal of tissue or organ from one individual and placement of organ in another individual for the purpose of improving the health of recipient. Human to Human organ transplantation has been accepted by doctors world wide as best line of treatment and often only one for a wide range of fatal diseases such as end stage renal disease i.e. kidney failure.

Historical background
In the middle Ages the possibility of organ transplantation was considered, and evidence for it exists particularly in Christian texts which describe attempts by various monks to exchange organs. But real organ transplantation began in 1902, when Karl, a French surgeon working in the United States, demonstrated a technique for connecting blood vessels. This represented the first basis for modern transplantation. In 1936, first attempt was made by Varonoy, a Russian surgeon, to transplant a kidney in a person dying of kidney failure. The transplant held for thirty-six hours, after which time the patient died.

The first real move towards clinical transplantation took place in 1954 when Professor Tom Starzl began transplanting organs with the help of immunosuppressive agents using a method similar to that which we use today. In 1966 the HL-A (Human Leukocyte Antigen) system was discovered, assisting in the determination of organ compatibility.

Different types of donations
Cadaveric and living organs are the two main sources for transplantation. The cadaveric donation includes related and unrelated donations. There are five types of living organ donations: 1) Living Related Donation. 2) Living Unrelated Donation. 3) Crossover Transplantation. 4) Domino. 5) Indirect Living Organ Donation.

Legal aspects of Organ donation and transplantation
Due to the illegal medical practice in transplantation, commercialization of human organs and so on, many countries formulated transplantation laws. The status of transplantation law can be divided into three groups: opting-out, opting-in, and required request. 1) According to the opting-out system, every human being will be considered a possible donor after death unless he/she has officially expressed a contrary option. It is also known as presumed consent. 2) By opting-in we mean a process by which people voluntarily sign and submit a will saying that they want to become donors once they are dead. If they do not do this, they will not be legally considered donors. 3) Required request law requires hospitals to ask the family of a deceased patient for a donation of organs and tissue if the deceased is a suitable candidate for organ donation.

The Indian scenario
The kidney bazaar has a long history in India. Right form the eighties when kidney transplantation was established in India, doctors in large hospitals have been performing living “unrelated” kidney transplants where typically kidneys were bought form the poor through middlemen. The early nineties saw a series of media exposes of how rich patients, especially Arabs, were coming to Indian to buy kidneys giving the required international touch to a thriving kidney trade.

Till the enactment of the Transplantation of human organ act, (THOA) in 1994, there was no comprehensive legislation allowing the removal of human organs form brain dead cadaver. In 1991, the Government constituted a committee to prepare a report, which could form a basis for all-india legislation. Although the main terms reference of the committee were concerned with “brain death”, it also recommended that trading in human organs be made a punishable offence. The Act legalizes ‘brain death’ making removal of organs permissible after proper consent.

The Transplantation of Human Organs Act (THOA) 1994
The Transplantation of Human Organs Bill was passed by Parliament of India in June, 1994 and the President of India gave his assent of July 8, 1994. The Act came into force for, February 4, 1995 by a Gazette notification. THOA defines transplantation as means of grafting of any human organs from any living person or deceased person to some other living person for therapeutic purposes. THOA defines brainstem death as a stage at which all the functions of brain-stem have permanently and irreversibly ceased. No human organ is to be removed from the body of a person in the event of his brain-stem death unless such death is certified by a Board of medical experts.

The other main provisions of the Act are as follows:

a) The donor should give in writing, in the presence of two or more witnesses (at least one of whom is a near relative of such person) at the time of his death, for the removal of the organs from his body after death.
b) The age of authorization is 18 years and in cases of minor, the parents may give such authority.
c) In cases of unclaimed bodies lying in the hospital for more than 48 hours, the person in charge of the hospital can authorize for the removal of the organs from such bodies.
d) When the body has been sent for post-mortem examination either for medico-legal or pathological purposes, the competent doctor can authorize for the removal of the organs if he has reason to believe that such human organ will not be required for the purpose for which the body has been sent for post-mortem examination.
provided he is satisfied that the deceased person has not expressed before his death any objection for the removal.

e) No human organ removed from the body of a donor shall be transplanted into a recipient unless the donor is near relative of the recipient.

f) The organs removed form the body of a live unrelated donor can be transplanted into the body of any recipient who may be in need of such organ, provided the prior approval of the Authorization Committee has been obtained.

g) The hospitals engaged in removal, storage or transplantation of human organs are to be registered. If they violate any of the conditions, the registration may be cancelled after a proper inquiry.

h) Any person or hospital associated in the removal of any human organ without authority, shall be punished with imprisonment up to five years and fined up to Rs. 10,000.

i) If a registered medical practitioner is convicted, his name may be removed form the medical register for a period of two years for the first offence and permanently for the subsequent offence.

j) The punishment for commercial dealing in human organs is imprisonment not less than two years by may extend to seven years and liable to fine not less than Rs. 10,000 but may extend to Rs 20,000.

Lacunae in the law

According to sub-clause (3), clause 9, of Chapter II in the Act: “If any donor authorizes the removal of any of his human organs before his death for transplantation into the body of such recipient not being a near relative as is specified by the donor, by reason of affection and attachment towards the recipient or for any other special reasons, such human organ shall not be removed and transplanted without the prior approval of the Authorization Committee”.

This clause in the law that permits unrelated donors to donate live kidneys for reasons of “affection and attachment” has been misused by unscrupulous persons. It is not necessarily difficult to find an unrelated donor who suddenly develops an “affection or attachment” for the recipient provided” he or she is properly rewarded.

In addition, the Authorization Committee set up by the respective State government only ensures that all documents needed under the Act have been supplied. The Committee has neither the means nor the authority to verify the facts stated in an affidavit before a magistrate. If the Act have been supplied. The Committee has neither the means nor the authority to verify the facts stated in an affidavit before a magistrate. If the conditions, the registration may be cancelled after a proper inquiry.

Remedy of illegal trades- Cadaveric organ donation and transplantation

The Human Organ Transplantation Act legalized the concept of brain death’ for the first time in India making organ transplants from brain dead donors possible. Improved infrastructure such as ventilators and other emergency measures are necessary to improve the lives of the accident victims. Also, routine ‘brain death’ certification in neurosurgical wards could significantly increase the number of cadaver donors. Furthermore, people need to be educated about the futility of keeping brain dead victims ‘alive’ on support system at ICUs as ‘brain death’ is death and not euthanasia. The functions of the heart and the lungs can be artificially maintained by machines whereas that of brain death cannot be, till date. Hence, when due to any cause, the brain is irreparably damaged; the brain dies and the organs stop working, it is at this critical moment with the consent of relatives that the brain dead individual becomes an organ donor.

Myths about organ donation should be dispelled

Myth 1: Doctors will not try to keep the organ donor patient alive if they know he/ she is a donor.

Fact: There are two separate medical teams for the treatment and the transplant. Until all lifesaving efforts fail and death is determined, the Organ Procurement Organisation (OPO) is not notified. Also, OPO does not notify the transplant team until the family has consented to donation.

Myth 2: Organs are removed after the donors’ death.

Fact: Surgeons wait till loss of bodily reflexes. The respirator is turned off for 10 minutes and a less effective air hose is put down the patient’s windpipe. ‘Brain death’ is declared if the patient doesn’t begin breathing without the machine.

Myth 3: The donor’s family is charged if one decides to donate organs.

Fact: A donor’s family is not charged for donation. If a family believes it has been billed incorrectly, they should immediately contact the local OPO.

Myth 4: The wealthy and powerful have precedent over the poor for organ transplantation.

Fact: The organ allocation and distribution system is blind to wealth or social status. The length of time it takes to receive a transplant is governed by many factors, including blood type, length of time on the waiting list, severity of illness and other medical criteria. The fairer medical systems allocate vital organs to those considered best able to survive the anti-rejection drugs and limitations of a transplant organ.

Myth 5: All organs of the donor’s body are removed.

Fact: As a donor you may specify what organs you want donated. Your wishes will be followed.

Myth 6: Only heart, liver and kidneys can be transplanted.

Fact: The pancreas, lungs small and large intestines, and the stomach also can be transplanted.

Conclusion

There is a real scarcity of human organs even though organ transplantation facilities are widely available. In this context cadaveric organ donation and transplantation must be promoted. Everyone should give a thought to the need for organ donation after death. Organ donation and transplantation highlights the relational and social dimensions of human life. Through organ donation and transplantation also one can proclaim and promote the gospel of life. We can not force any one to donate, but people should be motivated to make free and voluntary donations. In this condition, a spirit of charity, relevant both from religious and secular point of view can work properly with regard to the promotion of cadaveric donation and transplantation.

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Management of impacted maxillary central incisor associated with a supernumerary tooth

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A case report

Abstract
Supernumerary teeth may be defined as any teeth or tooth substance in excess of the usual configuration of twenty deciduous, and thirty two permanent teeth. These are a relatively frequent disorder of odontogenesis, characterized by an excess number of teeth.

Supernumerary teeth in the maxillary midline are common and can present both esthetic and pathologic problems that can be extremely difficult to treat. This article presents a case of delayed eruption of maxillary permanent central incisor as a clinical complication due to an impacted supernumery tooth (mesiodens) and its surgical approach.

Introduction
Development of the tooth is a continuous process with a number of physiologic growth process and various morphologic stages interplay to achieve the tooth’s final form and structure. Interference with the stage of initiation a momentary event may result in single or multiple missing teeth or supernumerary teeth (Haltabb et al 1994). A supernumerary tooth is one that is additional to the normal series and can be found in almost any region of the dental arch. These teeth may remain embedded in the alveolar bone or can erupt into the oral cavity. When it remains embedded, it may cause disturbance to the developing teeth.

The term mesiodens denotes a supernumerary tooth located between the maxillary central incisors (Sykaras in 1975). The occurrence of supernumerary tooth in various population is between 0.3% to 0.8% in primary dentition and 1.5% to 3.5% in permanent dentition (Mason et al 2008). There is no significant sex distribution in primary supernumery teeth; however males have been shown to be affected more in permanent dentition than females. Early diagnosis of mesiodens can be made through routine radiographs in preschool children which permit early intervention and more favorable prognosis with minimal complications. Clinical problems that can be observed are nasal eruption, over retained maxillary permanent central incisors, malpositioned teeth, unaesthetic situation, pain, displacement of the median palatal suture and cyst.

The surgical removal of mesiodens is the treatment of choice to prevent clinical complications and also to treat an established complication.

The purpose of this paper is to report a case of delayed eruption of maxillary permanent central incisor and its normal eruption after surgical removal of embedded supernumery tooth.

Case report
This report presents a case of 10 year old boy who reported to a private clinic with his mother. The chief complaint was the delayed eruption of permanent right maxillary central incisor and an unaesthetic appearance derived from the absence of primary central incisor. The medical history was unremarkable. Clinical examination revealed a mixed dentition comprising of the following permanent teeth - first molars, maxillary left central incisor, maxillary lateral incisors and mandibular incisors. The edentulous area showed a bulge of fibrous gingival tissue with sufficient space available for eruption (fig.1). The oral hygiene was good and he was caries free. Radiographic examination revealed an inverted mesiodens close to the midline and palatal to an unerupted maxillary right central incisor (fig.2).

CT scan was done in order to assess the position of mesiodens labiobuccally (fig.3). After analyzing multiple sagittal sections of CT scan, it was clear that mesiodens was placed labiobuccally in oblique manner with its root in anterior region and neck of the mesiodens present in between both the central incisors along with bulky crown placed posteriorly (lingually). After consultation with pedodontist, it was planned that removal of impacted inverted mesiodens was necessary in order to set the unerupted left maxillary central incisor at their desired actual place.

Considering all the findings and position of mesiodens, surgical removal was planned. A mucoperiosteal flap (full thickness) was elevated under local anesthesia by using two vertical releasing incisions. The labial bone was removed from both the central incisors and the root tip of the mesiodens was exposed (fig.4 & 5). It was a difficult task as the mesiodens was placed obliquely with its bulky crown placed lingually. The root of unerupted right maxillary central incisor was fully developed so we luxated the impacted right Central incisor for easy eruption and to evade any type of ankylosis. The mesiodens was extracted by binding a number 40 k-file in apical foramen of mesiodens (fig. 6 & 7). Flap was sutured by 3-0 mersilk suture.

Discussion
Supernumerary teeth in the maxillary midline are common (Brook et al) and can present both esthetic and pathologic problems that can be extremely difficult to manage. Early detection of the mesiodens is most important to avoid such complications. When there is a significant delay in the eruption of a maxillary central incisor after the other has erupted, the presence of a mesiodens should be suspected. As in the present case, the sequel observed was the delayed eruption of permanent maxillary right central incisors. Furthermore, the patient complained about his unaesthetic appearance. It is important to emphasize that this dissatisfaction with one’s own appearance can bring social problems.

The periapical radiograph taken to know the reason of delayed eruption was acceptable to diagnose the mesiodens presence.

Although CT scan determines the spatial location, labio-lingual position of mesiodens is extremely important when surgical intervention is required. The panoramic view is not indicated for these cases due to the poor definition in the anterior maxilla.

The timing of the surgical removal of supernumery teeth is controversial. Some authors recommend immediate removal, while others recommend late intervention. According to Thoma 7 “if the mesiodens is not interfering with eruption its extraction should be...”
delayed until the roots of the permanent central incisors have formed completely to avoid injury to the developing root structure. In the present case, the removal was delayed due to late diagnosis of the condition because the patient failed to visit the dentist until the clinical complications had appeared.

Dibase reported that 75% of the incisors erupted spontaneously after removal of the supernumerary. It did happen in the present case also as within a period of 6 months the permanent incisor had erupted. Although the eruption usually occurs satisfactorily following the removal of supernumeraries, Howard had reported that sometimes it could fail. The author called this group of teeth a reoperation group, the surgical exposure of unerupted incisor and removal of bone around the crown, followed by an orthodontic traction has been reported.

Fortunately, in this case there was sufficient eruption without the need of orthodontic traction and only luxation of the impacted right central incisors had been done. This procedure was chosen because there was not enough anchorage to initiate orthodontic traction of the teeth at that moment. Moreover luxation has been reported as treatment for ankylosed teeth. In this situation it is important to state that mesiodens removal only cannot solve the problem of delayed eruption of maxillary permanent incisors at all times.

**Conclusion**

The presence of mesiodens in young children justifies a regular radiographic follow up. This procedure can provide mesiodens diagnosis by the dental as well as present clinical complications like the delayed

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**Fig.2:**

**Fig.3:**

**Fig.4:**

**Fig.5**

**Fig.6:**

**Fig.7:**

**Fig.8:** Preoperative.

**Fig.9:** post operative (after 6 moths).
eruption of the maxillary central incisors. Once clinical complications are encountered the solution is to remove the cause and follow up the patient. Sometimes only the removal of the mesiodens cannot solve all the problems and another surgical intervention is justified.

References

Victim profile and influencing factors in traumatic deaths on railway tracks in Calicut, Kerala

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Abstract

This is a study to find out the epidemiological features in traumatic deaths on the railway tracks, so as to identify the risk groups and to suggest prevention measures. Selections of cases were from the reported cases for autopsy. 79 cases of Traumatic deaths due to train-person collisions and from the trains were analysed. 86% were Males. 74.6% of the victims were between 21 and 50 years of age. Unique features of lost identity (22%), absence of survival time (92.4%) and undetermined manner of the death (24%) are the hallmark of such traumatic deaths on the railway tracks. 42% died due to suicide and 34% died due to accident. All the suicidal victims died due to train-person collision. 94% of the accidental victims were pedestrians. Most of the deaths occurred during commuting hours. About one-third of the suicidal events occurred on Sundays. While mental illness and unemployment were associated with suicidal deaths, alcoholic intoxication was found associated with accidental deaths. Our study found that traumatic events due to train-person collisions or fall from trains could be prevented.

Keywords

Traumatic death, Railway track, lost identity, survival time, manner of death, prevention.

Introduction

Railways are a convenient means of transport and the railway tracks pass through the thickly populated areas in India. Despite its transport efficiencies, this system has some inherent dangers. Traumatic Railway injury is highly fatal incident which is regularly associated with severe injuries, even high graded dismembering. With this type of unique death, there will be considerable trauma to bereaved relatives, and often considerable psychological difficulties for those indirectly involved such as train drivers and onlookers. The relation between traumatic injury and socioeconomic factors is being increasingly recognised. The aim of this study was to find out the epidemiological features in deaths on the railway tracks, so as to identify the risk groups and to suggest prevention measures.

Materials & methods

All cases of traumatic deaths due to train-person collisions or fall from the trains, brought for medico-legal autopsy at the Medical College Calicut from January 2004 to May 2005 were studied prospectively.

The data was collected by interviewing the relatives of the victim, police & railway staff, perusal of hospital records and by performing Medicolegal autopsy. Details such as sex, age, identity, religion, socio economic status, time of death, hospital stay, weekly variation, risk factors relevant in causation such as insanity, alcohol, etc and manner of death were used for analysis. In unidentified cases, the probable age range was determined by autopsy and the mean from the age range was considered for this study.

Results

During the 17 months study, 79 cases of traumatic railway deaths were studied. 69.6% of the cases were from the thickly populated areas in and around the city of Kozhikode (Kerala), while 30.4% of the cases were from remote areas.

Males were the predominant victims (86%) and 14% of the victims were females. 22% of the victims were not identified till the third day after autopsy. It was found that 27.8% of the victims were aged between 21-30 years (Figure-1). 74.6% of the victims were aged between 21-50 years. Age range of the victims was from 15 to 81 years.

Discussion

Traumatic deaths on Railway tracks are common in India. Traumatic Railway injury due to train-person collision is highly fatal incident with several difficulties for those indirectly involved such as train drivers, onlookers, passengers, police officers and autopsy surgeons. It is due to extensive disruption of body parts, lost identity of the victim, decomposition due to delayed reporting and undetermined manner of death. These deaths often provide limited data and paucity of literature about such deaths is therefore understandable.

The present study found that more deaths in thickly populated areas as compared to remote areas. This is supported by another report. Interventions such as special security patrols, improved signposts and proper fencing of the railway tracks could be useful. Hindus outnumbered victims of other religions in the present study. This is matching with the religion wise distribution of population in India.

In the present study, males are the commonest victims of railway related deaths which is also reported by other studies. This reflects the preponderance of males in the moving population.

In the present study, majority of the victims were in the age group of 21-40 years. Similar observations have been found by other authors. Such males are usually the bread winners for the entire family in India. Hence the railway related deaths are implying financial burden on the family.

Earlier study has found majority of the victims to be of younger age. The reason for contrast from the study can be attributed to the regional difference. The present study showed a raise in incidence after 60 years compared to earlier decade, which is supported by earlier study. This may be explained by the fact that the elderly individuals are at higher risk of accidents due to senility, and are prone for committing suicide due to depression or fear of dependency.

The present study found that the deaths occurring on the spot were significantly higher compared to the fatal cases which were treated in the hospital. This is supported by other authors. High fatality is a well known feature of trauma due to hit/ run over by a train. In contrast, case fatality is reported to be lesser than 66% in

Fig.1. Age Distribution of The Victims.

64% of the victims were belonging to Hindu religion. 13% were Muslims, 3% were Christians and 20% were of unknown religion. 92.4% of the victims had died at the scene of occurrence and 7.6% had died in the hospital (Figure-2).
The manner of Death was undetermined in 24% of the cases. Suicidal deaths outnumbered Accidental Deaths (Figure-3). All the suicidal victims had collided with the trains, either in the lying position or in the upright position. 94% of the accidental victims were pedestrians and 6% of the accidental victims had accidentally slipped from the moving train. None of the cases were termed as homicidal.

earlier studies related to railway deaths4,11,17,19. Low fatality rate is unlikely for train-person collisions especially in suicidal events.

The conclusions regarding the manner of death are decided by the police, after investigations and autopsy. Manner of death was undetermined in 24% of the cases. This is a problem which is also reported by other authors10,15,16.

The present study reports another major problem of 22% of dead bodies recovered from the railway tracks to be unidentified. It is usually presumed that they are either beggars or vagabonds. High fatality, lost identity of the victim and undetermined manner of death are unique features of Deaths due to train-person collisions, which are not seen in most of the other types of deaths in forensic practice.

Suicidal deaths outnumbered accidental deaths. Our findings are similar to earlier studies12,15,23. By contrast, accidental deaths to be more common than the suicidal deaths by other studies3,6,7,9,16.

The present study did not find any homicidal cases. This is similar to earlier report1. Some studies have found few cases to be homicidal in nature15,16.

### Table 1: Manner of death in relation to time characteristics of occurrence.

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Suicide (%) (n=33)</th>
<th>Accident (%) (n=27)</th>
<th>weekday</th>
<th>Suicide (%) (n=33)</th>
<th>Accident (%) (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00-5.59</td>
<td>6.1</td>
<td>11.1</td>
<td>Monday</td>
<td>9.1</td>
<td>22.2</td>
</tr>
<tr>
<td>6.00-11.59</td>
<td>27.3</td>
<td>25.9</td>
<td>Tuesday</td>
<td>12.1</td>
<td>14.8</td>
</tr>
<tr>
<td>12.00-17.59</td>
<td>30.3</td>
<td>40.7</td>
<td>Wednesday</td>
<td>18.2</td>
<td>11.1</td>
</tr>
<tr>
<td>18.00-23.59</td>
<td>27.3</td>
<td>18.5</td>
<td>Thursday</td>
<td>15.2</td>
<td>18.5</td>
</tr>
<tr>
<td>Not known</td>
<td>9.1</td>
<td>3.7</td>
<td>Friday</td>
<td>9.1</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Saturday</td>
<td>6.1</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sunday</td>
<td>30.3</td>
<td>11.1</td>
</tr>
</tbody>
</table>

History regarding victim’s occupation revealed that 23% of all the victims were manual daily wage labourers. 64% of the suicidal victims were either unemployed or in the old age. Mental illness was found significantly associated with majority of the suicidal cases. Alcohol intoxication was found more associated with accidental cases (Table-2).

### Table 2: Occupation and Factors associated with suicidal and accidental victims

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Suicide (%) (n=33)</th>
<th>Accident (%) (n=27)</th>
<th>Factors*</th>
<th>Suicide (%) (n=33)</th>
<th>Accident (%) (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>manual labor</td>
<td>21</td>
<td>26</td>
<td>Mental illness</td>
<td>60.6</td>
<td>14.8</td>
</tr>
<tr>
<td>Unemployed/old age</td>
<td>64</td>
<td>22</td>
<td>Alcohol abuse</td>
<td>9.1</td>
<td>18.5</td>
</tr>
<tr>
<td>Skilled labor</td>
<td>12</td>
<td>19</td>
<td>Narcotic substances of abuse</td>
<td>0</td>
<td>7.4</td>
</tr>
<tr>
<td>Student</td>
<td>3</td>
<td>7</td>
<td>No history</td>
<td>36.4</td>
<td>74.1</td>
</tr>
<tr>
<td>Not Known</td>
<td></td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Total exceeds 100% because more than one factor was found per victim

Out of 27 cases of accidental deaths, most of the victims met with the accident during the day. Out of 33 cases of suicidal deaths, about half of the victims had committed suicide during the day (Table-1).

The present study demonstrates the people’s disregard for safety measures. There is preponderance of the pedestrians as compared to passengers aboard in the train, in accidental deaths. This is supported by earlier reports3,9,15,16. Reason for pedestrians being the predominant accidental victims is that crossing the tracks or walking on the railway track is quite common in Indian railway networks. Pedestrians other than the railway employees are more prone for severe injuries16. Some studies found that in more than 50% of the cases, victim died after falling on to the track or from a train11,12. This is in contrast to the present study.

The accidental events occurred more during the day than at night. Similar finding was noted by others15. In contrast, other studies found unintentional events occurring more at night10,15,16. The suicidal events occurred more during the day or evening hours than at night. Similar finding was noted by others15,16. In contrast, most of the suicidal events occurred at night as per other study1.

Accidental events occurred without any special preference for a specific day of the week which is also supported by earlier study11. In the present study, it was noticed that the suicidal events occurred highest on Sundays in contrast to the other studies that found the highest death occurring on one of the working days13,15. It appears that the time characteristics for suicides are decided by impulses and surroundings, rather than the darkness. Sunday being a holiday could ignite the suicidal impulses during the lonely surroundings of that day for a suicidal act.

In the present study, a large proportion of victims were feeling insecure due to employment concerns. Very high incidence of unemployment was noted in suicidal victims. Unemployment as an
important factor among suicidal victims was also expressed by earlier authors\cite{10,12,26}. Economic hardship may make a person to commit suicide. Employment in general is a protection against suicide.

In the present study, Alcoholic intoxication was found in 18.5\% of the accidental victims, which is supported by earlier studies\cite{4,6,9,11,20,22,25}. It was present in more than 70\% of accidental victims as per some other researchers\cite{7,8,15,18}. We believe that without alcoholic intoxication, the risk of accident decreases significantly.

The present study showed that 60.6\% of the suicidal victims suffered from insanity. Our study confirms earlier reports that majority of suicidal victims of railway injuries were mentally ill patients\cite{1,10,27,28,15}. Suicide by lying on the railway track is not the preferred method amongst the general public in India, when compared to poisoning and hanging\cite{6,29}. The mentally ill patients prefer run over by railway as a method for suicide.

**Conclusion**

The present study highlights the following unique features regarding traumatic deaths due to train-person collisions and fall from the trains:

1. Several cases were unidentified.
2. Most of the deaths were not associated with any survival time.
3. The manner of the death was undetermined in several cases.

The other features that were found regarding traumatic deaths were that Males outnumbered females. Most of them were between 21 and 50 years of age. Most of the victims died due to suicide. All the suicidal victims died due to train-person collision. Majority of the accidental victims were pedestrians. Most of the train-person collisions occurred during commuting hours. About one-third of the suicidal events occurred on Sundays. While mental illness and unemployment were associated with suicidal deaths, alcoholic intoxication was associated with accidental deaths.

Preventive measures for traumatic deaths due to train-person collisions could be public awareness, special security patrols, improved signposts, proper fencing of the railway tracks, protective care of the mentally ill patients, control of alcohol abuse and sound economic policies by the government.

**References**

Epidemiological trends in the fatal poisoning cases in the Malwa region of Punjab

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Abstract

Poisoning represents major epidemic of non-communicable diseases in the present century. One of the commonest mode of un natural deaths all over the world are suicidal deaths and poisoning remains the commonest, particularly in countries like India, where there is no strict over the sale and storage of poisonous substances. The present study was undertaken to evaluate the pattern of poison deaths in the Malwa region of Punjab. This study was conducted on the autopsies cases brought to the mortuary, Government Medical College and Rajindra Hospital, Patiala. 562 medicolegal autopsy were performed in the mortuary, Government Medical College and Rajindra Hospital, Patiala, during the period from 1st September 2007 to 31st July 2008. Out of these 100 cases were suspected to have died of poisoning thereby constituting 17.8% of total un-natural deaths. Maximum cases were from 3rd decade of life and males outnumbered females. Data thus collected was analysed statistically.

Introduction

Every unnatural death represents a tragic waste of human life and resources, whether accidental, suicidal or homicidal. Death due to poisoning is no exception. It has increased gradually in the last 5-10 years and it represent major epidemic of non communicable disease of the present country. WHO estimated that the world wide incidence of acute pesticide intoxication has doubled during 1970s-1980s. Ingestion of poison is a common medical emergency. Acute pesticide poisoning, particularly in developing countries is frequent and thus has a great importance in public health. The increase in poisoning incidence can be blamed to the rapid in the field of science and technology and vast growth in the industrial and agricultural sectors. A number of chemical substances, which were developed to save the agricultural products from rodents and pests, so as to protect the human beings from starvation, are in fact themselves becoming man -eater. Punjab is a agricultural state and Aluminium Phosphide is commonly used as a pesticide. Also Organophosphorus compounds are widely used for insecticide purpose, particularly in this Malwa belt, where cotton is a major crop.

The exact incidence of this problem is uncertain but as per WHO, three million acute poisoning cases with 2,20,000 deaths occur annually worldwide particularly among agricultural workers. This figure could be just the tip of the iceberg since most cases of poisoning actually go unreported, especially in third world countries.

Material and methods

This study consisted of 100 autopsy cases brought to the mortuary, Government Medical College and Rajindra Hospital, Patiala, during the period from 1st September 2007 to 31st July 2008. Total 562 medicolegal autopsy were performed during this period. The data collected regarding age & sex from police inquest report and from the relatives of deceased. All the data thus collected and analysed statistically.

Results

562 medicolegal autopsy were performed in the mortuary, Government Medical College and Rajindra Hospital, Patiala, during the period from 1st September 2007 to 31st July 2008. Out of these 100 cases were suspected to have died of poisoning there by constituting 17.8% of total un-natural deaths. All the observation noted and results are as below:

Discussion

During this study 562 medicolegal autopsy were performed in the mortuary, Government Medical College and Rajindra Hospital, Patiala, during the period from 1st September 2007 to 31st July 2008. Out of these 100 cases were suspected to have died of poisoning thereby constituting 17.8% of total un-natural deaths, occurring during poisoning. A study conducted by Dalal et al also showed the percentage of poisoning cases to be 17.8% in 1994.

In our study 74% of total cases were males and 26% were females. The male: female ratio was 2.8:1. The finding were consistent with the study conducted by Jain et al in which the incidence of male victims was 69%. The study conducted by Behera et al showed ratio of male female victims was 2.7:1 consistent with present study. Various other studies also showed similar trends like Singh et al -2.9:1, Sharma and Bhullar- 3.1 and Mohanty et al -2.9:1 as the ratio of male:female victims. In the present study shows that 72% of cases were married in comparison with 28% cases which were unmarried out of which the males(73%) and females (69%) were married. This is in consistent with the study conducted by Gupta et al in which 74.8% victims were married. A similar trends was also observed by Dhattarwal and Dalal which showed that 66.6% victims were married.

In our study 42% of total cases belonged to age group of 3rd decade followed by 18% to the 4th decade, 15% to the 2nd decade, 3% cases in 6th decade and 2% cases in the first decade of life. The present study concurrence with other studies ie Sharma et al found that 47.43% of poisoning cases belonged to 21-30 years of age group, Gupta et al showed that 21.8% cases belonged to 31 40 years of age group and 21.1% cases belonged to the age group of 2-30 years, Dash et al found that 40.5% of cases belonged to 3rd decade, 21.6% in 4th decade, 20.9% in the 2nd decade. Similar trend was also observed by Gupta and Vagela which showed that 43.1% cases in the 3rd decade of life.

39% of the males and 50% of females victims were in the age group of 3rd decade. This incidence is decreasing on either side reaching minimum incidence in the extremes of age. This showed that most of victims were in the most productive age groups.

Summary and conclusion

Poisoning is a problem of the society that is to be considered seriously from all aspects. The present study has demonstrated this fact once again. In the present study entitled Epidemiological trends of the poisoning autopsy cases in the Malwa region of Punjab according to their age and sex. This study was conducted on the autopsy cases brought to the mortuary, Government Medical College and Rajindra Hospital, Patiala. 562 medicolegal autopsy were performed in the mortuary, Government Medical College and Rajindra Hospital, Patiala, during the period from 1st September 2007 to 31st July 2008. Out of these 100 cases were suspected to have died of poisoning.

Poisoning accounts for 17.8% of total un natural deaths. Males outnumbered females with male female ratio being 2.8:1. Most of the victims (42%) belonged to 3rd decade with minimum incidence in the extremes of the age.
The most common age group in poisoning cases were in 3rd decade of life comprising 42%, followed by 4th decade 18%, 2nd decade 15%, and 5th decade 14% and the minimum number of cases ie 2% in each 1st and 8th decade of life.

Table 2: Sex Wise distribution of cases

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. of cases</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>74</td>
<td>74%</td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>26%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Above table shows that in poisoning cases males comprised a majority and constituted 74 cases (74 percent) compared to females who were only 26 cases (26 percent). The male to female ratio in the study was 2.8:1 (male=74, female=26).

The mean age for males was 32.1 years and for females was 32.5 years. 72% of the cases were married.

Recomendations

On the base of various observations in poisoning deaths following measures can be adopted to minimize poisoning deaths:

1. The strict implementation of law regarding various poisoning substances, for their production, distribution, sale, storage and application. If necessary new laws may be framed and introduced.
2. Target groups should be identified and with the help of government and non-government organisations their problems should be solved.
3. Pharmaceutical companies should work for alternatives like some specific insecticides which can be used in very low doses to kill pests and at this concentration it is harmless to human being. They can add species specific emetic which will cause emesis if the poison got entry into the human body.
4. The farmers should be educated regarding use, storage and prevention while using insecticides etc.
5. Advance poisoning care centres with well equipped infrastructure should be present at every district to reduce mortality of poisoning cases.

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Abstract

Conventional autopsy has remained a valuable tool in medical teaching that allows a student to experience the information in a textbook and grasp the pathology in clinical contexts. It has played an important role in research activities and development of surgical techniques. Despite its well recognized importance 21st century is witnessing a huge decline in autopsy rates across the world for various reasons. Recently the conventional autopsy is being challenged by employment of advanced technology in which autopsy is guided by images like CT (Computed Tomography) scans, MRIs (Magnetic Resonance Imaging), MSCT (Multi slice Computed Tomography) and is named as ‘virtopsy’ or ‘virtual autopsy’. The present paper aims to put forth an overview of both methods and their suitability in Indian context.

Key words

Conventional autopsy, virtopsy, virtual autopsy, images.

Evolution of conventional autopsy

Modern medicine properly began with the institution of systematic autopsies, characterized by thorough examination and objective description. Before the adoption of complete autopsy, clinical medicine rested upon scattered observations of great merit, obscured in autopsies, characterized by thorough examination and objective description. Despite the well recognized importance of autopsies in twenty-first century medicine, there has been a huge decline in autopsy rates across the world since it has been used for medical purposes, viz. Creutzfeldt-Jakob disease, Alzheimer’s disease and West Nile Virus. Goldman believes that the autopsy will remain an important tool to diagnose the disease of old age.

Importance of autopsy

“You will remember some of what you hear, much of what you read, more of what you see and almost of all what you experience and understand fully”.

- Moore and Dalley in ‘Clinically Oriented Autopsy’

The above statement essentially reflects the value of ‘autopsy’ as a tool in medical teaching that allows a student to experience the information in a textbook and grasp the pathology in clinical contexts. This is because knowledge of the physiological process in disease states is better illustrated in autopsies.

The Royal College of Pathologists has defined ‘clinical audit’ as a process of methodically and critically appraising the quality of patient care. The main purpose is to identify the weaknesses in the system and recommend plans to rectify it. Here also conventional autopsy plays a vital role as it involves the thorough assessment of all clinico-pathologic aspects whereas clinicians diagnose only the condition that they suspect.

Surveys in many countries have revealed that there exists discrepancy in the ante-mortem and postmortem diagnoses. This discrepancy rate may be as high as approximately 40%. Every fourth diagnosis proved to be wrong in Edinburgh even when the clinicians were ‘fairly certain’ about their diagnosis. This discrepancy influences the issue of cause of death certificate which in turn definitely leads to significant error in epidemiological statistics which could have far reaching impacts on resource allocation, public health policies, and the ability to monitor outbreaks and detect environmental/occupational hazards. This again underlines the importance of conventional autopsy.

Autopsies have played an important role in research activities and development of surgical techniques. The technique of open heart surgery for example was perfected with the help of autopsies. Autopsies have also helped in the elucidation of diagnosis of specific disease viz. metastatic neoplasm and Alzheimer’s disease. It also has enabled the discovery of many new diseases ever since it has been used for medical purposes, viz. Creutzfeldt-Jakob disease, Alzheimer’s disease and West Nile Virus. Goldman believes that the autopsy will remain an important tool to diagnose the disease of old age.

Present scenario

Despite the well recognized importance of autopsies in twenty-first century medicine, there has been a huge decline in autopsy rates across the world, causing concern amongst the medical community. Factors that have contributed to the decline include distaste of the procedure in both the physicians and the relatives, lack of financial incentives, increased in faith in imaging technologies, fear of litigation, lack of importance of the autopsies in the teaching curriculum and lesser interest of the experienced in disseminating the knowledge to new comers. This has caused an immense loss of learning opportunity and fostered an attitude of apathy in physicians towards autopsy as a tool for learning.

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New alternative

The journey of ‘autopsy’ so far has been credible, though the procedures employed till now are almost a century old, though in other fields of forensic medicine, there is rapid growth and advancement in procedures performed and technologies employed. Recently the conventional autopsy is being challenged by employment of advanced technology in which autopsy is performed guided by images which is named as “Virtopsy or Virtual autopsy”. This technique is developed by Richard Dirnhofer, former director of Forensic Medicine, Berne, which was then continued by his successor, Michel Thali and his colleagues at the University of Bern’s Institute of Forensic Medicine, Switzerland. This technique can be stated in simpler way as a technique which involves the use of CT scans, MRIs, MSCT and minimally invasive biopsy to investigate the cause of death. In this technique there is no need of any dissection of the dead body for opening the body cavities or dissection of the organs of the body. By the use of different imaging techniques, which successfully provides a complete three dimensional view of the interior as well as exterior of the body, all the vital information like position and dimension of the wounds, or other pathological conditions in the body can be known and documented without the use of the scalpel.

It has the advantage of being quicker and less invasive in comparison to the conventional autopsy. It also proves useful in circumstances where relatives are unable to consent to a full autopsy due to religious/ personal reasons. As there is no mutilation of the body, re-postmortem is possible without any autopsy artifacts and acceptability of the relatives for this procedure remains on the higher side. Moreover the data can be stored in digital format making it absolutely possible to transmit it to any corner of the globe, if needed. Doctors can conduct autopsies through the internet, freeing the hospitals from the need to retain or hire forensic experts of their own. This means that hospitals with CT and MRI units can take advantage of virtual autopsies even though they have no in-house forensic expert. It also benefits the law as the three dimensional images can easily be shown in courtrooms and spare people from having to look at the traditional autopsies’ gruesome pictures of the victim’s body. The images from a virtual autopsy can also be made interactive, helping the judge and jury understand some technical facts. In a scenario where one has mass casualties and the autopsy surgeon can’t possibly autopsy every person, it can help figure out which body needs a conventional autopsy.

As far as the accuracy of virtopsy is concerned, Michel Thali and his colleagues claim that the findings of the virtopsy procedure have matched almost perfectly with those of the conventional autopsy procedures in more than one hundred autopsies. It is also claimed that when teamed together with postmortem angiography and biopsy procedures, there is little of forensic importance that the virtual autopsy cannot detect. Peter Vock, Director of Radiology, University Hospital Berne, states that results of imaging technique in case of cadaver are better, as there is no movement due to the respiratory and cardiovascular activities as in case of the living, which may at times distort the images.

This belief however seems to be questioned in a study comparing the use of MRI autopsy with the conventional autopsy. In this study, ten MRI autopsies were performed in cases of non forensic sudden unexpected adult deaths. Four radiologists were required to report their findings independently on all ten cases. In only one case out of the ten were all the radiologists able to state the same cause of death as that discovered by the conventional autopsy. In four cases, none of the radiologists were able to point the correct cause of death even though they discovered important features. Investigations performed by Patriquin et al support the above-mentioned study.

Conclusion

Many similar studies are being done and it is advocated that more research needs to be done to improve imaging techniques for pathology purposes, evaluate the sensitivity and specificity and also assess cost effectiveness.

A man of science will agree on the point that advances in technology can provide us most of the answers that we need. But there are some pockets that need to be filled before we fully rely on the newer procedure. There is insufficient database of comparative study of virtopsy and conventional autopsy. Virtopsy cannot distinguish all the pathological conditions and also cannot make out infection status. The newer method finds it difficult to differentiate ante mortem and postmortem wounds and fails to appreciate the postmortem artifacts. The appreciation of color change in the wound poses difficulty for the newer techniques. Nevertheless, it is a new development in the field of investigation of death, but still it has a long way to go to establish itself as an alternative to the conventional autopsy. Also its acceptability in the court of law is to be proved.

As far as Indian scenario is concerned [and similarly in other developing nations], few things are imperative to quote that despite all fallouts, there is no fall in rate of postmortem cases. Rather all centers empowered to conduct autopsies are overburdened with this job. Many issues (mostly financial) are attached with the autopsy of dead body so less incidence of refusal for autopsy is witnessed; moreover seeking of consent from next of kin is not mandatory in medico-legal cases for conducting autopsy. Above all, one cannot even imagine of employing these techniques for autopsy where these investigative facilities are not available easily for living individual. So being a man of science, the important thing is to keep abreast of the advancement in technologies for the sake of knowledge and forget about its employment due to various constraints till the time we overcome these constraints. Till then one should maintain believing that conventional autopsy still has an important role in modern medicine as it has been since centuries.

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Ethics in clinical research: Should guidelines be universally replaced by laws

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Abstract

Ethics defines right and wrong behaviour in a civil society and comes from within. It is different from law which regulates the external behaviour. Clinical research is research involving human beings and is a multi-million dollar industry today. It is regulated by international guidelines on the conduct of clinical trials called ICH GCP guidelines, which direct that clinical trials on human subjects should be conducted in an ethical manner. However, guidelines are only advisory in most cases and are yet to have the force of law in many countries. This is particularly relevant due to the alarming rise of ethical violations by pharmaceutical companies and research organizations wherein the safety and rights of clinical trial participants are jeopardized in pursuit of commercial and scientific gains. Stronger regulatory framework, registration of trials and ethics committees, and above all, stronger enforcement of laws in such cases are the need of the hour.

Background

"Ethics" is a generic term for understanding and examining the moral code of conduct. It defines right and wrong behaviour in a civil society and comes from within. It is different from Law which regulates the external behaviour. The basic ethical principle in the Physician-patient relationship of Non-maleficence, that is, "Do no harm" was increasingly challenged in the face of research on humans during and after World War II. Clear-cut areas of benefit and harm to patients were getting blurred and the medical conscience was disturbed by the developments. This paved the way for the birth of the new interdisciplinary science of Bioethics involving inputs from physicians, lawyers, theologians, philosophers, social scientists, and policy makers. Bioethics denotes the systematic study of the moral dimensions like moral vision, decisions, conduct and policies of the life sciences and healthcare, using interdisciplinary methods.

Biomedical research involving humans is called Clinical Research, which is regulated by international guidelines on clinical research ethics. Major landmarks in this regard are the Nuremberg Code on Experimentation on Human Subjects (1947), the Declaration of Helsinki by the World Medical Association (1964) and the Belmont report (1979). The document to be followed for conducting research worldwide is the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Guidelines for Good Clinical Practice, Current Step 4 version, dated 10 June, 1996) or, ICH GCP, in short. Countries use it as a basis for making their own clinical research guidelines.

Clinical research is a multi-million dollar industry today. After a promising new molecule is discovered, it is tested on animals (preclinical studies). If it passes this stage, subject to approval by the drug regulatory agency of the country, human trials are conducted for demonstration of efficacy and safety of the drug before releasing it for marketing. Clinical trials are conducted in four phases with varying duration and number of participants. The ethical conduct of clinical trials is regulated by this agency and also by the independent ethics committee which approves the trial.

Guideline is any document that aims to streamline particular processes according to a set routine, eg, ICH GCP. Regulation is a law or legal requirement passed by the Parliament and is enforceable, eg, Schedule Y.

The ICH Guidelines for Good Clinical Practice (GCP) for trials on pharmaceutical products endorse the Declaration of Helsinki as the accepted basis for clinical trial ethics. GCP is an international ethical and scientific quality standard for designing, conducting, recording, and reporting trials. Compliance with this standard provides public assurance that the rights, safety and well being of trial subjects are protected and that the clinical trial data are credible. Some important paragraphs from the declaration are briefly summarized below:

- Vulnerable research populations require special protection.
- Research must be based on knowledge of laboratory and animal experimentation.
- The protocol for a clinical trial should be reviewed by an independent ethical review committee. The researchers must report any adverse events to this committee.
- The design of all studies should be publicly available.
- Investigations should be ceased, if the risks are found to outweigh the potential benefits.
- The research is only justified, if there is a reasonable likelihood that the populations in which the research is carried out stand to benefit from the results of the research.
- Participation in a trial must be voluntary and participants must be informed. Physicians should obtain freely-given informed consent from each participant.
- Subjects who cannot provide informed consent themselves, for example children, should only be included in the research which cannot be performed on other subjects instead.
- The benefits, risks, burdens and effectiveness of a new therapy should be tested against those of the best currently available therapy. Placebo-controlled trials should only be allowed if no proven therapy exists or under special circumstances.
- At the conclusion of the study, all trial participants should be assured access to the best proven therapy identified by the study. Post-trial access arrangements must be described in the trial protocol.
- When medical research is combined with medical care, the physician should inform the patient which aspects of the care are related to the research.

Introduction

The legal force of ethical declarations and related regulations on the conduct of clinical trials in human subjects varies from country to country. In the US, the Code of Federal Regulations only come under legal documents, but the FDA (drug regulatory body) also issues guidance documents which can be legally enforceable as they are state of the art guidelines and infringements thereof constitute gross negligence. Other countries like the UK had earlier issued or ratified guidelines which had not been incorporated into any legal framework.

On 1st May 2004, however, new regulations came into force across Europe to protect the rights, safety and wellbeing of patients participating in clinical trials of investigational medical products (IMPs). This EU Clinical Trial Directive 2001/20/EC relates to the implementation of Good Clinical Practice (GCP) in the conduct of clinical trials of IMPs. It was incorporated into UK law by the Medicines for Human Use (Clinical Trials) Regulations 2004. The EU in July 2006 issued guidance on GCP issues. Anyone designing or conducting a clinical trial of an
IMP had to now comply with these regulations. However, the directive itself is not a law that individuals must comply with. It only requires that EU member state governments incorporate the policies contained in the directive into their own national law. Even in the UK, “ICH is only mentioned in the recital of European Directive 2005/28/EC. The recital is not legally binding”; “Some member states chose to make ICH GCP their legal standard – the UK did not.”

In India, we have Schedule Y of the Drugs and Cosmetics (1nd Amendment) Rules 2005 as a binding legal document which recommends that Indian GCP should be followed for clinical trials. Indian GCP Dec 2001 is based on ICH GCP, WHO, US FDA, European GCP guidelines and Ethical Guidelines for Biomedical Research on Human Subjects issued by the Indian Council of Medical Research.

There have been numerous occasions wherein pharmaceutical companies, research organizations and institutions involved in biomedical research, have violated ethics and the safety and rights of trial subjects for scientific and commercial gains. In the light of such transgressions, the question is how long we can wait before guidelines give way completely to the force of law all over the world.

Instances of unethical practices in clinical research in a post ICH GCP world

1. Inadequate pre-clinical safety data
   Trials on a promising new anti-diabetic drug Ragaglitazar was stopped midway following reports of drug-induced urinary bladder tumours in laboratory mice and rats. The company sponsoring the trial as well as the regulatory agency allowed the clinical trial to continue for five months after the detection of the aforesaid animal data before finally calling a halt. Preclinical carcinogenicity studies were lacking in this case which are necessary for any drug developed for treating a chronic disease, like diabetes.

2. Absence of regulatory clearance
   Eight patients died due to administration of a recombinant fibrinolytic drug Streptokinase to test its safety and efficacy in myocardial infarction. No permission was taken by the biotechnology company (which was sponsoring the trial) from the Genetic Engineering Approval Committee, the authority to clear such trials.

3. Lack of preceding phase completion
   Clinical trials proceed in an orderly manner from phase 1 to 4 as progressively larger number of trial subjects are exposed to the investigational drug. However, phase-3 trials for Glasebron, a new drug for treatment of irritable bowel syndrome and for Zoniporide, meant for management of perioperative cardiac events, were carried out in India before phase-2 trials were completed anywhere else in the world.

4. Lack of ethical committee clearance
   In a meningitis outbreak in Nigeria, a company tested its new drug Trovafloxacin on affected children in an infectious diseases hospital. It was never tested on children before and eleven of them died; others had seizures or became paralysed. Besides other violations, there was no ethical committee clearance for the trial.

5. Rubber stamping of trials by ethical committees
   Some independent ethical committees (IECs) are guilty of rubber-stamping clinical trials without any ethical considerations. This is due to lack of competence. Local ethics committees show wide variation in practices, resources, quality and experience. Assessment of performance is perhaps the most important problem facing the system since there are no standard measures of performance for the system as a whole or for assessing local IRBs. Some cursorial clearance of trials may also be attributed to the objective of getting more customers in case the IECs are professional bodies charging fees for consultation.

In a trial of an antibiotic, the IEC was warned by the drug regulatory authority as well as the employees of the company sponsoring the study about the hazardous trial, but the IEC ignored such genuine warnings, even after trial participants started dying of liver failure.

It is also possible to fraudulently obtain ethical clearance by “IRB shopping”, that is, when a trial is rejected by an IEC/IRB, the sponsor applies to another IEC without revealing details of previous rejection. The cycle goes on till the company manages to find a flexible IEC which approves its study.

6. Inefficient regulatory bodies
   Allowing trials to proceed without adequate pre-clinical safety data, phase-3 trials without completion of phase-2 is the fault of regulatory oversight. Moreover, incomplete information on adverse effects, even defective study designs and protocols have passed through the offices of regulatory agencies without objection.

In a study on Tacrolimus, an immunosuppressant, there was omission of statement about the phase of trial, as well as exclusion of all important adverse effects in the documents submitted to the regulatory authority for approval; yet, it was passed.

Regulatory bodies are also guilty of approving some trials in which there was no undertaking by the sponsor of compensation in the event of trial related injury, disability or even death.

Regulators have even rewarded companies on the basis of unethical trials. A case in point is the trial on Trovafloxacin mentioned earlier, which was undertaken with the aim of obtaining approval from the US FDA for use in the US in a larger clinical trial. A year after the Nigerian trials, FDA gave the approval on the basis of the scientific results of the study in Nigeria.

7. Conflict of interest
   Neither regulatory bodies nor IECs ask for conflict of interest information from investigators. This is important because financial incentives to investigators by the sponsor may influence the outcome of the study. If such declaration is made, the study results may be seen in true perspective. This holds true for IECs as well. There was a case in which the IEC approving an unethical trial was owned by the wife of the vice-president of the company which sponsored the trial.

8. Lack of strong regulatory framework
   Even on occasions where evidence of ethical violations has been detected by drug regulatory bodies, there was no strong punitive action taken against the offenders. Twenty six patients of oral cancer were tested without their knowledge with a new experimental drug NDGA while withholding the standard treatment, even before preclinical safety was established. Two patients died and trials on the drug were suspended for 6 months by the drug regulatory body. The scientist involved was barred by the sponsor from serving as principal investigator in any further research on humans. But the case warranted stronger action such as imprisonment of the guilty.

9. Use of placebo
   The use of placebo controls is a grey area; proponents say that they are useful to determine true efficacy and safety of many treatments, especially if used in the trial of a new drug for which there are no existing counterparts. But where standard therapy exists, it is unethical to use a dummy treatment, thus allowing the patients to suffer. The use of placebos in developing countries in trials designed to reduce maternal to child transmission of HIV-1 where the standard treatment Zidovudine was available, violated the standard of care principle where best available treatment should have been given to control arm of trial participants against test (new treatment) arm.

10. Treatment interruption and standard of care issues
    In a trial on Risperidone, an antipsychotic drug, patients of acute mania were taken off from existing medication saying it was not effective.
available and treatment was discontinued. They subsequently received Risperidone or a placebo, thus exposing one group to risk by withholding standard treatment. In another trial on HIV-AIDS patients, treatment interruption resulted in greater rate of clinical HIV-related disease. Deaths occurred and warnings were sounded. Moreover, re-initiating anti-HIV treatment brought about no improvement in these patients. Thus the best available treatment was ethically withheld to the detriment of trial subjects².

11. Lack of informed consent
Informed consent is a process wherein the essential elements are effective communication, full information and freely given competent consent. Thus the key elements are competence, voluntariness, full information and full comprehension⁴. Many trials have occurred in which the participants were never told that they were undergoing a clinical trial. 400 young women with problems of infertility were tested with the anticancer drug Letrozole to detect whether it helps in ovulation. None of the women were informed that this was an experimental treatment. The NDGA trial mentioned above is another example. The patients were not informed that they were being denied an established treatment⁵.

Even if the subjects know that they are undergoing a clinical trial, they are often not informed or explained about certain aspects. In trials on prevention of HIV transmission with the anti-HIV drug Tenofovir in Cameroon, 400 commercial sex workers were enrolled, but they were not adequately informed about the risks involved. These French-speaking women were counseled in English only, which goes against the requirement of informed consent that is it should be explained in their local language as well. Five women became HIV-infected. Similar was the case with the anti-HIV drug VGV-1 trials in China, where trial participants were not informed about risks involved and no effort was made to explain incomprehensible aspects of the informed consent form⁶.

In a premier health institute in India, 49 babies died while clinical trials for a pneumonia vaccine were conducted. Most of the children belonged to poor and uneducated families and the parents of the children could not fully comprehend the risks that were involved with the experimental treatment⁷.

Omission of important adverse effects or risks in the consent form is another factor. In a trial involving the immunosuppressant compound TGN1412 as experimental treatment in Rheumatoid arthritis, the consent form lacked sufficient information about risks involved. Volunteers developed multi-organ failure within minutes of administration of the drug⁸.

Many a time, informed consent is not taken at all, citing vague reasons, as in the Trovafloxacin trial in Nigeria, where the company took verbal consent from the people as they were illiterate⁹.

Any change in trial protocol must be informed to participants, but this does not always happen, as in the Prevention of mother to child transmission (PMTCT) trial with Nevirapine, an anti-HIV drug used in Uganda, wherein investigators administered doses different from what was mentioned in the original protocol⁵.

12. Negative risk – benefit ratio
Treatment interruption trials mentioned above had a definite negative risk – benefit ratio and should never have been cleared. In an experiment on estimation of pesticide levels absorbed by children under 3 years, parents were asked to spray pesticide in the child's room, but there were no pests in the room altogether. So, there was needless exposure to a toxic compound without any benefit to the subject, thus blatantly skewing risk – benefit ratio¹⁰.

13. Compensation issues
This is another contentious issue. Concerns exist regarding the potential for payment to unduly influence participation and thus obscure risks, impair judgment, or encourage misrepresentation¹¹. Inducements to volunteers with money for participation in trials should be regulated. Although compensation is necessary, it should be proportionate to the degree of risk involved and should not be the overriding factor to participate in a trial. In the instance of pesticide testing in children mentioned above, disproportionate inducements to parents, like video cameras were provided as incentive¹².

In trials conducted in a contract research organization in the US, compensation was back loaded towards the end of the trials, thus pressurizing participants unfairly to complete them¹³. Moreover, industry research sponsors are increasingly paying fees to health-care professionals to encourage them to recruit patients for trials¹⁴,¹⁵.

14. Non-uniformity of regulations across countries
A new drug for treatment of hepatitis C called Histamine 2HCl (Maxamine) was not allowed to be tested in humans by US FDA before any animal tests were conducted. The company could not get approval for phase 3 trials in the US, so it moved to Russia where researchers were not aware of the FDA directive as it was not mentioned in the consent forms. It was approved in a month.

In a multi-centre trial of Aloseltron for treatment of irritable bowel syndrome, involving many countries, the drug was withdrawn from the US market following safety concerns by the FDA, but 7500 trial participants in other countries continued to receive the drug. The company stated that it would take over a month to phase out the studies in other countries⁵.

15. Lack of special protection to vulnerable groups
Vulnerable subjects are regarded as individuals whose willingness to volunteer in a clinical trial may be unduly influenced by the expectation, whether justified or not, of benefits associated with participation, or of a retaliatory response from senior members of a hierarchy in case of refusal to participate. Examples are students, employees, prisoners, unemployed or impoverished persons, patients in emergency situations, ethnic minority groups, homeless persons, refugees, minors and those incapable of giving consent, like mentally retarded patients etc.¹⁶ In trials conducted in a particular centre in the US, trial participants were found to be largely poor immigrants from Latin America. FDA detected many ethical violations. Participants were not always allowed to leave at any time and the company threatened to arrange federal deportation of the immigrants if they disclosed unethical aspects of the trials. In another case, Phase-1 and phase-2 clinical trials of anti-HIV drugs and vaccination against infectious diseases were conducted on HIV-infected children and infants living in a foster care facility under the guardianship of New York city Agency for Children’s Services (ACS). The children were forced to take the experimental drugs that made them severely ill and had potentially lethal side effects. US Code of Federal Regulations (45 CFR 46.409 and 21 CFR 50.56) prohibits use of children who are wards of the state from being subjected to experiments involving greater than minimal risk⁵.

16. Insufficient post-trial benefits
After the launch of the anticancer drug Imatinib in the US and Europe, 7500 patients received the drug during clinical trials for regulatory approvals in other countries, but subsequently, post-trial access was denied over price disputes with governments of the respective countries. In the treatment interruption anti-HIV drug trials mentioned earlier, post trial benefits were absent and one of the drugs was not available in the country.¹⁷ In Thailand, in a trial using the anti-HIV drug Tenofovir on intravenous drug users with HIV infection, post-trial access to the drug was available only for a year whereas two years was the prevailing norm for post trial benefits in the country. The study design also did not provide for care of trial participants in the intervening period.
between study closure and marketing approval.12

17. Fraudulent and unlawful practices
In the Trovafloxacin trial in Nigeria, a forged and backdated letter from a non-existing IEC was produced by the sponsor as proof of ethical clearance.11 In the case of a US based research centre, the trial participants were pressurised to sign false statements to cover up unethical practices. In a trial with the drug Cariporide for myocardial protection after angina, artery-clearing or bypass surgery, which was conducted in Argentina, none of the 137 participants consented. Eighty signatures were forged in the consent forms, and the rest had signed without knowing the contents. Thirteen patients died, following which data in medical records were changed and key documents disappeared. In the PMTCT trials with the anti-HIV drug Nevirapine, insufficient documentation, delays and under-reporting of serious and life-threatening adverse effects were rampant. Moreover, fourteen deaths of trial subjects were not reported to the regulatory authority. When irregularities came to light, the company asked the health institute with which it was conducting the study to destroy an early copy of the research report before audit by the US FDA.12

Regulation of unethical clinical research

If we have a look at the regulatory or legal response to the above infringements in conduct of clinical trials, it is woefully inadequate, except for a few cases. In the Trovafloxacin trial, the Nigerian government inquiry reported that the company indulged in “exploitation of the ignorant”. It pressed criminal charges against the company that it caused grievous harm to research participants and sought 2 billion US dollars as damages.11 In the Cariporide trials in Argentina, criminal lawsuit was filed against the involved parties, and 3 of the 13 deaths were regarded as murders as the right treatment was not given to the trial subjects. The Streptokinase trial in India sponsored by a biotechnology company was declared as illegal by the Supreme Court. In the case of an IEC clearing a trial, unethical despite warnings by the drug regulatory body, it was subsequently imposed restrictions by the latter.12

Remedial measures for improved regulation of clinical research include
1. Mandatory registration of clinical trials in a clinical trials registry before enrolment of the first trial participant, with penalty for non-compliance.
2. Tighter regulatory framework with greater empowerment of drug regulatory authority.
3. Disclosure of composition of hospital ethics committees which approve the trial.
4. Mandatory declaration of conflict of interest by the IECs as many hospitals are now owned by pharmaceutical companies. Moreover, there should be no financial relationships between the regulatory agencies and the companies they regulate. Banning of payments to expert witnesses for specific research results, testimony or legal outcomes is also proposed.
5. Registration of IECs to prevent IEC shopping.
6. Governmental, private and non-governmental organizations can disseminate awareness and information on rights of participants in clinical trials.
7. Greater transparency of research outcomes, whether they are positive or negative, by publishing research results and making them accessible to one and all.
8. Address training needs of researchers in bioethics and regulatory affairs. Training of personnel in IECs and regulatory agencies is also vital and should be updated.
9. Reporting of unethical practices in clinical research, especially in case of fraud, deception, plagiarism, fabrication and falsification by trial participants or any other interested parties to appropriate regulatory and legal authorities. Public interest litigations (PILs) may be filed.
10. Researchers found guilty of ethical misconduct should be barred from conducting research activity for variable periods, proportionate to the degree of misconduct.11
11. Regulatory bodies should also be made more accountable to the ministry of health and family welfare for their role in ensuring protection of trial participants.

Of the above, registration of clinical trials is a reality but has not been made mandatory in India. In the Clinical Trials Registry – India, registration is voluntary but some fields marked are mandatory for registration to proceed. Some fields marked WHO also need to be filled if the trial is to receive a registration number that fulfills WHO requirements.14 Potential trial participants need all the information available about a given treatment before getting enrolled in a trial. Researchers need all available information about a particular treatment and results of previous and ongoing trials. Clinical trial registration helps in these matters by ensuring that investigators submit basic results to a public database. In another positive move, registration of Clinical Research organizations (CROs) with the licensing authority defined in Clause (b) of Rule 21 has been made possible in India by including new provisions of Drugs and Cosmetics Rules 1945 as Schedule Y-1. The provisions authorize the Drugs Controller General of India (DCGI) to conduct surprise inspections of the CROs. Registration of all IECs in the country is also being planned in India. In a bid to empower the DCGI, the Indian government plans to amend the Drugs and Cosmetics Act to slap up to 10 years imprisonment and cancellation of licence for violating ethical norms for clinical research. The move seeks to redress the issue of DCGI’s failure to take action against several companies due to the absence of legal provisions even after finding evidence of unethical practices during audits. PILs have been filed in 3 cases in South Africa where irrational, discriminatory and arguably unethical decisions of government authorities pertaining to health research were successfully challenged in courts. This model can be extrapolated to the case of unethical practices in clinical research by companies and research organizations. There should be provision for trial participants and other interested parties to seek legal redress outside the ethics review system. Community Advisory Bodies (CABs) were developed in response to the need for proving a forum to discuss issues that might arise in the course of research involving subjects with AIDS. CABs, as advocated by National Institute of AIDS Research, have participating workers, patients, vulnerable groups and others concerned who are committed to disseminate awareness and information on rights of participants in clinical trials.

Conclusion

In the light of the blatant flouting of ethical norms by commercial and research organizations involved in clinical trials, a stronger regulatory framework is the need of the hour. Perhaps it is time for guidance documents to assume the force of law in all countries for uniformity of enforcement. A provision of negligence in ethical conduct of clinical trials can be implemented worldwide. Even though it is not advisable for the judiciary to interfere in matters of science, it can be a powerful deterrent to errant companies and institutions which take advantage of lax regulations, inefficient ethical review systems and vulnerable populations to further their research at the cost of the safety and rights of trial participants. There is a need for the principles of ICH GCP to have legal binding, so that the declaration of the World Medical Association, “Clinical research on human subjects should adhere to the highest ethical standards” becomes a reality.

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Ethylene di-bromide (EDB) – An underestimated lethal pesticide and its emerging clinico-biochemical trends


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Key words
Ethylene Di-bromide, SGOT, SGPT, Creatinine, Urea, Prothrombin time.

Objectives
• To study biochemical laboratory findings in EDB poisoning, with special reference to liver and kidney function test.
• To estimate the hospital stay of the patient in EDB poisoning.
• To clinically correlate these biochemical lab findings with the hospital stay in EDB poisoning cases.

Introduction
Ethylene Di-bromide, also called as 1,2-Dibromoethane is a pesticide and gasoline additive. It is mostly man-made, but also occurs naturally in the ocean in very small amount. It is a liquid at ambient temperature that has irritant effect locally to skin, eye mucous membrane and respiratory tract along with systemic damages to lungs, liver and kidneys in acute exposure. The systemic effect in part is due to conversion to the cell toxicant 2-bromoacetaldehyde. Ethylene Di-bromide alkylate macromolecules causes cellular disruption and reduced glutathione levels. Cellular disruption in tissues and organs such as liver and kidney, result in progressive dysfunction. It is sparingly soluble in water and miscible with most organic solvents.

Odour of EDB is very difficult to be detected. LD50 of EDB has been calculated for rat which is estimated to be 108 mg/kg, 250 mg/kg for mice, and 55 mg/kg for rabbits. It is a highly toxic compound and is labeled with a ‘DANGER’ signal word. Inhalation is the most hazardous route of exposure to EDB. Lowest dose that caused mortality in woman was 90 mg/kg body weight.

Until recently, ethylene di-bromide (EDB) was used extensively as a soil and post-harvest fumigant for crops, and as a quarantine fumigant for citrus and tropical fruits and vegetables. In 1983, the Environmental Protection Agency (EPA) suspended the use of EDB as a fumigant when low-level residues were found in groundwater and some grains. Today, EDB is principally used as a scavenger additive in leaded gasoline. It is also registered for use as a gas in termite and Japanese beetle control, beehive and vault fumigation, and spot fumigation of milling machinery.

Material method
All the Indoor patient of EDB poisoning, from October 2006 to October 2009 were studied in respect to their clinical and biochemical laboratory findings with special emphasis on Liver function test and Renal function test. Total 31 cases were admitted in the hospital with history of EDB poisoning out of which some of these patients were discharged, some left against medical advice and 04 patients died in hospital. Post-mortem was carried in the mortuary of SAIMS. In Liver function test, a day to day record of SGOT, SGPT, Bilirubin (Total, Direct and Indirect) was maintained and the study was made so as to ascertain the rise of these parameters in day to day basis. Similarly the serum creatinine, urea, electrolyte and Protein (Total protein, albumin, globulin and Albumin/Globulin ratio) levels were studied in live and dead patients along with blood parameters like prothrombin time, TLC and DlC. All these findings were based on the reports given by central laboratory of SAIMS, Indore.

Observation and results
Table 1: Out of the total 27 patients (pt.) who were alive, 16 pt. showed max. SGOT and 17 pt. showed max. SGPT within the normal range, 6 pt. had max. SGOT and max. SGPT in the range between 40-100 IU/l, 4 pt. had max. SGOT and three had max. SGPT in the range between 100-500 IU/l and 1 pt. had both max. SGOT and max. SGPT in the range above 1000 IU/l. Out of the total 4 pt. who died inspite of the treatment given, only 1 had the max. SGOT and max. SGPT within normal range and rest 3 had SGOT and SGPT above 1000 IU/l.

Table 2: Out of the total 27 pt. who were alive after proper treatment, 22 pt. showed max. Total Bilirubin; 4 pt showed max. Direct Bilirubin and 24 pt. showed max Indirect Bilirubin above the normal range. 23 pt showed max. Direct Bilirubin; 5 pt. had max. Total Bilirubin and only 2 pt. showed max Indirect Bilirubin above the normal range. None of the pts. that were alive had less than normal, total and Direct Bilirubin, but only one pt showed max. Indirect Bilirubin less the normal range. Out of the total 4 pt. who died, all had the max. Total Bilirubin, max. Direct Bilirubin and max. Indirect Bilirubin level above the normal range except one who’s Indirect Bilirubin was below normal range, which went upto 0.11 mg/dl.

Table 3: Out of the total 27 pt. who were alive after proper treatment; 26 pt. showed max. Creatinine and 24 pt. showed max. Urea within the normal range, only 1 pt. had max. Creatinine and 3 pt. showed max Urea above the normal range. Out of the total 4 pt. who died, all 4 had the max. Creatinine and max. Urea level above the normal range.

Table 4: Out of 22 live pt. 17 pts showed Sodium (Na), 20 pt showed Potassium (K) and 19 pt showed Chloride (Cl) within normal range and similarly 5 pt. showed Na and 3 pt showed Cl more than normal range. None of the live pt. showed K more than normal rather 2 pt. showed value below normal range which went upto 2.47 meq/l. None of the pt. showed Na and Cl below normal range in live pt. In the 4 pt. who cannot be saved 2 pt showed Na and K and 1 pt showed Cl within normal range. 1 pt. each showed Na, K, Cl more than normal range, while 1 pt. showed Na and K and 2 pt. showed Cl below the normal range.

Table 5: Calcium Phosphorus Magnesium (Ca, P, Mg) done in only 07 cases (5 live cases and 2 dead). Out of 5 live cases in which these investigations were done 3 pt. showed Ca and P and 4 pt. showed Mg within normal range; 1 pt. showed Ca and P and Mg more than normal range while 1 pt. showed Ca and P less than normal range. None of the pt. showed Mg below normal range. Amongst 2 pt who died both showed Ca within normal range P less than normal range and 1 each showed Mg within normal range and more than normal range.

Table 6: Serum Protein done in only 19 cases (15 live and 4 dead). Out of the total 15 pt who were alive, 14 showed max. total protein and Albumin while 9 pt showed max. globulin and 3 pt. showed max A/G ratio within the normal range. 6 pt showed max. globulin and and 1 pt. had max. Albumin above the normal range. None of the pts. That were alive had total protein and A/G ratio above normal range. 12 pt. had A/G ratio and 1 pt showed total protein less the normal range. Out of the total 4 pt. who died all had the max. albumin, 2 had total protein; 1 had Globulin and 3 had A/G ratio within normal range. 2 pt. had Globulin and 1 pt. had total protein level above the normal range. None of the pt. who died had albumin and A/G ratio above the normal range. While 1 pt. each had total protein; globulin; and A/G ratio
below normal range.

Prothrombin time

Prothrombin time was done in total 22 cases of which 18 cases were alive and 4 cases died in spite of the treatment given. All the four cases who died showed PT more than normal range which went up to max. > 2 min as against 14 sec calculated by control. In live cases 4 pt showed PT above the practical normal limit which went max up to 21 sec as against 14 sec calculated by control.

TLC and DLC

Out of total 23 cases, 20 cases were live and 3 cases died in spite of the treatment given. In 7 cases (5 live and 2 died) TLC increased above normal range which went up to 25,100. 9 cases (7 live and 2 died) showed lymphopenia to the extent of just 3% of the total leucocytes. None showed the raised number of lymphocytes. 11 cases (9 live and 2 died) showed neutrophilia up to max of 95% of the total leucocytes and just 1 case showed neutropenia which was as low as just 1% but.

Discussion

In our study it is seen that only 4 cases died in our hospital out of total 31 cases which were admitted with history of EDB poisoning in three years of retrospective study, while in another study 14 deaths occurred due to acute EDB poisoning in three years of retrospective study. Another study suggests that only a few cases of acute ethylene-di-bromide toxicity have been reported and all of them have resulted in a fatal outcome. Out of 64 patients, 26 (40.6%) survived and 38 (59.4%) expired.

As shown in Table-1 and 2 and Graph-1, the SGOT and SGPT were raised to a higher level much above 1000 IU/L in 3 cases out of 4, which died in the hospital. Similarly the Total and Direct Bilirubin was raised in all the 4 cases which died while Indirect Bilirubin was raised in 3 cases out of total 4 cases which died. The Direct Bilirubin was raised in 23 cases which were alive out of total 31 cases suggesting hepatic origin of jaundice. Not much has been studied regarding raised value of SGOT and SGPT. In one of the study it was found that the Bilirubin is elevated, and SGOT, SGPT and alkaline phosphatase, may show mild-to-marked elevation. In Dead cases maximum range of SGPT went up to 11,700 (IU/L) and SGOT went up to 8,610 (IU/L), while in live cases maximum range of SGPT went up to 4,300 (IU/L) and SGOT went up to 6,440 (IU/L). Maximum range of Total Bilirubin for live cases went up to 1.87 mg/dl, that of Direct Bilirubin was 0.85 mg/dl, and of Indirect Bilirubin was 1.48 mg/dl. Similarly Maximum range of Total Bilirubin for dead cases went up to 4.85 mg/dl, of Direct Bilirubin 3.9 mg/dl, and of Indirect Bilirubin was 2.71 mg/dl.

Another important finding noticed was, that at the time of admission of EDB poisoning cases the value of SGOT and SGPT was normal and after 2nd or 3rd day the value suddenly raised to its peak (showing maximum value) in majority of cases and then it declined. This suggested the delayed involvement of liver. Hepatotoxicity was observed in 28 patients (43.7%) in the form of jaundice, elevated liver enzymes.

As shown in Table-3 and Graph-2, Creatinine and Urea were more than normal in all the 4 cases which died in the hospital. For live cases maximum range of Creatinine went up to 2.25 mg/dl and Urea went up to 4.2 mg/dl and Urea level was always above 50 mg/dl and went up to 102 mg/dl. This suggested that once kidney gets involved and the figure reaches above the described value, it becomes very difficult to save the patient even after plasmapheresis. In a case report of ethylene-di-bromide poisoning presenting with acute renal failure and toxic hepatitis that was managed

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Table 1: Number Of Patient With Normal Or Raised Sgot And Sgpt

<table>
<thead>
<tr>
<th>S.no</th>
<th>Total no.of Patient</th>
<th>Max. SGOT</th>
<th>Max. SGPT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
<td>Dead</td>
<td>Total</td>
</tr>
<tr>
<td>1.</td>
<td>Within normal range</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Between 40-100 (IU/L)</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Between 100-500 (IU/L)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Between 500-1000 (IU/L)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>&gt;1000 (IU/L)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>Total</td>
<td>27</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2: Number of patient with normal or raised bilirubin level

<table>
<thead>
<tr>
<th>S.no</th>
<th>Max. Bilirubin (mg/dl)</th>
<th>Normal</th>
<th>More than normal</th>
<th>Less than normal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
<td>Dead</td>
<td>Total</td>
<td>Live</td>
</tr>
<tr>
<td>1.</td>
<td>Total</td>
<td>22</td>
<td>-</td>
<td>22</td>
</tr>
<tr>
<td>2.</td>
<td>Direct</td>
<td>4</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Indirect</td>
<td>24</td>
<td>-</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 3: Number of patient with normal or raised creatinine & urea level

<table>
<thead>
<tr>
<th>S.no</th>
<th>Parameter for kidney function</th>
<th>Creatinine</th>
<th>Urea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
<td>Dead</td>
<td>Total</td>
</tr>
<tr>
<td>1.</td>
<td>Within normal range</td>
<td>26</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>More than normal</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Grand total</td>
<td>27</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4: No. of PT. with normal or raised electrolytes level

<table>
<thead>
<tr>
<th>Sno.</th>
<th>Electrolyte</th>
<th>Na</th>
<th>Dead</th>
<th>Total</th>
<th>K</th>
<th>Dead</th>
<th>Total</th>
<th>Cl</th>
<th>Dead</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Within normal range</td>
<td>17</td>
<td>2</td>
<td>19</td>
<td>20</td>
<td>2</td>
<td>22</td>
<td>19</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td>More than normal</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Less than normal</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>Grand total</td>
<td>22</td>
<td>4</td>
<td>26</td>
<td>22</td>
<td>4</td>
<td>26</td>
<td>22</td>
<td>4</td>
<td>26</td>
</tr>
</tbody>
</table>
successfully, has been reported\(^2\). In our study it was also seen that in many cases the maximum level of creatinine and urea peaked after 5\(^{th}\) day. In a study they mentioned that, there may be proteinuria and haematuria\(^2\). Amongst those who expired, 20 (52.5%) showed frank manifestations of hepatic failure and renal failure both. Four (10.5%) patients showed only renal manifestations in the form of renal failure and four (10.5%) only hepatic manifestations. Nephrotoxicity was seen in 32 patients (50%) with features like haematuria, albuminuria, uremia and oliguria\(^5\).

As shown in Table-4 and 5, maximum range of Sodium (Na), potassium (K), Chloride (Cl) level in all live or dead cases, was not much deranged, i.e. not much above normal range. Maximum Na went upto 151 meq/l; Cl went upto 108 meq/l; and K was always within normal range. Although minimum level of Na went upto 120 meq/l, that of K upto 2.47 meq/l and of Cl upto 50 meq/l. Calcium Phosphorus Magnesium done in only 07 cases (5 live cases and 2 dead) out of 31 cases, hence much opinion could not be drawn, since very less number of cases underwent this investigation.

As shown in Table-6, Serum protein level showed variable changes. In some of the cases the Globulin was raised and A/G ratio was decreased. Total protein went min upto 3.41 gm/dl and max upto 8.9 gm/dl. Albumin level went maximum upto 5.9 gm/dl. Globulin went maximum upto 4.2 gm/dl and minimum upto 1.54 gm/dl. A/G ratio in most of the cases was 1 or less which went minimum upto 0.9.

Prothrombin time (PT) also acts as an important parameter to judge the criticalness of the patient. As it is seen that PT was increased in all the four cases who died, which went more than 2 min as against 1.4sec calculated by control. In live cases 4 pt showed PT above the practical normal limit which went upto 2.1sec as against 1.4sec calculated by control. Increased prothrombin time and bleeding time has been observed in one of the study of EDB poisoning\(^4\). In many cases there was raised TLC which went upto 25100 along with Neutrophilia, which suggests acute inflammatory reaction.

**Clinical correlation**

- Raised TLC AND NEUTROPHILIA has been seen in 50% dead cases
- More than 70% cases showed ELECTROLYTES within normal range.
- Raised Kidney Function Test (Serum creatinine and urea level) & Prothrombin time.
- Over 70% cases showed DIRECT BILIRUBIN in all the dead cases and 22 live cases which went upto more than 10 times the normal range (not so in total and indirect bilirubin).
- All the 4 cases which died showed raised Kidney Function Test (Serum creatinine and urea level) & Prothrombin time.
- Over 70% cases showed ELECTROLYTES within normal range.
- Raised TLC AND NEUTROPHILIA has been seen in 50% dead cases and in significant live cases.

**Public health statement and health effects**

The Environmental Protection Agency (EPA) has identified 1,177 sites on its National Priorities List (NPL), 1,2-Dibromoethane has been found at 9 of these sites. We can be exposed to low levels of 1,2-dibromoethane in drinking water (especially well water), in areas where the chemical was used in farming or from hazardous waste sites and in air by evaporation or in the food we eat. The air most people breathe contains between 0.01-0.06 parts of 1,2-dibromoethane per billion parts of air (ppb). Groundwater is more likely to contain 1,2-

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**Table 5:** No. of PT. with normal or raised electrolytes level

<table>
<thead>
<tr>
<th>S No.</th>
<th>Electrolyte</th>
<th>Calcium</th>
<th>Total</th>
<th>Phosphorus</th>
<th>Total</th>
<th>Magnesium</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
<td>Dead</td>
<td></td>
<td>Live</td>
<td>Dead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Normal</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>More than Normal</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Less than Normal</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Grand Total</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 6:** No. of PT. with normal or raised protein level

<table>
<thead>
<tr>
<th>S No.</th>
<th>Protein</th>
<th>Total Protein</th>
<th>Albumin</th>
<th>Total</th>
<th>Globulin</th>
<th>Total</th>
<th>A/G</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
<td>Dead</td>
<td>Live</td>
<td>Dead</td>
<td>Live</td>
<td>Dead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Normal</td>
<td>14</td>
<td>2</td>
<td>16</td>
<td>4</td>
<td>18</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>&gt; Normal</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>&lt; Normal</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>4.</td>
<td>Grand Total</td>
<td>15</td>
<td>4</td>
<td>19</td>
<td>15</td>
<td>4</td>
<td>19</td>
<td>19</td>
</tr>
</tbody>
</table>

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**Conclusive remarks**

**Biochemical lab findings**

- SGOT and SGPT were raised to levels above 1000 IU/L in 3 cases out of 4 in the dead cases.
- DIRECT BILIRUBIN was raised in all the dead cases and 22 live cases which went upto more than 10 times the normal range (not so in total and indirect bilirubin).
- All the 4 cases which died showed raised Kidney Function Test (Serum creatinine and urea level) & Prothrombin time.
- Over 70% cases showed ELECTROLYTES within normal range.
- Raised TLC AND NEUTROPHILIA has been seen in 50% dead cases and in significant live cases.

**Graph 1:** Day with highest SGOT and SGPT level

**Graph 2:** Days with highest level of Creatinine and Urea

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\(^{1}\) Refer to the original source for detailed information on the study results.

\(^{2}\) Refer to the original source for detailed information on the study results.

\(^{3}\) Refer to the original source for detailed information on the study results.

\(^{4}\) Refer to the original source for detailed information on the study results.

\(^{5}\) Refer to the original source for detailed information on the study results.
dibromoethane with an average concentration of about 0.9 ppb. In foods, 1,2-dibromoethane has recently been found in 2 out of 549 samples at concentrations of 2 and 11 ppb.

When administered to rats by gavage at a dosage of 110 mg/kg/day, this lesion is corroborated by an increase in liver triglyceride levels that begins within 8 hours of treatment. Rats developed centrilobular dilatation within 8 hours after exposure, hepatocellular degeneration within 17 hours after exposure, and frank centrilobular necrosis 22 hours after 1,2-dibromoethane exposure.

Renal lesions have been reported in humans dying acutely after acute oral exposure to 1,2-dibromoethane. In a case report, the patient’s kidneys had equivocal necrotizing tubular lesions, proximal convoluted tubular cytoplasmic vacuolization, and proteinaceous casts in tubules near the corticomedullary junction. In a report of two fatalities, cell proliferation, predominantly in the proximal tubules, occurred in Wistar rats following a single oral dose of 100 mg/kg of 1,2-dibromoethane in corn oil. Mitotic activity peaked at 30 hours. Lack of any histologic evidence of tubular necrosis between 8-48 hours after treatment indicates that such proliferation was not a regenerative response.

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10. Toxicological profile for 1,2-dibromoethane; Agency for Toxic Substances and Disease Registry; U.S. Public Health Service; July 1992
Forensic odontology – a pedodontist’s perspective

R. Gopakumar*, Manju Gopakumar**
*Principal, Mahatma Gandhi Dental College Jaipur, **Reader, A.B.Shetty Dental College Mangalore

In India as well as over the world, crimes of different nature are on the increase. Both criminals and educated elite of the society, who make use of sophisticated technical measures, while committing their crimes socially, put the forensic scientist, police and the public off the scene. So, crimes challenge society in detection, diagnosis and identification of criminals. Role of forensic scientist, therefore with the scientific diagnostico-forensic aids in detection, and treatment; can never be overemphasized in civilized modern world, if justice is to be sought in solving medicolegal problems.

A comprehensive understanding of this science is absolutely necessary for the pedodontists as they are often the first one to deal with children. They can play a valuable role by helping the forensic experts in identifying the affected victim or criminal and thereby contribute significantly in supporting and strengthening families to enable them to care for children more adequately and the society to develop sensitivity and skills for the respectful and healthy personal relationship. Thus, a pedodontist can play a vital role in protecting the human rights of children.

Definitions

1. Forensic science
The word ‘forensic’ is derived from the Latin word ‘Forensis’ meaning public. Forensic Science refers to areas of endeavor that can be used in a judicial setting and accepted by the court and general scientific community to separate truth from untruth.

2. Forensic odontology
It is that branch of dentistry which in the interest of justice deals with proper handling and examination of dental evidence and with proper evaluation and presentation of the dental finding (Keiser Nielson).

Historical perspective

Forensic Dentistry, though a relatively new area of forensic science, has a long history that starts from 2500 B.C, when the first evidence was first found in the pyramid at Giza, Egypt, in a skull with a gold wire holding two molar teeth. In 45–70 A.D, at Rome, the dental findings being used as evidence first time in forensic manner where the King Nero had killed his mother who was identified by 2 maxillary canine teeth. Nero’s mistress Sabina had Nero kill his first wife and identified her by a discolored tooth. Similarly in 1477, the body of Charles the Bold was identified on the basis of several missing anterior teeth. In 1850, at Boston the first trial of hanging of Dr. John Webster was ended based on dental evidence. In 1897, at Paris the very famous burn incendence at Bazaar de Charite where about 125 Parisian were attending the ball was published as the first text of a mass disaster on forensic dentistry. Most of the bodies were identified by a practitioner, Dr. Amedo along with two forensic dentists. In 1967, a 14 year old girl, Linda Peacock had the bite mark along with other evidence which led to the conviction of a young man. Thus, it can be seen that dental evidences are of paramount importance in this science. With the growing international travel and association risk, the recognition has come to forensic dentistry internationally.

Major fields in forensic odontology

In respect of crimes of different nature, court desires to investigate basically four things for the precise purpose of justice in law, after the identification of unknown body in forensic science namely 4 responsible factors.

1. Identity of the person
2. Age Estimation
3. Sex Estimation
4. Cause of death whether natural or unnatural death.

However the problem of identification of age, sex and identity arises in cases of

- Recently dead
- Decomposed body
- Skeletal remains
- Fragments of skeleton in respect to age, sex and cause of death investigation.

In clinical and criminal practice, overlapping of above factors is seen with each other and assessment with forensic investigation has to be considered. So role of forensic odontologist cannot be over emphasized in all cases where dental recording and evidence has to be compiled with, either individually or collectively in team work – particularly in mass disasters in consultation with forensic pathologist or expert with relevant scientific aids.

The fourth consideration in regard to the cause of death to be determined ante mortem or postmortem as desired by judiciary does not fall within the purview of forensic odontologist or dentist as “India Dentist Act 1948” does not permit lawfully the practicing dentist or odontologist to certify the death of person in any circumstance. The cause of death determination is within the purview of medical practitioner.

The role of the pedodontist

Scientifically the role of pedodontist could be in many ways:

- Age determination
- Gender determination from teeth
- ABO Blood grouping from dental pulp
- Gender determination from cranio facial bones
- Bite mark evidence
- Child abuse and Dental neglect

Age determination

Identification of living person, and of the dead, fragmentary remains of the bone is important and prove necessary in crimes. Positive identification may be provided even if the jaws have been destroyed by conflagration or mutilation.

Teeth are among the most reliable tools in the process of identification of age, especially the first and second decades. The stages of development can be considered as one of the most dependable

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Percentage of positive result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 24 hours after exfoliation / extraction</td>
<td>100%</td>
</tr>
<tr>
<td>After 1 month of exfoliation / extraction</td>
<td>100%</td>
</tr>
<tr>
<td>After 6 months of exfoliation / extraction</td>
<td>40%</td>
</tr>
</tbody>
</table>
Gender determination from teeth

Various features of teeth, like morphology, crown size, root lengths etc. are characteristic for the male and female sexes. There are, also, differences in the skull patterns. These will help a forensic odontologist to identify the sex. New developments like PCR amplification etc. will assist in accurately determining the sex of the remains. (Table 1)  

Microscopic methods can also be used for the determination of gender. The pulp tissue of the tooth is an excellent source of DNA, and it can be used for the determination of gender by Polymerase Chain reaction (PCR) technique. It is possible to discriminate one individual from the other with a high level of confidence by 1 ng or less of target DNA by PCR amplification method. The amelogenin protein found in human enamel also can be used to determine the gender with very small samples of DNA.  

ABO blood grouping from dental pulp

Blood group has been one of the corner stones for identification of biological materials in forensic investigations, and ABO blood grouping is widely used in forensic laboratories. The presence of ABO blood group antigen in the soft and hard dental tissues makes it possible to assist in identifying highly decomposed bodies where the tooth is available or incases where teeth and bone are the only significant tissues remaining. In cases like kidnapped child victims. A study was done to identify the ABO Blood grouping from dental pulp by absorption-elution technique. The results of the study are shown below by Dr. Prabhawati P. Inamadar, Prof. (Dr) Kavitha Rai, Prof. (Dr) Amitha M. Hegde (Unpublished data)  

Lele et al. in his study of ABO blood grouping of 50 dental pulp stated that 43 cases where reported positive. There was no significant sex difference and results were more negative in older age groups and statistically only 4 cases where reported positive. There was no significant sex difference and results were more negative in older age groups and 43 cases where reported positive. There was no significant sex difference and results were more negative in older age groups and statistically only 4 cases where reported positive. However they did not present any variation of age, sex or anatomical position of the teeth. The negative results could be either due to the insufficient quantity of pulp or pathology involved in the pulp due to anastomoses of pulpal and periodontal vascular plexus.  

Gender determination from craniofacial bones

Until puberty there is little sexual difference in the skulls. During this time only pelvis can be used for determination of sex. After puberty, other bones used for determination of sex are sternum, long bones and craniofacial bones. Scapula and metacarpal bones may provide additional information.  

Bite mark evidence

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Percentage of positive result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Permanent teeth</td>
</tr>
<tr>
<td>Same day of extraction</td>
<td>100%</td>
</tr>
<tr>
<td>14th day of extraction</td>
<td>100%</td>
</tr>
<tr>
<td>30th day of extraction</td>
<td>80%</td>
</tr>
<tr>
<td>90th day of extraction</td>
<td>80%</td>
</tr>
<tr>
<td>180th day of extraction</td>
<td>80%</td>
</tr>
</tbody>
</table>

A trained Pedodontist can assist the forensic investigation team in the detection and evaluation of bite marks. Human bite mark compresses the flesh and causes abrasion, laceration and contusions, whereas, animal bite tends to tear flesh. This specialized field of investigation has proved to be invaluable in identifying suspects guilty of crimes relating to sexual assaults, child abuse and even murder.  

Child abuse and dental neglect

The maltreatment of children is an issue that has always been with us and civilized societies providing a range of services both social and medical care for children and families afflicted.  

A pedodontist can play a major role in identifying an abused child. Abuse can be emotional, physical, sexual or in the form of dental neglect. Emotionally abused child can easily be assessed by abnormal behavior pattern of this child in the dental clinic. Physical abuse can be evaluated by recording a proper history which includes timing, the mechanism and characteristic of injury and the child’s developmental capabilities. Failure to seek or obtain proper dental care could be due to lack of awareness or it could be intentional as in the case of a neglected child.  

Limitations in India

1) Though till today there is general acceptance of admissibility of scientific evidence and expert’s opinion in Indian courts, there is no special law with respect to this.  
2) Lack of trained personnel.  
3) Improper record keeping.  
4) Lack of accessibility of dental treatment, especially to rural population.  
5) Lack of Awareness for preventing the evidences at the crime site.  
6) Poor communication and delayed response from the public.  

Recommendations

- Importance to forensic Odontology in under graduate and post graduate curriculum is to be given.  
- To introduce forensic odontology as a specialty subject.  
- To implement clear policy and law.  
- To involve dental surgeons as routine members of any forensic team.  
- To establish standard forensic lab and facilities.  
- Regular interactions the team members.  

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A study of sexual offences in Punjab

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Abstract

Sex related offences are one of the common causes of crime in any society. In many countries, sexual offences are too common, but it remains an underreported crime, since many victims cannot or do not press charges against their attackers. The current study estimates the percentage of sexual offences happened in Punjab from 2003 to 2007. Data have been collected from various districts of Punjab and used to calculate the number and percentage of sexual offences like rape, sodomy and bestiality among the different age groups. The main thrust of this paper is to understand the phenomenon of sex related offences, their magnitude and prevalence. Substantial contributions have been made to advance the state of knowledge for law enforcement agencies, health professionals and criminal justice system. Such information has potential to impact substantially on the effectiveness of the investigative interview, the collection of forensic evidence, and the prosecution of cases.

Introduction

Sex related offences have always been a part of human culture. Throughout the centuries, rape has had an impact on women men and children also. Modern laws on sexual assault in the United States and elsewhere recognize that both women and men can be raped, that wives can be raped by their husbands, and that victims often know their attackers.

Sex related crimes include rape, sodomy, bestiality and other acts of sexual perversion. Sexually oriented interpersonal violence cases have been increasing during last few years but information on sexual offences often remains limited. The detail survey of literature has revealed that some aspects related with sexual assault cases have already been discussed by various workers. As far as Indian perspective is concerned, in the previous studies, Sagar (1992) reported 38 victims of sexual offences in 1991 and 80 by Bhardwaj et al. (1995) in year 1993-1994 from South Delhi. Kumar et al. (2009) conducted a study of sexual offences in 1991 and 80 by Bhardwaj et al. (1995) in year 1993-1994 from South Delhi. Kumar et al. (2009) conducted a study on 65 females victims brought for estimation of age at New Civil Hospital, Surat. Most of them were children. During 2005-2006, State chemical laboratory of Patiala reported that percentage of sodomy victims was 14% in adolescent age group of 16-20 years, while 8% in age group 21-30 years and only 5% in above 30 years (Monday April 14, 2008, The Tribune, Chandigarh, India). Gupta (2007) reported an increase in rape cases in metro cities like Chennai, Delhi, Mumbai and Kolkata from 2000-2002. Sarkar et al. (2005) published a study carrying 90 victims of sexual offences in South Delhi from January 2001 to September 2002. Some foreign authors have also studies the relevant data Harry et al. (1993); David and Lynch (1998); Grosin et al. (2003); Hagelstam and Hakkanen (2006); Hansen et al. (2008); Nyholm et al. (2009).

Collection and analysis of data

The relevant data were collected from various districts offices of Senior Superintendent of Police of Punjab in five years (2003-07). The following 19 districts of Punjab were surveyed for the collection of data:-


The layout of data collection Tables (1,2 &3) and Histograms (1 & 2) was designed in such a way that the required information about the age, sex, number of accused, type of sexual offence should be incorporated properly. The data were scattered to extract important information regarding total number of sexual offence cases in Punjab in selected time period, year wise number of sexual offence, number and percentage of rape, sodomy and bestiality cases per year, district wise number of sexual cases, districts wise percentage of rape, sodomy and bestiality cases. This information also includes the number and percentage of different age groups victims suffered from sexual harassment.

Observations and results

In the present study, the results of the data obtained from various districts of Punjab were tabulated and histograms were also prepared. It is evident from Table-1 and Histogram-1 that a total of 1954 sexual related cases were registered in Punjab during 2003-07. After comparative analysis, it was observed that 353, 373, 354, 368 and 506 sexual offence cases were registered in 2003, 2004, 2005, 2006 and 2007 respectively. Out of these 1954 cases, 1784 were of rape, 168 of sodomy and remaining 2 of Bestiality. The percentage of rape cases was calculated very high i.e. 91.29% in comparison to sodomy cases i.e. 8.59% while occurrence of bestiality cases was insignificant i.e. 0.10% only.

Year 2003 and 2005 did not show any noticeable change in the percentage of sexual cases but it increased in 2004, 2006 and 2007. Registered sodomy cases were highest in 2007 (52 cases) in comparison to year 2003 (32), 2004 (32), 2005(30) and 2006(22).

Results in Table-2 and Histogram-2 indicate the maximum number of registered cases of sexual offence in Ludhiana district (252 cases) in the selected time. Highest percentage (97.72%) of rape cases was reported from Gurdaspur district in comparison to district Faridkot having the lowest percentage (83.63%) of rape cases. Minimum numbers of sexual offence cases were registered from Fatehgarh Sahib and Gurdaspur districts while only two cases of Bestiality were reported in five years.

Under the category of types of sexual offences, registered rape cases were highest i.e. 91.29% among the victims of age group 16-20 years. It was also observed that the minor age group (20 or below) was more prone to sexual offence than that of major age group (above 20) as percentage of minor age group victim was relatively high (64.22%) in comparison to 35.77% percent among major age group victims.

Conclusion

Percentage of reported rape cases have been found very high in comparison to other sexual offences, while insignificant number of bestiality cases are also found. This analytical database is source of important information regarding types and trends of sexual offences, highly attacked age groups in Punjab. The paper is aimed at general readers and students who desire to learn about sex related offences and issues. Although it is impossible to include every item of significance...
Table 1: Showing Year-wise Sexual Crime during 2003-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Total no. of sexual offence cases</th>
<th>Total no. of rape cases</th>
<th>No. and percentage of rape cases</th>
<th>No. and percentage of sodomy cases</th>
<th>No. and percentage of bestiality cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>353</td>
<td>321</td>
<td>90.93%</td>
<td>32[9.06%]</td>
<td>-</td>
</tr>
<tr>
<td>2004</td>
<td>373</td>
<td>340</td>
<td>91.15%</td>
<td>30[8.57%]</td>
<td>3[0.26%]</td>
</tr>
<tr>
<td>2005</td>
<td>354</td>
<td>323</td>
<td>91.24%</td>
<td>30[8.74%]</td>
<td>1[0.28%]</td>
</tr>
<tr>
<td>2006</td>
<td>368</td>
<td>346</td>
<td>94.92%</td>
<td>22[5.97%]</td>
<td>-</td>
</tr>
<tr>
<td>2007</td>
<td>306</td>
<td>404</td>
<td>89.72%</td>
<td>52[10.27%]</td>
<td>-</td>
</tr>
<tr>
<td>2003-2007</td>
<td>1954</td>
<td>1784</td>
<td>91.29%</td>
<td>168[8.59%]</td>
<td>2[0.10%]</td>
</tr>
</tbody>
</table>

Table 2: Showing District-Wise percentage of rape, sodomy and bestiality cases during 2003-2007

<table>
<thead>
<tr>
<th>S.no</th>
<th>District</th>
<th>Total No. Of Cases</th>
<th>Percentage Of Rape Cases</th>
<th>Percentage Of Sodomy Cases</th>
<th>Percentage Of Bestiality Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amritsar</td>
<td>139</td>
<td>94.96%</td>
<td>5.03%</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Barnala</td>
<td>54</td>
<td>94.44%</td>
<td>5.55%</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Bathinda</td>
<td>119</td>
<td>93.27%</td>
<td>6.72%</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Fandikot</td>
<td>55</td>
<td>83.63%</td>
<td>16.36%</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Fatehgarh</td>
<td>44</td>
<td>86.36%</td>
<td>13.64%</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Ferozpur</td>
<td>150</td>
<td>89.33%</td>
<td>10.66%</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Gurdaspur</td>
<td>44</td>
<td>97.72%</td>
<td>2.27%</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Hoshiarpur</td>
<td>140</td>
<td>90.00%</td>
<td>9.28%</td>
<td>0.71%</td>
</tr>
<tr>
<td>9</td>
<td>Jalandhar</td>
<td>214</td>
<td>92.52%</td>
<td>7.47%</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Kapurthala</td>
<td>60</td>
<td>96.66%</td>
<td>3.33%</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Ludhiana</td>
<td>252</td>
<td>91.66%</td>
<td>8.33%</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Mansa</td>
<td>79</td>
<td>89.87%</td>
<td>10.12%</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Moga</td>
<td>45</td>
<td>88.88%</td>
<td>11.11%</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Mohali</td>
<td>56</td>
<td>92.85%</td>
<td>7.14%</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>Navashaher</td>
<td>67</td>
<td>91.04%</td>
<td>8.95%</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>Patiala</td>
<td>142</td>
<td>88.73%</td>
<td>10.56%</td>
<td>0.70</td>
</tr>
<tr>
<td>17</td>
<td>Roopnagar</td>
<td>60</td>
<td>90.00%</td>
<td>10%</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Sangrur</td>
<td>133</td>
<td>85.71%</td>
<td>14.28%</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>Taranteran</td>
<td>101</td>
<td>92.07%</td>
<td>7.92%</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3: Showing age group of the victims

<table>
<thead>
<tr>
<th>S.no</th>
<th>Age-group</th>
<th>No. of Victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-5</td>
<td>85</td>
<td>4.32%</td>
</tr>
<tr>
<td>2</td>
<td>6-10</td>
<td>161</td>
<td>8.23%</td>
</tr>
<tr>
<td>3</td>
<td>11-15</td>
<td>518</td>
<td>26.50%</td>
</tr>
<tr>
<td>4</td>
<td>16-20</td>
<td>695</td>
<td>35.56%</td>
</tr>
<tr>
<td>5</td>
<td>21-25</td>
<td>236</td>
<td>12.07%</td>
</tr>
<tr>
<td>6</td>
<td>26-30</td>
<td>121</td>
<td>6.19%</td>
</tr>
<tr>
<td>7</td>
<td>31-35</td>
<td>61</td>
<td>3.12%</td>
</tr>
<tr>
<td>8</td>
<td>36-40</td>
<td>52</td>
<td>2.66%</td>
</tr>
<tr>
<td>9</td>
<td>41-45</td>
<td>12</td>
<td>0.61%</td>
</tr>
<tr>
<td>10</td>
<td>46-50</td>
<td>8</td>
<td>0.40%</td>
</tr>
<tr>
<td>11</td>
<td>More than 50</td>
<td>5</td>
<td>0.25%</td>
</tr>
</tbody>
</table>

Histogram 1: Showing percentage of rape and sodomy cases from 2003-2007

Histogram 2: Showing age group of the victims with percentage to the topic in a one publication but this attempt is as comprehensive as possible. All attempts have been made to keep the entries in this paper up to date, accurate, and consistent study can be of immense use if data is further updated at the regular intervals.

Acknowledgement
We express our deepest gratitude to all the Senior/ Superintendent of Police (SSP) of Punjab, who provided us the required data record.

References
Colposcopic examination in rape victims: A review
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Abstract
Sexual assault is a heinous crime which goes unreported in majority of the cases due to the physical as well as the mental trauma associated with it. Medical examination is an essential step for collection of forensic evidence to be presented in court later on in order to prove the charge of rape. Colposcope is used nowadays as both a medical as well as a forensic tool. In the setting of a forensic examination following rape, colposcopy allows practitioners to identify and photograph genital injury not readily visible to the unaided eye, thereby clarifying the location and extent of injury as well as providing evidence for court proceedings. The use of colposcopy in the diagnosis of sexual abuse of children and adult victims of sexual assault has been upheld by the appellate court of California (Mendibles) and its use is described as being non-experimental and its findings are accepted by the courts to be conclusive of the sexual assault. In India, use of colposcope to examine rape victims is not very prevalent yet. This article is an attempt to review the advantages of colposcopic examination over conventional examination of the rape victim so that colposcopy can become a routine procedure in the examination of rape victims in India also.

Introduction
Sexual assault (rape) is a forensic term characterizing sexual activity perpetrated against the will of the victim. It remains one of the most intractable violations of women’s human rights resulting in undermining the integrity of victim, physically as well as mentally. Every hour in the United States, 28 acts of rape are committed. The exact data of rape victims is not available in India but, statistics suggest that 1 woman is raped every 25 minutes. Clinicians are often asked to identify and interpret findings of sexual abuse on the basis of physical findings utilizing their clinical skills. However, clinical examination does not provide much information about the nature of vulvar lesions due to the normal histology of this area, which is covered by a keratinized, stratified squamous epithelium. The multifocal nature of vulvar intraepithelial disease makes the examination more difficult. Colposcopy of the vulva – vulvoscopy – is now a days an important part of gynecological examination of the rape victim. Colposcopy should be performed in the examination of vulvar pathology because of its importance in identifying the individual components of the lesions, both for diagnostic, treatment and forensic purposes. Appropriate management of the patient requires a standardized clinical evaluation, an effective interface with law enforcement for the handling of forensic evidence, and coordination of the continuum of care with a community plan.

The victim needs:
1. Treatment of injuries.
2. Prompt examination.
3. Crisis intervention and support.
5. Assessment & prevention of pregnancy.

Justice System needs:
1. Accurate history of assault.
2. Documentation of physical findings.
4. Interpretation of findings.
5. Presentation of findings.

Examination of the rape victim
Conventional method of examination
The physical examination begins with careful examination of clothing which is removed whilst the woman stands on piece of collection paper. Collection paper is also used for the external examination where any debris on the skin and hair combings from the head and pubic area are undertaken. Careful documentation of visible injuries such as bruising, scratches and bite marks is a vital component. The third step is the examination of the genitalia which begins with gross inspection of the vulva with special attention to the introitus and hymen, perineum and the distal 2 cm of vagina. Predominantly injuries are situated at 3, 6 and 9 o’clock on the posterior fourchette and concentrated to the area between 5 and 7 o’clock. They include lacerations, abrasions, ecchymoses and swelling. The documentation of genital trauma includes inspection of the genital area with direct or gross visualization, followed by use of toluidine dye, and in western countries it is completed with the use of a coloscope.

Colposcopic examination
In India, the practice of using colposcope to visualize external and internal injuries during genital examination of a rape victim is either nil or minimal probably due to lack of colposcopes and training in the government hospitals where the examination of the victim of sexual assault or rape is carried out in routine. So in cases presenting after 72 hrs it become very difficult for the gynecologist or the forensic expert to make the diagnosis of rape with gross visualization alone. In the setting of a forensic examination following rape, colposcopy allows practitioners to identify and photograph genital injury not readily visible to the unaided eye, thereby clarifying the location and extent of injury as well as providing evidence for court proceedings. The purpose of this article is to analyze the role of colposcopy in the forensic rape examination of adolescent and adult women with reference to the Indian scenario where there is a great backlog of pending cases in the courts for want of conclusive evidence which colposcopic examination of the rape victim can readily provide.

History of colposcopy
It is clear that a physical examination is an important element in patient management, conventional protocols have historically yielded positive genital findings in only 10-30% cases. Colposcopic magnification maximizes visualization of genital findings both internal as well as external. The word ‘colpo’ means vagina and scope means to look. The colposcope allows for magnification, illumination and photography of the genital area. Colposcopy was developed in Germany in 1925 by Hans Hinselman, who developed the procedure as a way to improve detection of cervical cancer through the use of magnification and better lighting of the area. The colposcope was first used by forensic nurses to illuminate, magnify and photograph the genital region.

Historical review of conventional vs colposcopic examination
The first report on the use of colposcopy in forensic examination of adult rape victims was published in 1981 by Teixeira who reported an 11.8% increases in injury prevalence when colposcopy was used as compared to injury prevalence when unaided visual inspection alone was
used. It also was used by Muram & Elias (1989) to evaluate rape and sexual abuse in pediatric patients. The use of colposcopy was further advocated by Slaughter and colleagues who published two studies advocating the use of colposcopy in adult rape examinations. In their first publication, these researchers reported 87% genital injury prevalence following rape, which was much higher than injury prevalence previously reported in the literature. Slaughter et al. (1997) found positive anogenital findings and a consistent pattern of injury by location in 68% of 213 of 311 of rape victims. The frequency of injury by anatomic sites was posterior fourchette (70%), labia minora (53%), hymen (25%), and fossa navicularis (25%). Several investigators using colposcopy have identified the posterior fourchette as the most common genital location for injury in victims of rape. The posterior fourchette is a band of tissue that connects the two labia minora. It extends inferiorly as a low tissue ridge that fuses in the middle. Other important anatomical landmarks include the labia majora (longitudinal skin folds that form the outer lips of the vagina), labia minora (skin folds that surround the vestibule of the vagina), vestibule (cleft between the labia minora that contains the opening of the urethra and vagina as well as glandular structures), and the fossa navicularis (shallow depression located on the lower portion of the vestibule, below the vaginal opening and extending to the posterior fourchette). O’Brien (1997) found that the most common anatomical locations sustaining injury changed when colposcopy was used. In this retrospective study, injuries were compared for cases that were examined before the implementation of colposcopy and after colposcopy was introduced into the forensic examination. The investigator found that for victims between 13 to 17 year olds, the most common locations of injuries changed from the hymen and posterior fourchette when visual inspection alone was done to hymen and cervix when colposcopy was used. For the adult sample, the most common sites of injury with visual inspection were the hymen and cervix while the most common sites of injury when colposcopy was used were the labia minora and posterior fourchette. This investigator also reported an 11% increase in injury prevalence was used among 13 to 17 year olds and a 24% increase in injury prevalence among adults. Adams et al. 2001 found in rape victim that 36% had tears of the posterior fourchette, 32% had redness of the labia minora, and 28% had redness of the fossa navicularis. No injury was found in 36% of the subjects where colposcopic examination was not carried out in the rape victim.

Advantages of Colposcopy in sexual assault examination

Colposcopic examination of the rape victim has following advantages as under:

1. The primary benefit of colposcopy to the victim of sexual assault is the single examination. This examination, which has been appropriately documented through colposcopy, can then be reviewed with experts and provided to the legal system, avoiding the need for numerous examinations and/or examiners.

2. The use of colposcopy has become the standard of care for pre-adolescent children, and medical professionals. It has the benefits of video colposcopy for the evaluation of adolescent and adult sexual assault victims. With the addition of video, computer technology, and telemedicine, it is now the basis for international research and peer review. During the past decade photographs have been used to clarify terminology, improve accuracy of data, and promote regional and national peer review.

3. Currently, most sexual assault research projects require photographic documentation of all findings to ensure that inter-observer reliability is maintained and that the conclusions meet the accepted standards of diagnosis.

4. Video colposcopy adds a new dimension to the examination of the rape victim. The examination can be virtually recreated via videotape and is particularly important when evaluating the adolescent or adult patient. In these patients the estrogenized hymen tends to be more dynamic and moves during the examination. Video documentation allows the examiner to evaluate all of the folds and clefts which may be missed during still photography.

5. As an added benefit, video colposcopy gives teaching programs the ability to instruct through closed circuit video, rather than having numerous evaluators in the room during the examination.

6. The primary use of photographic documentation by the legal system has been in the substitution of photographs for re-examination. Defense and court-appointed experts can review prior evaluations easily without additional trauma to the patient. This use of colposcopy in the diagnosis of sexual abuse of children and adult victims of sexual assault has been upheld by the appellate court of California (Mendibles) and its use is described as being non-experimental and its findings are accepted by the courts to be conclusive of the sexual assault.

Conclusion

Improved methodology including Colposcopy and trained forensic examiners have increased the recovery of forensically valuable evidence and have identified a pattern of genital injury not previously understood. Protocols for assessing sexual assault victims focus on the identification and documentation of both genital and non-genital injuries. As we continue to build a system which can accurately and appropriately respond to the challenges of sexual assault, photo documentation will play an important role. Video colposcopy is a major tool in providing the best of care to all victims of sexual assault. It allows us to protect the victim, educate medical professionals, provide case peer review, and guarantee appropriate, expert evidence to the legal system. Video colposcopy will not replace the meticulous, sensitive, well-trained professional, but it can bring the best of documentation and accountability to a diagnosis which must be made accurately and scientifically for the protection of both the victim and the system. This is truly a case where “a picture is worth a thousand words.”

References

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Male menopause: Myth or reality

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Abstract

The medical profession has long debated the existence of male menopause. Male menopause is a distinct physiological phenomenon that is in many ways akin to, yet in some ways quite different from female menopause. There occurs progressive but individually variable decline of serum free testosterone levels at a rate of 1% per year after age 40. It is estimated that 20% of men aged 60-80 years have levels below the lower limit of normal.

The etiology of signs and symptoms of Andropause is often multifactorial. Three hormonal systems show decreasing circulating hormone concentrations during normal aging- testosterone (Andropause), dehydroepiandrosterone (Adrenopause), and growth hormone (somatopause). It is a syndrome that characterized by physical, sexual, and psychologic symptoms. These changes become more pronounced as the male gets older. Erectile dysfunction is a characteristic feature of Andropause. Besides, other signs of virility and fertility: testicular volume, muscle mass, pilosity, daily production of spermatozoa, plasma testosterone levels, the number of Leydig cells and blood supply of the testis decrease significantly with age. Physical symptoms include asthenia, fatigue, reduced muscle and bone mass, impaired hematopoiesis. Behavioral symptoms- decreased libido, depressive mood, lack of motivation and energy, lower psychological vitality, anxiety, irritability, insomnia, decreased work and sport performances, difficulty in concentrating, memory impairment and low dominance also develop. Risk factors to the development of the above features include diabetes mellitus, hypertension, chronic alcohol consumption, obesity, and inactive life style.

This androgen deficiency state can be restored by the use of testosterone replacement therapy. For some males, the adjustment of circulating testosterone levels with replacement therapy to levels seen in young men can improve physical performance, induce a sense of well-being and restore the androgen-dependent sex drive that declines with aging. Impotence in contradistinction to impaired libido is not usually amenable to hormone replacement alone.

Keywords

Male menopause Testosterone Dehydroepiandrosterone Serum hormone binding globulin Erectile Dysfunction Depression Hormone Replacement Therapy

Aging brings about many physiological changes in humans. This process involves all the systems of human body. Endocrine system also does not stay untouched by this physiological process. These changes occurring in the female after menopause are called post-menopausal syndrome. A parallel, if not identical stage in the life course of men is termed as “Andropause” or “Male menopause”. Andropause is a less well-defined symptom complex consisting of physical, sexual and psychological symptoms that include weakness, fatigue, reduced muscle and bone mass, impaired hematopoiesis, oligosperma, sexual dysfunction, depression, anxiety, irritability, insomnia, reduced cognitive function and memory.

Male menopause has been coined several other names as Mid-life crisis, Male climacterium, Partial Androgen Deficiency in the Aging Male (PADAM), Partial Endocrine Variations of the Aging Male (PEVAM), Andropause2, Viropause, Late Onset Hypogonadism (LOH), Androgen Deficiency in the Aging Male (ADAM).

It usually occurs between 45-60 years age but sometimes as early as age 30. There occurs decline of about 35% of total and 50% of free testosterone levels between the age of 20 and 80 years. Plasma levels of testosterone decline about 7% in men of 40-60 years age, 20% between 60-80 years and about 35% in men more than 80 years age.

Role of testosterone

Spermatogenesis is maintained by testosterone along with FSH. Testosterone acts both on Sertoli cells and germ cells and thus maintains spermatogenesis. Besides, androgen suppression of LHRH and LH by negative feedback effect also takes place. Testosterone causes androgenic pattern of hair growth. With increasing age male baldness may be initiated. It maintains sexual drive (libido) and erectile function (potency). It maintains interest in the opposite sex and is responsible for aggressive behaviour seen in the males. It leads to increase in total quantity of bone matrix and causes calcium retention.

The increase in bone matrix is believed to result from the general anabolic function of testosterone plus the deposition of calcium salts in response to the increased protein. Because of the ability of testosterone to increase the size and strength of bones, it is often used in older men to treat osteoporosis. It stimulates erythropoiesis; therefore accounts for greater hemoglobin concentration and RBC count in males. Testosterone also increases circulating levels of low-density lipoprotein cholesterol, and decreases plasma high-density lipoprotein cholesterol.

Difference between female and male menopause

Unlike menopause in female which represents a well-defined period in which hormone production stops completely, male hormone decrease is a slower process. Female menopause involves complete decline of sex hormones. Estrogen levels decline and disappear producing acute symptoms and complete loss of fertility. On the contrary, sudden arrest of gonadal functions does not occur in men. Instead, a gradual decline of both endocrine and exocrine testicular function takes place. Men will never lose their fertility completely after Andropause (permitting a man to have children till up to 80 years age).

Predisposing factors

The problem cannot be attributed to aging alone, however, because well over 40% of males remain sexually active at 70 years of age and beyond. Some factors that are known to contribute to this condition are hypothalamic sluggishness, hormone abnormalities (high estrogen, prolactin, underactive or hyperactive thyroid), excessive alcohol consumption, obesity, smoking, diabetes mellitus, hypertension, poor diet, lack of exercise, poor circulation and psychological problems, notably mid-life depression (psychogenic impotence). Other factors, notably the co-existence of degenerative diseases (Parkinsonism, multiple sclerosis) are culpable. Besides medications - antihypertensives, antidepressants, tranquilizers, antihistamines, asthma medications, digestive medications are also known to contribute.

As alcohol consumption, diabetes mellitus, and metabolic syndrome individually lead to Erectile Dysfunction (ED), it may be said that these further accentuate ED development in male with increasing age.
Postulated mechanism

Many factors related to aging are thought to contribute to the occurrence of PADAM-related symptoms. Among them, pol polymorphic alterations are believed to be the major culprit. It is proposed by some that stochastic damage accumulating within aging leads to progressive dysregulation at each level of the hypothalamic-pituitary-gonadal axis and in local auto/paracrine interactions, thereby inducing morphological changes in reproductive organs, such as prostate, testis and penis. Age alterations at the hypothalamic-pituitary levels of testosterone production and an increase in the gonadotropin sensitivity to hormonal influences realized via the feedback mechanism are found. Though the responsiveness of the gonadotrophs to GnRH remains unimpaired, one may assume that the amount of GnRH released at each pulse is also reduced, possibly as the consequence of a decline of the cellular mass of GnRH neurons. Some owe the idea that aged tissues may not remain androgen sensitive. Besides, others hypothesize that the local balance between androgen and estrogen, or their ratios, may play an important role in maintaining normal spermatogenesis. In another study there is evidence of decreased LH pulse amplitude caused by lowered output of GnRH from hypothalamic neurons, but the primary site of the aging effect appears to be the Leydig cell's inability to respond to LH with increased testosterone production. The enzymes that scavenge oxygen free radicals are not as highly expressed in aging Leydig cells which are, therefore, increasingly vulnerable to oxidative damage. Some propose that the damage may disrupt LH signaling in particular by changing the fluidity of Leydig cell membrane, an effect seen in membranes of aged vascular endothelial cells. All of atrophic responses in the steroidogenic machinery of aging Leydig cells downstream to LH signaling appear to conform to expectations for deficient gonadotropic stimulation.

Changes occurring with age

(A). Physical changes

It has been found that muscle weakness, osteoporosis, benign prostrate hypertrophy, changes in body composition, fatigue, decreased sexual interest and activity, and increased prevalence of ED occur with increasing age. For physical changes, joint and limb pain (77.6%) were named the most frequent, followed by back pain (68.2%), the decreased interest in sex (62.6%) and weight gain (55.0%). Besides impaired hematopoiesis, oligosperma, depression, anxiety, irritability, insomnia and memory impairment, impaired mobility and balance, and poor endurance, were also observed. Positive independent associations were observed between serum bioavailable testosterone and muscle strength and bone mineral density (BMD). It was negatively associated with fat, associated with changes in the BMI, osteoporosis, and sleep and mood disorders. Low testosterone levels are associated with ED and high risk of developing visceral obesity, metabolic syndrome, DM, cardiovascular disease, osteoporosis, decreased capacity to recover from acute diseases. Testosterone shows negative correlation with VLDL, triglycerides, body mass index and body fat mass (risk factors for cardiovascular disease). Therefore endogenous sex steroids impact beneficial effect on heart. Human observational studies have mostly concluded that men with lower testosterone levels tend to have higher incidence of coronary artery disease. Emerging evidence supports that men with lower testosterone levels tend to have higher triglycerides, body mass index and body fat mass (risk factors for disease, osteoporosis, decreased capacity to recover from acute lowering of the values recorded during the night occurred with aging. The inter-individual variations in the plasma levels are, however, very important and 25% of men >75 years have still testosterone levels in upper quartile values. Three male endocrine axes are characterized by age-related changes in concentration of circulating hormones: (i) the hypothalamic-pituitary-testicular axis with lower serum levels of testosterone and higher serum levels of LH and FSH, (ii) the hypothalamic-pituitary-adrenal axis with a gradual decline in Dihydroepiandrosterone (DHEA) and Dihydroepiandrosterone-sulphate (DHEA-S) (Adrenopause), (iii) Growth hormone/IGF-1 (somatotopic) axis showing decreased hormone production concomitant with symptoms similar to those of GH-deficient adults (somatopause). LH pulse also seems to be reduced in elderly men as compared to young subjects. This is most probably the consequence of a reduction in the amount of LH/CRF released by hypothalamus.

Testosterone levels decrease through both central (pituitary) and peripheral (testicular) mechanisms. Decrease in Leydig cell function occurs due to (a) decrease in number of Leydig and Sertoli cells. (b) decrease in LH pulse amplitude (LH pulse frequency remaining the same). Men do not experience a rapid decline of Leydig cell function or irreversible arrest of reproductive capacity in old age. A decline of about 35% of total and of 50% of free testosterone levels occurs gradually over decades due to increase in SHBG concentration that binds testosterone and reduces activity of testosterone. There is decreased tissue production of dihydrotestosterone that is critically needed for full male sexual function and bodily well-being. The testosterone receptors in the cells become less sensitive to even the same levels of testosterone. Decline in DHEA substantially which is involved in the production of testosterone, and sensitization of cells to testosterone in aging male also takes place.

About 5% of men who have ED have low testosterone levels. In certain studies aging was negatively correlated to serum levels of sex steroids and IGF-1 with a mean decline (youngest to oldest) of 51% for testosterone, 64% for free testosterone, 78% for basal testosterone, 32% for estradiol, 62% for basal estradiol, 29% for E, and 51% for IGF-1 starting in early adulthood whereas SHBG increased after the fifth decade of life. A study done by Miwa Y, et al suggests that PADAM-related symptoms as evaluated are not significantly related to serum levels of testosterone, free testosterone, estradiol, LH, FSH, DHEA-S, growth hormone as many factors related to aging are thought to contribute to the occurrence of PADAM-related symptoms.

Circadian profile of plasma melatonin of old subjects, both demented or not, was clearly flattened, particularly during the night. This was related to both age and the severity of mental impairment. Significant lowering of the values recorded during the night occurred with aging. Besides, higher cortisol values at evening and midnight are also observed in elderly subjects.

(B). Hormonal changes

In contrast to the female situation, sex hormones in healthy non-obese men decline concomitantly with age. Hypogonadism in aging men, as defined by a low free testosterone index, is due to declining testosterone production and increase in Serum Hormonal Binding Globulin (SHBG) resulting in further lowering the concentration of free biologically active androgens. About 30% of men in their 60s and more than 80% of men over 80 may have a low free testosterone index. This decline has already started in the third decade, and is paralleled by a decline of Insulin-like Growth Factor-1 (IGF-1) serum levels leading to a substantial proportion of elderly men with markedly lowered serum levels of bioavailable sex hormones and IGF-1 compared to the young adult male range. The inter-individual variations in the plasma levels are, however, very important and 25% of men >75 years have still testosterone levels in upper quartile values.

Testicular tissue mass and blood supply to testicles decrease significantly with age. The testes continue to produce sperm, but the rate of sperm production slows. The epididymis and seminal vesicles, and the prostate gland lose some of their surface cells but continue to produce the fluid that helps carry sperm. The volume of fluid ejaculated usually remains the same, but there are fewer living sperms in the fluid. The prostate enlarges with age as some of the prostate tissue is replaced.
with a scar-like fibrotic tissue. Decrease in sex drive (libido) may occur in some men. Sexual responses may become slower and less intense. This may be related to decline in testosterone level, but it may also result from psychological or social changes related to aging, illness, chronic conditions or medications. Erection occurs less frequently. It is most often the result of a medical/psychological problem rather than simple testosterone deficiency. A reliable diagnostic sign that a man is low in testosterone is the loss of morning erection. When testosterone is supplemented, frequently morning erections resume.

(D). Emotional & psychological changes
Good mental health in men depends upon healthy levels of testosterone. When levels of testosterone fall below optimal levels, men are more vulnerable to mood disorders such as depression. There is a strong interrelationship between sexual function and mental health. Testosterone promotes the desire for sex and the chemical that sends the signal is dopamine. Orgasm further enhances dopamine and other brain chemicals that help with healthy brain function. Research shows that when there are sexual problems, men are vulnerable to depression. Men with ED have high levels of depression and anxiety symptoms. They also display considerable levels of anger and personality disorders. There is reduced Quality of Life, impaired social and job functioning and often substance abuse.

Weakeness, fatigue, decreased libido, depressive state and mood swings, lack of motivation and energy, lower psychological vitality, anxiety, irritability, insomnia, decrease in work and sport performances, difficulty in concentrating, memory impairment and low dominance are more commonly observed in aging men. Psychological and behavioral aspects of PADAM overlap with signs and symptoms of major depression. Hypogonadism is not central to major depressive disorder; hypothalamic-pituitary-gonadal hypofunction may have etiological importance in mild depressive conditions such as dysthymia. Decreased testosterone level increases risk of incident depression in older men.

Sex hormones are important for the development and maintenance of acquired cognitive abilities. Hormonal changes in androgen levels in older men modulate the cognitive changes of aging. Slowness of behaviour with age is scientifically significant because of relation of speed to cognitive functions on one hand and to physical fitness and electrophysiological measurements on the other.

Older adults have consistent difficulties in recognizing both positive (happy) and negative (angry and sad) vocal and bodily expressions. Older adults are worse at least some of the time in the recognition of anger, sadness, fear and happiness in bodily expressions and of anger in vocal expressions. They have difficulty in matching auditory expressions to facial expressions and bodily expressions, suggesting an additional problem with integration. In one study, nearly ⅓ of older adults functioning at a level similar to the lowest ⅓ of young adults, suggesting that age-related changes are common. The predominant pattern across all emotions and modalities was of age-related decline with the exception that there was a trend for older adults to be better than young adults at reduction in the attentional demands of appraising facial expressions as perceptual skill increases, or changes in processing the self-relevance of facial expressions during social interaction and cognitive activities.

Treatment
The effects of testosterone therapy in men are unequivocal. For some males the adjustment of circulating testosterone levels with replacement therapy to levels seen in the young men can improve physical performance, induce a sense of well-being and restore the androgen-dependent sex drive but rarely to a level thought adequate by the patient. No proven beneficial effect on erectile dysfunction and other possible beneficial effects on hemopoiesis, bone metabolism, lipids and fibrinolysis have been demonstrated. No benefit of testosterone therapy on fatigue has been noted as it seems more due to stress. Though some studies report consistent effects of therapy on body composition, there is good evidence that age-related decline in testosterone levels is at least a co-determinant of these symptoms and testosterone supplementation has shown favorable effects on many of them. Androgen replacement in older males increases muscle and decreases fat mass to a small degree, but to date has not improved muscle strength, physical functions or insulin sensitivity, nor does it convincingly improve bone density, though some report increased muscle strength, bone mineral density and hemopoiesis.

Androgen deficiency partially protects against prostate disease, and that restoring androgen exposure increases the risk to that of eugonadal man of the same age. Men using androgen replacement therapy should have age appropriate surveillance for prostate disease as it can increase prostate cancer risk too.

Unfortunately the results of studies so far conducted are incoherent what makes it difficult to establish indications for the therapy and the time of beginning of testosterone supplementation. To date there is no evidence-based documentation of clinical benefits of androgen therapy to elderly men with normal or moderately low serum testosterone level in terms of diminished mortality or of improved survival or quality of life. Therapy should be reserved for the minority of elderly men who have both clear clinical symptoms of hypogonadism and frankly low serum testosterone levels. Androgen replacement may be of benefit in some men aged more than 65 years, particularly in men with low serum testosterone levels (< 2ng/ml) increased lean body mass, bone mass and possibly strength. For older men with testosterone levels between 2-3.5 ng/ml, one might consider 6-12 months trial of therapy after full discussion and explicit consent, followed by a reassessment of the value of ongoing treatment. Androgens have the advantage of excellent dose adjustability, lack of skin irritation and low cost. As men age the prevalence of frailty increases whereas levels of androgen decline. Low levels of bioavailable testosterone are independently associated with worse baseline frailty status. Frailty status should be considered as an indication for testosterone therapy.

In few studies, therapy with androgens in hypogonadal men showed an improvement in cognitive, verbal and visual memory, mental status, visuomotor scanning and attention, verbal knowledge and language, spatial abilities and memory for both verbal and visual information. Testosterone replacement has demonstrated short-term tolerability and efficacy in augmenting antidepressants to alleviate treatment refractory depression in adult males. Testosterone monotherapy is effective in treating late-onset but not early-onset major depressive disorder in older male. In eugonadal males, testosterone replacement does not have a significant effect on mood; in hypogonadal males some studies show an effect whereas others do not. Testosterone replacement as primary or adjuvant therapy of depression may prove useful in elderly, hypogonadal males who fail to respond to conventional antidepressants.

Testosterone therapy does not lead to increase incidence of cardiovascular disorder or events as myocardial infarction, stroke or angina. Side effects of this substitutive therapy are minimal when care is taken to keep plasma testosterone levels within the physiological range.

The appearance of age-associated androgen insensitivity can be delayed by dietary calorie restriction, an effective means for life-span extension. To prevent or delay age-related changes, men should live active life, exercise regularly, maintain healthy body weight, remain tension free and lead a busy life.

References


Introduction

The popularity of tooth whitening has increased with the advent of patient-applied, peroxide-based whitening agents, as well as increased media influence. Peroxides are considered effective and safe when used under professional supervision. Whitening methods include those prescribed by a dental professional for the patient’s at-home use, those applied by the dental professional in the office, a combination of both, or methods available over the counter (OTC). This article reviews the effect of contemporary whitening agents and illustrates the clinical application of three methods prescribed by dental professionals.

Key words
Carbamide peroxide, polyethylene strips, hydrogen peroxide,

This article presents the use of three different types of whitening agents for improved aesthetics. Upon reading this article, the reader should be able to:
- Distinguish the difference between professionally administered in-office and at-home tooth whitening results.
- Identify the effects of whitening agents on dental tissues.

Carbamide peroxide has been used as a bleaching agent since 1989. Using a concentration of 10% carbamide peroxide, vital bleaching became a standard technique also known as “nightguard vital bleaching” (Figures 1 and 2). This technique (i.e. at-home bleaching) allows the patient to use a tray whitening device at home, while the results and concentrations are monitored by a dental professional.

Other materials based on higher concentrations of hydrogen peroxide are also available for in-office power bleaching. More recently, polyethylene strips impregnated with 5.3% or 6.5% hydrogen peroxide (OTC concentration and dentist-prescribed concentration, respectively) were introduced (Crest White-strips, Procter & Gamble, Cincinnati, Ohio).

Effects of whitening agents on hard dental tissues

Carbamide peroxide has been used for many years as an oral antiseptic before it was applied as a gel for home bleaching. Numerous carbamide peroxide-based home bleaching products have been introduced in the last 13 years for use with the nightguard bleaching technique.

Carbamide peroxide is basically urea combined with hydrogen peroxide. Both products are released when carbamide peroxide breaks down in contact with saliva. Initially, tooth bleaching with peroxides (both hydrogen peroxide and carbamide peroxide) was performed without a comprehensive understanding of the effects of the bleaching procedure on the structure and chemical composition of the enamel surface.

More recently, studies on enamel bond strengths and structural effects of peroxide-based materials on enamel have been undertaken. Several studies have shown that hydrogen peroxide- and carbamide peroxide-based bleaching agents adversely affect the immediate bond strength of resins to enamel\(^1\). Bond strengths to dentin treated with hydrogen peroxide for 60 minutes followed by 37% phosphoric acid for 60 seconds (and vice versa) were reported to be 0.0MPa. Clinically, this decrease in bond strengths is relevant because whitening is often considered a preliminary treatment to improve the appearance of teeth prior to the application of a bonded restoration. Some authors have implied that the adverse effects of peroxides on bonding are caused by residual oxygen that inhibits resin polymerization, but roughening the surface eliminates this adverse effect. Surface analysis techniques have demonstrated that oxygen does not accumulate within the near surface of enamel that has been bleached with peroxides. Consequently, the bond-strength reduction caused by bleaching with peroxide-based whitening agents is not associated with the inhibition of resin polymerization by oxygen accumulated within the enamel structure. The reduction in enamel microhardness after two weeks of whitening with 10% carbamide peroxide may be responsible for the decrease in enamel bond strengths, especially for gels with low pH. At four weeks, the decrease in microhardness was reversed. The action of bleaching agents on enamel may be related to the fact that hydrogen peroxide is a strong oxidizing agent that can remove stains from enamel and dentin by oxygen-release mechanical cleansing.

Bleaching agents may also cause alterations in the chemistry of hard dental tissues\(^3\),\(^4\),\(^5\), inverting the ratio between organic and inorganic components and increasing solubility. In a recent energy dispersive spectrometry study, the effects of 30% hydrogen peroxide on enamel were found to differ from the effects induced by two 10% carbamide peroxide-based materials. While 30%hydrogen peroxide resulted in a significant reduction in the Ca:P ratio, neither a commercial 10% carbamide peroxide gel nor an aqueous solution of 10% carbamide peroxide resulted in significant changes in that ratio. Another study has shown that a 6-hour treatment of human enamel with 10% carbamide peroxide results in a significant loss of calcium compared with a water control, as measured with atomic absorption spectrophotometer. These alterations in the chemical composition of enamel may be transitory; their clinical relevance has not been determined.

Effects of whitening agents on soft tissues

The carcinogenic potential of whitening agents has raised some controversy. A court ruling resulted in a ban of peroxide-containing...
Oxidative stress can induce damage in oral epithelial cells, resulting in premalignant changes. The application of hydrogen peroxide and DMBA (9, 10-dimethyl-1, 2-benzanthracene), a known carcinogenic analogous to those found in tobacco smoke, resulted in hyperkeratosis or carcinomas in the mucosa of hamsters after 22 weeks, depending on the concentration of hydrogen peroxide. A recent study, however, found that the chronic use of 35% carbamide peroxide did not result in alterations of the cell cycle in the oral mucosa of rats.

Concerning the pulpal tissue, teeth that were scheduled to be extracted for orthodontic reasons were bleached with 10% carbamide peroxide for 4 hours or left untreated. No significant differences were found in the concentration of the enzyme heme oxygenase-1 (HO-1) in the pulp. This enzyme HO-1 is increased in cells subjected to oxidative stress. Based on current information, it has been concluded that the use of dentist-monitored, at-home tooth whitening gels containing 10% carbamide peroxide carries no carcinogenic risk and does not cause irreversible damage to enamel.

At-home whitening

Nightguard vital bleaching using 10% carbamide peroxide gel is the most common whitening method applied by the patient while supervised by a dental professional.

Studies have shown that whitening of vital teeth is very effective, durable, and safe. The literature has further indicated that peroxides diffuse quickly into dentin reaching the pulp chamber. While tooth sensitivity seems to be the most common adverse event with carbamide peroxide whitening, sensitivity subsides with the termination of treatment. Sensitivity is generally associated with previous history of sensitive teeth, increased frequency of application, or the utilization of higher concentrations of carbamide peroxide (e.g. 20%). Although sensitivity may be a result of the potential of carbamide peroxide to penetrate the pulp chamber, the rate of penetration depends on the concentration and the commercial brand. Another factor that may affect sensitivity is the pH of the bleaching gel. For whiteners used with the at-home technique, the pH is within a range of 5.66 to 7.35. Sensitivity is also directly related to the frequency of application of the gel patients who change the whitening solution more than once a day report significantly more side effects than those who do not change the whitening solution. Potassium nitrate and fluoride have recently been added to the composition of certain whitening gels to prevent sensitivity during treatment.

One clinical study demonstrated that potassium nitrate and fluoride added to 10% carbamide peroxide gel reduced sensitivity over a 2-weeks treatment period when compared to a 10% carbamide peroxide gel without those two components.

The use of reservoirs in the tray to allow for space to retain the bleaching gel is a controversial issue. Despite the recommendation of some manufacturers as a light-cured block-out resin or a self-adhesive strip, the use of spacers to create reservoirs for the bleaching gel does not seem to increase the success of home bleaching. The bleaching gel, however, remains active for longer periods when reservoirs are used.

Power bleaching

In 1918, a high-intensity light was first used to induce a rapid increase in the temperature of hydrogen peroxide and thereby accelerate the whitening process. Lasers and high-intensity lights have been recommended by some authorities for in-office bleaching despite the disappointing results obtained in some studies. Power whitening procedures are currently performed in-office with concentrations of hydrogen peroxide in the range of 15% to 40%. The most effective in-office whitening materials are those that include a chemical catalyst: LumaArch (LumaLite Inc., Spring Valley, CA; 35% HP, pH=5.5), Opalescence Xtra Boost (Ultradent Products, South Jordan, UT; 38% HP, pH=7.0), Zoom (Discus Dental, Culver, CA; 25% HP, pH=7.9). When a chemical catalyst is added to the hydrogen peroxide immediately prior to bleaching, the oxygen is released rapidly, inducing the whitening effect. Both LumaArch and Zoom use light sources exclusively for the bleaching treatment. For Opalescence Xtra Boost, the use of light is optional. Despite the recommendation, however, the application of light does not significantly affect the rate of decomposition of hydrogen peroxide for any of the bleaching procedures.
three in-office materials, as the whitening results are very similar with and without irradiation with a light source. Heat accelerates the release of oxygen, but these power bleaching gels do not reach temperatures in the mouth high enough to significantly increase the decomposition rate of hydrogen peroxide.

The primary advantage of the in-office power whitening technique compared to the at-home technique with a nightguard is that the former is not dependent upon the patient’s compliance and the results can be appreciated by the patient in the same session during which the procedure is completed. On the other hand, in-office procedures require extensive tissue isolation and/or a resin barrier to prevent the gel from irritating the soft tissues.

Hydrogen peroxide strips

An OTC, 5.3% hydrogen peroxide-coated polyethylene strip (Crest Whitestrips, Procter & Gamble) was recently introduced to the market. According to the manufacturer’s recommendation, the patient applies two strips per day for 30 minutes each. A similar 6.5%hydrogen peroxide-coated strip is available by prescription.

Clinical studies comparing the whitening efficacy of 10% carbamide peroxide (which breaks down in 3.5% hydrogen peroxide) with the efficacy of the hydrogen peroxide-coated strips have demonstrated that use of the thin 14% hydrogen peroxide gel strip resulted in greater whitening.\(^1\)

Other Methods

An 18% carbamide peroxide (equivalent to 6.5% hydrogen peroxide) paint-on liquid is also available as an OTC agent (Colgate Simply White Clear Whitening Gel, Colgate-Palmolive, New York, NY). While clinical studies have shown that this method can be effective, additional independent clinical studies are needed to confirm its long-term impact on this therapeutic category. Another OTC paint-on liquid is now available (Crest Night Effects, Procter & Gamble) as a 19% sodium percarbonate bleaching film.

Conclusion

A variety of whitening options are currently available for patients seeking to enhance the appearance of their smiles. When suggesting a professionally administered whitening option, clinicians must be aware of the variety of options currently available. Based on the patient’s existing condition and desired whitening effects, in-office, at-home, or OTC modalities can be used to safely and effectively address a variety of aesthetic concerns.

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Lie detection: different methods with special discussion on brain fingerprinting

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Abstract
In modern times, when the mode of the execution of the crime is becoming more and more complicated, the need for sensitive, reliable and sophisticated procedures for crime scene investigation is becoming necessary. Today, we are much more dependent on the scientific evidences. Many scientific methods have helped the law enforcing agencies to solve the otherwise impossible cases. During the process of investigation, the main hurdle faced by the investigating authority is to extract the truth from a person and science has come to his rescue in the form of polygraph test, brain scan or the brain fingerprinting etc. This paper is aimed to discuss a few of them with special reference to the brain mapping or the brain fingerprinting.

Key-word
lie detection, brain fingerprinting, brain mapping.

Introduction
Our brain retains daily activities in the form of memory; like that of the hard disk of a computer. So, whenever there is an external stimulus in the form of visuals and others, in relation to the event in question, the brain will respond to it, in the form of alteration of some physiological functions like the rate of respiration, pulse rate, temperature etc. also there is some local effect in the brain itself. On the basis of this principle, many methods are tried to find out the truth from an accused or to find out whether the person is lying or not.

Historical background
Since ancient times many methods were tried to find the truth finding. Some used eggs which is to be transferred from one person to the other and if the egg breaks, the person who breaks the egg was considered as the liar, the basis of this test was the belief that when someone tells lie, he will be nervous and he cannot do things properly.

Polygraph
Modern method of lie detector was used by Cesare Lombroso (1885) in police cases, which was based on the change of the blood pressure when someone lies.

Modern method of lie detector was used by Cesare Lombroso (1885) in police cases, which was based on the change of the blood pressure when someone lies.

In 192, a device which recorded the blood pressure and the galvanic skin response was invented by Dr. John A. Larson of University of California and used the same for detection of crime at Berkley Police Department. Further modifications on it were done by William Marston and then by Leonarde Keeler.

A device which recorded muscular activity along with changes in blood pressure was developed in 1945 by John E. Reid, who claimed that greater accuracy could be obtained by making these recordings simultaneously with standard blood pressure-pulse-respiration recordings3.

The present day lie detector, is based on the changes in the skin conductance, blood pressure, respiration, heart rate etc when someone lies, which are recorded during the test.

Procedure
Today, polygraph examiners use two types of instrumentation: analog and computerized. In United States, most examiners now use computerized instrumentation.

A typical polygraph test starts with a pre-test interview to gain some preliminary information which will later be used for “Control Questions”, or CQ. Then a “stim test” is often conducted: the subject is asked to deliberately lie and then the tester reports that he was able to detect this lie. Then the actual test starts. Some of the questions asked are “Irrelevant” or IR, others are “probable-lie “Control Questions that most people will lie about and the remainders are the “Relevant Questions”, or RQ, that the tester is really interested in. The test is passed if the physiological responses during the probable-lie control questions (CQ) are larger than those during the relevant questions(RQ).

But the main disadvantage of this method is that, it is based on the physiological changes in the human body, so, there are many more factors like emotional state of the person etc, which may influence the result of the observation in polygraph test.

Facial Micro-expressions (developed by Paul Ekman)
It would have the advantage of not requiring any obvious intervention with the subject. It could be used secretively by videotaping.
But, this is also not so accurate, as many persons may give equal responses in this test.

Neurotechnological Lie Detection (NTLD)
Here the blood flow or electrical impulses in the brain is measured to identify distinct indicators of deceptive communication. It is more reliable as it measures lying more directly by measuring brain activity rather than second-order indicators like pulse or respiration or other physiological changes. So, it is free from emotional state of the person and records the brain activities of the person directly in response to the lies.

Since 1890, it was known that blood flow and blood oxygenation in the brain is directly proportional to the activity of the neurons. The area of the brain which is active consumes more oxygen and this is achieved by less energetically active but more rapid anaerobic glycolysis. Then, it is followed by increase in the blood flow to that area after a delay of approximately 1-5 seconds, with a peak over a period of 4-5 seconds before falling back to baseline. This leads to local changes in the relative concentration of oxyhemoglobin and deoxyhemoglobin and changes in local cerebral blood volume in addition to this change in local cerebral blood flow.

Blood-oxygen-level dependent (BOLD) is the MRI contrast of blood deoxyhemoglobin first discovered in 1990 by Dr. Seiji Ogawa. He also recognized the potential importance of BOLD for functional brain imaging with MRI. In 1991, Dr. Kenneth Kwong successfully applied BOLD to image human brain activities with MRI. When there is some activity in the neurons, they require more oxygen in comparison to the inactive neurons and so, the blood releases more oxygen at greater rate to these neurons by the process called haemodynamic response. Haemoglobin is diamagnetic when oxygenated and paramagnetic when deoxygenated. The magnetic resonance signal is also slightly different in oxygenated and the deoxygenated haemoglobin. Higher BOLD signal intensities arise from increases in the concentration of oxygenated haemoglobin since the blood magnetic susceptibility now more closely matches the tissue magnetic susceptibility. By collecting data in an MRI scanner with sequence parameters sensitive to changes in magnetic susceptibility one can assess changes in BOLD contrast. These changes...
Brain fingerprinting

The brain fingerprinting was invented by Dr. Lawrence A. Farwell. The basic theory of the brain fingerprinting is that, brain processes the known, relevant information differently as it responds to unknown or irrelevant events which can be detected using the EEG. Initially, Farwell used the P300 responses of the brain to known or relevant information.

The P300 observed at the scalp seems to be a mixture of activity originating in different brain areas, notably the P3a and P3b, and more recently the P3f component. The P3b is an event related potential, whose peak corresponds to the main P300 peak. Referring to the P300 therefore usually refers to P3b. P3b is linked to attention and memory mechanisms and its amplitude on the scalp is higher over temporal and parietal regions. P3a by contrast is more fronto-central and is linked to task processing. A last component in the P300 has been termed P3f or parietal regions. P3a by contrast is more fronto-central and is linked to memory encoded in the brain of the person whether, he/she was involved in the crime or not on the basis of the memory encoded in the brain directly, it is much more reliable than the other methods as described. The evidence of an expert witness is not on the basis of the memory encoded in the brain of the person.

In a Brain Fingerprinting test, the suspect is made to sit in a quiet room in front of a computer monitor with the headband having the sensors attached to it to record the brain response. Then the words, pictures or sounds describing salient features of a crime are presented by a computer, along with other, irrelevant information, that would be equally plausible for an innocent suspect. Items are chosen that would be known only to the perpetrator and to investigators, but not to the public or to an innocent suspect. The subject is told which features he will see, but is not told which item is correct. If the record of the crime is stored in the subject’s brain, this response appears when the subject recognizes the correct, relevant items. If not, then the response is absent. A computerized mathematical analysis of the data determines whether or not the subject has knowledge of the salient details of the crime.

Procedure

Brain fingerprinting is such a method which does not require much proficiency or some bulky machinery. Moreover, as it records the changes in the brain directly, it is much more reliable than the other methods as described. The evidence of an expert witness is not on the basis of the facts; they can help the judiciary on the basis of the scientific findings. So, the opinion of the expert witness is of advisory nature, to advise the concerned authority on the basis of the scientific findings. In this regard, the brain fingerprinting can help the investigating agencies as well as the law enforcing agencies in solving the complicated cases with much ease.

Uses

All the new methods, when invented have to face some criticism. The same is the case of the brain fingerprinting. The brain fingerprinting won its first legal battle when on March 5, 2001 Pottawattamie County, Iowa District Court Judge Tim O’Grady ruled that Brain Fingerprinting testing is admissible in court. Dr. Farwell conducted a Brain Fingerprinting test on Terry Harrington, who is serving a life sentence in Iowa for a 1977 murder. The test showed that the record stored in Harrington’s brain did not match the crime scene and did match the alibi. Harrington filed a petition for a new trial based on newly discovered evidence, including the Brain Fingerprinting test. On February 26, 2003 the Iowa Supreme Court reversed his murder conviction and ordered a new trial. The Iowa Supreme Court left undisturbed the law of the case establishing the admissibility of the Brain Fingerprinting evidence.

In India also, the brain fingerprinting has been used on several occasion in many high profile sensational cases including the famous Telgi case. The Press Trust of India Ltd. on 4th September, 2004, added by quoting M S Rao, Chief Scientist and Director of National Forensic Science Laboratory that “India has become the second country after United States to introduce ‘brain finger printing’ for detection of white collar crimes”.

Discussion

With advancement of science, in every step of crime detection, we are depended on the different scientific methods of investigations. For testing the statement of the alleged offenders also, we need to use the scientific methods; we cannot stick to the age old methods of questioning or use of so called third degree for extracting the truth from the offenders. We must adopt the best method which is easier, without the need of much effort or need of much proficiency in this field.

But there is always a hurdle in application of the advanced methods as, as per the Article 20(3) of Indian Constitution, “No person accused of any offence shall be compelled to be a witness against himself.” On the basis of this, there are many counter pleas against the use of the new methods of scientific evidence including the brain mapping, challenging its validity in the court of law.

But in this context, report of the “National Criminal Justice System Policy” headed by Prof. N.R.Madhavanan has recommended various measures to be taken up by the Govt. for effective utilization of not only traditional Forensic Science requirements but also to overall Science and Technology as per the needs of Criminal Justice System to raise the levels of capability and sophistication. He recommended that “the evidence Act may need to amended to make scientific evidence admissible as “substantive evidence rather than opinion evidence’ and establish its probative value, depending on the sophistication of the concerned scientific discipline. He also recommended that “the network of laboratories should cater to not only traditional Forensic science requirements but also to the overall S & T needs of the criminal justice system, to raise their level of capability and sophistication.”

The brain fingerprinting is not direct evidence in relation to the crime, the result can only say, whether a person is lying or not, whether, he/she was involved in the crime or not on the basis of the memory encoded in the brain of the person.

Brain fingerprinting is such a method which does not require much proficiency or some bulky machinery. Moreover, as it records the changes in the brain directly, it is much more reliable than the other methods as described. The evidence of an expert witness is not on the basis of the facts; they can help the judiciary on the basis of the scientific findings. So, the opinion of the expert witness is of advisory nature, to advise the concerned authority on the basis of the scientific findings. In this regard, the brain fingerprinting can help the investigating agencies as well as the law enforcing agencies in solving the complicated cases with much ease.

References

15. India has become the second country after United States to introduce brain fingerprinting. The Press Trust of India Ltd. 2004 September 04.
Profile of poisoning cases in north Karnataka

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Dept. of Forensic Medicine, J. N. Medical College, Belgaum 590 010, Karnataka

Abstract
All around the world, acute poisoning remain a major cause of hospital admission. The wide availability and easy accessibility to potentially toxic chemicals (which have wide spread use in medicine, industry, agriculture and even in normal daily life) contribute to the ease with which the lay public can get their hands on lethal poisons. Poisoning has been used by man for murder and suicide as long as recording history, several modes of exposure may be recognized context with poisoning namely:

i) accidental and suicidal poisoning which cannot be prevented through legislation or preaching

ii) occupation exposure

iii) by standing exposure resulting from off target drift

iv) general public exposure who consume item containing pesticides residues.

Incidence of poisoning, as reported is 13-fold higher in developing countries than in highly industrialized nation. 300,000 people die each year from pesticide self poisoning in the rural developing world.

This is a pilot study conducted at Belgaum, North Karnataka to make preliminary assessment about poisoning cases etiologies. The aim of the study was finding out the common age group involved and mode of poisoning. Besides this it also attempts to relate with gender and their choice.

The common age group involved is in between 21 to 30 years. Males are more likely affected by poisoning (53%) compared to female (47%). This study serves as pilot project for more detailed retrospective and prospective studies in the future.

Key Words
Poisoning, North Karnataka

Introduction
Rapid industrialization and exposure to hazardous chemical products, introduction of newer range of drugs for treatment, massive use of pesticides in agriculture, increased alcohol consumption, unhealthy dietary habits has widened the spectrum of toxic products to which people have been exposed as compared with the early days. In the India alone more than 15-30% cases are reported every year to poisoning centers. Often many of these cases are detected, treated and discharged without serious complication.

According to WHO (1999) more than three million poisoning cases has been reported out of which 251,881 deaths occur world wide annually, of which, 99% of fatal poisoning occur in developing countries, predominantly among farmers due to various kinds of poisoning, including poisonous toxins from natural products are handled. A comparative data revealed that in developed countries, the mortality rate due to poisoning is only 1% to 2%, but in developing countries like India it varies between 15% to 30% (15) and is the fourth most common cause of mortality especially in rural India.

(Most of the victims present in unconscious in emergency department. The diagnosis should be state suspected in patients presenting with miosis, sweating and hyperparistalsis even in the absence of good supportive history. Such patients need careful thorough assessment, early diagnosis, vigilant monitoring and aggressive supportive management in the intensive care setting.)

The primary objective of the present study was to determine the mode of poisoning as well as common age group susceptible for poisoning. It is difficult to say that which of the age group as well as which gender is most susceptible for poisoning in this zone of Karnataka, India so we can do some efforts to bring some positive change because it always mentioned that precaution is better than treatment. Therefore we decided to do the same in this zone of Karnataka, to set a point of reference and for the purpose of comparison between gender susceptible for poisoning.

Material and methods
Study were carried out from 29 September 2008 to 15 June 2009. During 10 months period 100 cases of poisoning were registered in poison detection center, Forensic Medicine & Toxicology, J.N. Medical College, and KLE's Dr. Prabhakar Kore Hospital & MRC, Belgaum, Karnataka, India from north Karnataka.

All poisoning cases were screened by thin layer chromatography & colour test and same cases further confirmed by UV Spectrophotometer as well as enzymatic analysis.

The various agents implicated in poisoning cases were categorized under the heading of pesticides, drugs, alcohol & others. Pesticides mainly comprised of organo phosphorus compound, bromodilone, pyrethroid and other. Drugs encompassed mainly were sedative/ antidepressant. Alcohol cases were mostly due to consumption of ethanol and phenol.

Indigenously designed data collection forms were used to obtain data including the demographic origin of patients, age and gender as well as poison involved.

Result
Discussion
The present scenario of globalization, urbanization and industrialization is creating lot of stress on individuals in particular as well as on the society in common. Changes in social environment and economy along with modern mechanical the lifestyle have resulted increased distress and higher expectations. Family problems illness, (both mental or physical), loveaffairs, unemployment, failure in examination has been reported as the commonest causes responsible for poisoning among adult in India, while in middle age adult, sudden changes in economic conditions is an important additional causes beside those mentioned above. Changes in social environment stress associated with marriage, pregnancy, child bearing dependency interpersonal differences, maladjustment with spouse, dowry related harassment are the major factor in India women. Cooper et al (1994) mental or physical illness loss of love in relation, Mental illness, mainly affective disorders predominate in poisoning cases of both the genders. Marcikic et al (2003) reported loss of financial resources as the commonest cause of suicide. Increased occupation instabilities also contribute for increasing poisoning cases. Persons who are not able to sustain these stressful situations are the major victims of either suicidal or accidental poisonings. In this study, the poisoning trend
appears similar with pesticide predominating over other poison, mainly due to green revolution and industrialization, they have become household items of the agriculturists. Unfortunately, because of their easy availability and low economic values, they have also been commonly abused for poisoning purpose in the developing countries.

The sex incidence affected with poisoning was more with male which out numbered the female the ration being 1.12:1 and tallies with the other studies. In this study there was a male predominance (53%). Some other studies also reported the similar pattern done at Allahabad, Rohtak and Srilanka. The high incidence may be because males are more exposed to stress, strain and occupational hazards compared to females. When they are not in the position to satisfy their family emotionally, economically, they may get frustrated and in such condition the poisoning seems the answer of their questions.

As per this study, the most commonly involved age group belongs to 21-30 years. Studies done in India as well as in abroad also shown the same results. This is probably due to the fact that at this particular age group is the most active phase of life, most youth are in the process of transition from the teenage to adulthood and this is a difficult period associated with emotional upheavals, such as family expectations, competition in studies as well as in occupation to prove themselves all these factors make them stressed thus setting the stage for poisoning thoughts.

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

**Conclusion**

The most common age group implicated in poisoning cases is in between 21 and 30 years of age with the mean of 42% followed by the 11-20 years age group with the mean of 17%.

Poisoning are predominating among males (53%) as compared to females (47%).

The most commonly involved group comprises the pesticides (74%), followed by pharmaceutical (antidepressant) drugs (15%) and alcohol abuse (6%).

In all age groups primary mode of poisoning were pesticide followed by drug overdose.

Pesticide poisoning was most commonest in both gender.

There is an imperative need for implementation of the Pesticide Act strictly so that it could brace the legislature on availability of drugs.

<p>| Table 1: | shows the demographic characteristic of poisoning cases during 10 months period. Slightly more than 50% (i.e 53%) cases involved males. The majority of the poisoning cases were in the age group of 21-30 years. |</p>
<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
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<td>8</td>
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<td></td>
<td>53</td>
<td>47</td>
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</table>

Table 2: shows that in majority of cases (74%), mode of poisoning were pesticides. In that also 60% cases were due to organophosphorus compound followed by 28% cases of bromodilone. In drug overdose 14% cases were due to sedative and very few cases (5%) of alcoholic toxicity came in consideration.

<table>
<thead>
<tr>
<th>Pattern of poison</th>
<th>Frequency</th>
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<tr>
<td>Pesticide</td>
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<td>45</td>
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<tr>
<td>Bromodilone</td>
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<td>21</td>
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<tr>
<td>Lice powder</td>
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</tr>
<tr>
<td>Pyrethroid</td>
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</tr>
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<td>Carbamate</td>
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<tr>
<td>DDT</td>
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</tr>
<tr>
<td>Phenothiazine</td>
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<td>74</td>
</tr>
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<td>2.DrugsSedative</td>
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<tr>
<td>Other</td>
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<td>14</td>
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<tr>
<td>3.Alcohol</td>
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<td>5</td>
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<tr>
<td>4.Other</td>
<td></td>
<td>5</td>
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</tbody>
</table>

Table 3: shows that in all age group as well as in both gender primary mode of poisoning were pesticides followed by drugs and alcohols. 2 cases of poisoning of alcohol with drug and combination of pesticide with alcohol were reported.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Frequency</th>
<th>Pesticide</th>
<th>Drugs</th>
<th>Alcohol</th>
<th>Others</th>
<th>QNS</th>
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<td>34</td>
<td>7</td>
<td>2</td>
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<tr>
<td>31-40</td>
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<td>9</td>
<td>2</td>
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</tr>
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<td>2</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
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<td>71-80</td>
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<td>—</td>
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<td>76</td>
<td>15</td>
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</table>

QNS-Quantity not sufficient

Table 3: a female

<table>
<thead>
<tr>
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<th>Frequency</th>
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<th>Drugs</th>
<th>Alcohol</th>
<th>Others</th>
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<tr>
<td>31-40</td>
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<td>2</td>
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<td>2</td>
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<tr>
<td>41-50</td>
<td>5</td>
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<td>71-80</td>
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<td>6</td>
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Table 3: b male

<table>
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<th>Frequency</th>
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<th>Drugs</th>
<th>Alcohol</th>
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<td>41</td>
<td>8</td>
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and poisons substance in the market Enlightenment through educating young people by awareness programs about harmful effects of drugs, promoting poison information centres, introducing separate toxicological units in the hospitals and upgrading the peripheral health centres to manage cases of poisoning in emergency could possible help us to bring down the morbidity and mortality rate.

Acknowledgement

Authors are thankful to the Principal and Dean of Medicine Dr. V.D. Patil, MD & CEO Dr. M.V. Jali KLE’S Dr. Prabhakar Kore Hospital & MRC, Medical Superintendent Dr. R.S. Mudhol KLE’S Dr. Prabhakar Kore Charitable Hospital Belgaum, staff for their support and encouragement during the study data collection.

References

Fatality due to electric contact without visible electric burn mark-a rare presentation

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Abstract
Death of a person due to passage of electric current through the body is known as electrocution. In electric burns there may be small entry and exit points visible, of electric current. Fatal electrocution is divided into: Domestic electrocution low voltage (220-240V), Industrial electrocution high voltage (40,000-1,00,000V), Lightning very high voltage in thunder storms. The current may cause tissue damage or fibrillation if it is sufficiently high. Generally, currents approaching 100 mA are lethal if they pass through sensitive portions of the body. This is a case of fatal electrocution without visible electric burn mark. Occasionally, if the contact area is moist and duration of contact is very short, death could be possible without visible electric burn mark.

Discussion
Deaths due to the passage of electric current through the body are most often accidental, although suicides and homicides may occasionally occur. Electrical energy represents electron flow, or current, between two points with different potentials, measured in voltage. The amount of current is determined by the resistance of the conducting material. Electrocutons involving humans may be due to low voltages (<1000 V), high voltage (>1000 V), or to lightning. Deaths are caused by a direct effect of current on the heart, resulting in ventricular fibrillation, on respiratory muscles resulting in respiratory paralysis or on the brainstem respiratory centers. Deaths may also be caused by thermal effects of current, or by trauma or drowning associated with exposure to an electrical current, or to multorgan failure complicating initial injuries. The autopsy assessment of possible electrocution is complicated by the non-specificity and subtlety of lesions. Victims may have classical targetoid electrical burns of the skin with central charring, surrounding pallor and hyperemic rims. There may also be adjacent nodules of burnt keratin due to arcing of current. Victims of lightning strikes may demonstrate the typical ferning pattern of Lichtenberg figures. Conversely, other cases, e.g., electrocutons occurring in water, may have no pathological indicators of electrical injury. This is a case of fatal electrocution without visible electric burn mark.

Key words
electrocution, entry wound, moist skin

Case report
The dead body of a 15 year old boy was brought to the Mortuary of SMS hospital Jaipur, for a re- post-mortem examination. The post mortem of the deceased had already been conducted in a periphery hospital near the incident place. But due to public outcry and dissatisfaction of the authorities, a re- post mortem was conducted at SMS hospital, Jaipur. The deceased was playing in a water park, and he had just stepped out of a water ride and when he was walking to the next ride through a toy train track, he suddenly fell down unconscious. He was declared brought dead at the hospital emergency. According to first post- mortem at the periphery hospital, the cause of death was due to shock as a result of ante mortem head injury.

The second post mortem was done by a panel of doctors. It revealed abrasions and apparently non fatal minor injuries and there was no head injury. Viscera were preserved and sent for chemical analysis for common poisons and histopathological examination. Both the results were negative. Skin from both sides sole of foot were sent for histopathology, but they were inconclusive. The opinion was given as death due to electric shock, without visible electric burn mark.

The incident had occurred in a water park. The deceased foot would’ve been wet; hence accidental contact with the faulty train track of children’s train with moist foot ended up causing electrocution with no electric burn mark. All other possibilities of death were excluded and on the basis of circumstances, the cause of death was given as electrocution.
Earthing: The better contact between the person and the earth, the more dangerous will be its effects.

Resistance of the body: Dry intact skin offers high resistance; blood is a very good conductor. The most vascular area offers the least resistance to current conduction while sweating and moisture furthermore reduce this resistance.

To conclude, a well moistened skin may not show electrical burn, while a thick dry skin may show well marked electric burn. For this reason, the investigation of possible electrocution requires careful evaluation of the death scene and assessment of the electrical safety of the building and any electrical equipment that had been used. Meticulous examination of all body surfaces for subtle electrical burns with histological sampling is also required and exclusion of other possible causes must also be done.

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Intermediate syndrome due to organophosphate poisoning: Report of two cases in a tertiary care hospital of Punjab

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Abstract
We report 2 cases of organophosphate poisoning which developed intermediate syndrome. The first case was a male who took an organophosphate insecticide, and developed severe organophosphate poisoning. Respiratory support was needed. He was treated with atropine and 2-PAM. This was followed by weakness of neck muscles, proximal limb and respiratory muscle. By supportive treatment and careful monitoring, however, he recovered. The second case was a lady who developed severe organophosphate poisoning for which respiratory support was also needed. High dose of atropine, and PAM, was administered. She developed bulbar palsy, proximal muscle and respiratory weakness after the ingestion. Ventilation support was needed before weaning was successful. This report aims to alert physicians to recognize the intermediate syndrome for which adequate respiratory care is the crucial key for its management.

Keywords
Organophosphate, bulbar palsy, proximal muscle weakness, Respiratory failure.

Introduction
Organophosphate (OP) poisoning is a major global health problem with hundreds of thousands of deaths every year1,2. The clinical feature of organophosphate poisoning is a combination effect of acetylcholine stimulation on various kinds of acetylcholine receptors such as muscarinic and nicotinic receptors. Many factors are responsible for respiratory failure such as respiratory muscle weakness, bronchospasm with bronchorrhea, and respiratory tract infection. OP poisoning leads to three main syndromes: (1) acute cholinergic syndrome, (2) intermediate syndrome (IMS), and (3) OP-induced delayed polyneuropathy (OPIDPN). Regarding muscle weakness, two kinds of clinical features during acute organophosphate poisoning are described. Fasciculation and weakness from direct stimulation of nicotinic cholinergic receptor is well known. Another clinical feature is “an intermediate syndrome”3. IMS remains a major cause of the high morbidity and mortality in OP poisoning especially in developing nations like India4. IMS was first described as a syndrome of muscular paralysis occurring in conscious patients 24–96 h following ingestion, after their acute cholinergic syndrome was treated with atropine5,6. Muscle weakness affected predominantly the proximal limb muscles and those supplied by the cranial nerves. IMS was often associated with respiratory failure. More recent work suggests that IMS could occur before 24 h and even after 96 h7. The pathophysiology of IMS is not clearly understood but it is generally believed to result from a persistent excess of acetylcholine (ACh) at the neuromuscular junction8. The objective of this communication was to report on two interesting cases of neuotoxic manifestations from poisoning with Organophosphate (OP) poisoning. It is hoped that this report would serve to alert physicians to early recognize the intermediate syndrome during the course of severe organophosphate poisoning. Respiratory care is specifically emphasized as the key management for the intermediate syndrome patients.

Case reports

Case 1
A forty five year-old man was brought to the hospital with of after having consumed Organophosphate compound and was progressive comatose. On admission, he was unconscious, not responsive to pain stimuli. Vital signs revealed BP 120/80 mmHg, P 115/min, RR 24/min. Pupils were about 1 mm in diameter. Generalized sweating and coarse crepitation of both lungs were found. Muscle fasciculation was observed on both legs. He was intubated with and put on assisted ventilation. Poisoning with Organophosphate insecticide was then diagnosed. He was treated with gastric lavage via nasogastric tube feeding for gastrointestinal decontamination. Pralidoxime (2-PAM) and atropine were both administered. The dose of 2-PAM was 500 mg TDS and Atropine 1 ampoule was administered intravenously every 5 minutes till sign and symptoms of atropinization i.e. dryness of secretion of mouth, but the pupils remained 1-2 mm in diameter, so the atropine was continuously infused at the rate of 15 mg/hour. The patient’s consciousness was slightly improved. Secretion and sweating were minimal, heart rate ranged from 80–115/min, but the pupils were still 1-2 mm in diameter. On the second day of admission, his consciousness improved and he was able to follow verbal commands. The secretion was dry, but tachycardia and miosis still remained. The PAM and high dose of atropine were therefore continued. He was fully conscious on the 3rd day but was not able to flex his neck. Physical examination revealed bilateral symmetrical weakness of the proximal upper and lower extremities as well as neck flexor muscles as shown in Table 1. Although the lungs were clear, mechanical ventilation was still needed. No sensory deficit was detected. The intermediate syndrome was therefore diagnosed. On the 4th day, he developed visual hallucination, was restless and repulsive. He was sedated by haloperidol and diazepam. Then, atropine psychosis was suspected and the drug was discontinued. The psychotic feature then subsided. On the following days, patient’s secretion became less and hemodynamics was stable. Several weaning attempts were tried without success. Mechanical ventilation support was continued until the 7th day when weaken neck flexors and limb muscles improved to grade 4/5. Ventilator weaning was then initiated and patient could be weaned off the ventilator easily. He was finally extubated on the 9th day and fully recovered on the 11th day.

Case 2
A thirty-two year-old woman was referred to the hospital because of severe organophosphate poisoning. She intended suicide by ingesting Organophosphate insecticide 1 day ago. On physical examination, she was drowsy, with the vital signs: heart rate 85-96/min, BP 130/80 mmHg, RR 24/min. The pupils were pinpoint and there was hypersalivation, hypersalivation, with Muscle fasciculation and bleeding per vaginum. Atropine was started 1 mg every 10 minutes/hour and 2-PAM 500 mg every 6 hourly given intravenously. On the 2nd day she was more alert and able to follow verbal commands. Heart rate was 90-100/min. Pupils were 2 mm in diameter and reacted to light. Salivation was increased, but secretion was decreased but she complained of bilateral ptosis. Impairment of conjugated eye movement, bilateral medial gaze and upward gaze palsy were observed. Weakness of proximal muscles as well as neck muscles was detected as shown in Table 1. The intermediate syndrome was diagnosed. Atropine was gradually decreased to the rate of 1 mg mg/hour. 2-PAM was administered only on day 2 to day 3; then no fasciculation and generalized muscle weakness were found. On the following days, she was alert but could not breathe spontaneously. Continuous mandatory ventilation (CMV) mode was needed. The muscarinic signs were

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Organophosphate poisoning is a major global health problem with hundreds of thousands of deaths every year1,2. The clinical feature of organophosphate poisoning is a combination effect of acetylcholine stimulation on various kinds of acetylcholine receptors such as muscarinic and nicotinic receptors. Many factors are responsible for respiratory failure such as respiratory muscle weakness, bronchospasm with bronchorrhea, and respiratory tract infection. OP poisoning leads to three main syndromes: (1) acute cholinergic syndrome, (2) intermediate syndrome (IMS), and (3) OP-induced delayed polyneuropathy (OPIDPN). Regarding muscle weakness, two kinds of clinical features during acute organophosphate poisoning are described. Fasciculation and weakness from direct stimulation of nicotinic cholinergic receptor is well known. Another clinical feature is “an intermediate syndrome”3. IMS remains a major cause of the high morbidity and mortality in OP poisoning especially in developing nations like India4. IMS was first described as a syndrome of muscular paralysis occurring in conscious patients 24–96 h following ingestion, after their acute cholinergic syndrome was treated with atropine5,6. Muscle weakness affected predominantly the proximal limb muscles and those supplied by the cranial nerves. IMS was often associated with respiratory failure. More recent work suggests that IMS could occur before 24 h and even after 96 h7. The pathophysiology of IMS is not clearly understood but it is generally believed to result from a persistent excess of acetylcholine (ACh) at the neuromuscular junction8. The objective of this communication was to report on two interesting cases of neuotoxic manifestations from poisoning with Organophosphate (OP) poisoning. It is hoped that this report would serve to alert physicians to early recognize the intermediate syndrome during the course of severe organophosphate poisoning. Respiratory care is specifically emphasized as the key management for the intermediate syndrome patients.

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determined, but only a lower dose of atropine was needed to control the cholinergic effects. The extra-ocular muscle weakness recovered on the 5th day after the intoxication. Ptosis recovered on the 6th day. The secretion was dry and lungs were clear. However, weaning from the respirator was not successful. Arterial blood gas analysis showed respiratory acidosis (pH 7.39, pCO2 53, pO2 168 mmHg, HCO3 31.9 mEq/L). Atropine in the decrement rate of 0.6 mg/hour was needed for drying the secretion. On the 9th day, she was able to breathe spontaneously in continuous positive airway pressure (CPAP) mode, but showed a tendency to breathe at a slower rate while sleeping. Proximal muscle weakness improved to grade 4/5 and she was able to be extubated on the 11th day. The patient was discharged from the hospital subsequently on follow up all muscle weakness had disappeared.

Discussion

In organophosphate poisoning, muscle weakness is caused by over-stimulation of nicotinic cholinergic receptor at neuromuscular junction which causes depolarization blockade. The clinical features are muscle fasciculation and then generalized muscle weakness. There is another specific pattern of muscle weakness which is described as having weakness of proximal muscles, neck muscles, cranial nerve palsies, accessory respiratory muscles, and diaphragm. It was first reported by Wadia et al in 1974 as the type II paralysis after organophosphate poisoning. Senanayake and Karalliedde termed this pattern of weakness as “intermediate syndrome” (IMS) in 1987. The syndrome usually develops after acute cholinergic crisis phase, but may be superimposed on the cholinergic phase. Intermediate syndrome usually develops in cases of severe organophosphate poisoning. The onset is within 1-4 days after ingestion and it lasts for 7-21 days. The patients presented here had severe organophosphate poisoning and required a high dose of atropine to control the muscarinic cholinergic effects. They developed the typical features of IMS as well as the onset of the syndrome. The syndrome results in respiratory failure for a week since they had the IMS, even though the cholinergic effects were well controlled. Severity of cholinergic crisis during poisoning is more significant than the specific organophosphate in determining the development of IMS. However, not every organophosphate insecticide is reported to be associated with the intermediate syndrome. List of the organophosphate insecticides which cause IMS includes chlorpiriphos, diazinon, dimethoate, ethylparathion, fenathion, malathion, methamidophos, methylparathion, monocrotophos, oxamyl, and parathion. The exact cause of the intermediate syndrome has not been known. A hypothesis of muscle injury or necrotizing myopathy causing IMS fails to explain the whole clinical feature. Many electrophysiologic studies by electromyography and repetitive nerve stimulation have suggested that IMS might be due to the combination of pre and post synaptic impairment of neuromuscular transmission at the junction. Oximes are acetylcholinesterase enzyme reactivators which are theoretically helpful for organophosphate poisoning. There are many oximes including pralidoxime (2-PAM), obidoxime, trime Roxime and pyridine aldoxime methiodide. Another controversy with regard to oximes is the effect of oxime therapy and development of IMS. However, each oxime might have ineffectual efficacy or react differently with varying affinity to organophosphates as the various studies so far reported included different oximes and different organophosphates. Therefore, the effect of oxime therapy on IMS has to be further explored. So, it is concluded that there is insufficient evidence to indicate whether oxime therapy is beneficial or harmful in the management of organophosphate insecticide poisoning. Recognition of intermediate syndrome will help physicians to predict that the patient might be dependent on the assisting ventilator longer than cases that do not have, although signs and symptoms of cholinergic crisis are controlled.

Conclusions

Our findings suggest that IMS is a spectrum disorder in which the initial pathological process starts with acute cholinergic state, which may or may not progress through a series of electrophysiologic changes leading to respiratory failure and progressive decrement on RNS. Evolving findings provide valuable new objective information to facilitate assessments and to predict the development of IMS. It is intended that these findings will stimulate further clinical studies to determine the pathogenesis of IMS, which may in turn help to improve the management of OP poisoning.

References

Scientific, legal & ethical issues in stem cells research in India


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Abstract

Stem cells research is emerging as a new domain of biomedical research in India that has the potential to offer therapeutic options for incurable disease like Parkinsonism, diabetes and injuries. However like other scientific programme, stem cells research programme has created many scientific controversies and has raised social, legal and ethical issues, thus creating challenges for regulatory bodies, policy makers and scientists for making a uniform guideline in view of potential application of stem cell research and development of advance center for research activities. An open dialogue between the scientific community, physicians, patients and their advocates, lawmakers, and the lay population should be done to raise and address important ethical and legal issues and to balance the benefits and risks associated with stem cell Research and Therapy.

Introduction

Stem cells research is a new emerging domain of biomedical research in India that has the potential to offer therapeutic options for incurable diseases like Parkinsonism, diabetes and injuries. However like other scientific programme, stem cell research programme has created many scientific controversies and has raised social, legal and ethical issues, thus creating challenges for regulatory bodies, policy makers and scientists for making the uniform guidelines in view of potential application of stem cell research and development in advance centers for research activities. The technical safety and ethical challenges of this new treatment modality is substantial but its enormous promises provide strong incentive for ongoing research in the future. In India, Stem Cells Research Drafts have been formulated in 2007, jointly by the Deptt of Biotechnology, Ministry of Science & Technology and Indian Council of Medical Research. The Government of India has provided support to promote and carry out research on stem cells and also help in establishment of basic and advance training centers for both embryonic and adult stem cells across the country. Under these guidelines, Uniform stem cells research guidelines are required for making standard protocols for isolation of stem cells from various resources and for research on stem cells to address different aspects of human diseases.

Stem cells research and scientific issues

Stem cells are immature, undifferentiated cells found in the early mammalian embryo and have capacity to differentiate into different types of mature cells of the body.

Stem cells are also found in the fetus, in umbilical cord blood, and in tissues of the adult organism, where they provide a pool of progenitor cells for the development and renewal of specific tissues such as the blood and the nervous system.

Embryonic stem cells are self renewing, precursor cells for all other cells types and vary in their replicative capacity. They are derived from early stage of human embryo called Blastocyst. Usually the inner cell mass of Blastocyst are pluripotent in nature, transform in specialized stem cells that can turn into different types of cells forming various tissues in human body.

Adult stem cells may be derived from peripheral blood cells, bone marrow, cardiac tissues, cartilages, brain tissues and other tissues. The adult stem cells are hematopoietic, non-hematopoietic and organ specific stem cells. Hematopoietic stem cells, the blood forming cells are derived from bone marrow. Non-hematopoietic stem cells are mesenchymal stem cells and are derived from cartilage, fat, muscles, bone, placenta, lung, liver etc. Mesenchymal stem cells are pluripotent, non-immunogenic so not patient specific and have tendency to differentiate into different cell lineage like cartilage, bone and other active tissues. Because of these unique characteristics, mesenchymal cells can be used for allogenic transplantation.

Stem cells research and their applications

An important application of stem cell is making cells and tissues for medical treatments. Today, donated organs and tissues are often used to replace those that are diseased or destroyed. Unfortunately, people requiring any kind of transplant far exceed the number of organs available for transplantation. Here Pluripotent stem cells offer possibility as a source for replacement of cells and tissues to treat myriad of diseases, and disabilities including Parkinson's disease, multiple sclerosis, Alzheimer's diseases, spinal cord injury, stroke, , heart disease, diabetes, osteoarthritis and others.

Stem cells therapy now allows the development of novel methods for immune modulation in autoimmune diseases. One example is the genetic modification of hematopoietic stem cells or differentiated tissue cells with a “decoy” receptor for the inflammatory cytokine interferon gamma to treat lupus. So stem cells are the ideal targets for gene therapy approach as gene insertion into stem cells and their subsequent engraftment into the patient has capacity to grow and maintain lifetime supply of corrected cells. Other example is embryonic stem cells or adult stem cells that can be genetically modified before or during differentiation into pancreatic beta islet cells, to be used for transplantation in autoimmune induced diabetes. The resulting immune-modulated islet cells survive ongoing autoimmunity, increase the likelihood of long-term functioning of the transplanted cells, and eliminate the need for immunosuppressive therapy following transplantation.

Other applications of stem cells are also being investigated, for example as a source of differentiated cell types for drug screening and toxicity testing, or as vehicles for drug delivery. The availability of pluripotent stem cells would allow drug testing in a wider range of cell types. However, to screen drugs effectively, the conditions must be identical when comparing different drugs. Research on stem cells also promises to yield new insights into the molecular control of cell differentiation. At the L.V. Prasad Eye Centre, Hyderabad, more than 300 patients suffering from severe Limbal stem cell deficiency have been treated using limbal stem cells.

Stem cells research and ethical issues

In considering stem cell research associated with ethical issues, society has great diversity with respect to religious belief, moral values, individual’s rights and tolerance. Uncertainty, risks and limitations for how stem cells research should be used to alter the outcome of diseases. Religious views regarding this issue is the belief that the embryo, from the moment of Conception, is created by the God and has its own right with the same moral status as an adult human being. The only real difference between pro-lifers and pro-choicers involve the question of how the rights and duties of the individual and the embryo are balanced.
Stem cells research and legal issues (Global Regulations)

In UK, The Parliament has passed the 1990 Human Fertilization and Embryology (HFE) Act, which has remained the main guidelines for stem cell research in UK. The basic guideline under the HFE Act is that it is legal to carry out research on human embryos up to 14 days after fertilization. The 1990 Act enabled research programme to be licensed for certain specific purposes, mostly related to improve the understanding and treatment of infertility or miscarriages, or to the development of new methods of contraception. The Act also made it legal to create embryos specifically for research.

In India, Stem Cells Research Drafts have been formulated jointly by the Deppt of Biotechnology, The Ministry of Science & Technology and The Indian Council of Medical Research. Under these guidelines, establishment of new stem cells from spare, supernumerary embryos are permissible with prior approval of the institutional Committee for stem cell research and therapy and the Institutional Ethical Committee, provided appropriate consent is taken as per Drafts Guidelines.

In May 2005, the US House of Representatives passed the Stem Cell Research Enhancement Act-2005 that allows research on ES cells using donor IVF embryos only. U.S. government funds can be used only if the cells are derived from early human embryos that are created for the purpose of infertility treatment and are in excess of clinical needs of the individual seeking such treatment.

Some member states of the European Union (EU) have forced to make uniform guidelines for embryonic stem cell research. Not surprisingly the proposals have been considerably stricter than UK law, as many European nations prohibit the deliberate creation of embryos for research purposes while supporting other types of stem cell research. For example, the Council of European Convention on Human Rights and Biomedicine prohibits the creation of human embryos for research purposes thereby also prohibiting therapeutic cloning research, but not ES cell research based on supernumerary IVF embryos.

In Canada, Assisted Human Reproductive Act allows researchers to use embryonic cells from left over embryo. However in China, Human embryonic stem cells used for research purpose can only be derived from surplus IVF embryo, embryo created from fully donated gamets and by nuclear transplantation.

Conventions of the Council in 2001, France and Germany proposed the negotiation at the level of the United Nations, of an international convention against the reproductive cloning of human beings. A competent proposal was subsequently made by a group of States (including the United States of America and Costa Rica), which rejected this distinction and instead called for an international convention prohibiting human cloning, regardless of its purpose. This proposal had the support of over 60 nations but was highly contentious as it makers in the UK. They argue that embryos deserve respect because of the mere fact that they are alive and because people do ascribe value to them. But the moral status of the embryo is not the sole ethical consideration there is also a moral duty to protect human being from damage or injuries or other developmental disorders and if ES cell research has the potential to achieve that end, there is a moral duty to pursue it. And it would be justifiable because better prospects will be offered by stem cell therapy. The question, then, arises for achieving a balance between ethical values and scientific prospects.

The other ethical issues include concern about ownership, complication of therapy like cancer development in recipient, risk of transmission of potential genetic disorders, besides other general issues of confidentiality, justice and definite outcome of research. Is it ethical to take informed consent and to charge for this therapy from the patient, where outcome of the therapy is not known or not defined beforehand, by principal investigators, doctors or research centers? Answer to this question is still uncertain.
would prohibit all forms of human cloning, including that used for ES cell research. So it was, in turn, opposed by a group of States. A group of predominantly Islamic States have also opposed embryo cell research on the same ground that the human embryos in its earliest stages constitute life

Stem cells research and consent of donor

Legally donors should be protected by taking fully informed consent. Donors of embryos for research should be given appropriate counseling before donation and they must be given thorough and appropriate information about purpose and use of embryo for stem cell research. But socially, psychologically and also ethically it is not acceptable by the couples undergoing infertility treatment and they may not be mentally and physically sound to assess carefully the implications of donating their embryos or gametes for research purposes. The American Society for Reproductive Medicine recommends that consent for donation of embryos for research should only be taken once IVF treatment has ceased for whatever reason

Research by Sarah Franklin and colleagues 50 has pointed out positive and negative reasons of people who give their willingness to donate or not their spare embryos. Positive reasons include wanting to help others suffering from infertility and to help research in general. And those who not donated considered their embryo to be a potential life and therefore would not sacrifice it for research purposes; others did not donate because they did not understand what would be outcome of research.

Stem cells research and safety issues

Other important issues are assurance of safety and rights of those donating gametes, blastocyst or somatic cells for derivation of stem cells; or fetal tissues, umbilical cord cells or adult tissue (or cells) for use as stem cells. Safeguards should also be taken to protect research participants receiving stem cell transplants, and patients at large from unproven therapies.

So whether human stem cells are of embryonic, fetal, or adult origin, donor sources must be carefully screened. Routine testing should be done to prevent transmission of infectious diseases. Additionally, pedigree assessment and molecular genetic testing are also necessary. Thus parameters for stem cell research should include checking of chromosomal abnormalities, testing of infectious disease, looking for immune compatibility of the stem cell to patients requiring the treatments and also the ability of the stem cells numbers to be increased to useful amounts. The purpose of pedigree evaluation and or genetic testing is to establish whether the human stem cells are suitable for particular disease or not. For example, embryos derived from a donor with a family history of cardiovascular diseases may not be the good for treating damaged heart tissue. Similarly, the use of molecular genetic analysis could detect a mutation in the gene for alpha - Synuclein. This gene is known to be responsible for rare occurrence of early onset Parkinson’s disease. Detecting such a genetic abnormality in neuronal progenitor cells derived from an established embryonic germ cell line could block the use of those cells as a treatment for a number of neurodegenerative conditions, including Parkinson’s disease.

In order to make quality controlled protocols for stem cell research universally, it is necessary to adopt uniform controlled, standardized practices and procedures so that public can legally and ethically accept this technique.

Stem cell research and India

In India, over 40 institutions, hospitals and industries are involved in stem cell research, government has invested about 30 million dollars on stem cell research. Financial and scientific support to large and small biotech companies are also being considered through “Small Business Innovative Initiative Scheme” (SMIIIS).

For Scientific and Ethical Evaluation of Stem cells Research in India, a separate guidelines and committee have been made for reviewing and monitoring of research and therapy in the field of human stem cells. One at the National level called as National Apex Committee for Stem Cell Research and Therapy (NAC-SCRT) and the other at the institutional level called Institutional Committee for Stem Cell Research and Therapy (IC-SCRT). Under these guidelines, all institutions and investigators, both public and private, carrying out research on human stem cells have to be registered with the NAC-SCRT through IC-SCRT. All research studies using human stem cells have to take prior approval of IC-SCRT for permissive research and of the NAC-SCRT for restricted research. All new human stem cell lines have to be created, with prior approval of IC-SCRT or NAC-SCRT as applicable. All established human stem cell lines from any source, imported or created in India, have to be registered with IC-SCRT and NAC-SCRT. Permission for Import or procurement from other Indian laboratories have to be obtained from IC-SCRT. The investigator has to ensure that the cell line has been established in accordance with existing guidelines of the country. All clinical trials with any stem cell will have prior approval of IC-SCRT, Institutional Ethics Committee (IEC) and Drug Controller.

In India, many centers and institutions have made claims on successful use of stem cells in curing disease of the heart, liver and injuries to spinal cord and also said that they are approved by Governing Body for stem cells research. But in real practice when they were asked about their publications of work, procedures of stem cells therapy in respective patients and clinical trials and actual outcome of the treatment, governing body could not get any response from these centers in this context.

In August 2007 one center claimed to treat about 70 patient of spinal cord damage including Mr. Ajit Jogi, Chief minister of Chatisgarh, by stem cells therapy. But in real it was full drama, because none of those is standing or walking and all treated patients are on chair. Dr. P.M. Bhargav, founder directing for Cellular and Molecular Biology, Hyderabad confirms that in our country stem cells are being used without authorization and supervision in various parts of the country and bemoans the lack of a statutory agency to prevent such uses. Other lacuna is that bone marrow transplantation has not been included in ICMR guidelines (13th clause). Also it has not been defined who will perform this research and their basic essential qualification, their individual registration and also not mention ethical guidelines on involvement of doctors and scientists by ICMR or MCI in these activities. ICMR has confirmed that it has not given recognition to any centre for clinical applications of stem cell research and left it to the medical professionals to maintain a strict code of ethics in context to clinical practice. There is no stem cell research forum in our country to conduct regular meeting for stem cells research activities and discussion in respect to its future prospects.

Stem cells research and conclusions

To explore the definite clinical outcome of stem cell research, complete scientific research is essential. National agencies should be proactive for legalising the research programme, must promote for basic and advance research activities so that expertise can develop in this field. The interdisciplinary structure is yet to be created. Why is it important that the guidelines be made mandatory by legislation? Because guidelines are only guidelines, any violations cannot be punished; even the guidelines do not state that the IEC meeting proceedings should be reported to the ICMR, so that there is good coordination in IEC and governing body. An open dialogue between the scientific community, physicians, patients and their advocates, lawmakers, and the lay population should be made to raise and address important ethical and legal issues and to balance the benefits and risks associated with stem cell Research and Therapy.

Technical writing support

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Age estimation in adults using intra oral periapical radiographs in Indian population using Kvaal’s method

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Abstract

This study was undertaken to establish a precise technique for estimation of age in adults, both living and dead in forensic work and in archeological studies and to know the accuracy of the technique in age estimation. The aim of the study was to estimate the chronological age of an adult from measurements of size of the pulp obtained from intra oral periapical radiographs. The study group comprised of 100 normal individuals ranging from 20 to 70 years divided into six age groups. Patients with the presence of maxillary central and lateral incisors and second premolars and mandibular lateral incisors, canines and first premolars, from either left or right side as in the original study were selected for the study. The paralleling cone technique was used to take intra oral periapical radiographs of these teeth. The measurements of the teeth on the radiographs were taken using vernier calipers and stereomicroscope and the results were statistically analyzed. In the results it was noted that Pearson’s Correlation Coefficient of the width ratio’s was more significantly correlated (P<0.001) with age than length ratio’s (P<0.05). The standard error of estimation (S.E.E) in years of calculated age when compared to the chronological age for the three maxillary teeth was the lowest (10.2 years), followed by all six teeth (10.5 years). Among the single tooth maxillary central incisors had the least S.E.E. (11.5 years) and mandibular canines had maximum error of estimation (13.3 years). Gender wise student t-test showed no significant differences in age between male and female subjects.

Conclusion

Thus from this study it can be concluded that the study can be used in forensic investigations for age estimations with certain limitations.

Keywords
Age estimation by teeth; Intra oral periapical radiographs; Dental Pulp; Secondary Dentin.

Introduction

The effect of age on the human body is, to date, poorly understood. The effects of age on the body vary widely between individuals and will depend on such factors as genetics influences, disease experience, nutrition, life style and habits. Developmental indicators most commonly used are bone maturation, secondary sex characteristics, as well as height and weight.

Teeth may also tell a story. In a real sense there is a dental profile that can be developed from person’s mouth and teeth. Most recently, the dental maturation indicator system has been described as another useful index for comparison.

Estimation of age of the remains of a deceased individual can often be of great importance both in identification of cases and even in archeology. Age estimation from teeth has been frequently adopted, because teeth do get preserved long after all other tissues perish. Fully formed teeth show ageing changes that directly mirror those changes seen in the general system. Thus teeth can act as a biomarker of aging. The gradual changes taking place in the dental tissues after the teeth are fully formed are seen in the pulp and especially in the periodontal ligament which are examples of tissues where the turnover is high in the advancing age.

Dental age is one of the few measures of physiological development that is uniformly applicable from infancy to adolescence. After attaining maturity, teeth continue to undergo changes, making age estimation possible among adults.

Search for optimal age estimation procedures has continued over the years until the present day. The various developmental stages used in estimating the age of children and adolescents cannot be used in adults.

It is known that dental age estimation of individuals who are older than 21 years of age constitute a great challenge for medico-legal research. The dental age estimation methods most frequently used require extraction or microscopic sectioning of teeth which are expensive and time consuming.

With advancing age secondary dentin is deposited along the wall of dental pulp chamber leading to a reduction in the size of the pulp cavity, these changes can be measured from dental radiographs which would be a non-invasive and simple method and can be applied to both living and deceased.

Considering all the above factors, the purpose of our present study is to estimate the chronological age of adults without tooth extraction and destruction; by examining the relationship between age and pulpal size on periapical radiographs of maxillary central, lateral, and second premolar as well as mandibular lateral incisors, canines and first premolars.

Materials and methods

Intra oral periapical radiographs were obtained of 100 patients who were divided into five age groups ranging from 20 to 70 years. The five age groups included 20-29 years (17 males and 13 females), 30-39 years (9 males and 11 females), 40-49 years (12 males and 8 females), 50-59 years (10 males and 10 females) and 60-69 years (5 males and 5 females) (Table-1).

The subjects who fulfilled the following criteria were selected for the study after taking their consent:

1. The six teeth the Maxillary central incisor, Maxillary lateral incisor, Mandibular lateral incisor, Mandibular canine and Mandibular I premolar who were free from caries, any fillings, root canal filling, crowns and pathologies related to apical bone from either left or right side of the jaw were selected.
2. The mesiodistal plane of the tooth was parallel to the film.
3. The teeth were in normal functional occlusion.

The radiographs were taken using long cone paralleling technique under strict aseptic measures. The Paralleling technique was used in this study with the x-ray machine (trophy trex) and automatic exposure time for each tooth with a constant voltage of 70 Kvp and current of 8 Ma, using the film (Kodak E-speed film no: 2), using the film holder XCP (Extended cone projection). These radiographs were processed by using the standard methods of manual processing.

Measurements such as maximum tooth length, the pulp length and root length on the mesial surface from the cemento-enamel junction (CEJ) to the root apex (Figure-1) on the radiographs of all the six teeth i.e. (maxillary central incisors, lateral incisors, II premolar, mandibular lateral incisors, canine and I premolar) were carried out by mounting each radiograph on a SV-4 mini slide viewer and...
Statistical analysis

To reduce variation in the magnification and angulations of the radiographs the ratios such as the tooth/root length, pulp/root length, and Pulp/Tooth length, as well as the Pulp/width of root at three levels were tabulated and subjected to statistical analysis.

The measurements were calculated and recorded as:

- \(T\): Ratio between length of tooth and root;
- \(P\): Ratio between length of pulp and root;
- \(R\): Ratio between length of pulp and tooth;
- \(A\): Ratio between width of pulp and root at enamel-cementum junction (level A);
- \(B\): Ratio between width of pulp and root at mid-point between level C and A (level B);
- \(C\): Ratio between width of pulp and root at mid-root level (level C);
- \(M\): Mean value of all ratios (first predictor);
- \(W\): Mean value of width ratios from levels B and C;
- \(L\): Mean value of the length ratios P and R;
- \(W-L\): Difference between W and L (second predictor).

Correlation and regression analysis was performed to assess the relationship between chronological age and pulp/root measurements of different teeth and to estimate the age for given measurements. A prediction which included measurements of teeth from both jaws was calculated as were also separate predictions restricted exclusively from both the jaws were calculated. Separate predictions were also calculated for each of the six types of teeth included in the study.

Differences between chronological and calculated ages were analyzed using the student’s \(t\) test and the standard error of the estimated age was calculated. For all the tests a \(P\) value of 0.05 or less was considered for statistical significance.

Since no significant differences in ratios were found between male and female subjects, analysis including age estimation was done combined. All analysis was done with SPSS (Version 13) and Minitab Software (USA).

Formula used for analysis

Mean, \(\bar{x} = \frac{\sum x_i}{n}\)

Standard Deviation, \(SD = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}\)

Variance = \(SD^2 = \sum \frac{(x_i - \bar{x})^2}{n}\)

\(t\)-test, \(t = \frac{\text{Difference in means}}{\text{Std. error}}\)

Pearson’s Corr. Coefficient, \(r = \frac{\text{covariance}(x,y)}{\text{variance} x \times \text{variance} y} = \frac{\sum xy - \bar{x} \bar{y}}{S_x S_y}\)

\(r\) [Amount of change that is expected in one variable for unit change in another variable] Regression equation \(=\) can be used to predict age for given any other related measurements

\[Y = a + b_1 x_1 + b_2 x_2 \]

Coefficient of determination, \(r^2 = \frac{\text{explained variance for age due to related parameters}}{\text{total variance for age}}\)

Results

The Pearson correlation coefficients between chronological age and the different ratios (\(P, T, R, A, B, C\)) & (\(W, L, W-L\)) calculated based on length and width measurements are displayed in Table 2. All correlation coefficients noted in Table 2 were significant.

The correlations between the chronological age and ratio \(T, P\) were not significant for the different combinations of teeth. The coefficients of the difference between \(W\) (the mean value of width ratios from levels Band C) and \(L\) (the mean value of the length ratios \(P\) and \(R\)) were also not significant.

Correlation coefficient between age and the mean of the ratios from teeth from both jaws (bimaxillary) and from the maxillary and the mandibular teeth separately calculated are displayed in Table 3.

Highly significant correlation (\(P<0.001\)) between Age and mean value ratios of M, W and W-L was seen for all six teeth, three maxillary and three mandibular teeth.

Whereas relationship between the age and mean values of length ratios L for all six teeth, three maxillary and three mandibular teeth was not significant.

Regression equation predicted for all the six teeth, three maxillary teeth and three mandibular teeth and each tooth separately with \(M\) as first predictor and \(W-L\) as second predictor are displayed in Table 4. Based on the measurements made in this study and related to the calculation of age, statistical analysis also revealed the standard error of the calculated ages. Table 4 reports these standard error of the estimates (S.E.E.) as well.

Comparison of the difference between chronological age and calculated age was done using \(t\)-test analysis with (Alpha = 0.05) the results showed no significant difference between chronological age and calculated age for all the teeth except for mandibular canine which showed a significant difference (\(< 0.05\) ) (Table-5).

Gender wise comparison of measurements of all the ratios of each tooth showed no significant differences in age between males and females in almost all the teeth (\(P>0.05\)).

Discussion

Several studies have indicated that the amount of secondary dentin is correlated with chronological age and can be measured indirectly on radiographs and the formulae to predict age, based on ratios of lengths and widths of tooth/pulp as viewed on a radiograph have already been developed.\(^6,14,15\)

Some authors have looked at different methods of measuring morphological parameters on dental radiographs like image analysis and manual measurements when comparing both methods they concluded that there was weaker correlation with age when image analysis was employed than did ratios based on conventional measurements with same parameters\(^6,14\); i.e. despite advanced technology, conventional methods may be better suited for measuring linear morphological parameters in dental tissues\(^17\).

The ratios between the pulp and the root have been used for age estimation in this study taking the age change of pulp into account. (i.e. the size of the pulp is reduced with age due to formation of secondary dentin as age advances)\(^6,11,18\).

The continual secretion and mineralization of dentinal matrix
increased the mean crown dentinal thickness of all the teeth by 17.1%. Tooth dentinal thickness was found to increase by a total mean of 20mm per year in the root aspect while tooth dentin was found to increase by a mean of 13mm per year. The greatest root pulp diameter reduction was observed between age groups of 10 to 30 and 31 to 50 years, suggesting that the rate of physiological secondary dentinal secretion is not constant throughout life.

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The 10 years difference was taken because in a study statistically significant shrinkage in root canal due to dentin deposition was noted with advancing age between 10 years of age and 20.

The gender was not included in this study as the student t-test showed no significant difference in age of different gender in majority of cases.

The present study showed in the results that the relationship between age and the ratios of the tooth and root length (T) did not show any significant relation for all types of teeth which were similar to the preliminary study and two other studies where length ratios.

Table 1: Age and Gender Distribution of 100 Individuals

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>No. of Males</th>
<th>No. of Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20yrs – 29yrs</td>
<td>17</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>30yrs – 39yrs</td>
<td>09</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>40yrs – 49yrs</td>
<td>12</td>
<td>08</td>
<td>20</td>
</tr>
<tr>
<td>50yrs – 59yrs</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>60yrs – 70yrs</td>
<td>05</td>
<td>05</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2: Correlation Coefficients Between age and ratios of measurements from the dental radiographs and the mean ratios from each tooth n=100 (Pearson’s Correlation coefficient: r-values)

<table>
<thead>
<tr>
<th>Measures</th>
<th>11/21</th>
<th>12/22</th>
<th>15/25</th>
<th>32/42</th>
<th>33/43</th>
<th>34/44</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>-0.26**</td>
<td>-0.19*</td>
<td>0.06</td>
<td>-0.33**</td>
<td>-0.13</td>
<td>-0.06</td>
</tr>
<tr>
<td>P</td>
<td>-0.15</td>
<td>-0.14</td>
<td>0.07</td>
<td>-0.20*</td>
<td>-0.14</td>
<td>0.05</td>
</tr>
<tr>
<td>R</td>
<td>-0.39**</td>
<td>-0.39**</td>
<td>-0.40***</td>
<td>-0.28***</td>
<td>-0.44***</td>
<td>-0.35***</td>
</tr>
<tr>
<td>A</td>
<td>-0.51***</td>
<td>-0.33**</td>
<td>-0.38***</td>
<td>-0.05</td>
<td>-0.03**</td>
<td>-0.51***</td>
</tr>
<tr>
<td>B</td>
<td>-0.47***</td>
<td>-0.34**</td>
<td>-0.47***</td>
<td>-0.47***</td>
<td>-0.39***</td>
<td>-0.58***</td>
</tr>
<tr>
<td>C</td>
<td>-0.33**</td>
<td>-0.39**</td>
<td>-0.58***</td>
<td>-0.54***</td>
<td>-0.12</td>
<td>-0.26*</td>
</tr>
<tr>
<td>M</td>
<td>-0.52***</td>
<td>-0.45**</td>
<td>-0.31**</td>
<td>-0.46**</td>
<td>-0.27**</td>
<td>-0.26*</td>
</tr>
<tr>
<td>W</td>
<td>-0.45***</td>
<td>-0.38**</td>
<td>-0.57***</td>
<td>-0.54***</td>
<td>-0.27**</td>
<td>-0.43***</td>
</tr>
<tr>
<td>L</td>
<td>-0.34**</td>
<td>-0.30**</td>
<td>-0.06</td>
<td>-0.28**</td>
<td>-0.35***</td>
<td>0.16</td>
</tr>
<tr>
<td>W-L</td>
<td>-0.48***</td>
<td>-0.18</td>
<td>-0.43***</td>
<td>-0.23*</td>
<td>-0.13</td>
<td>-0.21*</td>
</tr>
</tbody>
</table>

r^2 = Co-efficient of determination (% Explained Variance), S.E.E = Standard Error of the estimate in years.

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Table 3: Correlation coefficient between age and the mean of the ratios from teeth from both jaws (BIMAXILLARY) and from the maxillary and the mandibular teeth separately (N=100, p < 0.001).

<table>
<thead>
<tr>
<th>Jaw/ Mean Ratio</th>
<th>Bimaxillary</th>
<th>Maxillary</th>
<th>Mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>-0.55</td>
<td>-0.55</td>
<td>-0.42</td>
</tr>
<tr>
<td>W</td>
<td>-0.63</td>
<td>-0.65</td>
<td>-0.49</td>
</tr>
<tr>
<td>L</td>
<td>-0.06, Ns</td>
<td>-0.05, Ns</td>
<td>-0.04, Ns</td>
</tr>
<tr>
<td>W-L</td>
<td>-0.48</td>
<td>0.43</td>
<td>-0.36</td>
</tr>
</tbody>
</table>

Pearson’s Correlation Coefficient. (r-value).

Table 4: Regression (prediction) equations for age in years based on dental radiographs from six teeth.

<table>
<thead>
<tr>
<th>Prediction Equation</th>
<th>r^2</th>
<th>S.E.E (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six teeth from both jaws</td>
<td>Age = 110 – 307 (M) – 157 (W – L)</td>
<td>0.44</td>
</tr>
<tr>
<td>Three Maxillary teeth</td>
<td>Age = 137 – 323 (M) – 145 (W – L)</td>
<td>0.47</td>
</tr>
<tr>
<td>Three Mandibular teeth</td>
<td>Age = 80.5 – 209 (M) – 11 (W – L)</td>
<td>0.28</td>
</tr>
<tr>
<td>Single Tooth 11/21</td>
<td>Age = 157 – 230 (M) – 54.2 (W – L)</td>
<td>0.32</td>
</tr>
<tr>
<td>12/22</td>
<td>Age = 140 – 170 (M) – 20.4 (W-L)</td>
<td>0.22</td>
</tr>
<tr>
<td>15/25</td>
<td>Age = 46.8 – 145 (M) – 103 (W-L)</td>
<td>0.29</td>
</tr>
<tr>
<td>34/44</td>
<td>Age = 89.6 – 143 (M) – 50.2 (W-L)</td>
<td>0.18</td>
</tr>
<tr>
<td>33/43</td>
<td>Age = 86.0 – 117 (M) – 34.5 (W-L)</td>
<td>0.10</td>
</tr>
<tr>
<td>32/42</td>
<td>Age = 116 – 215 (M) – 73.3 (W-L)</td>
<td>0.28</td>
</tr>
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</table>

P^2 = Co-efficient of determination (% Explained Variance), S.E.E = Standard Error of the estimate in years.

The 10 years difference was taken because in a study statistically significant shrinkage in root canal due to dentin deposition was noted with advancing age between 10 years of age.

The gender was not included in this study as the student t-test showed no significant difference in age of different gender in majority of cases.

The present study showed in the results that the relationship between age and the ratios of the tooth and root length (T) did not show any significant relation for all types of teeth which were similar to the preliminary study and two other studies where length ratios.

Legends for illustrations

Fig.1: Shows measurements such as maximum tooth length, the pulp length and root length on the mesial surface from the cemento-enamel junction (CEJ) to the root apex and the root and pulp width both at the CEJ (level A) and at the midroot level i.e. halfway between the CEJ and the apex of the root (Level C) as well as the midpoint between CEJ and mid root level (Level B).

Fig.2: Clinical photograph showing Measuring the length of the tooth

Fig.3: Clinical photograph showing Measuring the Width of the pulp and root

Table 3: Correlation coefficient between age and the mean of the ratios from teeth from both jaws (BIMAXILLARY) and from the maxillary and the mandibular teeth separately (N=100, p < 0.001).

Table 4: Regression (prediction) equations for age in years based on dental radiographs from six teeth.

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</tr>
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<td>10</td>
</tr>
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Table 2: Correlation Coefficients Between age and ratios of measurements from the dental radiographs and the mean ratios from each tooth n=100 (Pearson’s Correlation coefficient: r-values)
were poorly correlated to age. The reason might be that attrition, being significantly but relatively weakly correlated to age and moreover attrition is more of population specific due to changes in food habits and stress (bruxism).

However, the relation between age and ratio of length of the pulp and tooth showed significant relation to age i.e. as the age increases the length of the pulp decreases as it was proved in a previous study by Kvaal that root canal length for single rooted showed significant decrease as the age increases.

Related studies on the pulpal morphology have shown that the width of the pulp is a better indicator of age than the length. In the present study the width ratios of all teeth, was found to have a stronger correlation with age than the length ratios. The weaker correlation of width ratios of the mandibular lateral incisors and canine can be attributed to the curved jaws projected on a flat film which might result in certain amount of distortion.

A stronger correlation with age was found while employing the mean values of all the ratios from both the jaws. This was similar to the other related studies. Thus it can be attributed that as the age increases the width of the pulp decreases.

In the preliminary study, in the regression analysis formula the second predictor (W-L) was not included for mandibular canine as ratio at level A had negligible influence on principal component analysis in all teeth except canines. Where as in this study the (W-L) second predictor was also used for canines.

It was noted that coefficient of determination ($r^2$) was strongest when all the three maxillary teeth were included where as in other similar studies it was strongest for all the six teeth, however the difference is very negligible. The Standard error of estimation of calculated age when compared to the chronological age for all six teeth is 10.5 years and all the three maxillary teeth is 10.2 years. Also it was noted that the formula predicted in this study for all the six teeth gave a standard error of estimation of 10.5 years when compared to 8.6 years of the original study.

These differences might be attributed to the factor that this study was done in a different population. In the previous studies small fillings were taken into consideration but the reparative dentin cannot be differentiated from the secondary dentin radiographically so even the slightest of changes in size of the pulp might lead to change in measurements. However like the other studies these results indicated that the more extensive the information obtained from an individual, the greater will be the chances of arriving at a correct age estimation.

According to the grouping of percentage of errors standard errors more than $\pm 10$ years were considered acceptable for forensic investigations, thus this study could be acceptable for age estimation in forensic investigations.

Further the accuracy of the method depends on the precision of the measurements and the quality of the radiographs. In our study the measurements were made by only one observer. Inter and Intra observer differences were noticed in a non destructive dental age calculation method in adults i.e. in both morphological methods and radiographic methods. However the manual methods showed better correlation with chronological age than computer assisted ones.

In a study of age estimation performed with formule reported by Kvaal 1995 for the ratio of single teeth resulted in a mean under estimation of 31.44 years, for three maxillary teeth under estimate was 38.21 years and for all 6 teeth the under estimate was 46.04 years. In another study the regression formule reported by Paewinsky yielded a mean over estimation of chronological age of 20.8 years. When compared to these studies in our study a different regression formulae is used based on the technique of original study which gives a better estimation of age.

Short comings and limitations of this study could have been due to that an inter and intra observer difference has not been considered. Therefore it would be desirable if the human eye could be replaced by a machine or if the observer is trained also with a standard decision making process to avoid any bias due to a single observer.

However the formule presented in this study for estimating chronological age in adult teeth ought to be tested on various size and types of samples preferably by an independent observer. The application of this technique on different populations is time tested and reliable. Proper radiographic technique and good radiographs combined with reduction of the above mentioned short coming might give better result with less error of estimations.

Conclusion

From the results of this study it can be concluded that the use of Kvaal’s technique in adults and the application of the regression formulas of the present study on data’s obtained from the intra oral periapical radiographs may lead to age estimations with less error. The study being a non-destructive radiographic method done manually with simple materials and uncomplicated techniques appears to be promising and inexpensive. This study indicates that the width ratios are better indicators of age than length ratios and these can be used as parameters for age estimation. The formula used in this technique can be used on different samples. It is also observed that the accuracy of age estimation increases and the standard error of estimation of age decreases when more number of teeth is used for the age estimation from an individual. Thus from this study it can be concluded that the study can be used in forensic investigations for age estimations.

References


<table>
<thead>
<tr>
<th>Teeth</th>
<th>Chronological Age Mean ± S.D</th>
<th>Predicted Age Mean ± S.D</th>
<th>Mean Diff.(Chr – Pred) Mean ± S.D</th>
<th>S.E.</th>
<th>t-Value</th>
<th>P-Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sixteen from both Jaws.</td>
<td>39.5 ± 13.8</td>
<td>38.7 ± 8.5</td>
<td>-0.8 ± 10.3</td>
<td>1.03</td>
<td>0.78</td>
<td>0.44</td>
</tr>
<tr>
<td>Three Max teeth.</td>
<td>39.5 ± 13.8</td>
<td>39.2 ± 9.5</td>
<td>0.3 ± 10.2</td>
<td>1.02</td>
<td>0.29</td>
<td>0.77</td>
</tr>
<tr>
<td>Three Mand teeth</td>
<td>39.5 ± 13.8</td>
<td>39.3 ± 7.3</td>
<td>-0.2 ± 11.7</td>
<td>1.17</td>
<td>0.17</td>
<td>0.86</td>
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<td>11/12</td>
<td>39.5 ± 13.8</td>
<td>39.2 ± 7.8</td>
<td>-0.3 ± 11.5</td>
<td>1.15</td>
<td>0.26</td>
<td>0.79</td>
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<tr>
<td>12/22</td>
<td>39.5 ± 13.8</td>
<td>40.1 ± 6.3</td>
<td>0.6 ± 12.4</td>
<td>1.24</td>
<td>0.48</td>
<td>0.63</td>
</tr>
<tr>
<td>15/25</td>
<td>39.5 ± 13.8</td>
<td>39.7 ± 7.5</td>
<td>0.2 ± 11.6</td>
<td>1.16</td>
<td>0.17</td>
<td>0.86</td>
</tr>
<tr>
<td>34/44</td>
<td>39.5 ± 13.8</td>
<td>39.3 ± 5.8</td>
<td>-0.2 ± 12.5</td>
<td>1.25</td>
<td>0.16</td>
<td>0.87</td>
</tr>
<tr>
<td>33/43</td>
<td>39.5 ± 13.8</td>
<td>35.8 ± 5.3</td>
<td>-3.7 ± 13.2</td>
<td>1.32</td>
<td>2.80</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>32/42</td>
<td>39.5 ± 13.8</td>
<td>40.1 ± 7.4</td>
<td>0.6 ± 11.7</td>
<td>1.17</td>
<td>0.51</td>
<td>0.61</td>
</tr>
</tbody>
</table>

T-test NS- No significant difference. S- Significant difference.
Seasonal trends in suicide - a retrospective study

Raviprakash Meshram*, Shouvanik Adhya**, Biswajit Sukul***
*Post Graduate Student (Final Year), Department of Forensic & State Medicine, **MD, Formerly Post Graduate Student, ***MD Associate Professor, Department of Forensic & State Medicine, N.R.S. Medical College, 138, A.J.C. Bose Road, Kolkata 700 014

Abstract
Suicide is the second commonest manner of unnatural death flanked by accident and homicide. Suicide patterns and rates differ in various populations and cultures. It is known that in most countries that have been studied, more than 90 percent of those who commit suicide have a mental disorder. This behavior is often triggered by external & internal factors. In present study, we try to find out the seasonal variation in incidence of suicide. There are a lot of meteorological factors like ambient temperature, relative humidity, atmospheric pressure, rainfall, cloudiness and daily sunshine hours which may be the influencing agents causing difference in rates of suicide in different seasons of the year.

Key words
Suicide, Seasonal Trend

Introduction
The seasonal variation of suicides is a well-documented phenomenon in the medical literature. In the late 1880s, Durkheim (1970) found that the incidence of suicide was at its highest during spring or early summer and at its lowest during winter. This finding has been confirmed in numerous subsequent studies both from Northern (see for example, Kevan 1980, Massing & Angermeyer 1985, Chew & McCleary 1995, Altamura et al. 1999) and Southern Hemisphere countries (see, for example, Parker & Walter 1982, Flisher et al. 1997)1.

The suggestion of an association between meteorological factors and incidence of suicides dates back to the bioclimatic theory presented in the late 1800s by Morselli. According to Kevan (1980), Morselli suggested that meteorological factors, for the most temperature and its changes during spring and early summer, were important contributing factors in the seasonality of suicides1.

Many kinds of meteorological factors have been thought to exert an influence on the incidence of suicides.

Several studies have suggested a significant relationship between seasonal changes in meteorological variables and the incidence of suicides. For example, the monthly rhythm of suicides has been found to correlate with higher temperature, increased daylight duration, increased sunshine hours, or decreased humidity levels (Souetre et al. 1987, Salib & Gray 1997, Preti 1997)1.

Materials & methods
The study has an aim to find out the influence of temperature & humidity on the incidence of suicides in a part of Kolkata during the period 2008.

The study was undertaken at NRS Medical College Hospital, Kolkata. Out of total 2786 autopsies performed during this period, 773 were suicidal death.

Month wise distribution of suicidal incidence were taken along with average local temperature & humidity & then tabulated to retrieve relevant data for observation & comparison with various previous studies.

Observation

Discussion

Present observation is that the highest incidence of suicide occurs in the month of January & February but the study of Helinä Hakko2 shows those significant peak months were May, June and July, and troughs were January, February, March and December. The study of Flisher et al.2 shows a peak in the spring (that is, in September/October) or summer and a trough in winter. The study of Heeng-Ching Lin et al.3 show a significant peak in March-May (early to late spring) for violent suicides.

Conclusion
Researchers should further investigate to find various explanations for the apparent seasonal distribution of suicides. The relationship between suicides and meteorological conditions has been proposed to be explained by the seasonal pattern of recurrence of some psychiatric disorders, especially affective disorders. Meteorological factors have been suggested to act as an intermediary agent capable of interfering

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
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<tr>
<td>Acidity</td>
<td>Atmospheric acidity</td>
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<td>Air pressure</td>
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<td>Smoke levels</td>
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<tr>
<td>Cloudiness</td>
<td>Proportion of sky cover from sunrise to sunset</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>Geomagnetism activity, geomagnetic index, index of solar activity</td>
</tr>
<tr>
<td>Humidity</td>
<td>Relative humidity/humidity grade, humidity (maximum, minimum, fluctuation)</td>
</tr>
<tr>
<td>Latitude</td>
<td>Latitude for each nation’s capital city a</td>
</tr>
<tr>
<td>Length of day</td>
<td>Daylight duration</td>
</tr>
<tr>
<td>Rainfall</td>
<td>Quantity of rain, precipitation (minimum, maximum)</td>
</tr>
<tr>
<td>Sunlight duration</td>
<td>Amount of bright sunshine</td>
</tr>
<tr>
<td>Temperature</td>
<td>Ambient/air temperature (minimum, maximum, difference of maximum and minimum, departure from normal temperature)</td>
</tr>
</tbody>
</table>

Table 1: Month wise distribution of suicide victims according to average temperature.

<table>
<thead>
<tr>
<th>Months</th>
<th>Avg. Temp(celsius)</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan’08</td>
<td>20</td>
<td>113</td>
</tr>
<tr>
<td>Feb’08</td>
<td>22</td>
<td>109</td>
</tr>
<tr>
<td>Mar’08</td>
<td>27.5</td>
<td>66</td>
</tr>
<tr>
<td>Apr’08</td>
<td>30</td>
<td>57</td>
</tr>
<tr>
<td>May’08</td>
<td>30.5</td>
<td>51</td>
</tr>
<tr>
<td>Jun’08</td>
<td>29.5</td>
<td>51</td>
</tr>
<tr>
<td>Jul’08</td>
<td>29</td>
<td>49</td>
</tr>
<tr>
<td>Aug’08</td>
<td>29</td>
<td>54</td>
</tr>
<tr>
<td>Sep’08</td>
<td>29</td>
<td>57</td>
</tr>
<tr>
<td>Oct’08</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td>Nov’08</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td>Dec’08</td>
<td>19.5</td>
<td>61</td>
</tr>
</tbody>
</table>

Correlation -0.67283
with yearly rhythms in human biological processes. These biological rhythms may underlie a changing susceptibility to various factors, which are known to be related to suicide, such as depressive disorders.

References
1. Seasonal variation of suicides and homicides in Finland With special attention to statistical techniques used in seasonality studies, Helinä Hakko, Department of Psychiatry, University of Oulu, Department of Forensic Psychiatry, University of Kuopio, herkules. oulu. fi/ISBN9514256042/html/x335. html
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- Department of Psychiatry, University of Cape Town, J5 Groote Schuur Hospital, Observatory 7925, Cape Town, South Africa
- National Urbanisation and Health Research Programme, Medical Research Council, Tygerberg, South Africa
- Centre for Epidemiological Research in Southern Africa, Medical Research Council, Tygerberg, South Africa
- Department of Statistical Sciences, University of Cape Town, Cape Town, South Africa
- School of Health Care Administration and
- Department of Psychiatry, School of Medicine, Taipei Medical University,
- Department of Economics, National Taipei University, and
- Department of Psychiatry, Taipei Medical University Hospital, Taipei, Taiwan;
- Arnold School of Public Health, University of South Carolina, Columbia, S.C., USA

Table 2: Month wise distribution of suicide victims according to average humidity.

<table>
<thead>
<tr>
<th>Months</th>
<th>Avg. Humidity</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan’08</td>
<td>53.5</td>
<td>113</td>
</tr>
<tr>
<td>Feb’08</td>
<td>63</td>
<td>109</td>
</tr>
<tr>
<td>Mar’08</td>
<td>62.5</td>
<td>66</td>
</tr>
<tr>
<td>Apr’08</td>
<td>66</td>
<td>57</td>
</tr>
<tr>
<td>May’08</td>
<td>69.5</td>
<td>51</td>
</tr>
<tr>
<td>Jun’08</td>
<td>78.5</td>
<td>51</td>
</tr>
<tr>
<td>Jul’08</td>
<td>83</td>
<td>49</td>
</tr>
<tr>
<td>Aug’08</td>
<td>85</td>
<td>54</td>
</tr>
<tr>
<td>Sep’08</td>
<td>83.5</td>
<td>57</td>
</tr>
<tr>
<td>Oct’08</td>
<td>78.5</td>
<td>52</td>
</tr>
<tr>
<td>Nov’08</td>
<td>71</td>
<td>53</td>
</tr>
<tr>
<td>Dec’08</td>
<td>67</td>
<td>61</td>
</tr>
</tbody>
</table>
A retrospective study of Aluminium Phosphide poisoning cases in Ahmadabad region

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Abstract
The study was aimed to generate a baseline data on the epidemiological factors contributing to the incidence and mortality due to Aluminium Phosphide poisoning, so as to highlight the problem which required planned and concentrated effort in dealing with it on a broader horizon. Since prevention is the only logical approach there is an urgent need to take appropriate steps to prevent loss of lives. The analysis of data revealed that 100 cases of Aluminium Phosphide poisoning brought to the mortuary of SMT NHLMMC, Ahmadabad for medico legal autopsy during five years period 1995 to 1999. The age group ranged between 10-70 years with maximum incidences between 21-30 years and males outnumbering females. The main mode of poisoning was suicidal. The use of Aluminium Phosphide poisoning for suicidal purpose has markedly increased during the last decade. The incidences of poisoning were 12.65% of total post mortem in the hospital.

Key words
Aluminium Phosphide, Poisoning and Insecticides.

Introduction
Aluminium phosphide due to its low cost, easy availability and highly toxic nature is emerging as a common self poisoning agent in adult. Because of its highly lethal nature, depressed patients with high risk of suicide in the rest of the world also may soon be tempted to try this agent to end their real or imaginary misery.

Material and method
The material for the present study were collected from all these cases showing confirmed Aluminium phosphide poisoning on chemical analysis of viscera in the forensic science laboratory which brought for medico legal autopsy of Forensic Medicine Department, SMT NHLMMC, Ahmadabad from 1995 to 1999. Individual data was entered as deceased name, age, sex, address, marital status, occupation, type of poison consumed, amount, mode of poisoning and time of consumption. All data has been taken in a prepared preformed and analysis made from the data is analyzed in various tables.

Result
The present study reveal that out of a total 100 medico legal autopsies conducted during 1996 to 1999, Aluminium Phosphide was responsible for 100 (8%) of the unnatural deaths in Ahmadabad region with highest incidence in year 1996 and 1999(Table-1) the poisoning was common in the age range of 21-30 years. Male outnumbering the females, Female ratio being approximately 2:1(Table-2). The number of victim from the rural population was more than urban. 63% victims were from rural back ground and 37% from urban back ground. In rural category 19%male and 24% females were married whereas among urban victims 14% males and 12% females were married,(Table-3). Suicidal mode was the commonest with maximum number of cases reported during year 1996 & 1999 though all modes of poisoning were encountered.(Table-4).

Discussion
The five years retrospective study showed 100 cases of Aluminium Phosphide poisoning brought to the mortuary of Forensic Medicine department of SMT NHLMMC, Ahmadabad. Aluminium Phosphide is now rapidly becoming a very commonly used agent for suicidal poisoning as revealed by the present study and also by other- Sing et.al (01), Sepaha et. Al. (02) and Jain ET. Al. (05). Aluminium Phosphide is used as grain preservative particularly for wheat. It is easily available over counter and is marketed in India as CELPHOS, QUICKPHOS, SYNFUME and PHOSFUME tablets of 3 grams each contain 57% Aluminium Phosphide. A part from it’s easily availability other characteristic of Aluminium Phosphide is its highly lethal nature. The maximum incidence in the age group of 21-30 years noticed in our study is confirmed with the result of Siwach et.al. (03). The reasons for this trend may be that this age group is most susceptible associated with frustration, failure at school, unsuccessful in love affairs, conflicts with parents etc. It was observed in the present study that 63% victims from rural and 37% victims from urban. It is interesting to note that out of 48 females, 36 were married and 12 were unmarried females. Married females are outnumbering unmarried, may be because of social and financial stresses and devil of dowry causes the loss of patience. Married males outnumbering unmarried males in the rural population. The factor responsible for the trend observed in our study, an early marriage in rural community, along with its added familial responsibility, social customs and limited resources. Suicidal was the most common mode of poisoning(98%). This endorses our view that the inability to cope up with the demand put forth by the standard set but the materialistic modern society is the main factor responsible for fatal poisoning in this region. Different worker in this field have also found similar result in their studies14.

The initial explanation for increasing incidence was suggested to be the easy availability and high lethality. However despite the restriction on sale and distribution of this agent imposed by authorities has failed to reduce its use as suicidal agent.

Table 1: Annual Aluminium Phosphide deaths in comparison to total unnaturaldeaths.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total medico legal autopsies</th>
<th>Aluminium Phosphide poisoning case (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>759</td>
<td>08(1.05%)</td>
</tr>
<tr>
<td>1996</td>
<td>900</td>
<td>23(2.55%)</td>
</tr>
<tr>
<td>1997</td>
<td>904</td>
<td>25(2.76%)</td>
</tr>
<tr>
<td>1998</td>
<td>894</td>
<td>21(2.34%)</td>
</tr>
<tr>
<td>1999</td>
<td>935</td>
<td>23(2.45%)</td>
</tr>
</tbody>
</table>

Table 2: Age and Sex wise distribution of total Aluminium Phosphide poisoning cases.

<table>
<thead>
<tr>
<th>Age Group(Years)</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>14</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>21-30</td>
<td>27</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td>09</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>09</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td>03</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>61-70</td>
<td>00</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion
This study has brought forth following issues that there is a need:
A: To investigate the mechanism of action of Aluminium Phosphide with aim to develop an antidote for this killer poison.
B: To evolved measure for checking the increasing incidence and mortality due to Aluminium Phosphide poisoning
C: For centralized facility to manage poisoning case.

References

Table 3: Marital status of rural and urban victims.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Married (%)</th>
<th>Unmarried (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural male</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Urban male</td>
<td>14</td>
<td>07</td>
</tr>
<tr>
<td>Rural Female</td>
<td>24</td>
<td>08</td>
</tr>
<tr>
<td>Urban Female</td>
<td>12</td>
<td>04</td>
</tr>
</tbody>
</table>

Table 4: Modes of Aluminium Phosphide poisoning cases.

<table>
<thead>
<tr>
<th>Year</th>
<th>Suicidal</th>
<th>Accidental</th>
<th>Homicidal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>08</td>
<td>00</td>
<td>00</td>
<td>08</td>
</tr>
<tr>
<td>1996</td>
<td>23</td>
<td>00</td>
<td>00</td>
<td>23</td>
</tr>
<tr>
<td>1997</td>
<td>25</td>
<td>00</td>
<td>00</td>
<td>25</td>
</tr>
<tr>
<td>1998</td>
<td>19</td>
<td>00</td>
<td>02</td>
<td>21</td>
</tr>
<tr>
<td>1999</td>
<td>23</td>
<td>00</td>
<td>00</td>
<td>23</td>
</tr>
</tbody>
</table>

5. Jain ET. Al.: Aluminium Phosphide J Ind. Acad Forensic Med, 31(3)
Influence of sickle hemoglobinopahties on growth & development

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¹Lecturer, Department of Anatomy, Indira Gandhi Medical College & Hospital, Nagpur; ²Lecturer, Department of Physiology Government Medical College & Hospital, Nagpur; ³Professor, Department of Anatomy, Indira Gandhi Medical College & Hospital, Nagpur

Abstract

Sickle cell anemia patients have acute and chronic vaso-occlusion which may lead to poor nutritional status, lower hematocrit, more marrow, cardiovascular compensation and combinations of these factors affect growth which is consistent with constitutional delay. Sickle cell syndrome has considerable effect over development of an individual there by affecting forensic age determination. The present project was undertaken to study the effect of sickle cell anemia on growth status of 120 (27 homozygous SS disease & 93 AS trait) children of sickle cell anemia & 122 normal school children. Age of subjects ranges from 5-20 yrs.

The anthropometric parameters used were height, sitting height, length of hand, length of foot, interacromial & intercristal diameter. All measurements were taken in centimeters. Instruments used were anthropometer & spreading calipers, weight was measured in kilograms. Calculated values were tested for statistical significance. Sickle cell anemic patients appeared to be significantly shorter & weight was significantly reduced as compared to control. Length of hand & foot shows significantly lower value as compared to control, interacromial & intercristal diameter was significantly less as compared to control.

It can be concluded from present study that the growth of sickle cell anemic children is definitely affected by the disease process, children with sickle anemia are shorter, weigh less & have less transverse diameters. Therefore while examining a person for age assessment the forensic expert should address such issue and opinion should be furnished accordingly.

Key words
Age, Forensic, Sickle cell anemia, Height, Weight, Transverse diameters.

Introduction

Determination of age has civil as well as criminal importance. Forensic age determination is based on the assessment of physical features, secondary sexual development, dental status and radiological examination. Clinical examination is necessary to rule out disease or conditions affecting growth & development. Sickle cell syndrome has considerable effect over development of an individual there by affecting forensic age determination. Antecedent data suggests that children with homozygous sickle cell disease were found to be shorter, lighter & generally thinner body built than normal children.

Similarly delay in skeletal maturation and sexual maturation have been documented. Considering these factors the present study was undertaken to evaluate the somatic measurements in normal & sickle cell syndrome patient and to provide growth curves as a guide for forensic age determination.

Material & methods

The present prospective study was carried out at Indira Gandhi Government Medical College, Nagpur comprising of 120 ((27 homozygous SS disease & 93 AS trait) subjects in the age group of 5 to 20 years, attending sickle cell OPD. The diagnosis of sickle cell disease was confirmed by peripheral blood smears, sickling test and by paper electrophoresis. Patients having skeletal deformity were excluded from the study. The control group consist of 122 normal subjects. Subjects were measured wearing light clothing but shoes were removed. The anthropometric measurements were taken as per following procedure.

1. Height: Height was measured using an anthropometer with subject standing erect with heels together.
2. Weight: Weight was measured on beam balance scale measuring in kilograms upto accuracy of 100 gms.
3. Sitting height: Sitting height was measured with an anthropometer while the subject sitting on horizontal surface with head in eye-ear plane and his/her trunk stretched to maximum.
4. Hand length: Hand and forearm placed plain on a blank paper, the middle finger in line with the central axis of forearm position of styloid process of radius and tip of middle finger were marked and distance between two points was measured by spreading caliper.
5. Foot length: Subject was asked to put foot on foot board, position of posterior most point of heel and end of longest toe were marked and distance between two points was measured by spreading caliper.
6. Interacromial diameter: Subject was in anatomical position; the measurement was taken from the tip of acromial process of right scapula to the tip of acromial process of left scapula with the help of spreading caliper.
7. Intercristal diameter: Subject was in anatomical position; the measurement was taken from right iliac prominence to the left iliac prominence, with the help of spreading caliper.

Statistical analysis was done with unpaired t-test and the differences were calculated. The significant P value was less than 0.05.

Results

The present case control study consists of 120 case subjects consisting of 59 male & 61 female. Their age ranged from 5-20 years. The control group consists of 122 normal subjects consisting of 53 male & 69 female and their age ranged from 5-20 years. Male AS + SS, male SS, male AS patients were compared to total male control subjects. Female AS + SS, female SS, female AS patients were compared to total female control subjects. Total, both sexes (AS + SS), total SS & total AS patients were compared with total, both sexes control subjects.

The distribution of subjects according to sex & hemoglobinopahties is shown in table 1.

Height

Mean of the measured height was calculated for every year and plotted on graph (fig 1) to obtain growth curve for the height. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low height of study group as compared to control. Male (AS + SS) patient have significantly less value as compare to control male (P<0.005) height (AS + SS) of female appear to be significantly less than female control (P<0.005). Average height of male (SS) patient does not show significant value (P>0.05), average height (SS) female have significantly less value compared with control female. Average
height of male (AS) patient does not have significant value (P>0.05) as compared to control male. Average height of female (AS) patient does not show significant value.

**Weight**

Mean of the measured weight was calculated for every year and plotted on graph (fig 2) to obtain growth curve for the weight. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low weight of study group as compared to control. However statistically significant decrease in weight is seen for male (AS + SS) as compared to control subjects. Weight of total male patient (AS + SS) & female SS patient have significantly less value (P<0.01) as compared to control subjects. Male SS, AS & female AS patient also shows significantly less value (p <0.05) as compared to control subjects.

**Sitting height**

Mean of the measured sitting height was calculated for every year and plotted on graph (fig 3) to obtain growth curve for the sitting height. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low sitting height of study group as compared to control. However statistically significant decrease in sitting height is seen for female (SS) group & total (SS) group (p<0.05).

**Length of hand**

Mean of the measured length of hand was calculated for every year and plotted on graph (fig 4) to obtain growth curve for the length of hand. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low length of hand in study group as compared to control. Length of hand of most study group appears to be significantly less (p<0.05) than control subjects, except in male (AS + SS) & male (AS) (p>0.05).

**Length of foot**

Mean of the measured length of foot was calculated for every year and plotted on graph (fig 5) to obtain growth curve for the

---

**Table 1:** Showing distribution of subjects according to sex and hemoglobinopathies.

<table>
<thead>
<tr>
<th>Hemoglobinopathies</th>
<th>Female : Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS</td>
<td>51 : 42</td>
<td>93</td>
</tr>
<tr>
<td>SS</td>
<td>10 : 17</td>
<td>27</td>
</tr>
<tr>
<td>Total (AS + SS)</td>
<td>61 : 59</td>
<td>120</td>
</tr>
<tr>
<td>Control</td>
<td>69 : 53</td>
<td>122</td>
</tr>
</tbody>
</table>

**Table 2:** Showing different anthropometric parameters in sickle cell anemia patient & control subjects

<table>
<thead>
<tr>
<th>Study Subject</th>
<th>M</th>
<th>F</th>
<th>T</th>
<th>M</th>
<th>F</th>
<th>T</th>
<th>Control subject(t)</th>
<th>M</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ht mean</td>
<td>121.39</td>
<td>126.67</td>
<td>124.08</td>
<td>121.60</td>
<td>121.82</td>
<td>120.84</td>
<td>122.09</td>
<td>125.01</td>
<td>127.18</td>
</tr>
<tr>
<td>Sd</td>
<td>13.18</td>
<td>16.09</td>
<td>14.91</td>
<td>10.30</td>
<td>11.48</td>
<td>10.15</td>
<td>14.47</td>
<td>16.66</td>
<td>15.95</td>
</tr>
<tr>
<td>Wt mean</td>
<td>21.94</td>
<td>23.73</td>
<td>22.84</td>
<td>21.55</td>
<td>19.1</td>
<td>20.87</td>
<td>21.96</td>
<td>24.64</td>
<td>27.55</td>
</tr>
<tr>
<td>Sd</td>
<td>7.39</td>
<td>8.99</td>
<td>8.15</td>
<td>5.84</td>
<td>6.59</td>
<td>6.35</td>
<td>7.56</td>
<td>8.97</td>
<td>9.54</td>
</tr>
<tr>
<td>Sitt. Ht. mean</td>
<td>63.34</td>
<td>66.68</td>
<td>65.19</td>
<td>64.14</td>
<td>62.27</td>
<td>63.44</td>
<td>67.55</td>
<td>65.69</td>
<td>68.64</td>
</tr>
<tr>
<td>Sd</td>
<td>9.13</td>
<td>7.92</td>
<td>8.64</td>
<td>5.78</td>
<td>5.54</td>
<td>5.66</td>
<td>10.24</td>
<td>8.07</td>
<td>9.29</td>
</tr>
<tr>
<td>Sd</td>
<td>1.98</td>
<td>1.77</td>
<td>1.87</td>
<td>1.399</td>
<td>0.97</td>
<td>1.46</td>
<td>2.15</td>
<td>1.81</td>
<td>1.97</td>
</tr>
<tr>
<td>Lt. of foot mean</td>
<td>18.59</td>
<td>18.57</td>
<td>18.55</td>
<td>18.5</td>
<td>17.37</td>
<td>18.19</td>
<td>18.74</td>
<td>18.86</td>
<td>19.80</td>
</tr>
<tr>
<td>Sd</td>
<td>2.43</td>
<td>2.77</td>
<td>2.60</td>
<td>2.11</td>
<td>2.90</td>
<td>2.57</td>
<td>2.54</td>
<td>2.72</td>
<td>2.65</td>
</tr>
<tr>
<td>Inter-acromialmean</td>
<td>23.77</td>
<td>24.00</td>
<td>23.89</td>
<td>23.54</td>
<td>24.26</td>
<td>23.99</td>
<td>23.78</td>
<td>23.92</td>
<td>23.86</td>
</tr>
<tr>
<td>Sd</td>
<td>2.72</td>
<td>2.84</td>
<td>2.77</td>
<td>2.91</td>
<td>2.34</td>
<td>2.81</td>
<td>2.59</td>
<td>2.98</td>
<td>2.78</td>
</tr>
<tr>
<td>Inter-cristal diameter mean</td>
<td>17.35</td>
<td>17.85</td>
<td>17.60</td>
<td>17.15</td>
<td>16.27</td>
<td>16.95</td>
<td>17.34</td>
<td>17.16</td>
<td>17.94</td>
</tr>
<tr>
<td>Sd</td>
<td>2.91</td>
<td>3.72</td>
<td>3.34</td>
<td>2.31</td>
<td>2.21</td>
<td>2.33</td>
<td>3.13</td>
<td>3.89</td>
<td>3.57</td>
</tr>
<tr>
<td>P&lt;0.05</td>
<td>&gt;0.05</td>
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M- Male, F-Female T-Total, CT-Control, SD- Standard deviation, PV- P value, Ht- height, Wt- weight, Sitt- sitting height

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length of foot. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low length of foot of study group as compared to control. Length of foot of all study group patients appears to be significantly less (p<0.05) than control subjects except in male (SS) (p>0.05).

**Interacromial diameter**

Mean of the measured interacromial diameter was calculated for every year and plotted on graph (fig 6) to obtain growth curve for the interacromial diameter. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low interacromial diameter of study group as compared to control. Interacromial diameter of all study group patients appears to be significantly less (p<0.005). As seen in fig 6, sudden drop in growth of patient during age 13-16 yrs of age indicate substantial effect of disease process on interacromial diameter.

**Intercristal diameter**

Mean of the measured intercristal diameter was calculated for every year and plotted on graph (fig 7) to obtain growth curve for the intercristal diameter. The growth curves of study group & control group were parallel. The growth curve of study group follows control group and was at lower level. This denotes low intercristal diameter of study group as compared to control. Although this diameter are on average lower in patient it did not achieve a statistically significant reduction for male (SS, AS+SS, AS) & female AS group (p>0.05).

Analyzed by sex the result indicates that SS (female) show statistically significant decrease in all parameters as compared to control. Table 2, presents compiled anthropometric parameters in study group & control subjects.

The results indicate that when compared with normal children the SS children have smaller body measurement. Likewise AS children also show decreased values on several anthropometric measures when compared to normal children.

**Discussion**

It is known that there is variation in clinical severity associated with different sickle syndromes (sickle cell anemia, hemoglobin SC disease, SB+ thalassemia and SB- thalassemia). Sickle cell anemia in a homozygous state is having marked clinical manifestations where as sickle cell trait have somewhat benign course. Previous reports have presented varying and often conflicting data on growth and physical maturation in patient with the sickle cell syndromes. Some researcher reports of delayed growth & development in children where as some researchers indicated no differences in body weight or height measures when compared to normal adults.

In the present study the results showed that person (both sexes) suffering with sickle cell anemia exhibit low height, weight, sitting height, hand length, foot length, interacromial & intercristal diameter.
compared with control and the findings are in agreement with previous studies. Low weight is the most obvious abnormality, exhibits the most variation and may be most accurate in influencing the differences in physical maturation among the hemoglobinopathies.

Patients with sickle cell disease or chronic vasculocclusion, which may lead to poor nutritional intake. On the other hand, even without vasculocclusion, patients with more hemolysis have a lower hematocrit, more marrow and cardiovascular compensation and a large calorie requirement. Probably a combination of these factors can explain the observations that patients treated by transfusion show an increase in weight gain and spurt in physical maturation and that person with sickle trait have normal growth and development. Since the weight of children with sickle cell anemia are more severely affected than their height, the preponderance of linear or asthenic physique would be anticipated. Chronic ill health is recognized as a factor retarding growth in otherwise normal children and the susceptibility of SS disease children to infection may contribute, furthermore the energy requirement of increased cardiac work & high erythropoietic turnover, both present from the first few month of life might affect development. Previous studies have described the evidence of partial hypogonadism in children’s with SS type disease, & it may contribute both to abnormal prepubertal growth & to delay in secondary sexual development.

In agreement with other researchers, our data indicate differences in somatic development between normal & sickle cell trait subjects. The pattern of growth shows constitutional delay & roughly correlates with degree of hemolysis & sickling, since patients with homozygous SS disease are more severely affected than those with sickle cell trait (AS). The reason for such finding may be attributed to the minor sickling episodes that may take place in low oxygen tension areas of the vascular system of sickle cell carrier (AS). However this data should be regarded as preliminary and further study is required to address the issue.

The growth curves presented in the current study provide a guide for clinical assessment and investigation of patients with sickle cell hemoglobinopathies. The pattern of growth in sickle cell anemia is consistent with constitutional delay. The constitutional delay may affect physical and secondary sexual development of these subjects that in turn may affect forensic age determination. The delay in skeletal maturation is reflected in smaller body dimensions in SS group compared with controls. Therefore while examining a person for age assessment the forensic expert should address such issue and opinion should be furnished accordingly.

References
A comprehensive study of sexual offences in Tripura

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Abstract

Sexual offences are the most heinous crimes against women and children. It is the humiliating and the women and children remain the most vulnerable group of this crime. Finding out and preserving the biological evidences of sexual offences are the importance task for doctors and poor medical evidences are often responsible for low conviction rate of criminals. Careful analysis of preserved biological specimens is yielding the vital evidences in criminal investigations. Victims 11-20 years are vulnerable and dangerous for sexual assault.

Keywords

Sexual assaults, collection of biological evidences, poor evidences, low conviction rate, younger groups are vulnerable.

Introduction

The Agartala is a Capital City of Tripura which is geographically remotest and hilly area in the North-East States. Majority of the patients including sexual offences cases are referred to the Agartala Govt. Medical College and IGM Hospital, Agartala for necessary investigation and management.

Sexual offences are the act of sexual intercourse with a second person or an animal to obtain sexual gratification. The Law and customs of the society normally permit heterosexual intercourse between a man and his own wife as provided by the nature. Of all crime, sexual offences are the most barbarous and humiliating and the women and children remain the most vulnerable group of this crime. The alarming rise in rate of sexual offences worldwide creates a major health problems1.

As per statistic, in USA, an estimate of one in every four women and children2, in Nigeria four out of every ten women are victims of sexual assaults3. The incidence rate in South Africa is approximately 300 per 100,000 women4. But in India, over the last five years, rape cases have been shown alternate increasing and decreasing the trends with increase of 6.6% in the year 2000 over 1999 and a decline of 2.5% in the year 2001. In the year 2001, a total of 16,075 (1.6 per 100,000 population) cases of rape against women and 2,113 (0.2 per 100,000 Population) cases of child rape were reported all over the India. It shows that 11.2% and 19.5% of total crimes are against women and children respectively. The Delhi has the ranked of 5th for the incidence of rape cases against women and first for the rape on children (0.8 per 100,000 Population)5.

Careful finding out and preserving the evidences of sexual offences is an important task for a Doctor6. Poor medical evidences are often responsible for low conviction rate of the criminals7. Therefore, proper and correctly perform physical examination in sexual offences cases is of crucial importance. Careful analysis of preserved biological specimens such as blood, semen, saliva often yields vital evidence in the contemporary criminal investigation6. In the present article, the incidence and pattern of sexual offences in Tripura State along with the demographic variables, findings of physical and genital examination of victims and results of medical evidences collected are presented.

Material and methods

During the study period (January 2005 - December 2009) a total 71 victims of sexual offences were brought to the emergency block of Agartala Government Medical College and Indira Gandhi Memorial Hospital, Agartala for medical examination. Examination of female victims was carried out by the doctors of the Department of Obstetrics and Gynaecology. Details pertaining to the age, sex, religion, literacy, socioeconomic status, site of incidence, time interval between incidence and medical examination, number of assailants, relationship with assailants, findings of physical and genital examination, results of evidence collected during examination were noted.

Results

A total of 71 sexual offences cases of victims were examined and there no male victim was found in this study. The age of the victims ranged from a 4 years old child to 47 years old women. The most effected group of victims was between 11-20 years (70.42%) followed by 21 -30 years (9.85%). Three cases (4.22%) were above 41-50 years of age. Whereas under 10 years of age group there are six victims (8.45 %) which is significant (Table-1).

Discussion

The sexual assault is a neglected public health issue in most of the developing countries and there is likely to be an even smaller percentage reporting of sexual assault8. But only 10-50% female victims report such assault8. Under reporting of sexual assault is mainly due to social stigma, prejudice with regard to the chances of marriage being considered promiscuous and responsible for incidence, humiliation, shame, embarrassment caused by appearance and cross examination in the court of law, publicity in the press , risk of losing the love and respect of the society, friends, her husband, if she married9.

The present study was carried out on 71 victims sexual offences in the Agartala city of Tripura State from January 2005 –December 2009. In the previous studies, Sagar et al10 reported 38 victims in 1991 and Bhardwaj et al11 reported 80 victims in the years 1993 - 1994, Sarkar et al13 reported 90 victims in January 2001 – September 2002 in South Delhi population.

In this study, all the victims were females and the results are in consistent with the study of Sagar et al, 10 Bhardwarj et al, 11 Grossing et al 12, Riggs et al15 and Fimate et al., 16 Sarkar et al. 31 In the study of Bhardwa et al11and Malhutra et al 7 found that 40.70% victims of sexual assault were in the age group of 13 -20 years. In the study of DuMunt et al17 and Malhutra et al 7 found that 40.70% victims of sexual assault were in the age group of 13 -20 years. In the study of DuMunt et al17, majority of victims were of age group of 15 -20 years, while Islam et al 14 reported that 33.5% of victims were between 12 -15 years. In the present study, 50 (70.42 %) victims were between 11 -20 years of age. Malhotra et al 17 reported that the majority (76.9 %) of victims were adolescents. From this study, it can be concluded that no age is safe from rape. It is comparatively easy for assailants to rape children, as they are innocent and cannot physically resist and defend themselves. In India, as in some other countries, rape of children is due to the superstitious belief that venereal diseases can be cured by sexual intercourse with a virgin17.

In this study, the majority of victims were Hindu. The findings are...
In this present study, three-fourths of the victims were Hindu (90.14%), while 9.85% were Muslim and no Christian or other religion were found (Table-2).

Majority of the victims (46.47%) were not literate and less educated (21.12%) upto class V (Table-3). Lower socioeconomic background of victims 61 (85.91%) with monthly income below Rs.5000 (Table-4).

The majority of the victims (80.28%) were unmarried (Table-5). The vast majority of victims were knew their assailants. In 31(43.66%) cases there were acquaintance between victims and assailants, in 15 (21.12%) cases they were neibour, in 12 (16.90%) cases were closed friend while in 11(15.49%) cases assailants were stranger (Table-6).

The commonest sites of sexual offences were the houses of victims (49.29%) followed by road side or jungle (35.21%) (Table-7).

Maximum of the victims were brought for medical examination after 4th days of the incident (16.90%). Only 1(1.40 %) victim was examined on the day of incident and 9 (12.67 %) were examined after 4th weeks of incidence (Table-8).

In 41(57.74%) cases there was invalid consensual sexual intercourse followed by forcible rape in 17(23.94 %) cases and statutory rape in 11(15.49 %) cases. A large number of adult consensual rape cases, the assailants had a friendly relationship with their victims and had sexual activities after absconding together (Table-9).

There were 4(5.63 %) cases of gang rape, with a maximum of 3 assailants were involved in one case (Table 10). The simple to grievous injuries were found on the body of the victims. Eight (11.26%) victims had extra genital injuries, 9(12.67%) victims had genital and 5(7.04%) victims had combined genital and extra genital injuries. Rupture of hymen was found in 49(69.01%) cases (Table-11). The swabs collected from 46 victims and only one (1.40%) case spermatozoa was found positive (Table-12).

| Table 1: Age of the victims of sexual offences |
|-------------|-------------|-------------|-----|
| Age(years) | Female Victims | Male Victims | Total No. |
| 0-10 | 6 | 0 | 6 | 8.45 |
| 11-20 | 50 | 0 | 50 | 70.42 |
| 21-30 | 7 | 0 | 7 | 9.85 |
| 31-40 | 5 | 0 | 5 | 7.04 |
| 41-50 | 3 | 0 | 3 | 4.22 |
| >50 | 0 | 0 | 0 | 0.00 |

| Table 2: Religion of the Victims of sexual offences |
|-------------|-------------|-----|
| Religion | No. | % |
| Hindu | 64 | 90.14 |
| Muslim | 7 | 9.85 |
| Christian | 0 | 0.00 |
| Siks | 0 | 0.00 |

| Table 3: Literacy status of victims of sexual offences |
|-------------|-------------|-----|
| Education(Class) | Total No. | % |
| Not literate | 33 | 46.47 |
| Class I- Class V | 15 | 21.12 |
| Class VI-Class IX | 11 | 15.49 |
| Class X-Class XI | 9 | 12.67 |
| Above Class V | 3 | 4.22 |

| Table 4: Socio-economic characteristics of victims of sexual offences |
|-------------|-------------|----------------|
| Socio-economic status | Total No. | Percentage |
| Lower | 61 | 85.91 |
| Middle | 7 | 9.85 |
| Higher | 3 | 4.22 |
| Total | 71 | 100 |

| Table 5: Martial status of the victim of sexual offences |
|-------------|-------------|-----|
| Martial status | Total No. | % |
| Married | 13 | 18.30 |
| Unmarried | 57 | 80.28 |
| Widow | 1 | 1.40 |

| Table 6: Relationship of assailants with victims of sexual offences |
|-------------|-------------|-----|
| Type of Relationship | Total No. | % |
| Acquaintance | 31 | 43.66 |
| Stranger | 11 | 15.49 |
| Close friend | 12 | 16.90 |
| Neighbour | 15 | 21.12 |
| Teacher-students | 2 | 2.81 |

| Table 7: Places of incidence of sexual offences |
|-------------|-------------|----------------|
| Places of incidence | Total no.No=71 | Percentage |
| Victim’s house | 35 | 49.29 |
| Accused house | 9 | 12.67 |
| Relative house | 2 | 2.81 |
| Road side/Jungle | 25 | 35.21 |
| Total | 71 | 100 |

| Table 8: Time distribution of alleged sexual offences of victims |
|-------------|-------------|-----|
| Days/Week | No.71 | % |
| Same day | 1 | 1.40 |
| 2nd day | 5 | 7.04 |
| 3rd day | 9 | 12.67 |
| 4th day | 12 | 16.90 |
| 5th day - 7th day | 8 | 11.26 |
| 1st week - 2nd week | 11 | 15.49 |
| 2nd week – 3rd week | 10 | 14.08 |
| 3rd week – 4th week | 7 | 9.85 |
| > 4th week | 9 | 12.67 |

| Table 9: Types of sexual offences |
|-------------|-------------|-----|
| Type of offences | Total No.No=71 | % |
| Forcible rape | 17 | 23.94 |
| Invalid adult consensual sexual offences | 41 | 57.74 |
| Statutory rape | 11 | 15.49 |
| Attempted rape | 2 | 2.81 |
| Unnatural sexual offences | 0 | 0.00 |

| Table 10: Distribution of assiallant & victims of sexual offences in gang rape |
|-------------|-------------|-----|
| No. of victims | No. of assailant |
| 1 | 3 |
| 1 | 3 |
| 1 | 2 |
| 1 | 2 |
| 4 (5.62%) | 10 (Two assailant on each victims) |

| Table 11: Distribution of pattern of injury on victims of sexual offences |
|-------------|-------------|-----|
| Type of injury | Total no.No=71 | Percentage |
| Extra genital | 8 | 11.26 |
| Genital | 9 | 12.67 |
| Extra genital & genital | 5 | 7.04 |
| Hymen ruptured | 49 | 69.01 |
| Total | 71 | 100 |

| Table 12: Results of Laboratory Tests Performed of alleged rape victims. |
|-------------|-------------|-----|
| Test performed | No.46 | +ve | % |
| Microscopic Examination of spermatozoa | 46 | 1 | 1.40 |
| Acid phosphate test | 46 | 0 | 0.00 |
| Florence Test | 46 | 0 | 0.00 |
| Barberior’s Test | 46 | 0 | 0.00 |
| Hanging drop preparation | 1 | 0 | 0.00 |
in consistent with the study of Fimate et al16 (57%) and the population distribution in India. In the present study, majority of the victims 57 (80.28%) were unmarried which are agreement with studies of DuMont13 (65.2%), Islam et al 14(56.6%), Fimate et al 16(57%), Sarkar et al 31 73(81.1%). Majority of the victims 33(56.47%) were not literate and from a low socioeconomic background (n=61, 85.91% with a monthly income below of Rs.5000. While Islam et al14 reported that majority of victims were illiterate.

In this study, half of the victims were known to the assailants; only 11(15.49%) of the cases the assailants were stranger. Similar findings have been observed by Fimate et al16 of the victims and assailants relationship, acquaintance (69.7%) and strangers (25.6%). While Islam et al 14 reported that in majority of cases the victims knew their assailants. The National data of India5 shows that in majority of cases the assailants were the neighbour. Strangers have been reported as the common assailant in the study of Okonkwo et all 3(34.8%), Riggrs et al15(39%) and Dumont et al13(49.2%). Malhotra et al 7 reported that rape by person acquainted with victims is common for girls less than 10 years of age. Rape or assault by strangers increased significantly with age. Grossin et al12 reported that in half of the cases of victims examined within 72 hours, the assailant was a stranger; while in those examined after 72 hours the assailant was the Family member (58%), mainly the father (30%).

The most common site of sexual offences were the victim’s lower genitalia (49.29 %) as reported by Grossin et al12 and Okonkwo et al3. Majority of victims in this study were brought for medical examination on 4th (16.90%) while only 11(1.40%) was examined on the same day of the incidence. In the study of Grossin et al12 of the victims were presented for medical examination within 72 hours. In the study of DuMont et al13(40.1%) the victims were reported to the hospital within 2-6 hours after incident, while Islam et al14 reported that 23.7% of victims reported within 72 hours. .

There was invalid consensual sexual intercourse in 41(57.74 %) cases as found in this study. According to the section 375 IPC, a woman above 16 years is capable of giving consent to an act of sexual intercourse, but the consent must be free and voluntary and giving while she is in full possession of her faculties. Under section 114 A of Indian Evidence Act 1872 if a woman in her statement before the court states that she did not consent, the court presumes that she did not consent17. In maximum number of cases, the assailants had a friendly relationship with their victims and had sexual activities after abscinding together.

In this study found that 4(5.63%) cases there was more than one assailants (gang rape). In the study of Riggs et al 15 more than one assailants was involved in 20% cases. Grossin et al 12 reported that in 15% of cases examined within 72 hours and 10% of cases examined after more than one assailant was involved.

Killing of a victim following sexual act could be either in panic or to destroy a witness of crime17. Only 10-20% cases murder is prompted by the urge of sexual gratification. 18 Victims being under influence of alcohol and drugs was reported by Okonkwo et al 3(39% and 12% respectively) and Dumont et al 13(41.7%) of alcohol). Though it was not found in this study.

A quarter of victims had a few simple to grievous injuries on their bodies. Eight (11.26%) victims had extra genital, 9(12.67%) victims had genital and 5(0.04%) victims had combined genital and extra genital injuries. They were mostly involved in forcible rape. Rupture of hymen was found in 49(69.01%) cases of victims and maximum cases were of old rupture. Islam et al 14 reported extra genital violence in 2-6% of cases. Malhotra et al 7 reported injuries in 32.3%, extra genital injuries 21.5% cases. DuMont et al 13 reported injuries on bodies of victims in 64.2% cases. Grossin et al 12 reported if any sexual trauma and genital trauma in 39.1% cases and 35.1% cases examined within 72 hours and 6.3% and 19.5% cases examined after 72 hours respectively. Hymenal (11%), vulvovaginal (20%) and anal lesion (7%) cases were found. Riggs et al 15 found general body trauma (67%) and genital injuries (53%). Absent of genital injuries on the victims examined could be due to various reasons. Majorities of the victims were adults with prior sexual activities. No hymenal lesions can be seen in such victims because they have residual hymen. Genital injuries are common in children and post menopausal women. The nature and time of assault determines whether injuries would normally be expected18. The absence of physical injuries may not contradict the allegation as absence of general body trauma could be explained by the vulnerability of the victims and by the fact that the assailant could have exercised authority over the victims, so that the victim offers minimum resistance19. Rapidly healing injuries can be missed in cases with delayed examination or there may be false allegation20. Similarly, value of examination immediately following an alleged incident is limited by the fact that bruises may not become apparent for at lest 48 hours. It is widely acknowledged by the medical profession that absence of injuries or abnormality of an anal area in sodomy cases does not refute a history of anal intercourse as these are very few abnormalities which provide conclusive evidence of anal intercourse21.

The swabs collected from 46 cases of victims and show positivity for spermatozoa only in (11.40%) case. of victims. In the study of Grossin et al 12 spermatozoa were positive in 30.3% cases while Riggs et al 15 reported that evidence of sperm and semen in 48% cases. Devis and Wilson (1974) 22 observed that seminal blood group antigens could be detected on swabs collected within 48 hours, acid phosphatase upto 2 days, choline within 24 hours, and complete spermatozoa within 3 days after sexual intercourse. The absence of sperm may be attributed to any of the following causes, erectile inadequacy, impotence, premature ejaculation before penetration and ejaculation incompetence21. Other factors may include prolonged postcoital intercourse, oligospermic or orchidecstomised assailants, penetration without ejaculation, digital penetration, use of condoms or spermicidal agents and menstruation and vaginal inflammation22.

The present study highlights the importance of addressing rape as a public health issue and focuses on the demographic profile of victims in an urban area.

References
Interpretation of injuries and causes of death among victims of fatal road traffic accidents at KLES’s Dr Prabhakar Kore Hospital and Medical Research Centre, Belgaum – a cross sectional study

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Abstract

Background and objectives

Deaths due to Road Traffic Accidents (RTA) are increasing at an alarming rate throughout the world. Thereby it poses itself as a major epidemiological and medico legal problem. Victims of RTAs sustain large varieties of injuries and many of them are fatal or dangerous to life. The studies of pattern of injuries help in the reconstruction of RTA. The study of injuries associated with fatal outcome helps in implementation of measures to prevent fatalities due to RTAs. Hence, the present study was conducted on victims of fatal RTAs to know, injury pattern, survival period, incidence in relation to age and sex; time diurnal) and seasons. In addition, an attempt was also made to know the cause of death.

Methodology

The present cross sectional study is the post mortem study carried out on the victims of fatal RTAs who died while undergoing treatment in the KLES’s Dr Prabhakar Kore Hospital & medical research centre, Belgaum, during the period from 15-11-2006 to 14-11-2007.

Observation and results

RTA related deaths accounted for 56.81% of total medico legal autopsies conducted during the study period. Males out numbered the females with the ratio of 8.09:1. Most commonly involved Age group was 21–30 years (28%). Maximum numbers (42%) of RTAs recorded in the evening hours and season wise (48%) in the winter. Head and neck injuries were in maximum number of victims (87%), followed by thoracic injuries (12%). More than 1/3rd of victims (45%) died between 24 hours and 1 week after sustaining injuries. Intracranial injuries irrespective of skull fracture were responsible for death in 85 cases (85%) followed by due to hemorrhagic shock (7%).

Conclusion and interpretation

Intracranial injury is the most common finding in the study. It is observed that in majority of cases, intracranial injury especially with skull fracture either directly or indirectly contributed the cause of death. Moreover, the treatment of skull fracture and intracranial injuries were not successfully even in tertiary level hospitals, could be due to the physiological & anatomical configuration of brain. Hence, it proves that the fatality due to intracranial injury can be reduced by preventing the incidence of such injuries instead of treating them. So, prevention is better than cure stands true in intracranial injuries

Keywords

Fatal RTA, Types of injury, Cause of death, Skull fracture

Introduction

In recent years, deaths due to RTAs are increasing at an alarming rate throughout the world. Thereby it poses itself as a major epidemiological as well as medico legal problem. This is due to the tremendous increase in the number of vehicles, high-speed technology along with other contributing factors like congestion and poor condition of roads, intoxicating influence of alcohol or drugs, inexperienced drivers without proper driving license, ignorance or intentional violation of traffic rules etc. Victims in RTAs sustain large varieties of injuries, external as well as internal. External injuries may be abrasions, lacerations, contusions etc. Internal injuries may be fractures, rupture of viscer, destruction of major arteries etc. Fatality in RTAs can be due to immediate causes like haemorrhage, injury to vital organs, vagal inhibition, neurogenic shock, embolism etc. and late causes like infection, complications of injuries, mismatched blood transfusion etc. The city of Belgaum is a District Head Quarter and situated close to the National Highway. In Belgaum district, during the year 2003-04 a total of 2042 cases of RTA were registered, 3000 people were injured and 458 individuals lost their lives2. Therefore, the present cross-sectional study is undertaken to know, the injuries sustained in fatal RTAs and the exact cause of death among them.

Materials & methods

The present study was a cross-sectional study. The study material comprised of victims of RTA who succumbed and subsequently autopsied at the KLES’s Dr Prabhakar Kore Hospital & Medical Research Centre, Belgaum during the 1 year period from 15th November 2006 to 14th November 2007. The sample size was estimated to be 100 (by taking 80% of the average of similar cases, over a period of previous 3 years – (November 2004 to September 2006) and this was covered during the above said period.

Ethical clearance for the present study was obtained from the Institutional Ethical Committee, J.N.Medical College, Belgaum.

In the present study information regarding the bio-data of the deceased and various characters regarding the circumstances of the accident and time of accident were gathered from all possible sources like police records, hospital records and also by direct interrogation with investigating officer, eye witnesses (if available), relatives and friends of the deceased accompanying dead bodies. In addition to these X-ray report of each case was reviewed and the radiograph was examined for the presence of fracture before commencing the autopsy. In each case, a thorough external and internal examination was done for the injuries and opinion as to the cause of death was made after the examination. The data thus obtained was recorded in the predesigned and pretested proforma, comprised of relevant data concerned with the objectives of the study, and analysis.

All the victims of RTA who died in KLES’s Dr Prabhakar Kore Hospital & Medical Research Centre, Belgaum and subsequently autopsied at the same centre, were included in the present study. Controversial road traffic accidents cases were excluded from the study.

Written informed consent was obtained from the legally authorized person in every case for collection of data including photographs of autopsy findings.

Age of the deceased was calculated as to the nearest completed years categorized in an interval of 10 years. The time of accident categorized into 4 slots i.e. morning (6.01 am to 12 noon), afternoon (12.01 pm to 6pm), evening (6.01 pm to 12 midnight), and night (12.01 am to 6 am). In addition, the cases were grouped into three as
### Table 1: Profile of medico legal autopsies conducted during the study period

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<th>Type of case</th>
<th>No. of cases</th>
<th>Percentage</th>
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<td>56.81</td>
</tr>
<tr>
<td>Others</td>
<td>95</td>
<td>43.19</td>
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<tr>
<td>Total</td>
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### Table 2: Age and sex wise distribution of cases of fatal RTA

<table>
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<th>Female</th>
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</tbody>
</table>

### Table 3: Diurnal variation of cases of fatal RTA

<table>
<thead>
<tr>
<th>Time of accident</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning (6.01 am to 12 noon)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Afternoon (12.01 pm to 6pm)</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Evening (6.01 pm to 12 midnight)</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>Night (12.01 am to 6 am)</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 4: Seasonal Variation of cases of fatal RTA

<table>
<thead>
<tr>
<th>Season</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer (February to May)</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Rainy (June to September)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Winter (October to January)</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 5: Period of survival following accident

<table>
<thead>
<tr>
<th>Survival period</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 24 hours</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>24 hours to 1 week</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>1 week to 2 weeks</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2 to 4 weeks</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4 to 5 weeks</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 6(a): Profile of External injury

<table>
<thead>
<tr>
<th>Injury</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>External injury</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>No external injury</td>
<td>03</td>
<td>03</td>
</tr>
</tbody>
</table>

### Table 6(b): Profile of External injury:

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasion</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>Laceration</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Contusion</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Incised wounds</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Stab/penetrating wounds</td>
<td>00</td>
<td>00</td>
</tr>
</tbody>
</table>

### Table 7: Profile of Internal injury

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone fracture</td>
<td>4</td>
</tr>
<tr>
<td>Soft tissue</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 8: Profile of Soft tissue involvement

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of cases</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head &amp; neck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Spinal cord</td>
<td>05</td>
<td></td>
</tr>
<tr>
<td>- Brain</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Intracranial haemorrhage</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Thorax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lungs</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>- Heart</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>- Large vessels</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Abdomen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Stomach &amp; intestine</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>- Kidneys</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>- Spleen</td>
<td>04</td>
<td></td>
</tr>
<tr>
<td>- Liver</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>Pelvis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Bladder</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>- Organs of generation</td>
<td>00</td>
<td></td>
</tr>
</tbody>
</table>

### Table 9: Profile of Bone fracture

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of cases</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ribs</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Lumbar vertebrae</td>
<td>01</td>
<td>94</td>
</tr>
<tr>
<td>Pelvic bone (hip bone)</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>Long bone</td>
<td>03</td>
<td></td>
</tr>
</tbody>
</table>

### Table 10: Profile of Internal Injury in head & neck

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>No. of cases</th>
<th>Associated with skull fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal cord</td>
<td>05</td>
<td>01</td>
</tr>
<tr>
<td>Brain (laceration/contusion)</td>
<td>71</td>
<td>71</td>
</tr>
<tr>
<td>Brain haemorrhage</td>
<td>86</td>
<td>82</td>
</tr>
</tbody>
</table>

### Table 11: Profile of Intracranial haemorrhage

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>Extra Dural Haemorrhage</th>
<th>Sub Dural Haemorrhage</th>
<th>Sub Arachnoid Haemorrhage</th>
<th>Intracerebral Haemorrhage</th>
<th>Brainstem Haemorrhage</th>
<th>Skull fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra Dural Haemorrhage</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>03</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Sub Dural Haemorrhage</td>
<td>13</td>
<td>76</td>
<td>75</td>
<td>13</td>
<td>-</td>
<td>72</td>
</tr>
<tr>
<td>Sub Arachnoid Haemorrhage</td>
<td>12</td>
<td>75</td>
<td>84</td>
<td>14</td>
<td>01</td>
<td>78</td>
</tr>
<tr>
<td>Intra Cerebral / Cerebellar haemorrhage</td>
<td>03</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td>Brainstem Haemorrhage</td>
<td>-</td>
<td>-</td>
<td>01</td>
<td>-</td>
<td>01</td>
<td>01</td>
</tr>
</tbody>
</table>

---

per season of accident i.e. summer (February to May), rainy (June to September) and winter (October to January).

**Results**

In 195 medico-legal autopsies, 100 were of RTA cases (Table no 1). Of which, 89 males (89%) and 11 females (11%) with the ratio of 8.09:1. Maximum number of victims 60% were falling in the age group of 21 to 50 years (Table no 2). that too maximum cases 28(28%) were in the age group of 21-30 years. Youngest victim was a female child of 2 years and eldest was male of 80 years. It was noted that, more number of cases was of evening hours RTAs (42%), next was of afternoon 35(35%) and least number 14(14%) was each of night and morning. (%) (Table no 3).

Season wise it showed that maximum number of 48 cases (48%) occurred during the winter season, followed by 37 in summer(37%) and 25 cases in rainy season(25%) (Table no 4).

In relation to survival period, death within 24 hours after the accident was in 29(29%) cases, after 24 hours but within 1 week in 45 (45%) (Table no 5). External injuries were seen in 97 cases and the remaining 3 cases did not show any of the external injuries (Table no 6A). The type of external injury was abrasions in all 97 cases (97%), followed by lacerations in 93(93%) and contusions (Table no 6B).

Internal injuries like, soft tissue injuries were present in all 100 cases, where as fracture bones were present in 94 (Table no 7). Region wise, in the head & neck- presence of intracranial haemorrhages in 87 cases, brain injuries in 71 cases, and cervical spinal cord injury in 05 (Table no 8). In thorax region, lung injuries seen in 11 cases and heart injuries in 03 (Table no 8). In abdominal region, kidney injuries seen in 11 cases, spleen injuries in 04 and liver injuries 03 (Table no 8). In 94 cases of fracture bone, Skull fracture contributed to 82, Ribs fracture to 21 Lumbar vertebrae fracture to 1, Pelvic bone fracture to 03 and Long bone fracture to 03 (Table no 9).

Fracture skull was seen in all 71 cases of Brain injury (laceration/ contusion) (Table no 10), in 82/86 intracranial haemorrhage and in 1/5 spinal cord injury that too base of the skull. Among the intracranial haemorrhages, most common one was subarachnoid haemorrhage seen in 84 cases, followed by subdural haemorrhage (76), extradural haemorrhage in 14, intra cerebral/cerebellar haemorrhage in 14 and least is of brain stem haemorrhage 01 (Table no 11).

The fracture Ribs was seen in 7/11 cases of lung injury and all 3 cases of heart injury (Table no 12).

Among the abdominal injuries, spleen injury was maximum (04 cases), followed by kidney, lumbar vertebra & pelvis each in 3 cases, and liver in 2 cases (Table no 13).

Lower limbs fracture was noted in 3 cases and upper limbs in 2(Table no 14).

Intracranial injuries (85%) were accounted the maximum of cause of death followed by hemorrhagic shock (7%), spinal cord contusion (5%) and traumatic asphyxia (3%) (Table no 15).

**Discussion**

During the present study, 195 medicolegal autopsies conducted. Maximum number of cases -100 was of RTAs. Deaths due to fatal RTAs accounted for more than half of the total medicolegal autopsies conducted. This result is significantly more when compared with results of studies conducted. Out of 100 RTAs cases, 89 (89%) males and 11(11%) females with the ratio of 8.09:1, indicating that a large majority of victims were males. Maximum number of victims were in the age group of 21-30 years followed by 51-60 yrs. Minimum of victims were found in the extreme age group of 71-80 yrs and less than 10 years. Youngest victim was 2 year old female child and eldest was 80 years old male. Our findings are similar to the results of the study conducted at PGIMS, Rohtak. Our study results on diurnal variation showed that, maximum number of accidents occurred in the evening hours and minimum in the night which is similar to the observations made in the study conducted at, GTB Hospital, Shahadra (New Delhi). The result on seasonal variation in the present study is maximum number of cases are of winter, followed by summer.

**Table 14: Profile of Internal injury in limbs**

<table>
<thead>
<tr>
<th>Vessels</th>
<th>Soft tissue</th>
<th>Bone fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper limbs</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Lower limbs</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Table 15: Profile of Cause of death**

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracranial injuries/intracranial haemorrhage/ brain injury</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Hemorrhagic shock</td>
<td>07</td>
<td>07</td>
</tr>
<tr>
<td>Traumatic asphyxia</td>
<td>03</td>
<td>03</td>
</tr>
<tr>
<td>Spinal cord contusion</td>
<td>05</td>
<td>05</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
rainy season were comparative with the study done in Allahabad7. with respect to survival period 29 victims (29%) died within 24 hours after the accident, after 24 hours but within 1 week 45 (45%) died. The cases which succumbed within 24 hours had severe head injuries. The number of cases decreased with increase in survival period. Only 1 victim (1%) survived for more than 4 weeks. Similar findings were observed in a study done in north Bengal11 & Allahabad12. Where as, in a study done by Sharma BR et al 13, only 3% survived for one week.

In our present study internal injuries were classified like bone fracture and soft tissue injuries. The findings were similar to study done14. In our present study, bone fracture was seen in 94 cases. The bone fracture involved fracture of skull, ribs, lumbar vertebrae, pelvic bone & long bones. Skull fracture was seen in 82 cases. Ribs fracture in 21 cases, lumbar vertebrae fracture in 1 case, pelvic bone fracture in 3 cases and long bone fracture in 3 cases. Fracture of skull was most commonly observed in the study conducted at Bangalore, Queensland (48.3%) 15; PGIMS, Rohtak (51.6%)5; Birmingham Accident Hospital, Birmingham (52.18%) 16; Office of Judicial Medical Officer, Colombo (71.37%)6; Birmingham and Werwickehire (60%) 17. In the present study, brain injury (laceration/contusion) was seen in 71 cases and all associated with fracture of the skull. The spinal cord injury was seen in 5, of which 01 case had fracture of the skull. The intracranial haemorrhage was seen in 86 cases, of which 82 cases showed fracture of skull. The findings of our study are similar to study done at Rohtak5. According to various study, subdural haemorrhage is the most common haemorrhage which differs from our study done 5, 18, 11, 19. In our present study, injuries in thorax were classified as ribs fracture, thoracic vertebrae fracture, lung injury, heart injury and diaphragm injury. Ribs fracture was seen in 21 cases followed by lung injury in 11 cases and least was heart injuries in 3 cases. Most of the lung injuries were associated with rib fracture. All the cases involving heart showed fracture of ribs. The findings of the present study except in injuries associated with rib fracture are similar to study at North Bengal11. In our present study, abdominal injuries are classified as stomach & intestine, liver, spleen, kidney, lumbar vertebrae and pelvis. Among these, maximum are spleen injury 4 cases, followed by kidney, lumbar vertebrae & pelvis involve in 03 cases of each, and then liver in 02 cases. Injury of kidney with spleen was seen in 01 case. Injury to spleen with pelvic fracture was seen in 01 case. But, Liver was the most commonly involved abdominal organs According to some other's studies11, 18. In our present study, lower limb bones fracture seen in 03 cases and fracture upper limb bones in 02. Out of 03 lower limb bone fracture, 2 cases were associated with other bone fracture (01 with pelvis, 01 with upper limb and skull bone). Among the 02 cases of upper limb bone fracture, 01 was associated with rib fracture where as other was associated with skull and lower limb bone fracture. There was no involvement of any great vessels it is similar to the studies5, 19. In our present study, cause of death was intracranial injuries (85%) in maximum number of cases. Among the 85 cases of intracranial injury, 82 cases showed fracture of skull. Next to intracranial injuries was hemorrhagic shock (7%), spinal cord contusion (5%) and traumatic asphyxia (3%) and similar to others' studies11, 14, 16, 17, 12.

Conclusion

Constant rise in the number of motor vehicles, rampant encroachment of roads, easy to avail the vehicle because of loan facility, nasty tendency of violating traffic rules and anarchic traffic systems have greatly contributed to rapid increase in RTAs. Population explosion is a catalyzing factor for a number of accidents. The rise of road traffic accidents has become a major public health problem. RTAs cost a lot not only to the individuals affected and their families but also to the nation. The injuries, disability, and fatality resulting from unexpected RTAs put a significant drain on the economy of the nation. The deaths due to RTAs accounted for 56.81% of total medico legal autopsies conducted. That means, more than half of unnatural deaths are due to RTAs. All the victims of fatal RTAs had injuries of one or other system. In majority (86%) of victims, intracranial injuries contributed either directly or indirectly to death. Intracranial injuries cause alone was responsible for death in 85% of cases, followed by haemorrhagic shock (7%), spinal cord contusion (5%), and traumatic shock (3%). This shows that intracranial injuries are most common fatal injuries in road traffic accidents in this region. This could be due to the fact that, the intracranial injuries are still not treatable successfully, even in tertiary level hospitals. This may be because of their physiological and anatomical configuration. Hence, reduction in fatalities due to injuries of road traffic accidents can be reduced by preventing head injury (cranial and intracranial) i.e. “Prevention is better than cure”. In other words, prevention of RTA can reduce fatal injuries and fatality due to RTA. This can be achieved by the maintenance of the existing roads, designating separate roads for different vehicles and speeds, for different directions; improving in the visibility on roads, road signals; stringent enforcement of traffic rules etc. Injuries and its severity in road accidents/crashes can be prevented or reduced by encouraging the use of protective measures especially for head, like use of crash helmets, both by pedal and motorcyclists, use of seat belts by occupants of motor vehicle, inclusion of air bags in cars etc. If necessary, further structural modification of the motor vehicle can be advised. Traffic safety education should be given in schools for production of skilled and responsible drivers in future. In case of accident, severity and fatalities due to lapse of time can be prevented by establishing traffic aid post at suitable distances on the highways and establishment of mobile trauma clinics by the government as well as by NGO. This also helps to assist injured and transport of injured to the hospital for further management. Hence, an organized teamwork by personals of many disciplines like education, engineering, medical, law enforcement agencies are required for effective prevention of RTAs and in turn prevention or minimization of fatality by road traffic accidents.

References

18. Chaudhary BL, Singh D, Tirpude BH, Sharma RK, Meel V. Profile of Road Traffic Accident Cases in Kasturba Hospital of M.G.I.M.S., Sevagram, Wardha, Maharashtra; Medico-legal update 2005:5(4)
Torture and medical profession in India

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Key words

- torture, custodial death, Human Rights.

Why torture prevails in our society?

1. Deep and disparate divisions prevail within Indian society, dividing people sharply on economic/class lines, through tradition-driven caste based discrimination, community-driven biases and gender prejudices. Despite the commitment to democratic norms within the Constitution and within other laws, the political class and other institutions have reflected these biases instead of removing them. These discriminatory factors have lead to the non-application of protection and egalitarian measures within the law for marginalized sections. The result is active discrimination on the basis of either sustained non-application or the active connivance of prejudicial factors operating within mechanisms of the state.

2. Whenever a serious crime like robbery or a major burglary takes place, the area police sweeps on all possible suspects in the vicinity. They are picked from their homes and kept in the police station over several days, not formally in a lock-up, but in some other remote room, to escape detection. As the police are not quite comfortable keeping a man in illegal custody (because of fear of being discovered by the judiciary or magistracy or the media or human rights group) the tendency is to get over with the whole thing quickly by the short-cut method of third-degree. The fact is that confessions do come easily with third-degree, except in minuscule number of cases involving hardened criminals. (Padmanabhiah Committee Report)

3. A large section of people strongly believe that the police cannot deliver and cannot be effective if it does not use strong-arms methods against the criminals and anti-social elements of society. And these people include India’s political class, the bureaucracy, and large sections of the upper and middle class. In their own perception, the policemen feel that they are doing a job. They resort to torture of ‘professional objectives’ - to extract information or confession in order to solve a case; in order to recover stolen property or weapons of offence; to ascertain the whereabouts of other criminals; to locate hide-outs. Another professional objective that the police often follows, is to terminate the criminality of a professional criminal who could be a burglar, a robber or a gangster, or even a terrorist by maiming him, by making him lame, rendering him incapable of further crime.

4. Formal training in the skills of interrogation is hardly imparted to policemen, apart from a few odd lectures during training. As a result, a policeman learns the skills on the job, largely by improvisation and by watching his senior peers successfully extracting confessions through rough and ready methods of torture. Since they have no real experience of scientific and painstaking interrogation and since time is anyhow a premium with the police, they tend to gloss over the merits of sustained interrogation in favor of quick results that torture brings. (Padmanabhiah Committee Report)

5. Although section25 of the Indian Evidence Act makes it clear that confessions made to police officers cannot be used in evidence against the accused, section 27 of the Act (confession leading to corroborative evidence ) implies that confessions are still of use to the police. If a crime is ‘solved’ on the basis of illegal extraction of evidence, that evidence is still admissible.

Definition of torture

- The Webster Dictionary defines torture as anguish of body or mind; something that causes agony or pain; to punish, coerce or afford sadistic pleasure.
- The torture has not specifically defined in the Indian Constitution or specifically prohibited in penal laws.
- The world Medical Association (Declaration of Tokyo 1975), defined torture in relation to detention and imprisonment as “the deliberate systematic or wanton infliction of physical or mental suffering by one or more persons acting alone or on the orders of any authority, to force another person to yield information, to make a confession or for any other reason”.

Investigation of torture

Medico legal examination of victims of torture: living and dead.
Torture is one of the most inhumane acts an individual can inflict on another. In spite of its international standing among legal, health, and human rights experts, awareness of the Protocol is still relatively limited. In many cases, medical and legal university curricula do not provide instruction on the examination of torture victims, the treatment of torture victims, or the consequences of torture. As a result, many health and legal professionals have little or no training in the investigation and documentation of torture, which requires specific technical skills and knowledge on both medical and legal procedures to be conducted effectively.

The victim of torture may be a living person, or a dead body. The medical officer must have knowledge about various torture techniques used by law enforcing agencies and how to corroborate and prove them in the court of law by medical knowledge.

The various torture techniques for the ease of study can be grouped under following categories
1. Beating
2. Suspension
3. Near suffocation
4. Sexual abuse
5. Forced posturing
6. Electric shock
7. Dehydration and so on.

- The list of police excesses displayed by the NHRC in its website (www.nhrc.nic.in/policecase.htm. accessed on 2/11/07): The excesses listed include torture, illegal confinement and false implications and the methods to torture vary from beatings to amputation of the male organ to blinding to gang rape to even death of the victim
- Apart from the police there are several other government authorities like
  - Directorate of revenue intelligence, Directorate of enforcement in Delhi, Intelligence agencies like Intelligence bureau, Central bureau of investigation, CIA etc., which have the power to detain a person and interrogate him. There are instances of torture and death in custody of these authorities as well.
  - Various special laws the Terrorist and Disruptive Activities (prevention) Act, (TADA) which lapsed in 1995 was found to have led to widespread use to torture by law enforcement officials.
  - Maharashtra control of organized crime Act(MOCOA)
  - Areas where Armed Forces (special powers) Act is in operation (Jammu and Kashmir and the states of north east) there have been widespread allegations of torture.
  - POTA (Prevention of Terrorism Act)

**Examination in the living**
- Every accused person on arrest should be medically examined and injuries if any, on the person should be entered into the record.
- During this process, a policeman should not be allowed to remain present in the doctor-patient interaction.
- The usual posture adopted by the police to evade responsibility include;
  1. Showing that the body was found on the road-side or railway track so as to pass it off as a case of accidental or suicidal death, or
  2. To make out a case that the arrested person died after he jumped/fell from the building while trying to escape, or
  3. Jumped/fell out of the running vehicle as he was being transported to some disclosed site/place to affect some recovery, etc.

**In case of custodial death**
- Investigations into deaths in custody are mandatory in India under section 176 of the CrPC. Under law, the investigations can be held either an Executive Magistrate or by a Judicial Magistrate.
- Section 176 of the CrPC empowers the (nearest) Magistrate to suo moto hold inquest and investigate any deaths in police custody. This provision of the law is rarely invoked. Section 174 CrPC makes it binding on any officer in charge of a police station to investigate and report the cause of death in custody to The nearest Executive Magistrate. This is too done only when there is a public outcry led by rights’ groups.
  - The inquest should only be carried out by the district magistrate. The authority conducting the inquest should give the requisition for autopsy with necessary documents in the requisition itself, the authority should mention that autopsy should be done by a panel of two or more doctors. The said authority should also arrange for the videographer who should be selected from the panel of videographers accredited by the district magistrate for the above purpose
  - The autopsy of all such deaths should be done only by a forensic pathologist and on no condition should such autopsy be conducted in the absence of natural light (from sunrise to sunset)
  - In all custodial death cases, the proper assessment of time since death determination preferably by temperature changes and development of rigor mortis at the time of first examination at the scene is essential because most of the time the time since death evaluation is taken as defence by the accused.

**Norms to be followed by the videographer**
1. Place of occurrence of death in custody should be video graphed.
2. The process of post-mortem and the process of burial and exhumation of the body to be video graphed
3. The videography should be in a phased manner and it is usually done in six phases
4. During the videography of post-mortem in custodial deaths, the date and time button should be pressed so that data and time will be automatically superimposed
5. In most of the time, during videography, efforts should be made to maintain the identity of the body which is video graphed. Long-shot showing the whole body front view and continuing it with a near view of injuries should be taken is no doubt about the identity of the deceased or the injury/ mark on the body.
6. Each injury, whole and cut internal organs should be video graphed for a minimum of 5 seconds
7. Shots to prove that the autopsy has been conducted by the particular medical officer should be taken.
8. Wherever possible, while indicating positive or negative findings, doctors’ commentary in his own voice should also be recorded. Shots should be such identity of the person would be made out beyond doubt.
9. The videography should take minimum of 45 minutes, covering the performance of the post-mortem.
10. At the commencement of the post-mortem/ recording of the videography, the medical officer who conducts post-mortem should mention his name/ designation and details of the body being post mortomed, medical officer declaring the conclusion of the post-mortem should also be recorded.
11. Videography is visual document, not a news report or a chat show and therefore the coverage should be comprehensive and detailed.
12. Video cassette is to be used as corroborative evidence. Therefore avoid using visual gimmicks and bias
13. Video cassette is to be preserved as a source for future reference. Therefore maintain professionalism in recording and only provide and unedited version.
14. Relatives of the victim and other public interest bodies should be entitled to receive the copies of the video cassette from the National Human Rights Commission (NHRC)
15. Copies of the post-mortem certificate should be provided to the relatives of the deceased by the authority conducting the inquest without any delay whatsoever.
Discussions and recommendations

1. Discrepancy in the law should be removed.

   There are discrepancies in the law related to confessions—what is the contradictory provisions of sections 25 and 27 of the Indian Evidence Act. The latter is the cause of some unethical practices in the police force which should be repealed.

   A. Section 162 of the CrPC prohibits the use of a statement of an accused recorded by a police officer and prohibits the police officer from obtaining the signature of a person on a statement of an accused. Despite this safeguard, it is common practice for police to force detainees to sign on blank sheets of paper. The law relating to Confessions is to be found generally in sections 24 to 30 of the Indian Evidence Act, 1872 and sections 162 of the CrPC. Section 162 of the CrPC is a clear provision under the law enjoining the police not to extract signatures on confessions of accused persons during investigations and also to make sure that these statements are voluntary.

   B. Section 164 of the CrPC states that Magistrates are required to ensure that confessions are made voluntarily and sections 330 and 331 of the IPC provide for punishment for ‘voluntarily causing hurt’ or ‘Grievous hurt’ to ‘extort confession or to compel restoration of property’ but these provisions are rarely used against police officers.

   C. Responsible investigating officers have for some years now, been pointing out the existing discrepancies in the law related to confessions—that is the contradictory provisions of sections 25 and 27 of the Indian Evidence Act. The latter is the cause of some unethical practices that have been noticeable in the functioning of the police force. This calls for not just a public debate but a repealing of the section 27. Because, as long as section 27 exists, it will be used by investigating officers. No guidelines—however well intentioned can supersede the law.

   D. The 113th report of the law commission of India has recommended that Section 114(B) be inserted in the Indian Evidence Act to introduce a presumption that injuries sustained by a person while in police custody are presumed to have been caused by a police officer. Several Supreme Court judgments and NHRC recommendations have pressed the issue; the section still remains to be introduced with the Indian Evidence Act.

   E. In March 1999, the NHRC announced the establishment of Human Rights cells within the police departments of all states to deal with all complaints related to human rights violations. To date there is little information on the functioning of these mechanisms conceived to provide protection against increasing rights violations by the police.

   F. Article 12 of the Convention against torture requires that “each state party shall ensure that its competent authorities proceed to prompt and impartial investigation, wherever there is reasonable ground to believe that an act of torture has been committed in any territory under its jurisdiction.”

2. Justice for victims of torture

   • Two sections of the CrPC provide protection from criminal action to members of armed forces and public servants from any action, for anything done or purported to be done in the discharge of their official duties except after obtaining the consent of the Government. These are sections 45 and 197 of the CrPC. In case of section 45, this immunity can be extended to any forces charged with the maintenance of public order if a state government so desires. Forthcoming legislation (especially the CrPC amendment bill) proposes to widen the scope of immunity offered by section 45 of the CrPC. It proposes amending section 197 of the CrPC to ensure that all “public servants” charged with the maintenance of public order rather than just “members of the Forces” should be protected by ensuring that no court should take cognizance of any offence committed while acting or purporting to act in the discharge of his duty.

   • Failure to implement the provisions laid by the Supreme Court in D.K. Basu vs. State of West Bengal in any part of the country to be hauled up for contempt of court. Contempt of court proceedings may be lodged against any policeman violating basic legal safeguards regarding laws of arrest in any High Court of the Country.

   • There should be amendment in the law so that cases relating to violations of human rights and compensation are tried together in the same court with one set of evidences being led.

   • The guidelines of arresting person and handcuffing of an accused should be strictly followed.

   • Police is required to have people friendly attitude. Boards are supposed to be displayed prominently explaining basic facets of the law of arrest and related to the protection of human rights and the Station house officer also acts as a “Public relations officer.”

   • Every state Government citizens charter envisages certain bodies to ensure prevention of torture and schemes to establish harmony between the police and the citizens.

   • Social Security Committee

   For the prevention of atrocities against women, social security committees have been established. Once a month this Committee takes a review of atrocities inflicted on women. Legal provisions are brought home so as to enable them to deal with the atrocities inflicted on them.

   • Harmony between police and Citizen

   With a view to establish harmony between police and citizens and with a view to remove the misunderstandings in the minds of citizens and to create confidence in the minds of public, the Senior Police Inspector of the police station shall make himself available to the public, where the complainant can discuss and enquire about the progress of the enquiry into his complaint at least a week after registering the same.

   • Social Service Cell

   The main responsibility entrusted to this cell is that to create cordial relations with the citizens. Similarly delicate issues such as atrocities inflicted on women, family disputes, etc. are handled by it.

       • Protection of civil rights
       • Peace committee
       • Mohalla committee
       • Anti-corruption bureau.

   • The government of India must consult the NHRC, other independent human rights organizations, and member of the civil society—before instituting police reforms, criminal justice system reforms including training programme and amendment to law. The move to reform must be through wide and transparent public debate so that all parts of civil society can influence and have a say in the vision envisaged.

   • Detainees are regularly threatened by the police not to make complaints of torture and brought before Magistrates by the same police who have been responsible for their interrogation and torture. It has been clarified by the Supreme Court in Sheela Barse vs. State of Maharashtra (AIR 1983 SC 378) that section 54 of CrPC required that “the Magistrate before whom an arrested person is produced shall enquire from the arrested person whether he has any complaint of torture or maltreatment in the police custody and inform him that he has right under section 54 of the CrPC to be medically examined”.

   • It should be ensured that however that no executive/judicial enquiry should commence without the relatives of the deceased being provided a copy of the post-mortem certificate and the video cassette.

3. The following are some of the steps which can be taken to prevent “the torture”

   A. To abolish torture, we must devise a campaign amongst the
medical community against torture and how it is contrary to medical ethics.

B. Doctors should document evidence of torture and conduct autopsies in a fair manner and help the victims to obtain redress. It is the ethical obligation of all doctors to report cases of torture.

C. The medical associations should issue official directive condemning and banning these practices and prescribe strict ethical rules and guidelines in this regard and strict measures should be taken for their violation.

D. Training about torture, its consequences, treatment and rehabilitations of torture victims and medical ethics should form part of the medical curriculum especially at the under-graduate level.

E. Doctors involved in the cover-up operations should be made personally liable and preceded against Section 166 of IPC. The responsibility of filling such charges should be taken up by the Indian Medical Association

F. State Medical Councils should be properly activated to enforce ethics within the profession.

**Newer trends of torture**

The above mentioned discussion deals with the historical aspect and past scenario of “the torture”. Recently Narco analysis or the truth serum test is increased becoming a dangerous short cut for investigation. It has gained such currency in recent years that even politicians are demanding their use against each other. In India to get an accused Narco analysed, the police need to just say “suspect not cooperating with investigation”. The courts have been giving the go-ahead orders. Many accused like Veerappan’s men, accused in Godhra train burning, Mumbai train blast, Nithari killing, Arushi murder, Abu Salem, Abdul karim, Pragya devi have undergone Narco analysis. Many countries have tried, tested and discarded Narco analysis citing reasons ranging from “unscientific”, “unreliable”, “and unethical”. The ineffectiveness of this method has been exposed in many cases. Its application has been questioned on ethical and legal grounds to the human rights activists and lawyers say that if the technique is sound, it violates a person’s constitutional rights against self incrimination right to privacy. No person can be forced to give witness against himself. Liberty and protection of privacy enshrined in the constitution. Narco analysis takes away this right and it is unfortunate that the courts are permitting it.

Since 1879, in the Indian penal code and in the criminal procedure code, there is a right to defend one. With Narco-analysis becoming admissible, the whole question of self-defence is taken away. So where is the justice?

In my opinion, Narco analysis is another form of torture because it satisfies all the four components of the UN definition of torture

- it produces physical/mental suffering and is degrading;
- it is intentionally inflicted
- it is intended for getting information and confession
- it is inflicted by an official

Secondly the involvement of doctors in Narco analysis has been questioned. The world medical association of which the Indian medical association is a member has prohibited doctors from participating or assisting any kind of torture, and made it mandatory for them to report any case of torture. In these procedures, doctors are conducting the torture on behalf of the authorities in the premises of the hospital which must not be used for purpose other than healing patients.

With the advent of Narco analysis the investigating agencies are forgetting their basic functions of investigating the crime through traditional time tested methods and using the truth detecting techniques in one package i.e. pre test interview, and interrogation, polygraph test, brain fingerprinting test and Narco analysis. Fortunately, the ministry of home affairs have appointed a committee headed by a neuroscientist, the matter is also under consideration with the law commission of India.

There are three grave pathologies that alienate the judiciary from the people. The curative pharmacopoeia of fundamental judicial reform to counter these comprises forensic democratization, a process of social justice delivery and structural transformation of the justice system through innovative facilities for the have-not humanity. The trinity of recipes demands institutional creativity, procedural humanism and joint action by the executive, the legislature and the judiciary, inspired by the radical values inscribed in the constitution.

**Trends in involvement of doctors in torture**

Medical personnel doctor can be involved in acts in three ways:

1. As a humanist citizen
2. As a participant in the process of torture by
   - Coercion by society, government, terrorists
   - Unknowingly becoming a part of it
   - His own desire for other interests and benefits
3. As victims of torture e.g. in Chile, Turkey.

Participation of doctors in torture can be in various ways:-

1. Evaluating the victims capacity to withstand torture
2. Supervising torture through provision of medical treatment, if complications occur.
3. Providing professional knowledge and skills to the torturer
4. Falsifying or deliberately omitting medical information when issuing health certificates, or autopsy reports.
5. Administering torture by directly participating in it
6. Remaining silent in spite of the knowledge that abuses have taken place.

Most vulnerable doctors are those who work in the government and the army. Doctors may often have to face dilemma of whether to abide by the call of ethics or obey the order of superiors when such order is not prima face illegal.

**Declaration, principles and guidelines applicable to medical professionals**

1. Hippocratic oath
2. Declaration of Geneva
3. Declaration of Tokyo of WMA (1975)
5. Principles of Medical ethics relevant to the role of Health Personnel, particularly Physicians, in the protection of Prisoners and detainees against torture and other cruel, inhuman or degrading

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A study of suicide in Jaipur, Rajasthan (2002-2007)

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Key words
Suicide, Poisoning, Burn, Hanging

Abstract
In today's scenario, complex process of modernization, industrialization and urbanization has brought increase in occupational mobility, high ambition and desire for high standard of living that is leading to high incidence of suicidal deaths. Suicidal attempts in adults are on the rise in recent time. Nowadays suicidal gesture, attempted suicide & well successful suicide cases are seen every now and then in the society. A prospective cum retrospective study is carried out in the Department of Forensic Medicine and Toxicology, Mahatma Gandhi Medical College & Hospital, Sitapura, Jaipur w.e.f. 2002-Nov 2007. In this period out of total 637 autopsies, 228 were found as suicidal deaths. In these 228 cases, 88 cases ended their life by consuming poison, rest of them in the decreasing order are as follows – Train Run-over (55), Hanging (43), Drowning (22), Alcohol (11), Burn (4), Celphos Poisoning (3), Insecticides Poisoning (1), Vegetable Irritant Poisoning – Akda (1). This clearly indicates that availability of highly lethal suicidal method and rate of suicide are interrelated. During the study we have found three new innovative methods of committing suicide. All three victims were pursuing their professional qualification in medical and engineering. These three cases will be specifically presented. The unnatural death is one of the indicators of social and mental health. Responsibility for prevention of violence in our society does not rest only on the law enforcing personnel but also on public health and other human service agencies, that should assist in preventing primary violence to reduce other major causes of morbidity and mortality.

Introduction
Suicide is not new a human history rather it is as old as humanity itself and its sources reaches far back into the beginning of the culture. It is a specifically human problem. Any animal can die by disease and can be destroyed intentionally or accidentally by an outside agency but as far as we know only man can will his death and kill himself. At some stage of evolution man must have discover that he can kill himself. It is the most personal action, which an individual can take. The study on suicide illustrates that human action, however personal is also interaction with other people and that the individual can not understood in isolation from his social matrix.

Suicide is widely prevalent and no nation and culture has escaped from it, though the toll varies from place to place. The prevalence of suicide in today’s world is quite alarming. In year 2000 about 8,00,000 suicide deaths occurred worldwide. The world health organization estimates that more people die each year from suicide than in all the world’s arm conflicts.

The word suicide was first used by Sir Thomas Browne in his “Religio Medici” in 1642 and subsequently by Walter Charleton in 1651. Prior to the introduction of word “Suicide” it is self destruction, self killing and self murder were in practice.

Suicide has been defined by Beck et al as, “a willful self inflicted life threatening act which results in death.”

Schneidman (1976) defined it as, “the human act of self inflicted, self intentional cessation of life”. It is an act committed out of constricted thinking, tunneled logic and acute anguish.

The world health organization defines suicidal act “as the injury with varying degrees of lethal intent and suicide may be defined as a suicidal act with fatal outcome.”

Durkheim (1858-1917) defined suicide as “death resulting directly or indirectly from a positive or negative act of the victim himself, which he knows will produce this result.” This excludes those who survive the attempt.

Suicide may be defined as, “an intentional act causing harm to a person amounting to death and committed by person himself in the absence of contribution from any external agency particularly in the commencement of act. “Recently the term suicide has been replaced by “Intentional Self –Harm” (ISH) in the scientific literature due to derogatory nature of the word “Suicide”.

Nowadays suicidal gesture, attempted suicide, well successful suicide cases are every now and then we seen or hear in the society. Increasing numbers of deaths from suicide is a measure public health problem in India today.

Aims and objectives
1. To find out the pattern of suicide
2. To find out the stressful life event
3. To study the Psycho social cultural and precipitating factors for suicide in relation to age and gender with a view to formulate some preventive strategies

Material and method
The study is confined to the undoubtful cases of suicide. In the study various epidemiological characteristics of cases and medico legal aspects were collected from the perusals of police papers, postmortem reports and thorough questioning of the parents, relatives, friends, neighbours and police officers.

The nature of death was first evaluated by exclusion method then the dead body was examined externally and internally on autopsy table in different natures of death. Finally data pertaining to external and internal findings were collected, compiled and discussed.

Observations
In the study Suicidal cases from 2003-2007 were examined retrospectively and was carried out in the Department of Forensic Medicine and Toxicology, Mahatama Gandhi Medical College and Hospital, Sitapura, Jaipur.

Since year January 2003 to December 2007 total 627 medico legal autopsies were conducted, out of them 223 cases were found to be of intentional self harm (ISH).

Among them the most vulnerable age group was 21-30 years (Table 2). Males outnumbered the females (male 79, female 14- Table 2).

Poisoning was the most common method used for ending the life irrespective of the education level, socio-economic status and rural-urban life etc (Total No. of cases -101,- Table 4)

Jumping against the moving train was the second most common method used for ISH ( 7 ). Hanging remain the third manner of choice
for ISH ( ) followed by Burn ( ) being the least preferred method.

The study also reveals that Domestic unhappiness and shattered family relation is the most common precipitating factor for committing suicide (23.77%), followed by Unhappy Love affairs (18.83%). However despair over torture is the least common precipitating factor (1.35%). Table 5

Suicidal deaths are more prominent in married persons (Table).

In our study out of these 223 cases, we have found three new innovative methods, especially used by educated professionals, that are as follows:

1. A young Doctor of 32 years, married anesthetist by profession has applied his professional knowledge to put an end on the frustration and fear aroused due to marital disharmony and fear of proceeding of 496 A. He ends his life by injecting a cocktail of Ketamine and Vecuronium in the amount ——by self cannulation assessable left wrist.

2. A young unmarried 22 years old, Second year Engineering student designed a scene on the basis of his technical skills to end his life due to unhappy love affair. He has sealed the ventilators and windows of his rented room after putting a live coal Angeethi and bolted the door from inside. The dead body on postmortem examination depicted the typical features of CO poisoning.

3. A young male patient of 19 year, student of engineering college, brought to the hospital with the history of diffuse swelling around the dorsum of left hand with pain. After taking the patient in confidence, he revealed highly significant history indicating his suicidal intention by injecting snake venom on assessable left dorsum of hand, that he bought through a local snake charmer.

Discussion

The causes and circumstances for suicide are numerous and do not admit an easy classification and categorization. The common means adopted for suicide in India are poisoning, hanging, drowning, jumping from height, jumping against moving train, fire arm and fire etc.

Table No. 1-2 depicts the incidence and rate of suicidal deaths in India and various states of India.

In our study the young age group (21-20 Yrs) is the most common victim of ISH and consistent with P. Midha et al (2001).

The motives behind suicide in our study are marital disharmony and shattered family relations, Unhappy Love affairs and depression. This is in agreement with Kuo W H, Gallo J J and Eaten W W et al, where they have mentioned depression as the motive for committing suicide. Our findings are also in agreement with Nower (1994) who has found marital or relationship dispute as one of the motives for suicide. Marital disharmony is the most common precipitating factor both in India and abroad (P Midha et al -2001, Philips M R et al 2002, Vijay Kumar L. et al -2003.

The WHO has also reported the poverty as a major factor for suicide followed by stress, mental illness, unemployment and substance abuse. (Jancloes M. 1998; Stone G.D.2002).

Among the methods of suicides that are commonly encountered in the routine medico-legal practice could be categorized into physical and chemical methods.

The methods of suicide employed generally reflect the different avenue available in the community. Knowing the pattern of suicide in a area not only help in early management of such cases but also suggests taking earlier preventive measures. It is necessary for the death investigators to be aware of the common scenario, risk factors, methods and the victims as well as pitfalls that may be encountered.

In our study most common method is unknown poisoning (39%), jumping against moving train (25%), hanging (19%), Drowning (9%), Alcohol (4%), Burn (1.8%). Higher numbers of death due to jumping against a running train are due to the highly busy rail track connecting jaipur to west and south part of the nation. At the time of peak impulse the availability of passing by train is almost always there.

In our case study 3 different type of the case reports are identified and highlighted, that gives a warning alarm that youth are misusing their knowledge.

It is pertinent to mention here that cases of suicidal death due to firearm, sharp edged weapons are not found in our study.

Jumping from height and use of motor vehicles has not been found in our study and these 2 types of cases if not impossible but difficult to prove to be suicidal in nature.

Conclusion

The unnatural death is one of the indicator ——— morally. Therefore the government with its full resources in the association with the Non Government organization must develop a continuous intervention services for suicide attempts and population at risk in order to prevent further risk of suicide and safeguard valuable lives at risk without loosing any time.

Suicide

On retrospective investigation all cases of suicide were having one or other psychiatric problem originated due to anxiety, stress, depression, regression and guilt.

Suicidal attempts in adults are on the rise in recent time. Nowadays suicidal gesture, attempted suicide, well successful suicide cases are every now and then we seen or hear in the society. It is usual common knowledge that young women are coerced to commit suicide related to dowry.

Study of autopsy findings in series of ———number of cases of suicides has been studied in the Deptt. of Forensic Medicine, MGM& Hospital, Sitapura, Jaipur.

The study is confined to the undoubtful cases of suicide. In the study the nature of death was first evaluated by exclusion method then the dead body was examined externally and internally on autopsy table in different natures of death. Finally data pertaining to external and internal findings were collected, compiled and discussed as follows-

The common motives and circumstances which affect the incidents of suicide were Dowry, Menta stress due to various reasons, Maladjustment in marital life, Cruelty by the in-laws, Family quarrels, Unemployment, Infidelity, Failure in love in unmarried girls etc.

In the recent times issues related to women are raised and discussed in various fora, among these issues the crime against the women have occupied the centre stage. The modern society is also been active and alive to the needs and problems confronted by women. The period of 18-30 years of age form the most important and crucial part of a woman’s life. She has to face many types of burden i.e. mental, physical, psychological or social. This is the age for marriage, change of environment, taking up of job responsibility, bearing and rearing of children. As a consequence she may suffer from biases discrimination and many other psycho-social handicaps.

As a consequences most of the women experience physical violence and ill treatment by their husbands, in-laws and some other relatives. (Material and method)

The various epidemiological characteristics of cases and medico legal aspects were collected from the purusal of police papers, postmortem reports and thorough questioning of the parents, relatives, friends, neighbours and police officers.

The unnatural death is one of the indicators of social and mental heath. Responsibility for prevention of violence in our society does not rest only on the law enforcing personnel but also public health and other human service agencies should assist in preventing primary violence to reduce other major causes of morbidity and mortality.

The high incidence of suicidal deaths may be the result of complex process of modernization, industrialization and urbanization that has
brought increase in occupational mobility, high ambition and desire for high standard of living.

Out of total no. of …… postmortem conducted during the period ……. Cases are detected to be suicidal death.

Suicide by train run over is found to be more conspicuous in the study, because it is easy and safe to commit suicide by this method on the unprotected railway lines. In our study the area is of mixed population i.e. that is rural and urban both.

Motive to ingest or administer or exposure to a poisonous substance is rather the only important aspect of a medico legal study in relation to poisonous substance.

Some persons intentionally take poison or overdose of drug often impulsively after disagreement with key person in their lives or there may be an element of appeal- a cry for help in many cases and the act of self destruction may be seen as an form of communication intended to change another person behavior and/or attitude. The poison used for suicidal purposes are Organophosphate and Carbamates insecticides, HCN, KCN, Barbiturates, Aluminum Phosphide etc.

The causes and circumstances for suicide are numerous and do not admit an easy classification and categorization. The common means adopted for suicide in this study is ………

Various precipitating factors for suicide are………..

Suicide and recent attitude towards it

Currently there is a change in legal concept in relation to attempted suicide and suicide in India so it is worth to discuss the suicide which is the high spot motive in this study. Suicide is a problem with many facets from the psychiatric and psychological point of view on the hand to the mechanics of the mode of death on the others, also for every suicide there is far large number of attempted suicide and suicidal gesture so that successful suicide are merely the tip of proverbial iceberg.

Summary and conclusion pattern as on page 7 JIFM July-December 1996.

Table page 34 JIFM Jan-June 1999.
Table E8, page 87- Dr. Kochar Thesis.
Title-trends of suicide –A five year study
New trends of suicide among educated youth - A five year study

Suicide may be defined as an international act causing harm to a person amounting to death and committed by the person himself in the absence of contribution from any external agency, particularly in the commencement of act. Sometimes the subject commits the act but does not die, a state which has been conventionally termed as Parasuicide. ICD -10 lists suicide under intentional self harm (X60-X80) in the chapter 20 under the title ‘external causes of morbidity and mortality’ International self-harm has been included as the condition that is often found in association with disorders described in chapter V(F) of ICD-101.

It has been estimated that for each completed suicide, there are 15 to 20 nonfatal suicide attempts. A prior suicide attempt can create a major elevation in the risk of subsequent attempt. A prior suicide attempt also is a strong predicator for eventual completed suicide2.

Suicide attempts are uncommon among patients without any psychopathology. High rates of suicide have been found in psychiatric patients, particularly depression, schizophrenia and personality disorders. Most of the suicide victims fulfill criteria for a psychiatric disorder while remaining have recognizable clinical features not amounting to full blown syndrome. Psychological autopsies have found that these victims fall into one of three categories:

1) An irritable, impulsive, volatile and erratic group that were oversensitive to criticism.
2) Anxious group having anticipatory anxiety, fearful of making mistakes, difficult to adapt to new situations and perfectionists.
3) A group comprised of under treatment depressed patients and mainly includes girls.

Antisocial personality disorder is also not uncommon and is usually associated with alcoholism. However, previous suicide attempts and depression are most reliable markers to predict the suicide attempts21,22.

Mode to commit suicide can be classified as violent and non-violent. Violent methods include those means which disfigure the body of victim e.g. shooting, jumping, hanging or self-immolation. Non-violent methods include overuse of pills, poison etc.

A recent study suggests that the most common methods of self harming are self-poisoning, overdosing, cutting and in some cases jumping from high places. Among the reasons for such behaviour are attention getting, the releasing of negative emotions and conflicts often to do with family and relationships and sexual problems.

Lethal intent has been shown by a very small portion of all patients, and most of them feel glad that they have recovered. Thus, suicide can be divided into well-planned and impulsive types. Well planned suicide is uncommon and usually seen in psychiatric patients suffering from long lasting illness. Most of other attempts are impulsive and are usually have low risk for recurrence.

Protective factors include: caring family relationships, supportive tribal leaders, and positive school experiences. Carefully planned, culturally sensitive, comprehensive programs that address the social determinations of health outcomes such as poverty, school failure, familial conflicts, and limited access to health care, should be the focus of the blueprints for change for these vulnerable children 19.

It is aimed that resolution of predisposing factor and removal of precipitant. These factors can be recent chronic stress with poor coping strategies as mentioned, family dysfunctions and psychiatric illness. Patients should be taught to deal with these situations effectively using adequate intervention. In the USA, attempt is required to sign a contract with the clinician to the effect that he or she will not make a future attempt before the next clinic visit or if he or she has a strong urge to do so, will first contact the clinician. Limiting accessibility to dangerous methods is also helpful
Correlation of pattern of burns with morbidity and mortality - one year cross-sectional study

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Abstract
Burns have been the most important cause of concern for man from the prehistoric days to the present era of modern medicine. Present day statistics showing the increasing incidence of fire related morbidity and mortality indicate that we have not yet learnt to control it. Burns continue to be responsible for significant morbidity and mortality, especially in the developing countries. Present cross-sectional study was carried out to determine the correlation of pattern of burns with morbidity and mortality. In this study, incidence of burns was more in females; majority of victims were in the age group 31-40 years; maximum number of cases were due to dry heat with most common agent being flame; majority of victims had TBSA between 10-19%; more than half of the victims had superficial burns and mortality rate was 13%. In all the fatal cases the cause of burns was dry heat and majority of victims had deep burns. Residual disability was seen in 19% of victims and full recovery in 68% of victims. Incidence of occurrence of infection, systemic complications, contracture and permanent disfiguration of head and/or face was more in burns due to dry and deep burns.

Key words
Burns, Morbidity, Mortality, Cause of death.

Introduction
Man’s march towards civilization started with his mastery and control over fire in the form of production and stoppage of fire. Though man can produce this energy source, his control over stoppage of fire has not been as perfect. Due to this, till today many instances of injury due to fire are being reported.

Burn is an injury caused by heat; or by chemical or physical agent having an effect similar to heat. Burns are produced by dry heat or moist heat (scalds)1. From the prehistoric days to the present era of modern medicine, burns have been the major cause of concern for man. In 2002, global estimate of deaths due to burns was 3, 12,000 and it contributed to 0.5% of all causes of death. Whereas, in the countries of South East region, it was 1,84,000. In India, 25,467 people died due to burns during the year 20002.

Burns continue to be accountable for significant morbidity and mortality in developing countries3 and hence, prevention of injuries due to burns is included among the World Health Organisation recommended primary health care topics4. Incidence and source of fire vary from place to place in relation to age, sex, socioeconomic and cultural factors5.

Methodology
Present cross-sectional study was carried out from 23-10-2005 to 22-10-2006, to determine the correlation of pattern of burns with morbidity and mortality. Study material comprised of victims of burns admitted to KLE’s Dr. Prabhakar Kore Hospital & MRC, Belgaum, Karnataka and cases of burns autopsied at the above hospital’s autopsy block. Burn is defined as an injury caused by heat; or by chemical/physical agent having an effect similar to heat1 and burns are classified (pattern) based on cause of burns, degree of burns and total body surface area (TBSA) involved. Causes of burns6 were categorized as, burns due to dry heat (flame, electricity, lightning, chemicals, hot objects and radiation) and moist heat i.e. scalds (steam), hot liquids above 60°C like water, milk, oil, molten metal etc.). In adults, TBSA involved is calculated by “Rule of Nine”. In children TBSA is calculated as, head and neck 15%, front of trunk 20%, back of trunk 20%, upper limbs 20%, lower limbs 15%, and genitalia 0-10%. For small burns of irregular outline, burnt area is compared to the victim’s palm which approximates 1% of TBSA7. TBSA is categorized according to the Chapter XIX of International Statistical Classification of Diseases and Related Health Problems-10 (T 31.0-T 31.9)8. Degree of burns is calculated according to the modern classification on the basis of depth of involvement into, Superficial (depth does not extend beyond part of the thickness of true skin) and Deep (depth involves at least the whole thickness of true skin)9. Morbidity is measured in terms of duration of hospital stay, formation of contractures, infection of the burnt tissue, systemic complications and permanent disfiguration (head and/or face). In fatal cases, autopsy was done to determine the cause of death. Data required for the study was collected after obtaining the informed consent from the legally authorized person.

Results
Out of 100 cases, 46 (46%) were male and 54 (54%) were females [Table 1]. Maximum number of victims were in the age group 31-40 years (37%), followed by 21-30 years (28%); whereas, minimum number of victims were found in 71-80 years age group (2%) [Table 3]. Majority of the burns cases were due to dry heat (71%) [Table 2]. Among males, 83% of cases were due to dry heat and 17% were due to moist heat [Table 3]. In females, 61% sustained burns due to dry heat and 39% due to moist heat [Table 3]. Most common cause of burns due to dry heat was flame (48%) [Table 4] and moist heat was hot water (41%) [Table 5]. Majority of victims had TBSA between 10-19% (35%), followed by 20-29% (26%) [Table 6]. More than half of the victims had superficial burns (59%) [Table 7]. Mortality rate was 13% [Table 8] and all the victims died due to dry heat [Table 9.a]. Among the victims who died, 85% had deep and 15% had superficial burns [Table 9.b]; and, 46% had TBSA 60-69%, 31% had 70-79%, 15% had £10% and 8% had 80-89% [Table 9.c]. In majority of fatal cases, cause of death was septicemia (46%) [Table 10]. Residual disability was seen in 19% of victims and full recovery in 68% of victims [Table 8]. Incidence of occurrence of infection, systemic complications, contracture and permanent disfiguration of head and/or face was more in dry and deep burns [Table 11.a & b]. Out of 11 victims who had infection of burnt tissue maximum number of victims (46%) had TBSA 20-29%; of 5 victims who had systemic complication, majority (60%) had TBSA 20-29%; of 12 victims who developed contracture, majority (33%) had TBSA 30-39%; and out of 7 victims who developed permanent disfiguration of head and/or face 2 each had TBSA 20-29% and 30-39% [Table 11.c].

Discussion
In this study, it was observed that more than 50% of the victims were females, which is consistent with other studies10,11,12. This could be attributed to female’s close proximity to fire during work at kitchen. However, studies conducted at China13, Australia14 and Saudi Arabia15 revealed that males were more affected than females. This could be due to higher incidence of industrial burns among males in such countries.
Table 1: Sex wise distribution of cases

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>46</td>
<td>46%</td>
<td>54</td>
<td>54%</td>
</tr>
</tbody>
</table>

Table 2: Distribution of cases based on causative agent

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>46</td>
<td>46%</td>
<td>54</td>
<td>54%</td>
</tr>
</tbody>
</table>

Table 3: Age wise distribution of cases

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤10</td>
<td>5</td>
<td>5%</td>
</tr>
<tr>
<td>11-20</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>21-30</td>
<td>28</td>
<td>28%</td>
</tr>
<tr>
<td>31-40</td>
<td>37</td>
<td>37%</td>
</tr>
<tr>
<td>41-50</td>
<td>14</td>
<td>14%</td>
</tr>
<tr>
<td>51-60</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>61-70</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>71-80</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4: Distribution of cases of burns due to dry heat

<table>
<thead>
<tr>
<th>Type</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Flame</td>
<td>13</td>
<td>34.23</td>
<td>21</td>
</tr>
<tr>
<td>Electricity</td>
<td>12</td>
<td>31.57</td>
<td>6</td>
</tr>
<tr>
<td>Lightning</td>
<td>4</td>
<td>10.52</td>
<td>4</td>
</tr>
<tr>
<td>Chemicals</td>
<td>7</td>
<td>18.42</td>
<td>0</td>
</tr>
<tr>
<td>Hot objects</td>
<td>2</td>
<td>5.26</td>
<td>2</td>
</tr>
<tr>
<td>Radiation</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100%</td>
<td>33</td>
</tr>
</tbody>
</table>

Table 5: Distribution of cases of burns due to moist heat

<table>
<thead>
<tr>
<th>Type</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Steam</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hot water</td>
<td>2</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Hot milk</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Hot oil</td>
<td>1</td>
<td>12.5</td>
<td>4</td>
</tr>
<tr>
<td>Molten metal</td>
<td>5</td>
<td>62.5</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100%</td>
<td>21</td>
</tr>
</tbody>
</table>

Table 6: Distribution of cases according to TBSA involved

<table>
<thead>
<tr>
<th>TBSA (%)</th>
<th>Dry heat</th>
<th>Moist heat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>≤10</td>
<td>5</td>
<td>7.04</td>
<td>11</td>
</tr>
<tr>
<td>10-19</td>
<td>26</td>
<td>36.56</td>
<td>9</td>
</tr>
<tr>
<td>20-29</td>
<td>19</td>
<td>26.76</td>
<td>7</td>
</tr>
<tr>
<td>30-39</td>
<td>6</td>
<td>8.45</td>
<td>2</td>
</tr>
<tr>
<td>40-49</td>
<td>3</td>
<td>4.22</td>
<td>0</td>
</tr>
<tr>
<td>50-59</td>
<td>1</td>
<td>1.40</td>
<td>0</td>
</tr>
<tr>
<td>60-69</td>
<td>6</td>
<td>8.45</td>
<td>0</td>
</tr>
<tr>
<td>70-79</td>
<td>4</td>
<td>5.63</td>
<td>0</td>
</tr>
<tr>
<td>80-89</td>
<td>1</td>
<td>1.40</td>
<td>0</td>
</tr>
<tr>
<td>&gt;90</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>100%</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 7: Distribution of cases according to degree of burns

<table>
<thead>
<tr>
<th>Degree of burns</th>
<th>Dry heat</th>
<th>Moist heat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Superficial</td>
<td>38</td>
<td>53.53</td>
<td>21</td>
</tr>
<tr>
<td>Deep</td>
<td>33</td>
<td>46.47</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>100%</td>
<td>29</td>
</tr>
</tbody>
</table>
Table 8: Distribution of cases based on final outcome

<table>
<thead>
<tr>
<th>Final outcome</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Recovery</td>
<td>32</td>
<td>66.66</td>
<td>36</td>
</tr>
<tr>
<td>Residual disability</td>
<td>11</td>
<td>22.92</td>
<td>8</td>
</tr>
<tr>
<td>Death</td>
<td>3</td>
<td>6.52</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>100</td>
<td>54</td>
</tr>
</tbody>
</table>

Table 9: Correlation between pattern of burns and mortality

9.a. Cause of burns and mortality:

<table>
<thead>
<tr>
<th>Cause</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Dry heat</td>
<td>3</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Moist heat</td>
<td>0</td>
<td>00</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

9.b. Distribution of cases according to percentage (TBSA) of burns and mortality

<table>
<thead>
<tr>
<th>TBSA (%)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>≤10</td>
<td>2</td>
<td>66.66</td>
<td>0</td>
</tr>
<tr>
<td>10-19</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>20-29</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>30-39</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>40-49</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>50-59</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>60-69</td>
<td>1</td>
<td>33.34</td>
<td>5</td>
</tr>
<tr>
<td>70-79</td>
<td>0</td>
<td>0.00</td>
<td>4</td>
</tr>
<tr>
<td>80-89</td>
<td>0</td>
<td>0.00</td>
<td>1</td>
</tr>
<tr>
<td>&gt;90</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

9.c. Distribution of cases according to degree of burns and mortality

<table>
<thead>
<tr>
<th>Degree</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Superficial</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Deep</td>
<td>3</td>
<td>100</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 10: Distribution of cases according to cause of death

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Septicemia</td>
<td>1</td>
<td>33.33</td>
<td>2</td>
</tr>
<tr>
<td>Hypovolemic shock</td>
<td>0</td>
<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>Inhalation injury</td>
<td>0</td>
<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>Tumour</td>
<td>0</td>
<td>0.00</td>
<td>1</td>
</tr>
<tr>
<td>Electrocution</td>
<td>3</td>
<td>66.67</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

Maximum number of victims were in the age group of 31-40 years and same was the result in other studies too. This is the productive age when they are generally active and are exposed to hazardous situations both at home and workplace. Proper care and rehabilitation of these patients is important as they are usually earning members of the family. But, in some studies majority of victims were in the age group of less than 15 years.

Incidence of burns due to dry heat was more common than moist heat, which is similar to results of other studies. This might be due to the more exposure of people to dry heat. But, in the studies conducted at Turkey, Libya and Singapore maximum number of cases were due to moist heat.

Most common cause of dry burns observed in this study was flame. This might be due to the wide use of kerosene oil stoves in this part especially by the population belonging to low socioeconomic status. Use of substandard kerosene oil exposes the users to higher risks of injury. Flame was the most common cause of dry burns in other studies also. But in a few studies moist heat was found to be the frequent agent. This difference could be attributed to the standard of living and socioeconomic status of the study population.

Maximum number of cases of moist burns was due to hot water was and majority were females. This could be due to the more proximity of females to hot water during their work (cooking) at home. This is similar to the opinion expressed in surgery’s textbook of Schwartz.

In this study, all the victims who died had dry and deep burns; and majority had TBSA > 60%. In a study done at China most of the deceased had deep burns. Other studies also indicate that mortality rate is directly proportional to TBSA. Maximum number of victims died due to septicemia, which is similar to the result of other studies. High rate of mortality due to septicemia is probably due to the fact that burnt tissue acts as a nidus for infection and the rampant use of higher antibiotics which are resistant to the nosocomial microorganisms.

Conclusion

In India and most of the developing countries, burns is a serious
Public health problem. Final outcome in burns cases mainly depends on the severity of injury, physical condition of the patient, quality of the treatment and after-care support.

Burns cost a lot not only to the individuals affected and their families but also to the nation, the disability and fatality resulting from burns put a significant drain on the economy of the nation.

**Table 11:** Correlation between pattern of burns and morbidity

<table>
<thead>
<tr>
<th>Cause</th>
<th>Infection</th>
<th>Systemic complication</th>
<th>Total</th>
<th>Contracture</th>
<th>Permanent disfiguretion of head/face</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Dry heat</td>
<td>4 66.66</td>
<td>2 40</td>
<td>6 54.54</td>
<td>3 100</td>
<td>1 33.34</td>
</tr>
<tr>
<td>Moist heat</td>
<td>2 33.34</td>
<td>3 60</td>
<td>5 45.46</td>
<td>0 0.0</td>
<td>2 66.66</td>
</tr>
<tr>
<td>Total</td>
<td>6 100</td>
<td>5 100</td>
<td>11 100</td>
<td>3 100</td>
<td>3 100</td>
</tr>
</tbody>
</table>

**11.b. Distribution of cases according to degree of burns and morbidity**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Infection</th>
<th>Systemic complication</th>
<th>Total</th>
<th>Contracture</th>
<th>Permanent disfiguretion of head/face</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Superficial</td>
<td>2 33.34</td>
<td>1 20</td>
<td>3 27.28</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Deep</td>
<td>4 66.66</td>
<td>4 80</td>
<td>8 72.72</td>
<td>3 100</td>
<td>2 100</td>
</tr>
<tr>
<td>Total</td>
<td>6 100</td>
<td>5 100</td>
<td>11 100</td>
<td>3 100</td>
<td>2 100</td>
</tr>
</tbody>
</table>

**11.c. Distribution of cases according to percentage of burns and morbidity**

<table>
<thead>
<tr>
<th>TBSA (%)</th>
<th>Infection</th>
<th>Systemic complication</th>
<th>Total</th>
<th>Contracture</th>
<th>Permanent disfiguretion of head/face</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>≤10</td>
<td>1 16.66</td>
<td>0 0.0</td>
<td>1 9.09</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>10-19</td>
<td>2 33.34</td>
<td>3 60</td>
<td>5 45.46</td>
<td>1 33.33</td>
<td>1 50</td>
</tr>
<tr>
<td>20-29</td>
<td>3 50.00</td>
<td>2 40</td>
<td>5 45.45</td>
<td>2 66.66</td>
<td>1 50</td>
</tr>
<tr>
<td>30-39</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>40-49</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>50-59</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Total</td>
<td>6 100</td>
<td>5 100</td>
<td>11 100</td>
<td>3 100</td>
<td>2 100</td>
</tr>
</tbody>
</table>

Burn patients require years of supervised rehabilitation, reconstruction and psycho-social support. Omission of any step in the treatment regimen by any of the burn team members, including the doctor, nurse, physiotherapists, nutritionist, or psychosocial support staff, can result in less than optimal outcomes. Hence, prevention of burns is perhaps an easier option and certainly better than cure.
References

17. Wai-Sun HO, Ying SY. An epidemiological study of 1063 hospitalized burn patients in a tertiary burns centre in Hong Kong. Burns 2001 March; 27 (2) : 119-123.
Legislative microscopy of cyber crimes

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Introduction

Cyber crime is criminal activity done using computers and the internet. It includes anything from downloading illegal music files to stealing millions of dollars from online bank accounts, non-monetary offences such as creating and distributing viruses on other computers or posting confidential business information on the internet. Cyber crime is not a new form of crime, it is a description applied to new ways and means of committing familiar crimes of various kinds, principally involving dishonesty, principally (but not exclusively) involving money and often (but also not exclusively) involving very old forms of crime indeed (such as theft). Harmful acts of cyber crimes committed from or against a computer or network differ from most terrestrial crimes in the following four ways: (i) these are easy to learn how to commit; (ii) these require few resources relative to the potential damage caused; (iii) these can be committed in a jurisdiction without being physically present in it; and (iv) these are often not clearly illegal.

As per the Cyber Crime and Punishment report prepared by McConnell International, the laws of most of the countries do not clearly prohibit cyber crimes. With the day to day evolution of human minds, the modes of committing crime are also changing drastically. Day by day the criminals are getting smarter and are applying their minds in this context to commit crime and escape without getting caught.

With the advent of computers no one thought that it will become a mode or source of committing crimes. Cyber crime is so common that it is now a part of our lexicon, defined as a crime committed on a computer network, especially the internet. One of the fastest growing types of cyber crime, and perhaps the most apparent to the typical internet user, is a form of online identity theft called “phishing” in which internet users are spammed with official-looking e-mail messages in an attempt to persuade them to disclose personal informations.

Due to an increase in internet users and the growth of e-commerce as an important business model, the number of computer crime and cyber crime cases has risen dramatically, and the U.S. Federal Bureau of Investigation (FBI) reports that the cyber criminals have attacked almost all of the Fortune 500 companies. Year-wise percentage of the different types of cyber crimes during the years 2004-2008 are collected in Figure-1. Figure-1 depicts the trend of the different types of cyber crimes during the years 1999-2008. Similarly, Figure-2 present a bar chart showing percentage of the different types of the cyber crimes during the year 2008.

In this article, we present an overview of cyber crime and an international perspective for fighting against cyber crime. This article tries to define the concept of cyber crime, identify the reasons for the cyber crime, to analyze how it can be eradicated, to look at those involved and the reasons for their involvement, to understand how to detect criminal acts of cyber nature and to proffer recommendations that would help in checking/minimizing the increasing rates of the cyber crimes and criminals in the society.

Concept and definition of cyber crime

The term “cyber crime” is usually referred to as any criminal offense committed against or with the use of a computer or computer network. The US Department of Justice (DOJ) interchangeably uses the terms “cyber crime,” “computer crime,” and “network crime” to refer to acts such as computer intrusions, denial of service attacks, viruses and worms. A cyber crime incident can lead to loss of business and consumer confidence, financial loss, productivity loss, and even loss of intellectual property.

Thomas and Loader defined cyber crime as “illegal computer-mediated activities that often take place in the global electronic networks.”

The Oxford Reference Online defines cyber crime as crime committed over the internet. The Encyclopaedia Britannica defines cyber crime as any crime that is committed by means of special knowledge or expert use of computer technology. Cyber crime has been defined as encompassing “any proscribed conduct perpetrated through the use of, or against, digital technologies.”

History and scope of cyber crime

Charles Babbage, who is well known as the father of computer, would not have dreamt that the machine he is giving to the world might become a source of crime and would ever influence the society in a negative way. The major events in the use of computers and computer networks to commit criminal acts started in the 1970’s.

The legislation has now stipulated that cyber crimes punishable with imprisonment of three years shall be bailable offences. Cyber crime victims are typically organizations, whose systems are penetrated by the customers of that organization. In case of data theft, the data could be strictly related to the organization or it could be a customer database with data like social security numbers, credit card information, mailing addresses and other details. Therefore organizations may suffer substantial losses in the form of lost customers and/or stolen or compromised confidential information. Customers can also suffer financial losses, when their identity is stolen.

Cyber law is a generic term, which refers to all the legal and regulatory aspects of internet and the World Wide Web sites. This cyber law governs a boundless, timeless and spaceless, medium which has emerged to envision the future business, known as “cyber medium or cyber space”. While the lawmakers have to be complemented for their appreciable work removing various deficiencies in the Indian cyber laws and making it technologically neutral, yet it appears that there has been a major mismatch between the expectation of the nation and the resultant effect of the amended legislation.

The psychological factors behind the person committing such cyber crimes can be identified as greed, revenge, frustration, grievance and mismanagement. Cyber crime laws refer to offenses against the information technology infrastructure. Such conducts include:

(i) illegal access the access to the whole or any part of a computer system without right (ii) illegal interception the interception without right, made by technical means, of non-public transmissions of computer data to, from or within a computer system (iii) data interference the damaging, deletion, deterioration, alteration or suppression of computer data without right (iv) system interference the serious hindering without right of the functioning of a computer system by inputting, transmitting, damaging, deleting, deteriorating, altering or suppressing computer data (v) misuse of devices (vi) forgery and (vii) fraud.
All in all, given the glaring loopholes as detailed above, the new IT Act Amendments are likely to adversely impact corporate India and all users of computers, computer systems and computer networks, as also data and information in the electronic form. Some recent highlighted issues related to cyber crime in the year 2008 are presented in Table-2.

Types of cyber crimes

Cyber crimes can be categorized into four broad categories as: (i) data related crimes; (ii) network related crimes; (iii) crimes of access; and (iv) computer related crimes;

i. Data-related crimes: Data related crimes include interception, modification, and theft of data.
ii. Network-related crimes: Network related crimes include interference and sabotage.
iii. Crimes of access: Crimes of access include hacking and virus distribution.
iv. Computer-related crimes: Computer-related crimes include aiding and abetting cyber criminals, computer fraud, and computer forgery.

Duggal, who is the President of cyberlaws.net and consultant, in a report has clearly defined the various categories and types of cyber crimes. Cyber crimes can be basically divided into three major categories: (i) Cyber crimes against persons (ii) Cyber crimes against property and (iii) Cyber crimes against government.

i. Cyber crimes against persons: It includes various crimes like transmission of child-pornography, harassment of an individual with the use of a computer such as e-mail.
ii. Cyber crimes against property: These crimes include computer vandalism (destruction of others' property), transmission of harmful programmes.
iii. Cyber crimes against Government: Cyber-terrorism is one distinct kind of crime of this category.

Cyber crime in global scenario

On the global scene, cyber crime has skyrocketed with the advancement of the electronic medium. The growing danger from crimes committed against computers, or against information on computers, is beginning to claim attention in national capitals. In most countries around the world, however, existing laws are likely to be unenforceable against such crimes. This lack of legal protection means that businesses and governments must rely solely on technical measures to protect themselves from those who would steal, deny access to, or destroy valuable information.

Few most popular cyber crimes in India

Cyber crime is becoming even more serious. Findings from report on Computer Crime and Security Survey 2002 show an upward trend that demonstrates a need for a timely review of the existing approaches to fight against this new phenomenon in the information age.

Cyber crimes have gained momentum in India only in the recent past. According to the Union Home Ministry of India, cyber crimes in our country have sharply increased. There is no concrete statistics but,

Table 1: Year-Wise Percentage of Cyber Crimes during the Years 2004-2008

<table>
<thead>
<tr>
<th>Type of Cyber Crimes</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denial of service</td>
<td>39</td>
<td>32</td>
<td>25</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Laptop theft</td>
<td>49</td>
<td>48</td>
<td>47</td>
<td>50</td>
<td>42</td>
</tr>
<tr>
<td>Telecom fraud</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Unauthorized access</td>
<td>37</td>
<td>32</td>
<td>32</td>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td>Virus</td>
<td>78</td>
<td>74</td>
<td>65</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Financial fraud</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Insider abuse</td>
<td>59</td>
<td>48</td>
<td>42</td>
<td>59</td>
<td>44</td>
</tr>
<tr>
<td>System penetration</td>
<td>17</td>
<td>14</td>
<td>15</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Sabotage</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Theft/loss of propriety info</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>a) from mobile devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) from all other sources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abuse of wireless network</td>
<td>15</td>
<td>16</td>
<td>14</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Web site defacement</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Misuse of Web application</td>
<td>10</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Bots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>DNS attacks</td>
<td></td>
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<td></td>
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<tr>
<td>Instant messaging abuse</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Password sniffing</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Theft/loss of customer data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) from mobile devices</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>b) from all other sources</td>
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</tr>
</tbody>
</table>

Source: (Ref. # 21); *Data Not Available
Table 2: Some Recent Highlighted Issues of Cyber Crimes in Year 2008

<table>
<thead>
<tr>
<th>Months</th>
<th>Cyber Crime in Year 2008</th>
</tr>
</thead>
</table>
| January | • FTC settles with “Life is Good” (www.lifeisgood.com), which exposed credit card information due to SQL injection flaw.  
• Login page of Italian bank (Banca Fideuram) replaced using XSS.  
• RIAA website DoS’ed, then defaced, using SQL injection and XSS. |
| February | • CSRF used to hack a Korean e-commerce site (Auction.co.kr) and steal information on 18M users. |
| March   | • Hackers steal 4.2M card numbers of Hannaford shoppers, resulting in over 2000 fraud cases.  
• MySpace and FaceBook private pictures exposed online using URL manipulation (Jan and Mar).  
• SQL and iFrame injection are used to add Javascript code to websites which then download viruses and other malware from hacker sites when browsed. Search Engine Optimization (SEO) techniques result in infected pages being placed high on Google’s search results. Affected sites number in excess of 200K. |
| April   | • Just before the Pennsylvania Democratic Primary, XSS is used to redirect users of Barack Obama’s website to Hillary Clinton’s. |
| May     | • US Federal prosecutors charge parent who allegedly badged a girl to suicide on MySpace with three counts of computer crime (conspiracy and hacking).  
• Radio Free Europe hit by DDoS attack. |
| July    | • Online payment service E-Gold pleads guilty to money laundering.  
• Canadian Teachers Federation proposes adding Cyber-Bullying to Canadian Criminal Code.  
• Canadian porn site SlickCash pays $500K to Facebook after it tried to gain unauthorized access to Facebook’s friend-finder functionality back in June 2007.  
• Terry Childs, San Francisco City network admin, refuses to give out passwords, locking other admins out of network. |

Source: (Ref. # 12)

Table 3: Countries with Updated Laws

<table>
<thead>
<tr>
<th>Country</th>
<th>Data Crimes</th>
<th>Network Crimes</th>
<th>Access Crimes</th>
<th>Related Crimes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DI</td>
<td>DM</td>
<td>DT</td>
<td>NI</td>
</tr>
<tr>
<td>Australia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Brazil</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Canada</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Chile</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Denmark</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Estonia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>India</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Japan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Malaysia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Mauritius</td>
<td>✓</td>
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<tr>
<td>Peru</td>
<td>✓</td>
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<tr>
<td>Philippines</td>
<td>✓</td>
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<tr>
<td>Poland</td>
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<td>✓</td>
</tr>
<tr>
<td>Spain</td>
<td>✓</td>
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</tr>
<tr>
<td>Turkey</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>United Kingdom</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>United States</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: (Ref. # 12)


Table 4: Useful Tips to Prevent the Cyber Crimes

<table>
<thead>
<tr>
<th>DOs</th>
<th>DON'TS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure using a security program that gives you control over cookies that send information back to Web sites.</td>
<td>Allow your children to download files or software without your permission.</td>
</tr>
<tr>
<td>If your Web site serves up dynamic content from a database, consider putting that database behind a second interface on your firewall, with tighter access rules than the interface to your server.</td>
<td>Forget to make sure web servers running your public site are physically separate and individually protected from your internal corporate network.</td>
</tr>
<tr>
<td>Make sure web servers running your public site are physically separate and individually protected from your internal corporate network.</td>
<td>Reveal personal information which will help others to personally identify you e.g. real name, address, telephone number, etc.</td>
</tr>
<tr>
<td>Put in a firewall and develop your content off line.</td>
<td>Arrange meetings with strangers.</td>
</tr>
<tr>
<td>Send credit card information only to secure web sites.</td>
<td>Use adult/pornography sites.</td>
</tr>
<tr>
<td>Thoroughly check out the site you are doing business regularly.</td>
<td>Share your password with other people.</td>
</tr>
<tr>
<td>Use the latest anti-virus software, operating systems, Web browsers and email programs.</td>
<td>Tell others about personal or private information about your friends or family members.</td>
</tr>
</tbody>
</table>
are non-bailable offences where the accused is not entitled to bail as a result of various cyber offences ranging from three years to ten years. These laws. Currently, the IT Act, 2000, has provided for punishment for various cyber crimes which is popularly known as the Indian cyber law. The IT Amendment Act 2008 brings about various sweeping changes in the existing cyber laws. In the last week of December, 2008, the Indian Parliament has passed the amendments to the Information Technology Act 2000, which is popularly known as the Indian cyber law. The IT Amendment Act 2008 brings about various sweeping changes in the existing cyber laws. Currently, the IT Act, 2000, has provided for punishment for various cyber offences ranging from three years to ten years. These are non-bailable offences where the accused is not entitled to bail as a matter of right.

Cyber crime legislation in global scenario

As a tool, place, or target for criminal activity and behavior the development of cyber crime has affected law enforcement agencies and society. Enforcement has led to the creation of laws, policies, and legislation. Law enforcement agencies must vigorously fight and prevent cyber crimes in order to help create a safer society. The first comprehensive initiative on computer crimes was a staff study by the U.S. Senate Government Operations Committee in February 1977. This staff study addressed several problems associated with the computer programs, and recommended that legislation should be considered which would prohibit unauthorized use of computers. The Chairman of this committee was Senator Abe Ribicoff who introduced later in 1977 the Ribicoff Bill.

7.1. The Ribicoff Bill

This Bill was the first proposal for the federal computer crime legislation in the U.S. that would specifically prohibit misuse of computers. The Bill No. S.1766 (95th Congress) was cited as the “Federal Computer Systems Protection Act of 1977”. The Bill was not adopted, but this pioneer proposal became the model legislation in the state computer crime legislation in the United States and created awareness all around the world.

Some countries had already enacted Data Protection Acts in order to regulate the collection, maintenance, use and dissemination of personal data. But in the Swedish Data Act of 1973, its Section 21 also included also protection against unauthorized access to all categories of data.

7.2. Interpol

Interpol was the first international organization dealing with the computer crime and penal legislation. In conjunction with an Interpol Conference in 1981, a survey of Interpol member countries on the computer crime and penal legislation identified several problems in the application of existing penal legislation.

7.3. Organization for Economic Co-operation and Development (OECD)

Prevention of cyber crimes

“Prevention is better than cure” is not only meant for human health but also for the computers as well. It is always better to take necessary steps to prevent cyber crimes. Some of the useful tips are given in Table-4 to prevent the cyber crime to some extent. (Table-4)

Conclusions

Crime in a society is expected to remain at a tolerable level due to the deterrence factors; early detection of the crimes, identification of the criminals who have committed the crime. Warding of an exemplary punishment to him/her will dissuade other individuals who would have indulged in such instances in future. Criminals have adapted the advancements of the computer technology to further their own illegal activities and these inventiveness have, however, far out-paced the ability of law enforcement agencies to react effectively. Therefore, within the law enforcement agencies, a set of rules must be developed to address the various categories of computer crimes. According to “CSI Computer Crime and Security Survey 2008” the graph of the average financial losses due to cyber crimes has looked like nothing so much as a parabolic line nearing a horizontal asymptote. To ensure comprehensiveness, such enactment shall take into consideration cyber activities that are beyond traditional areas. Because cyber crimes cover such a broad scope of criminal activity, the examples...
above are only a few of the thousands of crimes that are considered as the cyber crimes.

According to the cyber crime forecasts 2009 from leading IT security firms the global recession will lead to a rise of cyber crime worldwide, as governments’ attention to cyber crime is deflected towards more pressing economic problems. Our economy and national security are dependent upon the internet, and will continue to be adversely impacted by cyber crimes. Cyber crimes will also continue to increase the risk of catastrophic system failure by weakening our critical infrastructures. The good news is that there exist tremendous intellectual and technological resources to meet the challenges. With the leadership and persistent efforts, one can turn the tide on cyber crimes.

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A retrospective study of prison deaths in western Maharashtra (2001-2008)

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Abstract
Retrospective study of prison deaths in western Maharashtra was carried out from year 2001 to 2008. A total 66 cases of prison deaths were examined excluding deaths in police custody. 64 inmates were male and 2 were females. The age ranged from 21 year to 80 years with mean age of death being 46.48 years. Natural cause of death predominates (n=63, 95.45%), tuberculosis related deaths (n=34, 51.51%) being maximum, followed by coronary artery disease (n=22, 33.33%), pneumonia (n=2, 3.03%), cancer (n=2, 3.03%), liver cirrhosis (n=2, 3.03), intracranial haemorrhage (n=1, 1.51%). Out of which 50 (75.75%) cases received treatment. Unnatural deaths (n=3, 4.55%) comprised exclusively of suicidal hanging, all were suffering from mental illness.

Key words
Prison deaths, Prison tuberculosis, Human rights, Hanging.

Introduction
The tragedy of a death in custody is experienced most deeply by the kin of deceased. It occurs out of spectacle within a makeup of confinement under the control of police or prison officers. Death occurs in situation where the deceased is totally dependent on his or her custodian for proper care and enough medical attention. The anguish and anger of the relatives, their fear and suspicion as to what may have happened inside a police or prison cell, demands a promise that the circumstances of the death will be thoroughly and fairly investigated\(^1\). It is also a public matter and raises media attention. Person held in arrest by prison authorities, retain their basic constitutional rights except for their right to liberty and a qualified right to privacy. Apart from magistrate inquest and information to Human Right Commission, under many situations preventable factors leading to death of prisoner remains unexplored\(^2\). So also lack of evaluation and scientific analysis of prison deaths prevents formation of strategy for better improvement of prison health\(^2,3\).

This retrospective study was carried out to classify of all prison deaths and other relevant contributory factors, in order to determine whether any of the deaths associated with the factors could have been prevented.

Methods
This retrospective study was carried out at Dept of Forensic Medicine, Govt. Medical College, Miraj, Maharashtra. We examined all available files of inquest papers, autopsy reports, histopathological examination reports, case papers and toxicological analysis into the deaths of prisoners from 2001 to 2008. Deaths occurred in police custody were excluded.

We used standard proforma to abstract data from the record to ensure consistency for the whole sample. Information collected includes age, sex, type of institution, place of death, medical attention received, cause and manner of death. We extracted, if present other relevant information such as history of psychiatric illness, drug or substance abuse.

Cause of death were categorized as unnatural (suicide, homicide or accidental) or natural (Cardiovascular disease, respiratory disease, liver disease etc.) The categorization is based on inquest, autopsy and laboratory conclusions.

Results
A total 66 prison deaths occurred in study period 2001 to 2008 and comprised of 66 cases. Maximum numbers of cases were of males (n=64, 96.96%) and only 2(3.04%) cases were of female. The age ranged from 21 year to 80 years with mean age of death being 46.48 years (Table no 1). Maximum numbers of deaths were in the age group 31-40 years (42.42%). Only three (4.54%) of the inmates died due to unnatural cause which was hanging comprising of two male and one female all of whom were suffering from mental illness. In two cases of males chadar (dari) and in case of female piece of saree was used as ligature material. Natural deaths (n=63, 95.45%) were found to be most common manner of death (Table no 2). Regarding causes of death (Table no 3) respiratory system diseases maximum (n=34), followed by cardiovascular (n=22, 33.33%), liver cirrhosis (n=2, 3.03%), cancer (n=2, 3.03%) and intracranial haemorrhage (n=1, 1.51%). Total 50 (75.75%) deaths received medical attention. Associated conditions found were hypertension (n=24, 36.36%), diabetes mellitus (n=3, 4.54%), anaemia (n=6, 9.09%) and mental illness (n=7, 10.6%).

Respiratory system diseases comprises maximum number of deaths and tuberculosis related deaths being maximum (34, 51.51%). We divided tuberculosis related deaths into pulmonary tuberculosis, disseminated tuberculosis and HIV associated with tuberculosis deaths. Pulmonary tuberculosis deaths were 13(19.69%), disseminated tuberculosis deaths were 13(19.69%) and HIV tuberculosis deaths were 8(12.12%). Out of which one case being tuberculous meningitis associated with tubuloma of cerebellum. In associated HIV infection Cryptococcal meningitis and pneumositis carni pneumonia were found in all 8 cases. Two cases were of pneumonia (3.03%).

In cardiovascular diseases all cases were found to be coronary artery disease (n=22, 33.33%) having coronary atherosclerosis and critical narrowing. Two cases of liver cirrhosis had previous history of alcohol abuse. In cancer deaths one prisoner died of cerebral astrocytoma and one with signet ring cell carcinoma of intestine. One case was found due to intracranial haemorrhage had a history of hypertension.

Discussion
Differing to other studies\(^5,6,7\), which concludes that the violent cause of death predominates prison deaths, our study reveals natural causes to be more. This finding is consistent with study from Nagpur by Bardale Rajesh et al\(^2\). This finding also denotes Government vigilance and Human Right Commission set up. As natural death predominate the causes of death the age group in which maximum number of deaths (42.42%) found was 31-40, denoting premature deaths. These deaths can be surely preventable. These findings are also consistent with study of Bardale Rajesh et al\(^2\).

In this study only two female prisoners were noted, one due to tuberculosis and other from hanging. Female prisoner who hanged herself in prison cell used piece of saree as a ligature material and she was known case of mental illness. Rarity of crimes by female may in part to explain minimum number of female deaths.

Two of the male prisoners who died of hanging used piece of chadar (dari) as a ligature material. Place they chosen to hang themselves were prison cells and were suffering from mental illness. The suicide in prison cell is worrisome and suggests lack of preventive effort by the authorities. Prison suicides are often preceded by signs of suicidal
intent, and these signs should, at minimum, prompt the provision of further psychiatric care. All three cases in the study were suffering from mental illness. Research into suicide in prison must be directed toward the exploration of protective factors and environmental factors that may influence suicidal behavior.

Tuberculosis related deaths outnumbered natural causes (51.51%). This finding is consistent with Bardale Rajesh et al (30%) but cases were little higher in number than quoted study. Bock et al reported 10(7%) deaths in their study of 142 inmates with tuberculosis who were treated in the prison hospital. All cases were HIV seropositive. Their study also states that 39 inmates out of 142 released prior to completion of therapy, 23(59%) completed therapy after release, one died prior completing treatment, and 15(38%) were lost to follow up.

As prisoners constitute a high risk group for acquisition of TB infection as compared to general population due to overcrowding, closed living conditions, insufficient ventilation, generally low socioeconomic status, poor nutrition and poor health of prison inmates, HIV has only compounded the situation. In this study 8 cases of HIV with tuberculosis were found. Transmission of tuberculosis in prisons is also particularly dangerous as it often involves resistant strains. Directly or indirectly, these threats apply, not only to prisoners, but to all who come into contact with prisons including the prison staff and community as a whole. Prisoners are eventually released back in to society, bringing them the illness and behaviors generated and worsened by their incarceration. Prison health is often forgotten or given low priority.

The problem of TB and poor health of prisoners will not only confined to prisons but ultimately will have effect on the community as a whole. Currently there are no data available on prevalence of TB infection in the prisoners in India. The studies that had been done on prison tuberculosis in various other countries (including other Asian countries) showed alarming TB rates in prisoners. PubMed search regarding such type of study in India revealed not a single study. So the situation urges the scientific study on prison tuberculosis.

The study also revealed 22(33.33%) deaths due to coronary artery disease, 2(3.03%) cases of pneumonia, liver cirrhosis and cancer and one case of intracranial haemorrhage with hypertension. Society punished these prisoners twice, once by incarceration and second time by illness. As simple things could probably have prevented the death or least extended the life. Arrangement of periodic health check up, health education, appropriate exercise, monitoring, improvement of living condition and healthy food, could be gateway for achievement of prison health and life.

**Conclusion**

This retrospective study of nine years consists of total 66 prison deaths from the year 2001-2008. Natural deaths (n=63, 95.45%) were common in prisons with tuberculosis related deaths (n=34, 51.51%) being prominent in number. Maximum cases comprised of male inmates. Significant number of deaths occurred in the age group of 31-40 years. Other associated conditions were hypertension, diabetes mellitus, anaemia and mental illness. Moreover, inmates who died due to unnatural causes were due to hanging. These suicidal hanging occurred in prison cells and all were suffering from mental illness.

Providing adequate medical aid, urge of scientific research for prevalence of prison tuberculosis, accordingly prison tuberculosis control program, healthy food, potable water and periodic health check up can significantly reduce the mortality of health ailments in prison.

Lastly, as said in custodial jurisprudence, the prison is a place of great symbolism and ritual. This ritual begins the moment a prisoner comes through the gate of a prison. His clothes were taken from him. He is required to bathe or shower. He is given a set of uniform. He is given number, which will become important than his name. This symbolism will continue until the moment of his release. And before it is done, the symbolism is taken away so that the stigma of prisoner does not hang over him. We medical fraternity will hope this symbolism will not be added with diseases particularly prison tuberculosis, by scientific studies, accordingly prison health policies.

**References**

DNA typing as a forensic investigation

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Introduction
Within a species, one chromosome of a given type is very similar to another but at some places (loci) on the chromosome, there occurs some variability in the DNA sequence between the chromosomes. These differences can lead to phenotypic polymorphism of alleles leading to genetic polymorphism. Alleles can be detected using genetic markers. Further DNA is a robust molecule which can tolerate remarkable range of temperature, PH and other factors. DNA mixed with detergents, oils gasoline and other adulterants does not alter its typing characteristics.

Application of DNA typing
DNA typing can be applied to identify an individual in criminal as well as in civil cases like Rape, Murders, Kidnapping, Exchange of babies, Infanticide, Abandonment of child, illegal abortion, Disputed paternity, Inheritance, etc. Biological samples which can be utilized for DNA typing:- 1) Blood, liquid or dried stains on clothes, weapon, crime scene 2) Seminal stains and swabs 3) Hairs with roots 4) Tissues like muscle 5) Whole bone like femur, humerus 6) Teeth 7) Viscera like intestine, spleen and heart 8) Feotal tissues along with placental tissues. 9) Dry tissues in case of exhumed body

Procedure of dna typing in forensic laboratory
Two ml of blood is taken each from male baby, mother & alleged father. Blood 500 microliters is added in an appendrof. Equal volume of lysis buffer-l is added to blood. Then the mixture is kept in a freezer at 70 degrees Celsius for one hour. The mixture is thawed in boiling water at 65 degrees Celsius for eight minutes. Then it is subjected to centrifugation at 10,000 rotations per minute at 15 degrees Celsius for ten minutes. Then decant the lysate. A pellet is found in the bottom of the appendrof. To homogenize the pellet, equal volume (500 microliters) of lysis buffer-II is added. Then it is subjected to vigorous shaking in vortex machine till pellet converts into liquid. Then sodium dodecyl sulfate 10% solution about 50 micro liters and also 2 microliters of Proteinase K is added to the mixture. Then the mixture is incubated at 37 degrees Celsius for four hours or 56 degrees Celsius for two hours. Tris saturated phenol 500 micro liters are added and the mixture is shaken manually for ten minutes. Then it is subjected to centrifugation at 10,000 rotations per minute at 15 degrees Celsius for 10 minutes. Transfer the lysate into fresh appendrof tube. 500 micro liters of half volume of Tris phenol and half volume of chloroform isoamyi alcohol (24:1) is added and then subjected to centrifugation. Transfer the lysate into fresh appendrof tube. Equal volumes of chloroform isoamyl alcohol is added and then subjected to centrifugation. Equal volumes (500 micro liters) of isopropanol and 1/30 volume of sodium acetate is added and centrifuged at 10,000 rotations per minute at 15 degrees Celsius for ten minutes. Decant isopropanol. Ethyl alcohol 100 micro liters is added and the pellet dried under light for thirty minutes. Tris EDTA buffer is added and incubated at 65 degrees Celsius for one hour. The resultant mixture obtained is the “STOCK DNA”.

To 5 micro liters of stock DNA, 995 micro liters of TE buffer is added and read at 260nm and 280 nm in UV Spectrophotometer. If the ratio of optical density at 260nm to optical density at 280 nm is 1.7 or above, then extracted DNA is in required quantity for further analysis. Sharp bands are obtained on subjecting to miniger electrophoresis if the DNA extracted is of good quality without any impurities.

For PCR amplification, 2 micro liters of DNA solution is taken which contains 0.1 nanogram of DNA per micro liter. To this DNA solution, 5.25 micro liters of identifier kit which contains reaction mix, primer sets, TAQ gold polymerase and then subjected to PCR amplification. After PCR amplification, 0.5 micro liter of amplicon to which 25.5 micro liter of internal size standard is added and subjected to STR analysis in STR analysis machine. In STR analysis machine, the amplicon is subjected to capillary electrophoresis.

The amplified products which are radiolabeled are detected by laser gun present in the analysis machine. The sizes of PCR products is determined by comparison with a DNA ladder which contains DNA fragments of known size, run on the capillary electrophoresis alongside of the PCR products. These radio labeled amplified regions are read out as coloured spikes electropherogram, when connected with computer loaded with data collection software. These electropherograms is the DNA profile of the individual at study which can be interpreted manually as well as by gene scanner.

Result
The DNA profiles of male baby X aged one year, mother Y and alleged father Z are recorded in the form of electropherogram on a single paper and analysed. The DNA profile of baby is found matching with the DNA profile of alleged father and hence he is identified as the
biological father of the baby. The electropherogram of this DNA matching case is given below.

**Statistics**

About 25 cases of disputed cases were studied in the month of October 2007. In all the cases, DNA Typing is done using blood as biological sample. All the twenty five cases are positive cases i.e., all are DNA matching cases. Number of cases where there was error or no result obtained cases were zero.

**Discussion**

DNA can be extracted from any body fluid or tissue in which nucleated cells are present. The mechanism of DNA Typing is

A. **Extraction of DNA from nucleated cells:**

Extraction of DNA from nucleated cells involves disruption of cells and fraction of cellular organelles. Dissociation of DNA from protein by use of salt solution or detergent. Addition of an extractant to phase separates the bulk of the protein from the DNA. Use of enzyme or differential precipitation to remove RNA and polysaccharides. The isolated DNA is quantified by ultraviolet spectrophotometry. The qualitative check up is done by electrophoresis in which if distinct bands are obtained then the DNA extracted is of good quality without impurities. If a smear is obtained, the obtained DNA is not extracted without impurities. All the samples whether blood (white blood cells), bone marrow semen, hair roots, tooth pulp, skin or tissue from any organ should be frozen at -20 degree Celsius if not used immediately.

B. **Short tandem repeat analysis in PCR machine:**

The isolated DNA sample is mixed with radio labeled known primers available in the market and now ready for STR amplification in PCR Machine. The DNA is split apart by heating the sample to 94 degrees centigrade. Then the temperature is lowered during which small segments of DNA (primers, radiolabelled) bind specifically to the DNA which has the polymorphic regions of interest. The temperature is again raised to 72 degrees centigrade which causes DNA polymerase (TAQ Polymerase) to extend the primers and copy the two separated strands of DNA.

Detection of amplification products is done by running the DNA through capillary electrophoresis and visualizing the radio labeled regions by laser gun and this radiolabelled regions can be recorded on the graphs called Electropherogram with the help of appropriate software.
loaded computer which can be analysed manually as well as by computer. Hence the electropherogram of child, his mother and his father can be recorded on a single sheet and compared.

**Conclusion**

The probability of result by DNA typing is so high and positive that it is leading to certainty. If there is something wrong done in the procedure, it is leading to no result being obtained rather than erroneous result. Since control samples are provided with the experimental samples, the chances of error is very very low. These prove its reliability as a superior and scientific investigation for identification.

However there are some disadvantages of DNA typing. It cannot differentiate between identical twins. It is very expensive as the necessary chemicals and PCR machine which are needed for the procedure are very costly. Extraction of DNA other than from blood sample is difficult and challenging.

**Acknowledgement**

Personal experience at center for DNA Fingerprinting Wing, courtesy, Director, Moorthy, state forensic science laboratory, Hyderabad, Andhra Pradesh state

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Primary neurogenic shock and its medico - legal aspects

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Abstract

Primary neurogenic shock or vaso vagal shock or acute neurogenic cardiovascular failure is a common cause of sudden deaths. Its diagnosis is mainly based on exclusion of all other causes of death. In this article effort has been made to explain the mechanism and causes of neurogenic or vaso vagal shock.

Key words

Shock, Neurogenic Shock, Vaso vagal Shock, Sympathetic nervous system, Parasympathetic nervous system

Introduction

Shock is a syndrome about which there has been a great deal of confusion and controversy. Part of the difficulty lies in the loose use of the term by physicians and laymen e.g. electric shock and spinal shock bear no relation to the condition produced by hemorrhages and related cardiovascular abnormalities. So shock may be defined as a state in which the failure of circulatory system to maintain adequate cellular perfusion results in widespread reduction in delivery of oxygen and other nutrients to tissues.

Classification of shock

1. Hypovolemic Shock [Decreased blood volume]
2. Distributive Shock [Marked vasodilation, also called low resistance or vasogenic shock]
3. Cardiogenic Shock
4. Obstructive Shock

Here we are mainly concerned with neurogenic or vaso vagal shock which can be sub classified under distributive shock i.e. the blood volume is normal but the capacity of the circulation is increased by marked vasodilation. It may also be called as warm shock because the skin is not cold and clammy. In neurogenic shock, sudden autonomic activity results in vasodilation and pooling of blood in veins.

Physiology of autonomic nervous system

The nervous control of cardiovascular system is carried out by autonomic nervous system, which consists of two mutually antagonistic divisions the sympathetic adreanal and parasympathetic division.

The effects of sympathetic and parasympathetic divisions are mediated through chemical mediators, which are mainly, nor epinephrine and acetyl choline respectively. Besides these dopamine, GnRH, VIP, ATP and neuropeptide Y also act as co transmitters. The affects of these divisions on the circulatory system and heart are as follows.

In short, we can say that sympathetic nervous system has stimulatory effect on heart while parasympathetic nervous system has inhibitory effect on the heart.

The two divisions of autonomic nervous system have their antagonistic affects on the other organs of the body also.

The parasympathetic division supplies the visceral structures in the thorax and abdomen through vagus nerve, in the head via oculomotor, facial and glossopharyngeal nerve while the pelvic viscera is supplied via the pelvic branches of 2nd to 4th sacral spinal nerves.

The organs, which are supplied via vagus nerve are heart, larynx, trachea, bronchi, lungs, stomach, small intestine, gall bladder, pancreas, kidneys, colon and abdominal vessels.

Nerve supply of heart

The parasympathetic fibers arise from the nucleus ambiguus or from the dorsal nucleus of the vagus. These fibres eventually join the vagus nerve. These are the pre ganglionic fibers. Ganglia are situated in the SA node or AV junctional tissue. The cardiac fibers of right vagus terminate on the SA node while those of the left vagus on AV junctional tissue. However there is good deal of overlapping. Almost all vagal fibers terminate on the atria and only a few of them extend up to the ventricles. Vagal fibers thus supply the atrial musculature together with the SA node and AV junctional tissue. The neurotransmitter is Ach. While the receptors are mainly muscarinic M2. The right vagus stimulation produces sinus bradycardia where as that of left vagus causes heart block. The sympathetic fibers supplying the heart arise from the spinal centers in the upper five thorasic segments of spinal cord but most notable from T-3 and T-4. The preganglionic fibers eventually relay in the para vertebral chain of ganglions from where the post ganglionic sympathetic fibers arise and ultimately supply the heart. The neurotransmitter is chiefly nor adrenaline and the receptors are beta receptors.

Effects of reflex autonomic stimulation

So the acute neurogenic cardiovascular failure may occur by the over stimulation of sympathetico adrenal nervous system as well as the parasympathetic nervous system. The pre-existing cardiac diseases like coronary artery sclerosis, cardiac hypertrophy/ fibrosis, fatty changes in the myocardium, valvular diseases, AV block etc. make the person more vulnerable to such deaths.

Ventricular fibrillation which ultimately leads to CHF is responsible for the deaths occurring due to sympathetic stimulation while syncope [with pallor, without dyspnoea] is the probable mechanism of death in parasympathetic inhibition of heart.

Causes of neurogenic shock

1. Fright, dread, anger or any other emotional excitement. Sudden psychic shock is liable to cause death by parasympathetic inhibition of heart while sympathetic adrenal stimulation is more common in cases of fear especially when accompanied by painful stimulation.

2. Application of constrictive force to the neck as in hanging, strangulation etc.

When a constrictive force is applied over the neck, there will be pressure on the baro receptors of carotid sinuses, carotid sheaths or the carotid body, which can result in bradycardia or cardiac arrest. Death would result due to parasympathetic inhibition of circulatory system. If the ligature is situated below the sinuses but in a position in which carotid arteries can be occluded death may be due to sympathetic adrenal stimulation also. The mechanism acts through a reflex arc in which afferent nerve impulse arise in the carotid complex of nerve endings but not in
7. Distension of hollow organs.

6. Electrocution and burns.

5. Blow on abdomen, pre cordial region, scrotum, neck, larynx, urinary bladder, diaphragm. The unexpected blows on these regions can cause sudden death from reflex cardiac arrest. The rapidity with which such deaths occur, the absence of visceral congestion and the absence of any marked traumatic lesion at autopsy possibly suggest the possibility of vagal inhibition.

4. Immersion syndrome.

3. Reflex vagal inhibition due to impacted food or the foreign body.

A foreign body impacted in bronchus may also produce reflex cardiac inhibition. Occasionally choking may also cause vagal inhibition of heart.

8. Puncture of pleural cavity.

Reflex cardiac inhibition reported due to puncture of pleural cavity is again mainly because of apprehension on the part of the patient. So appropriate premedication may be desirable for the purpose of calming a patient and avoid such accidents.


Introduction of Stomach tube/vaginal/rectal instrumentation/ traction of extra ocular muscles may even cause vagal inhibition of heart, the efferent pathway being parasympathetic nervous system

10. Acute myocardial infarction/Defects in the conduction system of heart.

Parasympathetic stimulation in persons with AV block or sinus bradycardia may further depress the heart rate and may induce cardiac arrest [Stokes Adams Morgagni Syndrome]. Cardiac arrest in the patients with myocardial infarction is associated with ischaemic denervation of the sino atrial node. Atropine is responsible in counteracting bradycardia and partial heart block in patients where increased vagal tone is responsible e.g. myocardial infarction and digitalis toxicity.

11. Reflexive heart block due to irritation of vagus nerve is also observed in patients with oesophageal diverticula, mediastinal tumors, gall bladder diseases, cardiac sinus diseases and glossopharyngeal neuralgias. In these conditions, reflex bradycardia is usually of sino atrial than atrio ventricular type.

12. Low oxygen, high carbon dioxide tension in blood, hypoglycemia also cause sympatho-adrenal stimulation both by direct action on the medullary centers as well as reflex action through the chemoreceptors of the aortic and carotid bodies. Cardiac arrest of vagal origin is primarily noticed on the operation table due to insufficient induction or low maintenance dose of anesthetic agent.

Summary and conclusion

Acute neurogenic cardio vascular failure or primary neurogenic shock is a common cause of sudden deaths. Diagnosis of neurogenic shock is mainly based on the exclusion of all other causes of death. When an apparently healthy person dies sudden and unexpected death and no adequate cause of death is found at autopsy, the possibility of neurogenic shock may be considered. Histological study of suitable sections of myocardium should also be performed before making such a diagnosis.

If a definite evidence is available that the death occurred suddenly and appropriate nervous system stimulation was there e.g. in cases of drowning in cold water, but still no sign or the features of drowning are there but a cardiac lesion is found at autopsy and acute congestive visceral changes are there ,it may be concluded that the probable mechanism of death was ventricular fibrillation due to over stimulation of sympathetic nervous system. Even if no cardiac lesion is found at autopsy and the fatal clinical changes are those of syncopal [with pallor and without dyspnoea] and visceral congestion is absent, it may be inferred that death is due to cardiac arrest or parasympathetic inhibition of heart.

References

335-36, 365-66
A five year (1998-2002) study of burns at Gulberga, Karnataka

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Abstract

Deaths due to burns are common causes of unnatural deaths contributing nearly 25% of all autopsies. Dowry deaths are a menace to the society and many of these are caused by burns. In the current study a total of 525 cases of burns were analysed over a period of five years at Government General hospital Gulbarga. Of these 381 (72.5%) cases were of female. During the five years the cases were almost evenly distributed with highest of 121 cases in the year 2000. Out of the 525 cases studied 450 cases were accidental in nature and 52 cases were suicidal and 23 cases were homicidal in nature based on history from the relatives and inquest papers furnished by police which some times was sketchy. Out of the 381 female cases, 92 were unmarried and the remaining 289 cases were of married females. Maximum numbers of cases i.e 289 were admitted to hospital and 92 were brought dead. Out of these 289 cases, a maximum of 74 cases survived for period of more than five years.

Key words

Burns;Death;Autopsy;

Introduction

Thermal burns are more common incidents, which stands next to road traffic accidents in India. On an average 1/4th of the deaths constitute death due to burns among all postmortem examinations conducted. Mortality rate due to burns is much more than any other developed countries.

Dowry deaths; dowry prohibition Act, 1961 defines “dowry” to means any property or valuable security given or agreed to be given either directly or indirectly. The obnoxious and ubiquitous practice of dowry has been perpetuated a new alarming rise in mortality from burns, so called “Dowry Deaths”. 

During the wedlock, the male partner is disgruntled and dissatisfied with a paltry dowry where he had been promised more, and then the dangerous situation arises. In most of such situations, with intention to marry some other girl who can get him more wealth, he tries to adopt the cruel and violent act of murdering his wife. This could be again because of the cumbersome procedure of divorce. According to the 498 A & 304 B Indian penal code explanation, dowry deaths occur either by murder of a married woman, or she herself commits suicide being unable to bear harassment or cruelty for not fulfilling the promises by her parents at the time of her marriage and such husband or relative shall be deemed to have caused her death. Most of the dowry deaths take place in secrecy like within the house or the places access to any outsider is not possible. Subsequently the evidences will be concealed or disappear. The method adopted to murder such helpless victim by fire is known as bride burning. In all cases of unnatural death of the female within 7 years of marriage or below the age of 30 years, postmortem has been made compulsory and in case of death due to burns, it should be done by two medical officers.

Taking into consideration of the magnitude of the problem and the burden it poses on society the current study was undertaken to analyse the pattern of burns over a period of five years and to find out the incidence of dowry related deaths in this area.

Materials and methodology

The present study was conducted over a period of 5 years from January 1998 to December 2002 at Mortuary, Government General Hospital, Gulbarga. Information was collected from police, relatives/ friends/neighbours of deceased, hospital case records if any, inquest report from magistrate and relevant documents.

Information from case history papers and relevant hospital documents of the victims, along with the autopsy findings, were tabulated and statistically analysed.

Discussion

The result / information obtained is compared with the studies conducted in different parts of our country.

Incidence

The incidence of death due to burns is 25.41%, which is the second commonest cause of death next to road traffic accidents in the present study. This finding is comparable with the other studies done by V.N. Ambade1 Rao.N.G2 in which the incidence was 21.6% and 22.73% respectively.

Manner of death

Maximum death were due to accidental burns (85.67%), followed by suicidal burns (9.89%) and the minimum number of cases were of homicidal burns (4.44%). Nevertheless, the above facts remained controversial, when we actually looked into the real history and circumstantial evidences. History in such cases was debatable, because of common age group and allegations of dowry deaths.

In many cases of alleged suicide and accidental deaths, when questions were put to the relatives or the attendants of deceased, a hostile attitude was often noticed which arouse suspicion of foul play. In some of these cases, the fact is that the relatives of the deceased were forced to give false account of cause of death, to make it appear accidental though in all probability a clear case of suicide.

Further highly selective factors, such as socioeconomic conditions, domestic quarrels, disturbed domestic life, chronic disease, mental disorder, disappointment in love or failure in examination etc, may determine the number of suicidal cases.

Sex distribution

Females out numbered males by about 3-times i.e., the incidences being 73.20% in females and 26.80% in males. In fact, by close observation more number of deaths occurred in the young females in the age group 15-30 years. This study clearly depicts the magnitude of the problem in young females, particularly in the early-married life. Mohanty MK et al3 in a study on death by burning found that female preponderances was more with 79.5%. Ambade VN et al3 observed female predominance (74.2%) in burning with male-female ratio equal to 1:2.9. Ashish K. Jaiswal4 found that the incidence was more in females as an absolute number (70.3%). Mago V5 found that female out numbered males with a ratio of 1.17:1.

Therefore, the present study is in consistent with the above studies conducted by Mohanty3, Ambades3, Ashish4 and Mago5
Place of death

The cases brought dead includes the cases which either dies just before admission and treatment or those who died on the spot, died in other hospitals, nursing homes and brought dead directly to the mortuary. Apart from the cases brought dead directly to the mortuary for above said reasons, the other major contributing factors being lack of transportation facilities, literacy, and awareness are among the major contributions to brought dead cases.

The hospital deaths and brought dead ratio is 3:1 approximately.

Dowry death

Very surprisingly, one of the most common history given in the police requisition, in a recently married girl is that she caught fire while cooking or the pressure stove got burst. This reasoning cannot obviously be accepted to be happening only in a newly married girl.

The magnitude of the problem has been realized and in view of this, the Indian penal code, the code of criminal procedure and Indian Evidences Act has been amended as per the Criminal Law.

"Dowry Prohibition Act, 1961" has been amended subsequently to make the law more effective and deterrent in this regard. Still in practice, much remains to be done. Even if a woman survives her burns, she often succumbs to conciliatory sweet talks; after all, she has to most often go on living with the same in-laws.

If she dies, on the other hand evidence of foul play is very difficult to get in most of the cases, since the whole episode takes place indoors. It is not difficult for the interested family members to give it the colour of an accident.

If she dies, on the other hand evidence of foul play is very difficult to get in most of the cases, since the whole episode takes place indoors. It is not difficult for the interested family members to give it the colour of an accident.

Despite repeated strictures from courts and a standing executive order, that such cases be investigated by no less than a deputy superintendent of police, rarely and one senior than sub-inspector of police or Haqavadar visits the spot and investigates the cases. The junior officers besides being over-burdened with other pressing engagements have also not much experience in the matter, nor are they able to exert effective pressure on the witnesses to come out with facts.

Table 1: Total number of autopsies and Death due to burns.

<table>
<thead>
<tr>
<th>Year</th>
<th>Autopsies</th>
<th>Autopsy in case of burns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>388</td>
<td>106</td>
</tr>
<tr>
<td>1999</td>
<td>422</td>
<td>96</td>
</tr>
<tr>
<td>2000</td>
<td>458</td>
<td>121</td>
</tr>
<tr>
<td>2001</td>
<td>407</td>
<td>105</td>
</tr>
<tr>
<td>2002</td>
<td>383</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td>2058</td>
<td>525</td>
</tr>
</tbody>
</table>

Table 2: Sex wise distribution

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>26</td>
<td>80</td>
<td>106</td>
</tr>
<tr>
<td>1999</td>
<td>20</td>
<td>76</td>
<td>96</td>
</tr>
<tr>
<td>2000</td>
<td>31</td>
<td>90</td>
<td>121</td>
</tr>
<tr>
<td>2001</td>
<td>32</td>
<td>73</td>
<td>105</td>
</tr>
<tr>
<td>2002</td>
<td>35</td>
<td>62</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>381</td>
<td>525</td>
</tr>
</tbody>
</table>

Table 3: Manner of death.

<table>
<thead>
<tr>
<th>Year</th>
<th>Accidental</th>
<th>Suicidal</th>
<th>Homicidal</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>1998</td>
<td>94</td>
<td>83</td>
<td>3</td>
<td>100</td>
</tr>
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<td>83</td>
<td>12</td>
<td>5</td>
<td>100</td>
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<tr>
<td>2000</td>
<td>104</td>
<td>12</td>
<td>5</td>
<td>121</td>
</tr>
<tr>
<td>2001</td>
<td>88</td>
<td>11</td>
<td>5</td>
<td>104</td>
</tr>
<tr>
<td>2002</td>
<td>81</td>
<td>11</td>
<td>5</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>52</td>
<td>23</td>
<td>525</td>
</tr>
</tbody>
</table>

Table 4: Marital status in females.

<table>
<thead>
<tr>
<th>Year</th>
<th>Unmarried</th>
<th>Married</th>
<th>Total no. of females</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>24</td>
<td>56</td>
<td>80</td>
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<tr>
<td>1999</td>
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<td>63</td>
<td>76</td>
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<td>2001</td>
<td>19</td>
<td>54</td>
<td>73</td>
</tr>
<tr>
<td>2002</td>
<td>20</td>
<td>42</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>289</td>
<td>381</td>
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Table 5: Hospital deaths Vs Brought dead in females

<table>
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<th>Year</th>
<th>Brought dead</th>
<th>Hospital death</th>
<th>Total</th>
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<tr>
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<td>18</td>
<td>62</td>
<td>80</td>
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<td>9</td>
<td>67</td>
<td>76</td>
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<tr>
<td>2000</td>
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<td>57</td>
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</tr>
<tr>
<td>2001</td>
<td>19</td>
<td>54</td>
<td>73</td>
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<tr>
<td>2002</td>
<td>13</td>
<td>49</td>
<td>62</td>
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Table 6: Period of survival in brought dead cases.

<table>
<thead>
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<th>Period of survival</th>
<th>No. of cases</th>
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<tr>
<td>Upto 12 hours</td>
<td>61</td>
</tr>
<tr>
<td>1st day</td>
<td>33</td>
</tr>
<tr>
<td>2nd day</td>
<td>56</td>
</tr>
<tr>
<td>3rd day</td>
<td>20</td>
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<tr>
<td>4th day</td>
<td>45</td>
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<tr>
<td>5th day</td>
<td>74</td>
</tr>
<tr>
<td>Total</td>
<td>289</td>
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</table>

Table 7: Total number of autopsies and Death due to burns.

<table>
<thead>
<tr>
<th>Year</th>
<th>Autopsies</th>
<th>Autopsy in case of burns</th>
</tr>
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<tbody>
<tr>
<td>1998</td>
<td>388</td>
<td>106</td>
</tr>
<tr>
<td>1999</td>
<td>422</td>
<td>96</td>
</tr>
<tr>
<td>2000</td>
<td>458</td>
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<td>2002</td>
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<tr>
<td>Total</td>
<td>2058</td>
<td>525</td>
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Table 8: Sex wise distribution

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
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<tr>
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<td>26</td>
<td>80</td>
<td>106</td>
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<td>76</td>
<td>96</td>
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<td>2000</td>
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<td>90</td>
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<td>2001</td>
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<td>105</td>
</tr>
<tr>
<td>2002</td>
<td>35</td>
<td>62</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>381</td>
<td>525</td>
</tr>
</tbody>
</table>

Table 9: Manner of death.

<table>
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<th>Year</th>
<th>Accidental</th>
<th>Suicidal</th>
<th>Homicidal</th>
<th>Total</th>
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<td>1998</td>
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<td>83</td>
<td>3</td>
<td>100</td>
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<tr>
<td>1999</td>
<td>83</td>
<td>12</td>
<td>5</td>
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<tr>
<td>2000</td>
<td>104</td>
<td>12</td>
<td>5</td>
<td>121</td>
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<tr>
<td>2001</td>
<td>88</td>
<td>11</td>
<td>5</td>
<td>104</td>
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<tr>
<td>2002</td>
<td>81</td>
<td>11</td>
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<td>450</td>
<td>52</td>
<td>23</td>
<td>525</td>
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Table 10: Marital status in females.

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<th>Unmarried</th>
<th>Married</th>
<th>Total no. of females</th>
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<td>24</td>
<td>56</td>
<td>80</td>
</tr>
<tr>
<td>1999</td>
<td>13</td>
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<td>2000</td>
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<tr>
<td>2001</td>
<td>19</td>
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</tr>
<tr>
<td>2002</td>
<td>20</td>
<td>42</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>289</td>
<td>381</td>
</tr>
</tbody>
</table>

Table 11: Hospital deaths Vs Brought dead in females

<table>
<thead>
<tr>
<th>Year</th>
<th>Brought dead</th>
<th>Hospital death</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>18</td>
<td>62</td>
<td>80</td>
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<td>9</td>
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<td>2001</td>
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<tr>
<td>2002</td>
<td>13</td>
<td>49</td>
<td>62</td>
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</tbody>
</table>

Table 12: Period of survival in brought dead cases.

<table>
<thead>
<tr>
<th>Period of survival</th>
<th>No. of cases</th>
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</thead>
<tbody>
<tr>
<td>Upto 12 hours</td>
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<td>1st day</td>
<td>33</td>
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<td>2nd day</td>
<td>56</td>
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<td>4th day</td>
<td>45</td>
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<tr>
<td>5th day</td>
<td>74</td>
</tr>
<tr>
<td>Total</td>
<td>289</td>
</tr>
</tbody>
</table>

Period of survival

Period of survival is directly related to surface area of body involved in burns. In this study maximum number of cases survived for more than 5 days period i.e., 74 cases.

Cause of death

The findings of the present series noting the sepsis as the most important factor for the cause of death, as the period of survival in maximum number of cases is more than 5 days. In the present study, 78 cases were due to septicemic shock and minimum 4 cases were due to Neutrogena shock.

This is because of the victims of burns, who survived the initial 24 hours after burns, succumbs to infection of the burnt area and its complications. Burns cause devitalization of tissue leaving extensive raw areas, which usually remain moist due to the outflow of serous exudates. The exposed moist area along with the dead and devitalized tissue provides the optimum environment favoring colonization and proliferation of numerous microorganisms, which is further enhanced by the depression of the immune response. All these factors contribute towards sepsis in a burns victim.

Conclusion

Accidental burns are mostly preventable by adequate safety measures and safety education. “Bridge burning” is a social evil unmatched in its cruelty and cynicism in today’s civilized society. Any discussion on its etiopathogenesis and remedial measures must take into account the socio-cultural and economic ramifications underlying this scourge. Legal measures however, harsh or deterrent, cannot suffice to combat this scourge due to complete dependence of the woman on her husband and in-laws. More stringent laws for possession and use of explosive and inclusive and inflammable, materials to prevent accidents.
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Unnatural sexual offences and Indian law- a cross sectional study on medical students perspective

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Department of Forensic Medicine and Toxicology, KLE University’s Jawaharlal Nehru Medical College, Belgaum, Karnataka, India

Abstract

Introduction
In India the legal system is largely a gift from British rulers. The law governing the unnatural sexual offences in India comes under the ambit of section 377 Indian Penal Code (IPC).

Objective
Little is known about perception and perspective of Indian medical students regarding sexual practices, offences, and homosexuality and laws governing them. Hence the present study was undertaken to know the medical students panorama towards unnatural sexual offences and the Indian law.

Materials and methods
The study was undertaken at J.N.Medical College, Belgaum. Study participants were 423 medical students with a mean age of 18.50 years. Questionnaire concerned with the objectives of the study was voluntarily filled by them and the data was analyzed.

Results and discussion
Awareness among the Indian medical students regarding unnatural sexual offences and law is high (82.74%). Mostly awareness was imparted through media (54.04%). Majority (77.75%) think that sec 377 IPC exclusively deals with homosexuality. Majority (56.24%) of participants feel that legalization of same sex marriages is going to reduce the population growth, 41.60% feel that it is going to have a negative social impact and 65.52% are against legalizing same sex marriages in India. Best part (61.70%) of participants feel that legalization of same sex marriages depends on socio-cultural background of any nation. Majority (67.18%) feel that sexual attraction amongst people of same biological sex as a manifestation of some psychopathology. 52.24% feel that homosexuality is on rising trend in India. Relatively a smaller proportion of participants (26.09%) feel exclusive vaginal intercourse as natural, however majority (45.90%) had an extended definition for this and considered any form of sexual act between a man and a woman (vaginal, rectal or oral course) as a natural sexual act. 91.34% consider masturbation as unnatural, bulk of the participants (79.19%) did not want it to be included under section 377 either. Most of them (50.83%) are of the opinion that section 377 IPC should be reconsidered seriously and suitably amended.

Conclusions
The awareness level among Indian medical students regarding unnatural offences and law is high. However, the stand and attitude of Indian medical students on homosexuality is biased due to lack of scientific knowledge and inquiry. Change in the legal stand on same sex relationships should be done gradually. The demographic impact of legalizing same sex marriages is unpredictable. Section 377 IPC needs to be suitably considered and amended.

Key words
Homosexuality, Unnatural Sexual Offences, Sec 377 IPC, Masturbation.

Materials and methods
The study comprised of 423 medical graduate students with mean age of 18.50 years. Questionnaire, on various aspects of unnatural sexual acts and law centering them was voluntarily filled by the participants. The Study was conducted from October 2009 to December 2009. The data obtained from the study was analyzed.

Results
The study comprised of 423 medical graduate students with mean age of 18.50 years, 48.46% of them were males and 51.54% females. At the time of study, 82.74% of participants were aware and 11.82% were unaware of the sec 377 IPC. Of those who were aware, 52.04%ssss
got their awareness from the media (i.e. newspaper, internet, television etc.), 24.53% from their friends and 21.41% from the classroom interactions. Most (77.75%) of participants thought that section 377 IPC deals exclusively with homosexuality. 7.11% felt that it deals with any form of unnatural sexual act, 3.66% felt that it deals with masturbation, 2.75% felt that it deals with rape, 1.38% felt that it deals with sodomy, 0.22% felt that it deals with bestiality and rest (7.11%) did not comment on it. When asked regarding legalization of same sex marriages in India 31.44% of participants agreed and 65.72% were against and 2.83% did not comment. Bulk (41.60%) of participants felt that legalizing same sex marriage would set a negative impact on the society, 38.29% participants felt that there would be no impact on the society in any way, 13% felt that legalization would affect the society in a positive way and 1.18% did not comment. Large proportion (56.24%) of the participants felt that same sex marriages would help the country in reducing the existing rate of population growth, where as 39.71% felt it would have no impact whatsoever, however 0.94% opined that it would actually increase the population growth and 3.07% did not comment. On the issue of recent liberal stand on same sex marriages by various countries, 65.48% of participants refused to comment as they felt that this depends on the socio-cultural factors of that nation, and 19.62 % of participants revealed that it was an unwise move by these countries and 14.89% opined that it was a logical move. According to 67.13% of participants sexual attraction amongst people of same sex is a manifestation of some psychopathology, however 29.30% viewed that the phenomenon was normal and physiological and 3.54% refused to comment. 52.24% participants felt that homosexuality is on rising trend in India, 12.29% felt the contrary and 35.45% had no idea on the current trend. Only 26.09% participants consider exclusive peno-vaginal intercourse as natural, 45.90% of participants felt that any form of sexual activity between a man and a woman as “natural”, 5.33% considered oral sex also as natural, 7.04% considered peno-rectal intercourse as “normal”, 4.95% considered sexual activity between people of same sex as “normal”, 1.90% did not comment on this issue, additionally 8.76% also considered masturbation as “natural”. Most (79.19%) felt that masturbation should not be considered as an unnatural sexual act; however 16.31% were of the opinion that masturbation be included under the purview of unnatural act. As per 56.97% of participants the penalties for violating section 377 were too harsh and reduction in punishment was necessary, 40.18% felt that penalties were proportionate to the “offence” and wanted the penalties to be continued. Bulk (50.83%) of participants felt that there is need for suitable amendments to section 377 IPC, while 14.89% wanted section 377 IPC to be continued without any amendments; however 34.24% of participants refrained from making any comments.

Discussion

Perpetuation of any species requires reproduction. To make sure that this occurs with the highest probability, the nature has devised its own indigenous mechanisms. When it comes to mammals, mating/sexual intercourse is very essential and this act is accompanied with a high quantum of pleasure (in the form of orgasm). Food, shelter and sex form the basic necessities of human life. Logical thinking and experimentation are a gift possessed only by the humans, therefore, man experiments and tries to find newer modalities and techniques of deriving and optimizing pleasure, whereas logical thinking results in the concept of morality, the thought of good and bad, the concept of right and wrong. It is the balance between these two forces that decides the attitude of a society towards any trend or issue.

According to the present study the awareness level among the medical students regarding sexuality and sexual offences is high. Another work, “Study in sexuality of medical college students in India” conducted at a medical school in New Delhi, revealed that knowledge regarding sexual intercourse, masturbation, contraception, and sexually transmitted diseases was satisfactory among the medical students. Most of the students in the present study got their awareness through media like television, internet & news paper which indicates that mass media in future has a major role to play in sex education of Indian population.

Section 377 IPC deals with any “unnatural” form of sex namely, sodomy, oral coitus, bestiality and even thigh sex for that matter. Even though it includes other types of penetration other than peno-vaginal, irrespective of gender of the offenders, high proportion of participants think that it exclusively deals with homosexuality and this again is probably a result of media hype on issue of homosexuality in the recent times. Majority of participants feel that legalization of same sex marriages is going to reduce the population growth of the country, at the same time bulk of participants also feel that it is going to have a negative social impact. Till date no long term studies have been conducted to know impact of same sex marriages on demography, especially on the population growth.

As an indicator of the liberal Hindu heritage, Kama Sutra (the literal meaning is, “the technique of sex”), a classic written in the first millennium by Sage Vatsyayana, devotes a whole chapter to homosexual sex saying “it is to be engaged in and enjoyed for its own sake as one of the arts.” Besides providing a detailed description of oral sex between men, Kama Sutra categorizes men who desire other men as “third nature” and refers to long-term unions between men. In the present study vast majority are against the concept of legalizing same sex marriages in India and large proportion of participants feel that concept of legalizing same sex marriage in some western countries depended all upon social and cultural background of that nation. In 86 countries homosexual acts are illegal, and in seven punishable by death. Iran has executed 800 such criminals since 2005.

In 1973 American psychiatric association officially accepted a normal variant model and removed homosexuality per se from its diagnostic and statistical manual of mental disorders (DSM) in 1992. WHO followed the American example and made similar change in tenth revision of international classification of diseases (ICD-10).

In the current study majority of participants feel sexual attraction amongst people of same biological sex as manifestation of some psychopathology. The contrary was found in the work, “Study in sexuality of medical college students in India”, where in the authors found that 83.40% felt homosexuality as a normal behavior. Till date there have been no grounds for the fulfillment of any criteria to place homosexuality as a disease nor have any claims of finding genetic markers for homosexuality been replicated either.

Currently there are no statistical data available regarding the number of homosexual population in India, however according to Ashok Row-kavi a self acclaimed homosexual activist, the number of exclusively or predominantly homosexual men in India may be over 50 million. As per the current study, great proportion of participants feels that homosexuality is on rising trend in India.

Relatively a small proportion of participants feel exclusive vaginal intercourse as natural, however majority had an extended definition and considered any form of sexual act between a man and a woman namely peno-vaginal, rectal or oral intercourse as a natural sexual act and this observation is in contrary to a study conducted by University of Chicago in 1994, The national health and social life survey (18-59 years), where in 83% of men and 78% of women considered vaginal intercourse as the most appealing type of sexual experience. Though all most all participants felt that there was nothing natural about masturbation, quite a high proportion did not want it to be included under the ambit of unnatural sexual act. Masturbation usually is a normal precursor of object related sexual behavior and a form of sexual pleasure that generally lasts throughout a person’s lifetime. Nearly all men and 75% of women masturbate some time during their lives. No other form of sexual activity has been as universally practiced as masturbation, in spite of being severely condemned by many cultures
for long periods of time’. If there are no reasons for criminalizing masturbation then there should not any either for homosexuality.

If proved guilty under section 377 IPC, the person can be charged life imprisonment or up to ten years rigorous imprisonment with or without fine. Majority feel that these penalties are out of proportion of ‘crime’ and need to be reduced. According to Manusmriti, the most popular Hindu law book of medieval and ancient India. “If a man has shed his semen in non-human females, in a man, in a menstruating woman, in something other than a vagina, or in water, he should carry out the ‘painful heating’ vow.” This peculiar vow, which involves application of cow’s urine and dung, over the accused body, was meant not only for homosexuals but also for the errant heterosexuals.

The penalty is even milder if the homosexual belongs to an upper caste. As Manusmriti puts it, “If a twice-born man unites sexually with a man or a woman in a cart pulled by a cow, or in water, or by day, he should bathe with his clothes on”

Irrespective of divided stand of participants on various aspects of “sexual offences” and homosexuality, majority are of the opinion that section 377 IPC should be reconsidered seriously and suitably amended.

Nicolaus Copernicus once challenged the geocentric model of universe which followed great resistance and concept was then considered ‘unnatural’ and against the order of God. Today we know beyond doubt that it’s the heliocentric model proposed by him which is the irrefutable scientific truth. Most of the concepts once considered eccentric are not only widely accepted today but also form cornerstones of science and technology. Man has always experimented and challenged the nature and most of the times he has won. Contraception, medical termination of pregnancy, organ transplantation, recombinant technology are few of the examples. Initially they were considered to be unnatural and had the resistance from the society on grounds of morality, today they are all widely accepted and not much heated discussion occurs on these issues.

Conclusions

Awareness level among the Indian medical students regarding unnatural offences and law (IPC section 377) is high, however there is general lacking in understanding of the law, as majority feel that it exclusively deals with homosexuality. The stand and attitude of Indian medical students on homosexuality is biased and lacks the scientific knowledge and thinking on the issue. There is a necessity of introducing moral sex education at the basic level; the media too has a major role to play in taking out the taboo on the issue. Though changing the legal stand on same sex relationships is the need of the hour, it can only be done gradually, as abrupt changes are unacceptable in India on the basis of social and cultural background. Authors are of the opinion that section 377 IPC, need not be abolished, however it needs to be suitably considered and amended. The demographic impact of legalizing same sex marriage is unpredictable as statistical data is lacking.

“Any form of consensual sexual act between ‘humans’ of appropriate age and sound mental health under adequate conditions of privacy” should be considered as “natural”!

Acknowledgement

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