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Contents

CASE REPORT

CLINICAL BRIEF

 ISSN : 0971 - 0973, e - ISSN : 0974 - 0848

From Editor's Desk

Respected seniors and dear colleagues,

Wishing you all a very happy new year 2023. With new year is coming the fourth issue volume 44 of JIAFM 2022. I hope 2023 brings success and laurels to our subject and to people working hard for the betterment of the fraternity. With the passing years, JIAFM is growing, and spreading wisdom to all the readers.

The year 2022 was the beginning of a new assignment for the newly formed editorial board. Board is committed to upholding the standards of JIAFM, which were set by previous teams, and for this, we tried our best to bring forward all the issues of 2022, on time in a short span of 7 months, maintaining the standards and minimizing the pitfalls whether its scientific content or grammar or quality of hard copies etc. Slowly but surely, we are maturing by learning from our mistakes. In order to improve the overall impact of our journal we always require blessings from our teachers and support from our colleagues. Right from receiving the article till publishing in the journal is a mammoth task which could only be achieved through a strong knitted team and a positive mind.

All the issues of JIAFM vol 44 are uploaded and have been distributed to all the subscribers on time. I am thankful to my editorial team **(Dr. Siddhartha Das as Joint Editor; Dr. Mandar Sane; Dr. Narendra Patel & Dr. Vivek Chouksey** as Associate editors; **Dr. Richa Nigam** as Research and Statistical Editor; and **Mr. Chain Singh Lodhi** as the technical editor), who have been supporting me in my endeavour of bringing up JIAFM volume 44. I would also like to bring to the notice of all readers that we are reviewing the statistics and material methodology of all the original articles and requesting the authors to correct them and reframe the title accordingly.

All the manuscripts have undergone a double-blinded peer review process; grammar and plagiarism check (wherever required), and separately the reference check. We have responded to all the queries of the authors through our new official email ID of the editorial team - editorjiafm2022@gmail.com. In the year 2023, I along with **Dr. Siddhartha Das as Joint Editor** would like to incorporate newer dimensions to JIAFM with a certain vision and mission for which I would like to have input from our experienced fraternity members.

I am again thankful to all the **reviewers** who helped me in the review process. As far as possible, the overall comments given were constructive and detailed. They marked and inserted their suggestions as comments on the manuscript file or made changes in the manuscript using the track changes option. They supported with sufficient reasons and detailed suggestions for the authors so that they could improvise, revise, or resubmit their work accordingly.

I give my sincere thanks to all the **authors** for submitting the articles on their research and cases to JIAFM. I thank you all once again for the cooperation given in 2022 and request your all to further support us in the year 2023. Best wishes!!

Sincerely

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EDITORIAL

Comprehensive Forensic Nursing Care of Victims & Families

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Abstract :

Many nurses are not mentally ready to provide services to the victims of violence and offenders. Those who get training in forensic nursing are always ready to assist this group of the population. They can provide good care to such victims while simultaneously taking care of the medico-legal issues. They can provide short-term and long-term care to them and simultaneously they can take care of their families and friends during the tense moments of their life. They not only can advocate their cause but also help in the prevention of crime. Forensic nurses can provide comprehensive forensic nursing care to the victims and their families in an effective manner by providing all services required by them immediately and in the long run.

Keywords : Comprehensive forensic nursing care; victims of violence; families of survivors.

Introduction :

Comprehensive forensic nursing can be defined as holistic nursing care covering physical health, mental health and social issues of a victim of violence and all those persons affected by violence on the victim and interested in the welfare of the patients.

The victim is a term for a person who has suffered or has been exposed to physical, mental, emotional or economic harm and whose fundamental rights have been violated. Immediate family members and dependants of such victims may also be called victims if they suffer harm while assisting victims or preventing victimization.[1]

Forensic nursing care is required in a variety of cases. These cases may differ from personal enmity which is most common in the emergency department and other than cases of road traffic accidents. Forensic nurses have also to care for the victims of abuse & neglect in different age groups and genders. Cases of sexual assaults and abuse are also common which forensic nurses have to take care of. Such victims and survivors are often accompanied by their friends and family members who are also psychologically traumatised due to their love, affection and sympathy for them. In such circumstances, victims, survivors and their family members all need to be handled carefully and empathetically.

Victims, survivors and their family members need holistic and comprehensive care which can be effectively done by forensic nurses because of their knowledge, skills and aptitude acquired during their teaching and training. This will include immediate care after the violence and the long-term care of the victims.

Comprehensive forensic nursing care has already been developed in some countries e.g. the USA, UK and Canada and other countries are trying to develop it in their own countries according to their needs.[2-4]

Type of victims : Victims can be of different aetiology. They may be victims of violence, abuse, neglect reporting in the hospital or offenders in correctional institutions or survivors of mass disasters.[5] There may be also victims of self-harm. Abuse of children, abuse of elders, and abuse of women, are common in domestic abuse and forensic nurses can play a good role in the management of such cases. Sexual assault and sexual abuse is a special group where sexual assault nurse examiners have played a leading role in the USA, UK and Canada.

Components of the Comprehensive Forensic Nursing Care : The following roles of the nurses are visualized for the comprehensive forensic nursing care of the victims, survivors and their families in India and other developing countries:

- Visit the crime scene.
- Assessment of the victim.
- Support to the victims.
- Care of the current problem.
- Care of the associated morbidities.
- Evidence collection.
- Evidence preservation & dispatch of evidence.
- Documentation.
- Presenting the evidence from the right perspective in the courts.
- Care of the survivors.
- Care of the families & friends.
- Prevention of the crime.
- Advocacy of the victims and survivors.
- Epidemiology and Research.

Visit the crime scene : It will help forensic nursing in having first-hand information and initial assessment. Forensic nurses will know the history of occurrence of the crime and simultaneously they can observe the crime scene. This will help in the better assessment of the crime scene and victims and thus can provide better comprehensive forensic nursing care to the victims and survivors.

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Assessment of the victims : Forensic nurses can first asses the victims of violence. Medicolegal and medical histories are taken and care can be provided for both components.[6]

Support to the victims : After the initial assessment, urgent support can be provided at the crime scene in the form of first aid and then can be referred to the appropriate institution saving valuable time for saving the lives of the injured or incapacitated people. Psychological support at these precious moments will also be of great use towards comprehensive forensic nursing care.

Care of the current problem : It involves taking care of the injuries, psychological support and social support.

Physical care of the injuries : Physical care of the injuries is possible at the crime scene as well as in the emergency departments of the hospitals. Forensic nurses will take care that while taking care of the injuries that evidence is not weakened or destroyed during this process. In one of the studies in the USA in the age group of 1-44 years Injuries including due to violence are one of the major causes of disability and mortality. One-third of the emergency patients were due to injuries and 90% of these were seen by a nurse.[7] This data tells the importance of forensic nursing in emergency departments.

Preventing the complications of the crime are also part of comprehensive forensic nursing care e.g., guiding the victims in the prevention of unwanted pregnancies, prevention and treatment of sexually transmitted diseases after sexual assaults and protecting the victims from further exposure to the assailants.

Psychological care : Most of the victims and survivors often get psychologically disturbed and forensic nurses can provide them with good psychological support during and after the crisis hours.

Usually, forensic nurses work in a team evaluating the violent offenders found not guilty because of mental illness and too dangerous patients and with forensic education nurses feel better to handle such patients[8] and will be able to provide better care to such persons.

It should be a routine to screen and assess the survivors for any help needed as anxiety, depression, and post-traumatic stress disorders are common after violence and become more pronounced after repeated incidences especially when a sufferer is not in a position to stop such occurrences. It should also be understood that often physical symptoms have their psychological origin.[9]

Providing aftercare kits to the victims goes a long way in the direction of comprehensive care[10] as these kits will be useful to the victims because sometimes even clothing and personal belongings are needed to be taken as evidence and the victim requires these things urgently and in such situations kits containing clothing and other daily need items will be very useful to the victims.

Social care : Persons do not have to go through all the processes alone after victimization and forensic nurses can provide support and comfort in these situations and can act as a liaison between different agencies to help the victims and their families to complete all the formalities after the criminal incidences.

Forensic nurses can also help the victims to communicate with their friends and families in these hours of crisis.

There may be financial implications when a person is traumatized. Finances are needed for the treatment and to deal with the morbidity due to violence. Survivors need finances to cope with the after-effects of violence and often offenders are the providers of the needs till economic aid is available to the victims, they will not be able to survive and fight the cases against the offenders. They can guide the victims to NGOs and other resources in such situations.

Some stigmas are associated with certain crimes and there is a need to reaffirm to the victims that it is not their fault and it is entirely the fault of the offenders and they should not be ashamed of the happening.

Care of the associated morbidities : Victims of violence may have pre-existing diseases. Treatment of these diseases may get interrupted in these situations. Forensic nurses can get the history of these diseases and can help in providing timely treatment for these diseases so that no emergency arises during these situations.

Evidence collection : Clinical forensic nurse provides care to living persons and can help in the evidence collection which may be physical or non-physical. Clinical forensic nurses will augment the level of care in such cases.[11] They can collect biological evidence which can be of immense help in the investigation of the cases.[10]

Evidence preservation & dispatch of evidence : Evidence collected may become weak if it is not properly preserved. Evidence can be preserved depending upon the type of evidence. They can be of vital help in packing, labelling and dispatching this evidence to the concerned officials. Keeping the chain of evidence intact is an important issue and utmost care should be given to maintain it.

Documentation : Documentation is a very important step and forensic nurses are taught to document what they observe, collect and intervene in a particular situation.

Photo documentation is also an important aspect and forensic nurses may utilize this avenue too.

Documenting all the processes will be of intense importance in providing comprehensive forensic nursing care to the victims.

Presenting the evidence from the right perspective in the courts.

Forensic nurses will be considered expert witnesses and they can give evidence in court for the work done by them. This will help the victims in getting justice and this will improve the lives of the people through crime reduction.

Care of the survivors : Types of care : Comprehensive care can be provided in different settings.[12] Compassionate care is the need of the hours in most of the situations being faced by forensic nurses.[13]

Hospital care : There are specialists in forensic nursing who can provide comprehensive care in hospital settings. These are known as forensic nurse hospitalists.[12] Usually they work in the emergency unit of the hospital and usually work in collaboration with the medical officers or medical examiners.

Community settings care : When forensic nursing service is provided in community settings special care should be taken of the environment and how the work is going to affect the environment should also be taken care of. In hospitals usually, mechanisms are there to cause the least environmental pollution. Even when the comments are made in public these should be evidence-based and never exaggerated. The sensitivities of the communities should also be kept in mind.[14]

Care of victims and survivors : Victims of violence need a different type of care. Victims and survivors need an evaluation that what needs to be done and then a plan to be prepared for the management of the cases.[12]

Short-term and long-term effects of the violence : When a person is involved in violence it has both acute and chronic effects on the victims. The forensic nurse needs to provide care both in the hospital[12] and after the patient is discharged till the survivor is in the need of help or support.

Care of family members & friends : The forensic nurse can be an important team member when liaison work is to be done between law enforcement agencies, non-government organizations, patient, and their relatives. Family members are anxious and afraid and forensic nurses can calm them down and provide the required support due to their good communication skills. They can also provide the family members with psychological counselling if required.

Sometimes friends are accompanying the victims and they also feel traumatised when their friends become victims. They also need care at that time and forensic nurses can provide them with the required assistance too.[15]

For comprehensive care, forensic nurses should know to reach and work in unison with various government and non-government organisations.

Prevention of violence & crimes : Forensic nurses can play a crucial role in the prevention of violence.[5] This is an area which has not been given importance in forensic nursing. Prevention of interpersonal violence will save a lot of money for governments and communities. Prevention can be done at all levels from the primary level to the tertiary level. A beautiful example is given in cases of drowning where rescuers rescue drowning people and upstream there was a bridge with holes in it and no warning signs on the bridge which is why the people were falling into the river. Doing some prevention work there could have saved many lives. Similarly in other situations, this can be done and even can be done by forensic nurses as little preventive work is being done in the criminal justice system.[16]

Advocacy of the survivors : Forensic nurses in addition to other roles can also be good advocates of the victims and survivors.[13] Forensic nurses usually are involved in the examination of cases of asylum seekers in the USA who are in fear of being prosecuted in their countries. Forensic nurses can be good advocates for such victims[17] similarly in other situations they can help advocate the cause of the victims of crime.

Epidemiology and Research : Research is required to make our approach evidence-based and this evidence needs to be developed for comprehensive forensic nursing care for the victims of crime, survivors of the crime and their families. We need to also know the epidemiology of various crimes to understand the prevalence of crime in a particular region of our country and the necessary support to be made available and funds to be allocated for this purpose. National Crime Record Bureau is a good source of the epidemiology of the various crimes reported in India.

Other issues : Advocacy of the victims and respecting the rights of the victims and offenders are other issues which can be taken care of by forensic nurses.

Rights of the victims and offenders : Forensic nurses should know and understand that victims as well as offenders have certain rights and they must know and respect these rights. By respecting the rights better nursing care will be provided to the victims and survivors and this is a part of comprehensive forensic nursing care.

While giving care to the victims, forensic nurses must respect the autonomy of the patient. They should never breach the confidentiality of the patient. They must take the informed consent of the patient and if the consent is withdrawn even during the examination and collection of the evidence that also must be respected.

According to the Human rights office of the United Nations victims must have access to justice and fair treatment. Such victims should be dealt with compassion as well as respect and should be informed of their rights to get legal aid and justice and required assistance should be provided for the same. Forensic nurses can help provide this required information and resources for the same to the victims reducing their inconvenience and helping them to avoid delays. They can also help in the process of restitution.[1]

Discussion :

Comprehensive Forensic Nursing care will start from the crime of scene and providing support to the victim and taking care of the current problems and taking care of associated morbidities, collecting evidence, caring for the survivors and caring for the families & friends.

Comprehensive forensic nursing care will also involve preventing future harm to the victims[9] and bringing better care through the study of the epidemiology of the crimes and doing further research for the better care of the victims and their families.

Forensic nurses can provide comprehensive forensic nursing care to the victims in cases of interpersonal violence, self-directed violence and collective violence. They are helpful in intentional violence as well as unintentional violence as they understand the outcomes of this violence and the effects of violence on health.

Usually, forensic nurses have to work as team members and they must learn to work as team members. Evidence collection and preservation will become much better and this will help in the successful prosecution of the cases which will further help in the reduction of crime as more offenders will be in prison and that will reduce the number of possible offenders in the society.

Preventive work can be done by forensic nurses and this will ultimately be hugely beneficial to society in the long run as preventive work in criminal matters is a neglected field.

Care of family members and friends is usually not included in medicolegal cases but with the advent of forensic nursing, they will also be cared for which will be good the society in the long-term basis.

Conclusion :

Nurses working in the emergency in India are yet not trained to deal with medicolegal work and they are uncertain or not sure what to do in these situations. But in countries where forensic nursing discipline has developed the situation is different and they can provide comprehensive forensic nursing care to the victims and their families. In addition to providing forensic nursing care, they can also provide prevention services which will help in the reduction of crime. Forensic nurses can be good advocates for the victims and survivors and provide them with acute and long-term care. One-to-one, holistic and comprehensive care by forensic nurses will help in the healing process of the victims and their families.

Conflict of Interest : None

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ORIGINAL ARTICLE

Detection of Foreign Bodies in Air Passages in Drowning – An Autopsy Based Comparative Study between Light and Polarizing Microscope Examination.

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Abstract :

The diagnosis of drowning poses a difficult situation for a forensic pathologist especially when the body is in a decomposed state or mutilated. There is no objective morphologic finding which is pathognomonic of drowning. Presence of foreign bodies in the air passages especially in the terminal ones has been regarded as a significant finding by many authors. Minute foreign particles cannot be detected by naked eye examination, which are better picked up by a light microscope. A polarizing microscope can more efficiently detect crystalline particles like sand which has birefringent property. They can be used to detect foreign bodies which may go unseen under the naked eye or light microscope. Data from 100 cases of drowning brought for autopsy to the mortuary wing of Department of Forensic Medicine, were collected and analysed with respect to their sociodemographic profile, external as well as internal features of drowning, presence of foreign bodies in air passages by naked eye examination, light microscopy and examination under polarizing microscope. The presence of foreign bodies were seen in 36% cases on naked eye examination, 46% cases under light microscopy and 71% cases under polarizing microscope. The p values were obtained as significant, but polarizing microscope can be considered a better tool as examination under light microscope is more difficult and requires more expertize.

Keywords : Drowning; Foreign bodies; Air passages; Light microscopic examination; Polarizing microscope; Sand particles.

Introduction :

Drowning is defined as a form of death in which air is prevented from entering the lungs by submersion in fluid or other medium.[1] Death by drowning is a diagnosis based on history, circumstances surrounding death, and a complete autopsy to exclude other causes of death.[2] There is no objective morphologic finding which is pathognomonic of drowning. The so called drowning tests are not diagnostic of drowning when positive and do not exclude a diagnosis when negative.[3,4,5,6,7] Forensic pathologists are in a more difficult situation when the body is in a decomposed or mutilated state. The various tests involving blood biochemistry are almost obsolete now.[8,9] Even though diatom test is considered as a gold standard by many, even this test has many fallacies.[5,9,10] Presence of foreign bodies in air passages, which are a constituent of the drowning medium has always been a significant finding even in decomposed bodies. This study is an attempt to understand the usefulness of polarizing microscope as a diagnostic tool in drowning.

Objectives : 1. To compare the detection of foreign bodies using light and polarizing microscope.

2. To find out the proportion of cases of drowning in which foreign bodies are detected in air passages.

3. Sociodemographic profile of cases of deaths due to drowning

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Materials and methods:

The study was started after getting approval from Institutional Ethics Committee (IEC No.07/24/2008/MCT of Human Ethical Committee, Government Medical College, Thiruvananthapuram).

Type of study and selection of study sample : A cross sectional study was conducted in the mortuary wing of Department of Forensic Medicine, in 100 cases of drowning brought for autopsy from June 2008 to December 2009.

Analysis of data: The data obtained from 100 cases of drowning is analyzed using SPSS software in respect of their socio demographic profile, signs of decomposition, medium of submersion, froth present at the mouth, nostrils, and air passages, presence of blood stained fluid in chest cavity, gross appearance of lungs, paltauf's haemorrhages, weight of lungs, nature of fluid on cut section, type of foreign body sticking to the surface of body, presence of foreign body on naked eye examination, level up to which foreign bodies are seen in the air passages and proportion of cases in which foreign bodies are detected in light and polarizing microscopes.

Procedure of microscopic examination of lung tissue : Bits of lung tissue beyond smallest dissectable division of bronchi are collected, preserved in 10% formalin, processed and sections of 5 to 7 microns are prepared for microscopic examination, the slides are examined under low power (100x) and high power microscope (400x) and then under polarizing microscope for the presence of foreign bodies in lungs. Polarizing microscope is used to detect substances having crystalline structure like quartz or

sand. They exhibit the property of birefringence or anisotropism or double refraction; that means exhibiting different indices towards light passing through the crystals. When viewed under polarizing microscope quartz or sand will alternately appear black with a succession of bright colors.

Results:

Age and gender distribution : Among the 100 cases, majority were males (72%) and 28% were females. Most of the males were in the 5th and 6th decades and females were in the 3rd and 6th decade (Figure no.1).

Medium of submersion : Fresh water sources were the most common medium of submersion (93%) like rivers, ponds, lakes etc (Figure no.2).

External features of submersion : External features of submersion were seen in 87% of cases. Fine froth was seen in 34 (34%) cases and blood stained fluid was present in 30% cases. Eighteen cases (18%) showed changes of decomposition of which 12 cases (12%) were in advanced stage of decomposition.

Cases with early decomposition changes included those from the appearance of greenish discoloration of right iliac fossa up to the stage of marbling and advanced decomposition in which changes have occurred beyond the establishment of marbling. There was only one case (1%) with cadaveric spasm and 43% cases had foreign bodies sticking to the surface either mud, sand or leafy particles.

Internal appearance of lungs : The presence of froth or blood stained fluid was seen in 89% cases and gross features of drowning suggestive of emphysema aqousm, that is, the lungs were enlarged, pale or congested, doughy and crepitant were seen in 79% cases. Paltauf's haemorrhages were seen in 4% cases and blood stained fluid was seen in 26% cases. Thirty six percent of cases had presence of foreign bodies in air passages on gross examination, of which 86.1% had them in tertiary bronchi. The weight of the lungs were above 300 mg in 70% cases in the right lung and 84% cases in the left lung.

Presence of foreign bodies on gross, light and polarizing microscope examination : Foreign bodies were seen in 36 cases on gross examination and 54 cases in light microscope. Examination under polarizing microscope showed that 71 cases had presence of foreign bodies; The comparison between gross

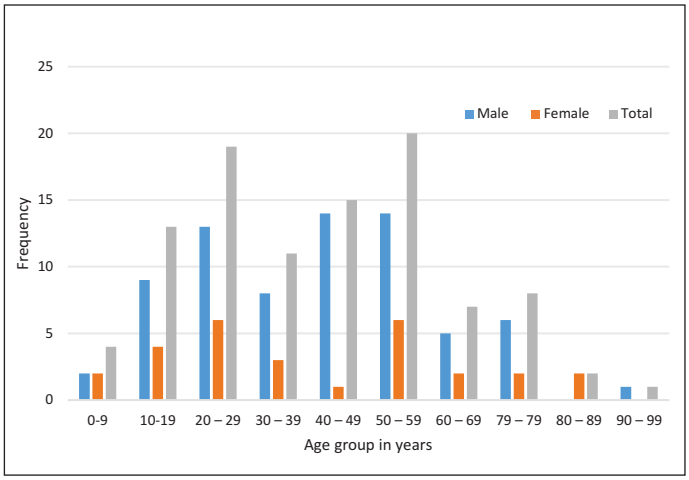

Figure 1: Bar diagram showing age and gender distribution of the study population

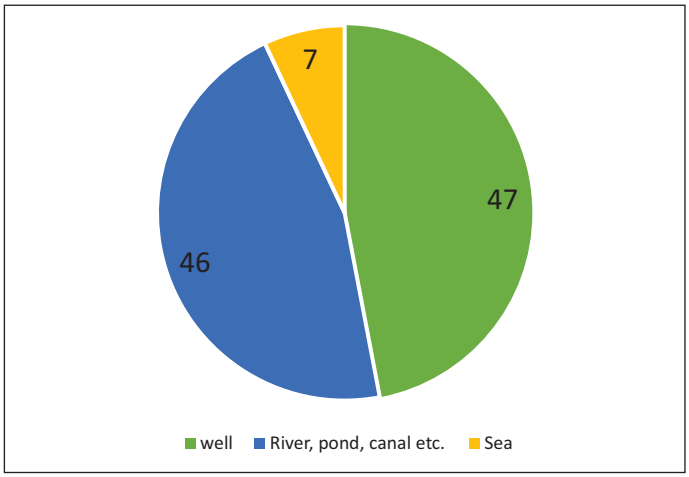

Figure 2 : Pie chart showing medium of submersion.

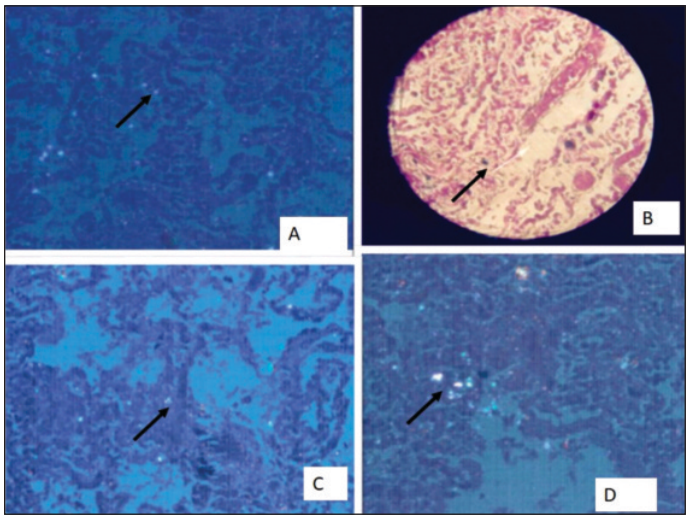

Figure 3: Photomicrographs showing foreign bodies in light and polarizing microscopes (400x)

Table 1: Comparison between presence of foreign bodies on naked eye examination and polarizing microscope

Examination	Foreign bodies present	Foreign bodies absent	Total
Naked eye examination	36	64	100
Polarizing microscope	71	29	100

Chi-square=6.62, p value=0.036

Table 2: Comparison between cases showing foreign bodies under light and polarizing microscope

Examination	Foreign bodies present	Foreign bodies absent	Total
Light microscope	54	46	100
Polarizing microscope	71	29	100

Chi-square=1.38, p value=0.24

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examination and light microscope gave a p value of 0.033 and gross examination and polarizing microscope gave a p value of 0.036 and chi square value of 6.62 which were significant. The comparison between light and polarizing microscopes for the ability to detect foreign bodies gave a p value of 0.24 and chi square value 1.38 (Table-1 & 2).

Association between weight of lungs and presence of foreign bodies : When they were analyzed using ANOVA, the p values were obtained as 0.443 for right lung and 0.690 for left lung which is not significant.

Discussion :

The analysis of the cases showed that 79% cases showed the gross features of a typical drowning lung. Presence of foreign bodies, which is a major aspect of the study, were seen on gross, light and polarizing microscopic examinations and the interpretation of those findings were as follows.

Detection of foreign bodies by gross examination : Among the study cases, 36% of cases showed the presence of foreign bodies on naked eye examination, of which 86.1% had foreign bodies in tertiary bronchi remaining were seen in the secondary or primary bronchi. The presence of foreign bodies beyond the level of vocal cords is considered as a significant finding by many authors.[11-14]

Detection of foreign bodies under light microscope : Foreign bodies were detected in 46% of drowning cases. The 64 cases which did not show any foreign body on naked eye examination, 45.3% showed them on light microscopy and of the 36% of cases which showed foreign body on gross examination, 69.4% showed foreign bodies under light microscope. The p value is 0.033 which shows that there is a significant difference in identifying the foreign bodies by the two methods and light microscope can identify the type of foreign body and hence the medium of submersion.

Detection of foreign bodies under polarizing microscope : Examination of lung tissue under polarizing microscope shows that out of the 100 cases 71 were positive for birefringent particles. On comparing the cases that showed foreign bodies at autopsy and polarizing microscope the p value obtained was significant (0.036) and given the high proportion of cases that showed foreign bodies under polarizing microscope, we can assume that this test can be used to diagnose drowning.

Comparison of cases showing foreign bodies in light and polarizing microscope reveals that out of the 46 cases which did not show foreign body under light microscope 30 showed them under polarizing microscope. The p value was 0.24, which was not significant. Even though there is no statistical significance, polarizing microscope may be considered as a better tool because of the higher proportion of cases showing foreign bodies and also because it is less time consuming and even an untrained person can do it.

Association between weight of lungs and foreign body : While analyzing the association between weight of lungs and presence of foreign bodies in air passages. It was seen that there is no significant association between the two factors. By using ANOVA the p value was obtained as 0.443 for right lung and 0.690 for left lung, which is not significant.

Comparison of results with other studies : A similar study was conducted by Dr.S.Gireesh[15] to determine the significance of foreign bodies in air passages in drowning, where polarizing microscope was used and he detected foreign bodies in a significant proportion of cases; which is very well in agreement with the results of this study.

The results showed that 36% cases out of the 100 cases showed foreign bodies on naked eye examination in air passages in drowning, of which majority (86.1%) had foreign body in tertiary bronchi. The presence of foreign bodies beyond the level of vocal cords is considered as an antemortem sign of drowning by many authors. Light microscopic examination showed that 46 cases had the presence of foreign bodies and comparison between the cases and controls showed that is a useful method to diagnose drowning (Table no.1). When the study and control groups were analyzed for the presence of foreign bodies under polarizing microscope the p value obtained was significant (table no.2). Even though both p values are significant, polarizing microscope may be considered a better tool because it is easier and less cumbersome than a light microscope to use and requires lesser expertise.

It can be concluded that polarizing microscope is highly useful in detecting foreign body, especially sand or sand like particle in the alveoli and detection of foreign bodies may be considered as a diagnostic test for drowning.

The main limitation of the study is that polarizing microscope is not routinely used in Forensic practice, so provision has to be given to make it available. Even though easier to use compared to light microscope, an expert help may be required in the initial stages.

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Conflict of interest: The authors declare that there is no conflict of interest.

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ORIGINAL ARTICLE

Profile of Medicolegal Cases in the Casualty Department of Government Medical College, Badaun, Uttar Pradesh

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Abstract :

Medicolegal cases constitute a significant proportion of the emergencies brought to the casualty department of the hospital. Profiling of these medicolegal cases is an excellent strategy to speculate the kind of case load in a specific region and to strengthen the health care services of the concerned hospital accordingly. With this insight a hospital based study was conducted in the Government medical college of Badaun to determine the common causes of the medicolegal cases in the inhabitants of this region. A prospective study was conducted in the casualty department of the hospital and all the medicolegal cases which presented from 15 September 2019 to 15 January 2022 were studied thoroughly. Gender analysis revealed preponderance of male cases (72.01%) over female cases (27.9%). Majority of the patients were in the age group of 21-30 years (35.57%). Maximum medicolegal cases were of RTA (51.89%), followed by Poisoning(15.45%) and assault (13.41%). Maximum cases were reported between 12 p.m. to 6 p.m. (44.6%). The present study highlights the profile of medicolegal cases in Badaun region which clearly shows a very high incidence of road traffic accidents. In all trauma cases whether they are due to RTA, farm related injuries, thermal injuries, etc. the outcome can be improved firstly by injury prevention education, secondly by providing appropriate emergency medical care in well-equipped trauma centres associated with the hospital.

Keywords : Medico-legal cases; Trauma centre; National telemedicine services; eSanjeevani.

Introduction :

Casualty Department is the back bone of a hospital as it not only provides prompt clinical care in medical & surgical emergencies round the clock and serves as an outpatient department after routine OPD hours but also deals with medicolegal cases. A Medico-legal case [MLC] is defined as "any case of injury or hurt, which the attending medical officer after complete history taking and examination, considers investigation by the law enforcement agencies necessary, in order to fix responsibility regarding the related injury in accordance with the prevailing laws of the country."[1]

Profiling of these medicolegal cases is an excellent strategy to know the burden of medicolegal cases in a specific region. With this insight a hospital based study was conducted in the Government medical college of Badaun to determine the common causes of the medicolegal cases in the inhabitants of this region with an aim to suggest recommendations for devising appropriative preventive measures and to deliver emergency medical care without delay.

As this study measures the burden of medicolegal case load in the community it will prove beneficial in understanding the ethical values among the individuals of this area and to know the crime profile of the region.

The Government medical college is a Tertiary health care centre established by the Government of U.P. in the year 2019, with the primary aim of semiurban population of Badaun along with the providing medical facilities to the rural and adjacent Kasganj and Sambhal districts. Our institute brings benefits of modern facilities to the doorstep of rural population.

Numerous studies have been conducted in recent past, in various hospitals across the country to find out the pattern of medico-legal cases common in their area but no such information is available from Badaun region. Hence the present study was performed to evaluate the pattern and profile of the MLCs in Badaun district of Uttar Pradesh.

Materials and Methods:

A prospective study was conducted in the casualty department of GMC Badaun from 15 September 2019 to 15 January 2022. During the study period 343 cases presented as medico legal cases. A pre structured proforma was used to record the type of cases and additional information like the demographic profile, age, month and time of occurrence of the incidence, time period between the incidence and reporting to casualty department. Ethical clearance was taken from the Ethical committee of GMC Badaun before the start of the study. The cases and their treatment sheets were then followed up for the outcome like discharge after treatment, Leave Against Medical Advice (LAMA), referral to higher centres or death during treatment. The data thus obtained was analysed and observations were presented in tables, and pie charts, discussed and compared with the established findings of other studies.

We have tried to study the association between the number of medicolegal cases with the season of presentation. Since our hospital caters to the rural and semiurban population. We have

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Table 1 : Gender wise distribution of Medicolegal cases.

Sex	Number of cases	% of cases
Male	247	72.01%
Female	96	27.9%

Table 2:Age wise distribution of Medicolegal cases.

S.no.	Age(years)	No. of cases	% of cases
1	>60 years	67	2.04%
2	51-60	19	5.54%
3	41-50	35	10.2%
4	31-40	55	16.03%
5	21-30	122	35.57%
6	11-20	84	24.5%
7	1-10	21	6.12%

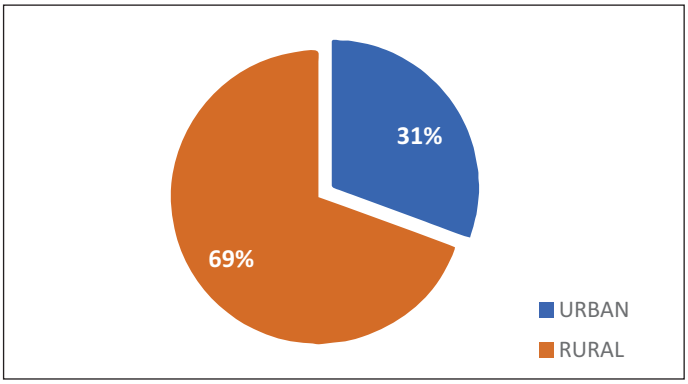

Figure : Shows the distribution of cases according to demography

also included the cases of accidental injuries due to hitting by the violent bulls and buffaloes.

Observations : The observations of our study are as follows-

Discussion:

In the present study 343 medicolegal cases were studied in the casualty department of GMC Badaun. Gender analysis revealed preponderance of male cases (72.01%) over female cases (27.9%). The obvious reason for this could be that our hospital caters to the rural population of U.P, where the males are mostly the head earner, occupied in various outdoor activities, and other occupations, which increases their vulnerability to various types of injuries. This observation is in accordance with the other studies conducted in various regions of India.[2-4]

The commonest affected age group was 21-30 years with an incidence of 35.57%. It is also noteworthy that this age group presented with more injury related MLC'S like road traffic accidents, thermal injuries, assault, and firearm injuries. This seems to be relevant in context to our society where adults in this age group are entrusted with more outdoor responsibilities thus justifying a high number of 122 cases in this age group. The findings of our study are in concordance with the studies by other researchers.[4,5] The second common vulnerable age group is 11-20years(24.5%), comprising of teenagers and young adults. However Manju L, Beevi PN[6] reported 30-40 years as second most common age group. The possible reason for this variation is the fact that an immature and aggressive mind with lack of

Table 3 : Pattern of MLC'S with gender wise distribution of cases.

Type of MLC	Males		Female		Total	
Road traffic accidents (RTA)	138	40.23%	40	11.7%	178	51.89%
Assault	34	9.91%	12	3.5%	46	13.41%
Poisoning	24	7%	17	4.96%	41	11.95%
Fall from height	11	3.21%	10	2.92%	21	6.12%
Burns/scalds	3	0.9%	6	1.75%	9	2.62%
Electrical injuries	8	2.33%	1	0.3%	9	2.62%
Mechanical injuries	5	1.46%	4	1.16%	9	2.62%
Hanging	3	1.16%	3	0.9%	6	1.74%
Snake bite	4	1.17%	1	0.3%	5	1.46%
Hit by a bull/buffalo	3	0.9%	2	0.6%	5	1.46%
Alcoholic intoxication	7	2.04%	0	0	7	2.04%
Industrial accidents	4	1.16%	0	0	4	1.17%
Firearm injuries	3	0.9%	0	0	3	0.9%

Table 4 : Season wise distribution of Medicolegal cases.

Season	No. of cases	% of cases
Winters (Nov-Feb)	142	41.4%
Summers (March-June)	81	23.6%
Rainy (July-Oct)	120	35%

Table 5 : Distribution of cases according to time of reporting in casualty department.

Time	Male	Female	Total
12 am - 6 am	6	5	11(3.06%)
6 am -12 pm	44	17	61(17.78%)
12 pm - 6 pm	110	43	153(44.6%)
6 pm - 12 am	87	31	118(34.4%)
Total	247	96	343

Table 6 : Distribution of cases according to the outcome of case at casualty department.

Disposal of cases	Male	Female	Total cases	
			No.	%
Brought dead	1	2	3	0.87%
Discharged after treatment	186	65	251	73.18%
LAMA	20	12	32	9.32%
Referred to higher centre	35	15	50	14.58%
Hospital death	5	2	7	2.04%

experience may act as the triggering factor for various impulsive acts of suicidal poisoning, hanging, road accidents due to high bike speed etc. The young children and toddlers reported a high incidence of thermal injuries, mainly scalds, fall from height and accidental poisoning.

In our study road traffic accidents (RTAs) were the most common type of medicolegal cases comprising of 178 cases (51.89%), of the total MLCs which corroborate with the observations of similar studies conducted in other parts of India.[7,8] The probable reason for so many road traffic accidents is the proximity of this area to two national highways (NH-530b, 21) and three state highways (SH18,33,43) and ignorance and carelessness of the

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rural population to the safety traffic rules. The second most common type of cases reported were poisoning which were 53(15.45%). in number. This is concordance to findings of Trangadia Mahesh M et al [9] and Yahoo GH et al [10] who also reported poisoning as second most common type followed by burn cases in their studies. Out of the 53 cases, the type of poison could be traced only in 44 cases. We noted that ingestion of hair dye constituted the major cause of suicidal poisoning. There were 8 reported cases of organ phosphorous poisoning, majority of the cases were of accidental nature, because of not using adequate protective measures while using the pesticides in the fields. Other substances commonly used in this region were celphos and rat poison. Drug over dose was seen in 6 cases. Substance abuse among males was seen in relation to opium, dhatura and cannabis. 2 cases of kerosene ingestion and 3 cases of corrosive acid intake. We noted 5 cases of snake bite, most of these occurred during the rainy season and only 7 cases of alcohol intoxication, a surprisingly less number keeping in mind the habitual consumption of local liquor by the male population at large.

In our study we observed that 13.41% cases of assault came to the casualty. Family clashes relating to property issues, inter-caste and inter-religion disputes are fairly common amongst the rural population leading to so many assault cases.

A significant proportion (6.12%) of cases were reported as fall from height among which 8 cases were less than 18 year and 13 were above 50 years of age . In majority of these cases a history was given by the relatives that the victim was chased and attacked by the troop of monkeys on terrace of house and the injuries were sustained in an attempt to run and escape the situation.

In our study we had 2.62% burn cases. Most of affected victims were females who got the accidental burns during cooking. Electric burns and electric shock cases (2.62%) were commonly seen during the summers. This is solely because of using illegal means of getting electricity by connecting naked wire to the poles. We had 0.9% of cases of firearm injuries. We noted 6 cases of attempted suicidal hanging, commonly seen among the young adults. The precipitating cause for such drastic measures was either a failed relationship or failure in examination. We also encountered 5 cases of bull hit injury.

Maximum number of medico-legal cases reported between 12 p.m. to 6 p.m.(44.6%) owing to the fact that during these hours of day people engage themselves maximally into several activities. Minimum incidences(3.06%) of medico-legal cases are encountered between 12 a.m. to 6 a.m. as people usually remain asleep. Consistent findings were reported by Trangadia MM et al[9] and Yatoo GH et al[10]

Majority of the victims were discharged from hospital after treatment(73.18%) while in 9.32% of the victims had absconded or took LAMA (Leave against medical advice), 14.58% of cases were referred to higher centre and death was noted in 2.04% of cases which were subjected to medico-legal autopsy. In this study the maximum number of patients were discharged successfully after treatment and number of hospital deaths were minimum which is attributable to the availability of skilled and experienced Casualty Medical Officers and generous facilities in this hospital. However the referral cases to higher centres are also significant in number which is attributable to shortage of Medical specialist in most of the clinical departments of the hospital. These observation are in compliance with the findings of Trangadia MM et al[9] and Yadav A et al.[13]

Conclusion :

The present study highlights the pattern of Medicolegal cases in Badaun region which clearly shows a very high incidence of road traffic accidents in the productive age group of 15-45 years age group, seemingly associated with increased vehicular speed, rare use of helmets and seat belts, along with drunken driving. Emphasis should be made to root cause of road traffic accidents and a multifactorial intervention is a need of hour to prevent such incidences in near future in this region.

In all trauma cases whether they are due to RTAs, firearms, farm related injuries, thermal injuries, etc. the outcome could be improved firstly by injury prevention education, secondly by providing appropriate emergency medical care in well-equipped trauma centres associated with the hospital. There should be facility for air ambulances for transfer to higher medical centres in case of very critical patients. We appreciate the endeavour of Government of India in initiating the National Telemedicine Services recently in 2021 which proved very beneficial not only during lockdown in country when OPD were closed but also during the ongoing phase of vaccination drive in the country. It has not only aided the Indian health care delivery system but also addressed the shortage of specialists through eSanjeevani AB-HWC platform where doctor to doctor teleconsultations are made possible which is very beneficial for new institutions like ours.

Owing to significant cases of monkey related injuries observed in the study the author wants to spotlight the fact that monkey menace is a routine affair in Badaun and Ujhani region. Besides causing crop damages in this region they wreak havoc both in the life of villagers as well as city dwellers. We recommend the administration to issue advisory to the citizens educating them how to handle monkeys. Steps should be taken to catch monkeys from residential areas and relocating them to nearby wildlife sanctuary situated in Rampur district.

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Ethical Clearance : Taken

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ORIGINAL ARTICLE

A study of Ossification Status in Hand Radiograph in 14 to 16 Years Age Group

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Abstract :

A study was conducted to note the status of ossification at the lower end of Radius and Ulna in the 14 to 15 and 15 to 16 years age group. Healthy school-going male children were examined for ossification status at the wrist joint using hand radiographs. Six stage ossification system was used to assess the epiphyseal development at the lower end of Radius and Ulna. The two age groups are found to be significantly different with respect to ossification of the lower end of Ulna. Distal end of Ulna was seen in advanced union in 50% of boys from age group 14 and same was significantly increased to 82% in 15 years age group.

Keywords : Forensic age estimation; Ossification status; Radius; Skeletal age estimation; Ulna; Wrist joint.

Introduction :

Even after the technological advancement, it is still not possible for Forensic practitioners to give exact age. The judiciary has also held that one can only estimate a range of age.[1] Medical opinion regarding the age is routinely sought in cases like child labor, juveniles in conflict with the law, and sexual violence.

Among various methods of age determination, epiphyseal ossification as observed radiologically is considered to be a reliable guide. Though these ages are fairly constant for a particular bone, there are great variations with racial, geographic, climatic, and various other factors. Hence, it is difficult to develop a single standard formula for age determination. This highlights the need to have a local data for each population. Many researchers across the world have given their valuable contribution to building such data. In the present study, an attempt is made to know the status of ossification at the wrist joint and the impact of various external factors on ossification in school-going boys between 14 -16 years age group of Bagalkot city in India.

Materials and Methods:

Permission from the institutional ethics committee (Letter no. SNMC/PG/2009-10) was obtained. Informed consent was taken after explaining the purpose and procedure of the study. In this prospective study, a total of 100 hand radiographs (14-year group and 15-year group: 50 radiographs each) were examined for the status of ossification. Radiographs were taken under the standardized condition with all due precautions.

Inclusion Criteria: Healthy, normal boys who were born and brought up in Bagalkot city and have documentary evidence of age.

Exclusion Criteria: Boys with chronic illness, skeletal deformity or injury,

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Method of collection of data: All the selected boys were classified into two different groups:

1. 14 years age group: 14 years to 14 years +364 days

2. 15 years age group: 15 years to 15 years +364 days

The staging of epiphyseal union: As the process of ossification starts, its spread can be observed radiographically. Keeping this in mind we have used six stages of epiphyseal union.[2]

Stage 0: No ossification.

Stage 1: Epiphyseal cartilage begins to decrease in thickness.

Stage 2: Ossification thickness of epiphyseal cartilage is almost equal to metaphysis but there is no union.

Stage 3: When epiphysis has begun to fuse with the metaphysis.

Stage 4: Complete union but epiphyseal scar still visible.

Stage 5: Complete union with the absence of epiphyseal scar.

Modified B.G. Prasad classification was used for identifying socioeconomic status.[3]

Results:

Statistical data for the status of ossification at the lower end of Radius and Ulna for the age group 14 and 15 years is shown in Table 1. As per 1. A), in 14 years boys, epiphyses for the distal end of Radius were in Stage 3 union among 92% of individuals while remaining individuals were in Stage 4 union i.e. 8%. None of the boys showed complete union (Stage 5). In the 15 years, age group only 1 boy showed stage 5 of the epiphyseal union while 90% of boys were still in the stage 3 of the epiphyseal union. Since 91% of all boys observed in stage 3 of union, it is concluded that in boys complete union of the distal end of Radius in this area takes place at later age, more than 16 years.

As shown in Table 1, as per 1. B) for the distal end of Ulna, at 14 years, 50% of the boys were in Stage 2 of the union while the remaining 50% boys were observed in Stage 3 of the epiphyseal union. At age 15, 80% of boys had epiphyses for the distal end of

Ulna in Stage 3 of the union while only 4% of boys showed complete union. As 65% of all the boys were in stage 3 of epiphyseal union, it is concluded that complete ossification of the distal end of Ulna in this area takes place at later age, more than 16 years.

Table 2 and 3 shows the association of different factors such as socioeconomic status, diet, or exercise affecting the ossification of the lower end of Radius and Ulna. It's observed that these factors did not show any significant association with the ossification status of the lower end of Radius however with regards to the lower end of Ulna, statistically, the significant association is observed with age but not with diet, socioeconomic status, or type of diet. As shown in Table 3, the two age groups are found to be significantly different with respect to ossification of the lower end of Ulna (p-value <0.001).

Discussion:

In 1895, Röntgen discovered X-ray. His discovery opened a new dimension for age estimation in living subjects. The use of his discovery in forensic medicine was nearly immediate. Initially, the radiographic status of ossification was recorded as fused and not fused. Soon it was realized that complete ossification of epiphyses is a long process and it can be divided into various stages to obtain better co-relation of age.[4-8] As shown in Table 4, it can be observed that a huge time gap exists between the start of the ossification and commencement of the union. It is possible to increase the accuracy of age estimation by making use of this time gap. Considering the same, in the present study we have used 6 stages of ossification.[2]

Multiple studies have been done across the world to observe the status of ossification around the wrist joint. As shown in Table 5, it can be said that pace of the process of ossification is different in populations belonging to different regions. In most of the studies conducted outside India, the age of ossification at the lower end of

Table 1: Ossification status around wrist joint.

Ossification Status	14 Years Boys		15 Years Boys		Total	
	n	%	n	%	n	%
1.A) Distal end of Radius						
Stage 0	0	00	0	00	0	0
Stage 1	0	00	0	00	0	0
Stage 2	0	00	1	02	1	1
Stage 3	46	92	45	90	91	91
Stage 4	4	08	3	06	7	7
Stage 5	0	00	1	02	1	1
Total	50	100	50	100	100	100
1.B) Distal end of Ulna						
Stage 0	0	0	0	0	0	0
Stage 1	0	0	0	0	0	0
Stage 2	25	50	7	14	32	32
Stage 3	25	50	40	80	65	65
Stage 4	0	0	1	02	1	1
Stage 5	0	0	2	04	2	2
Total	50	100	50	100	100	100

Table 2: Factors affecting ossification of the epiphysis of lower end of Radius.

	Ossification status of lower end of Radius				
	Not appeared (Stage 0)	Active (Stage 1, 2)	Advanced (Stage 3,4)	Complete (Stage 5)	Total
Age					
14 years	0	0	50	0	50
15 years	0	1	48	1	50
Total	0	1	98	1	100
	Fisher exact test, p= 0.4949				
Socioeconomic Status					
Upper class	0	1	54	1	56
Lower class	0	0	44	0	44
Total	0	1	98	1	100
	p= 0.99				
Exercise					
Never	0	1	81	1	83
Daily	0	0	17	0	17
Total	0	1	98	1	100
	p= 0.99				
Diet					
Veg.	0	1	39	1	41
Mixed	0	0	59	0	59
Total	0	1	98	1	100
	p= 0.1657				

Table 3: Factors affecting ossification of the epiphysis of lower end of Ulna.

	Ossification status of lower end of Ulna				
	Not appeared (Stage 0)	Active (Stage 1, 2)	Advanced (Stage 3,4)	Complete (Stage 5)	Total
Age					
14 years	0	25	25	0	50
15 years	0	7	41	2	50
Total	0	32	66	2	100
	Fisher exact test, p< 0.001				
Socioeconomic Status					
Upper class	0	21	35	0	56
Lower class	0	11	31	2	44
Total	0	32	66	2	100
	p= 0.1033				
Exercise					
Never	0	26	55	2	83
Daily	0	6	11	0	17
Total	0	32	66	2	100
	p= 0.7046				
Diet					
Veg.	0	17	24	0	41
Mixed	0	15	42	2	59
Total	0	32	66	2	100
	p= 0.1657				

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Table 4 : Staging of ossification status used by different researchers.

Researcher	Staging used
Galstaun[4]	O No Union C+Commencing Union JC+ A later stage in the same process N+ Nearly complete but the epiphyseal line visible J+ Union just complete
Sidhom and Derry[5]	First stage - Entirely separate and partially united epiphyses Second stage - Completely united epiphyses with plate of bone between epiphyses and shaft is still visible Third stage - Completely united epiphyses and plate of bone between epiphyses and shaft already absorbed
McKern and Stewart[6]	Stage 1 - Beginning. Stage 2 - Active. Stage 3 - Recent. Stage 4 - Complete union. This staging was based on the direct observation of bones in the dead bodies.
Kothari[7]	Stage 0: No ossification Stage 1: When the thickness of epiphyseal cartilage was found to be reduced appreciably. Stage 2: When the epiphyses have begun to fuse with shaft and complete union was well underway. Stage 3: Complete union but epiphyseal scar present Stage 4: Complete union with absence of epiphyseal scar.
Baumann et al.[8]	Stage 1- Epiphysis not ossified Stage 2- Epiphysis ossified but nonunion of the epiphysis and metaphysis Stage 3- Partial union of the epiphysis and metaphysis Stage 4- Complete union but epiphyseal scar visible Stage 5 - Complete union and no epiphyseal scar

Table 5: Comparison of age of ossification of the epiphyses around the Wrist joint given by various workers in India/abroad with the results of the present study.

	Age of ossification of epiphyses in years	
	Radius lower end	Ulna lower end
Davies and Parson(England)[9]	19-20	20
Paterson (Manchester)[10]	21	21
Sidhom and Derry (Egypt)[5]	19-20	19-20
Flecker (Melbourne)[11]	19	19
Baumann (Germany)[8]	18	18
Lall and Nat (Lucknow-India)[12]	19	19
Pillai (Madras-India)[13]	18	18
Galstaun (Bengal-India)[14]	18	18
Loomba SD (UP-India)[15]	20-21	20-21
Saksena and Vyas (MP-India)[16]	19-20	19-20
Kothari (Marwar-India)[7]	18-19	18-19
Banerjee and Agrawal (UP-India)[17]	19-20	19-20
Jain S (Jaipur-India)[18]	19-20	19-20
Nemade (Vidarbha-India)[19]	20-21	19-20
Bhise (Mumbai-India)[20]	17-18	17-19
Patel DS (Gujrat-India)[21]	19-20	19-20
Present study- Bagalkot, India	Above 16	Above 16

Figure 1: Radiograph of 14 years old boy showing the distal end of radius – Stage 3 and the distal end of ulna – Stage 2.

the radius and ulna was noted above 19 years, with the exception of a study conducted in Germany where the age of ossification was noted above 18 years.[5,8-11] In Indian studies depending on the region, the age of ossification at the lower end of the radius and ulna ranged between 17 to 21 years.[7,12-21] In the present study, the ossification at the lower end of Radius was seen to be completed only in 1% while ossification at the lower end of Ulna was found to be completed only in 2% of all boys. Hence complete union in this area must be taking place at age above 16 years. The age range of epiphyseal union in this area could not be determined in the present study due to the limitation of the age of the study groups.

The previous literature review has mentioned that factors like nutrition and exercise may influence bone ossification by affecting levels of calcium, growth hormone, and inflammatory markers.[22] In the present study we could not find any significant impact of nutrition and exercise on ossification status at the lower end of Radius and Ulna. This may be because of the limited sample size.

Conclusion :

The two age groups were found to be significantly different with respect to ossification of the lower end of Ulna. Distal end of Ulna was seen in advanced union (Stage 3 and Stage 4) in 50% of boys from age group 14 and same was significantly increased to 82% in 15 years age group.

From our study experience, we feel that instead of merely mentioning the status of ossification as fused or not fused a better co-relation of age can be made by dividing the ossification status into different stages. Further studies are required on these lines.

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ORIGINAL ARTICLE

Association of Atheromatous Plaques in Aorta with waist-hip Ratio and Cardiac weight in Unnatural Deaths: A mortuary based study from West Bengal, India

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Abstract :

Atherosclerosis is a pathological change that occurs in the arterial wall, wherein abnormal accumulation and deposition of atheromatous material occurs in their inner layer causing complete and partial blockage of the arteries. Ischemic heart disease is an important cause of morbidity and mortality in vulnerable people the world over. Atherosclerotic coronary artery disease is an important cause of sudden and unexpected death even in young individuals. It remains as one of the major cause of embolism. The abdominal obesity has also a major role in formation of atheromatous plaques leading to sudden cardiac death. The waist–hip ratio is a better predictor of risk of cardiovascular diseases as compared to BMI, as shown in various studies. The prevalence of coronary artery disease is also strongly associated with calcium intake quite common in many populations. Abdominal circumference above 102 cm in the case of men and above 88 cm in the case of women signifies central obesity and involves increased risk of cardiovascular disease. A waist/hip ratio above 0.9 in the case of men and above 0.85 in the case of women indicates central obesity and is strong predictor of observable pathological changes in the coronary vessels. The current investigation was designed to find association of atheromatous plaques in aorta with waist hip ratio and cardiac weight in unnatural deaths done on 310 bodies came for Medico-legal autopsy in Burdwan Police morgue of Burdwan Medical College of West Bengal.

Keywords : Atherosclerosis; Waist hip ratio; Atheromatous plaques; Cardiac weight.

Introduction :

Atherosclerosis is a pathological change that occurs in the arterial wall, wherein abnormal accumulation and deposition of atheromatous material occurs in their inner layer causing complete and partial blockage of the arteries. This in turn, leads to subsequent ischemic changes. Ischemic heart disease is an important cause of morbidity and mortality in vulnerable people the world over.

Atheromatous changes of cardiac vessels are an emerging trend that has affected all populations including Indians, especially those in the active age group. This has remained as an ever progressing and a silent killer putting an enormous burden on the health and well being of the population at large. Coronary atherosclerosis is one of the major causes of cardiac deaths in different parts of world. Important underlying risk factors are stressful lifestyle, change in food habits, smoking, alcohol, diseases (e.g. Diabetes, Hyperlipidemia), metabolic syndrome, etc.

Atherosclerotic coronary artery disease is an important cause of sudden and unexpected death even in young individuals. It remains as one of the major cause of embolism.

The abdominal obesity has also a major role in formation of atheromatous plaques leading to sudden cardiac death. The waist–hip ratio is a better predictor of risk of cardiovascular diseases as compared to BMI, as shown in various studies. The prevalence of coronary artery disease is also strongly associated with calcium intake quite common in many populations.

Abdominal circumference above 102 cm in the case of men and above 88 cm in the case of women signifies central obesity and involves increased risk of cardiovascular disease. A waist/hip ratio above 0.9 in the case of men and above 0.85 in the case of women indicates central obesity and is strong predictor of observable pathological changes in the coronary vessels.[1]

Macroscopic examination : On macroscopy, the aorta shows i) fatty streaks, ii) fibrous plaques, iii) complicated or uncomplicated lesions. In case of coronary arteries, the lesions of atherosclerosis were studied under two parameters:-a) degree of occlusion and b) plaque; and were graded as follows:-

Degree of occlusion : Grade 0 : No change on gross and microscopic examination

Grade I: Artery grossly appearing normal, but having microscopic findings of atherosclerosis.

Grade II: Thickening of vessel wall, with 25 to 50% narrowing of the lumen.

Grade III: Thickening of vessel wall, with 50 to 75% narrowing of the lumen.

Grade IV: Thickening and calcification with more than 75%

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Table 1: Descriptive statistics showing the range, mean and standard errors of the different parameters within the sample (i.e. Age, waist-hip ratio, cardiac weight and plaques per sq.cm.)

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean	
					Statistic	Std. Error
Age	310	40	25	65	48.72	.539
Waist (in cms)	310	71.12	45.72	116.84	76.1664	.64987
Hip (in cms)	310	65.28	65.53	130.81	91.5473	.60252
Ratio	310	.240	.660	.900	.82993	.003606
Cardiac weight (gms)	310	805.00	155.00	960.00	330.0194	5.76844
Plaque/sq.cm	310	8.00	.00	8.00	.8871	.09064

Table 2: Table showing the female-male ratio in the sample.

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	F	115	37.1	37.1	37.1
	M	195	62.9	62.9	100.0
	Total	310	100.0	100.0	

Table 3 :Frequency table showing the incidence of the different causes of death.

Descriptive Statistics

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	BURN	17	5.5	5.5	5.5
	CVA	7	2.3	2.3	7.7
	DISEASED	42	13.5	13.5	21.3
	DROWNING	16	5.2	5.2	26.5
	ELECTROCUTION	11	3.5	3.5	30.0
	FALL	1	.3	.3	30.3
	H/0 FALL	5	1.6	1.6	31.9
	H/O FALL	4	1.3	1.3	33.2
	HANGING	39	12.6	12.6	45.8
	HEADINJURY	7	2.3	2.3	48.1
	HOMICIDE	1	.3	.3	48.4
	MURDER	1	.3	.3	48.7
	POISONING	44	14.2	14.2	62.9
	RAILWAY ACC	20	6.5	6.5	69.4
	RTA	63	20.3	20.3	89.7
	SNAKE BITE	21	6.8	6.8	96.5
	STABINJURY	5	1.6	1.6	98.1
	STRANGULATION	2	.6	.6	98.7
	SUNSTROKE	4	1.3	1.3	100.0
	Total	310	100.0	100.0	

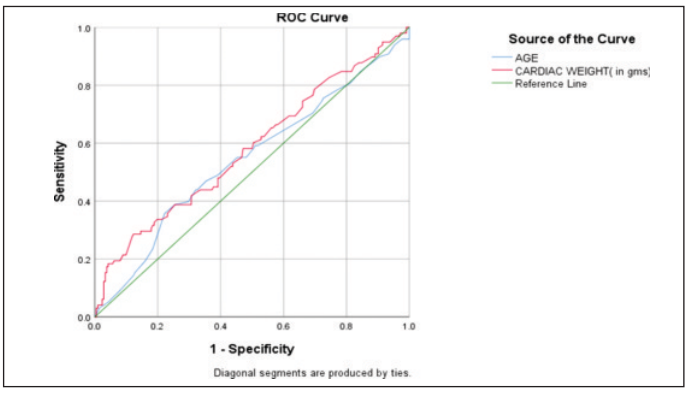

Figure : ROC Curve between age and cardiac wt.

Table 4 : Descriptive statistics showing the mean and standard deviations of the cadavers, based on plaques/sq.cm., cardiac weight, age and the waist-hip ratio

	Mean	Std. Deviation	N
Plaque/sqcm	.88710	1.595958	310
Cardiac Weight (gms)	330.01935	101.563918	310
Age	48.71935	9.495457	310
Ratio	.82993	.063493	310

Table 5 : Table showing the correlation between plaque per sq cm and cardiac wt.

Control Variables			Plaque/ sqcm	Cardiac Weight (gms)
Age & Ratio	Plaque/sqcm	Correlation	1.000	.172
		Significance (2-tailed)	.	.002
		Df	0	306
	Cardiac weight (gms)	Correlation	.172	1.000
		Significance (2-tailed)	.002	.
		Df	306	0

narrowing of lumen.

Grading of Atheromatous Changes: American Heart Association classified the atherosclerotic plaque into 8 grades:[2]

Grade 0 - No change.

Grade 1 - Isolated intimal foamy cells (minimal change).

Grade 2 - Numerous intimal foamy cells often in layers (fatty streaks).

Grade 3 - Pools of extra cellular lipid without a well-defined core (intermediate lesion or pre-atheroma).

Grade 4 - Well defined lipid core with luminal surface covered by normal intima (atheromas or fibro plaque).

Grade 5 - Lipid core with a fibrous cap with or without calcification (fibro- atheroma).

Grade 6 - Fibro-atheroma with cap defect such as hemorrhage and thrombosis.

Grade 7 - Calcification prominent.

Grade 8 - Fibrous tissue change prominent.

For the sake of convenience, feasibility and easy practical application, the author merged these 8 grades of atheromatous changes into THREE BROAD GROUPS:-

Grade 1 – Presence of foamy cells (fatty streaks).

Grade 2 – Presence of pre-atheroma, fibrous plaques and fibro-atheroma.

Grade 3 – Presence of hemorrhage, thrombosis, calcification or plaque ruptures.

In this study, he specifically noted the pathological findings present within the thoracic aorta.

A study conducted by Kitulwatte et al compared the histological patterns of atherosclerosis in young and old populations to derive any relationship between them. All the cases of coronary atherosclerosis in young people (<40 years) were compared with

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an equal number of randomly selected older people (> 65 years) over a period of 4 and a half years in the Forensic Pathology Unit of the Ontario Forensic pathology Service in Toronto, Canada. Among the 28 cases of atherosclerosis in young people, 23, i.e. (82%) had eccentric atherosclerosis compared with 11 (39%) of the old. Response of inflammation was seen in all 28 (100%) of the young in comparison with 17 (61%) of the old. Thirteen (47%) of the young compared with 3 (11%) of the old had thrombosis, whereas 9 (32%) of the young and 17 (61%) of the old had plaque haemorrhage. Pultaceous debris was the main component in 11 atherosclerotic plaques (39%) in the young, followed by foam cells in 7 (25%). In the older group, pultaceous debris was the principal component in 18 (64%) followed by dense fibrous tissue in 5 (18%). Microscopy of the heart in the young revealed 5 cases (18%)of isolated acute myocardial infarction, 8 cases (29%) of acute myocardial infarction on top of old scars, and 2 cases (7%) of isolated old scarring. Seven cases (25%) were microscopically negative for any lesion, whereas 6 (21%) had nonspecific features like scanty lymphocytic infiltrates. In the old, there were 4 cases (14%) of isolated acute myocardial infarction, 12 cases (43%) of acute myocardial infarction on top of old scars, and 8 cases (29%) of isolated old scarring. Three cases (11%) were microscopically negative for any lesion, whereas 1 (3%) had nonspecific features. Ten cases (38%) of the young and 6 cases (21%) of the of the old had clear historical evidence of smoking. Postmortem toxicology revealed no cocaine or amphetamines in the blood, especially among the young. Twenty cases (75%) of the young compared with 15 cases (54%) of old were either obese or overweight. Obesity found to be associated with aggravated coronary atherosclerosis in adolescent and young adults. Most of the young people with lethal coronary atherosclerosis (75%) in that study were either overweight or obese. Hypertension, hyperlipidaemia, hyperglycaemia, hyperhomocysteinemia, infections, and smoking are known as risk factors causing subtle endothelial injury and subsequent inflammation.[3]

Babu et al,[4] in their study determined the prevalence and distribution of atherosclerosis in different age groups in Tirupati area AP. The study included 100 heart samples from the autopsy cases from which Aorta was separated from the heart and lesions stained in Sudan stain and kept for 5-10 mins and washed. Respective sections were sent for histopathological examination the heart was also sectioned accordingly. It included proximal part of right coronary artery, left coronary artery circumflex artery, thoracic and abdominal aorta. The results were analysed using statistical methods. The age, sex and disease distribution of patients were evaluated with the help of Chi-square (applied for more than 40 patients) and Fisher exact probability tests (for smaller groups).P value was 0.01.The overall observation was that 70% were males and 30% female groups were present. Major proportion of males belonged to higher age groups as compared to that of females. The incidence of atherosclerosis were found to increase with age, the lowest in 10-19 years of age group (78.6%) and highest in 60 and above age group which were 100%.The significant lesions were seen in chronic smokers, alcoholics and in non-vegetarians.

In a study by Khanna et al, the atherosclerotic changes in aorta and coronary arteries were studied in North Indian population. The study involved 150 cases of different age groups brought for postmortem in the Department of Forensic Medicine Pt. BD Sharma, Post Graduate Institute of Medical Sciences (PGIMS), Rohtak. Only intact hearts were used in the study. First, the gross examination of the heart, and aorta and coronary arteries were done. The aorta was examined for presence of any atheromatous plaques, any lesions, any thickening of its wall, and degree of calcification. The coronary arteries were cross sectioned at 5mm intervals from the ostia to the terminal pericardial branches to look for any presence or absence of atherosclerotic plaques. 4 micrometer sections were taken and sent for histopathological examination. In the coronary arteries, the lesions were evaluated in two parameters pertaining to:- degree of occlusion and plaque. Degree of occlusion was graded into 4 types, where grade 3 and 4 were considered significant. The plaques were divided into 8 grades, where grades 4-8th lesions were considered significant. SPSS software version 20 was used for statistical analysis. Chi-square was used to test the significance. Majority of the cases belonged 3rd decade of life (26%) followed by 4th decade (20%) and 5th decade (18.7%). Predominant cause of death were Road traffic accident in 61/150 (40.7%); followed by suicidal poisoning and burns in 50 (36.7%) and 20 (13.3%) cases respectively. Absence of grade 4 atherosclerosis was seen at any age, whereas only 7% subjects had grade 3 changes, with 3 subjects each in 4th and 5th decade. About 54% had grade 1 severity. Maximum no. of atherosclerotic changes were in grade 4 which accounted to 33.3%. Histopathological grading revealed Grade III lesions were maximum (27.5%) followed by grade IV lesions (19.0%) and in no section grade VIII lesions were seen. The present study would help clinicians to take measures at an early stage to prevent the progression of the disease and help forensic pathologists in dealing with opinion regarding cause of death.[5]

Jain et al, in their study on coronary atherosclerosis dealt with morphological and morphometric analysis. The study was carried out at Department of Pathology, Bangalore Medical College and Research Institute (BMCRI), Bangalore. 150 autopsy cases of both sexes belonging to 30-60 years age group were taken, having history of deaths due to natural as well as unnatural causes (accidental, suicidal, homicidal, etc.). The heart was dissected following standard protocol and sections were sent for histological examination. The lesions were graded into 6 types. Out of 150 cases, 28 cases including 16 males and 12 females showed normal histology in all three major coronaries. Coronary atherosclerosis was present in 122 cases (81.3%) with mean age of 43 years. 85.9% of males and 66.6% of females showed coronary atherosclerosis. LAD was the most commonly involved coronary artery (74%) followed by LCX (68%) and RCA (60%) respectively. This study results indicated that the morphometric parameters correlated with the morphological grades of atherosclerosis in all three coronaries. Hence these parameters can serve as reliable indices for assessing the severity of atherosclerotic lesions supplementing the histo-morphological analysis.[6]

Green et al. studied on sudden cardiac death associated with premature atheroma in young population. The study was carried

out on young age group (≤ 35 yrs.) associated with premature atheroma of Royal Brompton Hospital, London. The BMI was calculated and any History of smoking, alcohol consumption were noted. Macroscopic examination of the cardiac tissues for presence of any infarctions, details of the vessels containing atheroma were noted. Premature atheroma was considered significant if it contained ≥ 75% of vessel occlusion resulting in pinpoint lumen of <1mm diameter. Microscopic features included any band necrosis, acute infarction, atheromatous plaques etc. Among the cases, 33 (72%) were males. The median age of death was 30 yrs, whereas it was 31 years in case of females. The range was 11-35 yrs. The mean BMI was 30 kg/m.^{2} overall, 3 patients had normal BMI, 8 were overweight and 15 (62.5%) were obese. The mean heart weight in males was 413 gm., whereas it was 327gms in case of females. In 28 cases, only one coronary artery was involved in atheromatous plaque. Overall, the LAD was involved in 39/46 cases and lipid plaques accounted for only 7/28 cases. The study highlighted premature atheroma in a single vessel in young age group with/without presence of ventricular ischaemia. Thus dyslipidemia should be ruled out in family members with premature atheroma.[7]

Materials and Methods:

After getting Institutional Ethical Clearance (Memo No.- BMC-84 dt. 08/01/2019) one Observational, Descriptive study of cross-sectional design was conducted for 18 months starting from July,2019 over the 310 bodies of deceased came for medicolegal autopsies at Burdwan Police Morgue of Burdwan Medical College by following complete enumeration method for determination of sample size between the age group of 25 years to 60 years with the help of measuring tape, flexible tape, ruler, weighing machine, disposable gloves, probes, scalpel, cutting knife, blunt-ended scissors, forceps-plain and toothed, Electronic Digital caliper, Pencil, standard prepared master charts for data recording and with the following exclusions-

1. Decomposed bodies
2. Mutilated bodies, fragmentary skeletal remains.
3. Bodies with congenital malformations (eg CTEV).
4. Bodies with acquired bony abnormalities (eg caries spine).
5. Grossly charred and deformed bodies following severe burn injuries.

The cardiac weight, waist-hip ratio, atheromatous plaque in aorta (root of aorta and arch of aorta) were measured by dissecting the heart following the conventional inflow-outflow method. Heart was fixed in 10% formalin, weighed, and dissected by conventional inflow-outflow method of dissection. Measurements of right ventricular wall, left ventricular wall, and stump of aorta were done. Three main coronaries (right coronary, left coronary and left anterior descending) and aorta were dissected extensively at every 1cm (card-board made multiple squares each having sides of 1cm length were used to calculate the 1sq. cm area) to look for yellow streaks, thickening, plaques and calcification macroscopically. Then routine processing and paraffin embedding, 3-5micro meter section cutting and staining with H&E was done. Microscopic examination was done and graded according to Modified American Heart Association criteria although in this current study only macroscopic features have been considered. Information about socio-demographic profile and their cardiovascular risk factors were collected from medical records of the deceased, inquest reports. All the cases were received after completion of police or magistrate inquest.

Results:

The Descriptive Statistics of the different parameters within the sample (i.e. age, waist-hip ratio, cardiac weight and plaques per sq. cm) showing the Range, Mean and Standard errors is depicted in table1. The mean value of waist-hip ratio was 0.82; cardiac weight was 330.0 and that of plaque per sq. cm was 0.88, along with the mean of other parameters as noted in the said table. Table 2 shows the male-female ratio in the sample where males were 62.9% and females were 37.1%. The frequency showing the incidence of the different causes of death is depicted in table 3, where the frequency of RTA was 63, followed by Poisoning which were 44, Diseased (42) and Hanging (39), along with the other causes shown in the table. Table 5 is a descriptive statistics highlighting the mean and standard deviations of the cadavers based on plaques per sq. cm, cardiac weight, age and the waist-hip ratio. The mean value of cardiac weight was 330.01 and that of plaque per sq. cm was 0.88. The correlation between plaque per sq. cm and cardiac weight is depicted in table 6. Controlling for age and waist hip ratio; there is statistically significant positive correlation between cardiac weight and the number of plaques per square cm at aortic root. ROC curve between age and cardiac weight. analysis shows that cardiac weight is not a strong discriminator between plaques and non-plaque cases in the given series.

Discussion:

The descriptive statistics which is seen from tables 1-3 the demographic profile and cause specific deaths in the given sample was comparable with previous published works from different parts of India (Babu 2015, Khanna et al 2019). In the present study, obesity was ascertained by measurements of the waist hip ratios cadavers. The waist hip ratio ranged from 0.660 to 0.900 (mean= 0.82993) as noted in Table 1. So the subjects were not overweight as such, considering <0.85 as normal 62.9% were males and 37.1% were females (as noted in Table 2). The highest frequency of deaths was found among the age groups 40 to 50 years, with the mean of 48.72 years. The minimum age of the subject where plaque was found was 25 years This again is comparable with previous published works. The present work also revealed that a higher hip waist ratio was associated with greater frequency of plaques in the aorta.

The most remarkable domain of the present work was the quantitative assessment of plaques of ascending aorta. Plaque per square centimeter was the variable that has been used as surrogate marker of disease prevalence and pathological changes of the coronary vessels. Its association with the risk factors and coronary pathology was assessed as part of the investigation. Ten percent of the cases had 2 plaques per cm square while four and above plaques per square cm was seen in 8.2%. It was seen that the plaque per sq. cm had a positive correlation with the cardiac weight (p=.001). Controlling from age and waist hip ratio, the

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partial correlation of plaque per sq. cm and Cardiac weight showed significant correlation (coefficient .172 and P= .002). Furthermore, we examined the discriminating power of cardiac weight from plaque and non-plaque cases. It was observed contrary to our expectations that cardiac weight was a poor discriminator between the plaque and non-plaque group (ROC analysis area under the curve 0.580 p=0.02. Other works however did not indicate similar trends (Jain et al 2013, Green et al 2016). Though mean cardiac weight was more in the group with positive plaques than the mean in non-plaque group. This difference was statistically significant as seen from the independent t test (t=2.94 p= .003)

The present research to the best of our knowledge and belief is the first study to examine the presence and density of plaque at ascending aorta and its correlation with the cardiac-weight and waist hip ratio (WHR) in a given population (West Bengal, India). Our work clearly emphasizes that at autopsy the findings of atheromatous plaque of diameter greater than 5mm at ascending aorta, especially at the root with increased cardiac weight and waist hip ratio is a strong predictor of coronary narrowing and or occlusion. This should be borne in mind during autopsy investigation of sudden death. This would be an indication for further careful coronary vascular dissection to clinch the diagnosis. Regarding the shortcomings, the present study is a pilot study and of preliminary nature. Further studies need to be designed with larger number of sample from multiple centre to explore the diverse population. It will be possible to draw inference based on sound reasoning. The other difficulty was the accuracy of the waist hip ratio measuremnent in the dead body. The technique is difficult and cannot be equated with the measurement in the living in erect posture as ther is obvious changes of skin tension and positioning of the organs. However this has been admitted and comparaple figures from othe studies on living subjects were compared accepting the margin of error.

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Conflict of Interest : The authors declare that there is no conflict of interest. This research work is a part of dissertation submitted at the West Bengal University of health sciences in compliance with partial fulfillment of eligibility for MD Examination.

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ORIGINAL ARTICLE

Utilization of Pumpkins [Low fidelity- organic Bench top Simulator's] to Demonstrate Mechanical Injuries Among MBBS Students

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Abstract :

Simulation has found its way in the current medical education system. Simulation based teaching or training is very effective and has high receptiveness among students. Simulation are of various types and models for the same are available at variable costs. Simulation based teaching for undergraduates in forensic medicine is need of the hour in the absence or less exposure to medicolegal autopsies and clinical forensic cases. In this paper we had used pumpkins as a teaching model to demonstrate mechanical injuries. Students were given various weapons and was allowed to inflict multiple injuries over the pumpkin under the strict supervision of the faculties. Features of abrasion, incised wound, stab, chops were well demonstrated. While features of laceration, contusions were minimally demonstrated. Pumpkins are cheaper than conventional ballistic dummies or mannequins used of simulation. Concept of simulation based teaching in forensic medicine is in very primitive stage and new ideas must be explored. Thus combination of conventional teaching along with simulation based teaching will have greater reach among students.

Keywords : Simulation; Teaching models; Medical education; Vegetables; Mechanical injuries.

Introduction :

Medical education in India has seen a drastic change recently following the implementation of the CBME curriculum. The important things of CBME is implementing interactive or new teaching methods. Mechanical injuries chapter is very important and every medical student must be fully aware of the type of injury, biomechanics and effective documentation in certificates. Effective demonstration and teaching of mechanical injuries is best achieved by observing autopsies or observing trauma case in emergency medicine department. In India medico-legal activities such as conducting postmortem and issuing medicolegal certificates are carried out only in government medical colleges or institutes. Unfortunately there are around 350 private medical colleges functioning in India where no medical legal works such as autopsies and issuing medical legal certificates are carried out. Students who get trained from these institutes are devoid of practical knowledge regarding the medico legal works. However the students perform these tasks such as postmortem report writing and issuing medical legal certificate without observing cases based on case scenarios. This issue can be addressed by a new teaching methods such as simulation technique. Various simulation techniques are available in the market of medical education. Simulation exercises improves the critical understanding of the practical concepts to be demonstrated to the undergraduate students simulation will enhance detailed observations and they will learn the concept there by reducing the errors when executing the actual procedure. Low cost simulation techniques in the forensic medicine teaching for undergraduates is been explored in this paper. Generally silica gel torso or ballistic dummies are used to recreate mechanical and ballistic injuries in investigative process. However the cost of each ballistics dummies range from 1 to 1.5 lakhs in the market. Thus a pumpkin, a lost cost bench top simulator is used to demonstrate injuries to the students for better understanding.

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Materials and Methods:

Fifty undergraduate students were taken up for the study. They were divided into 10 groups with each group containing five members. Each group was provided with a pumpkin and five weapons which included three blunt and two sharp weapons. Blunt weapon that was given to students included wooden log, iron rod, hammer, stone. Sharp weapon included screwdriver, scalpel, scissors, chopper, single edge and double edged knife. [Figure 1] Students under the strict supervision of the faculties were allowed to inflict various injuries over the pumpkin with weapons provided in a stepwise manner. For example a student was given a screwdriver and was allowed to inflict multiple stabs over the pumpkin and the faculty described the biomechanics, weapon characteristics and the injury pattern produced on the pumpkin. The students with great enthusiasm performed the tasks and their doubts on mechanical injuries were cleared immediately.

Results:

Abrasion pattern were well demonstrated over the pumpkin by using a stone with the rough surface. Heaping feature which indicates the direction of application of force was also well appreciated [Figure 2]. Imprint abrasions pattern were well demonstrated over the pumpkin using cycle chain [Figure 3]. Using a scalpel tip, multiple incisions were inflicted over the pumpkin and the wounds demonstrated tailing which is a pathognomonic feature of the incised wound [Figure 4]. Using the head of the hammer multiple blows were inflicted over the

Figure 1: Pumpkin and the weapons provided to each group of students.

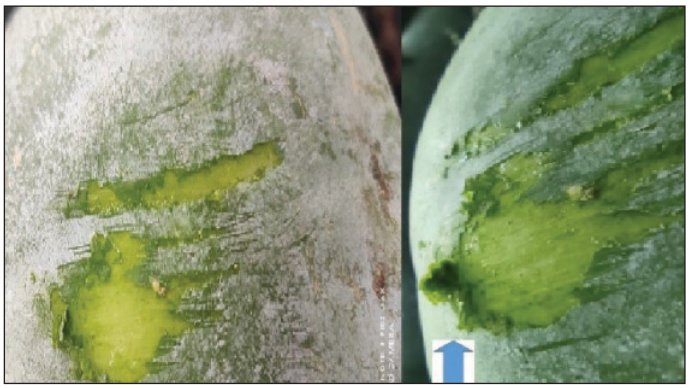

Figure 2: Features of grazing and heaping.

Figure 3: Imprint pattern of the cycle chain.

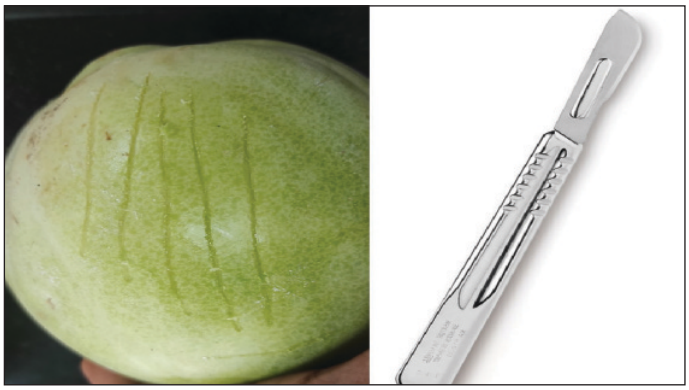

Figure 4: Multiple incised wound pattern with scalpel.

Figure 5: Pattern created by the claw or peen of the hammer.

Figure 6: Multiple stab with a single edged sharp knife.

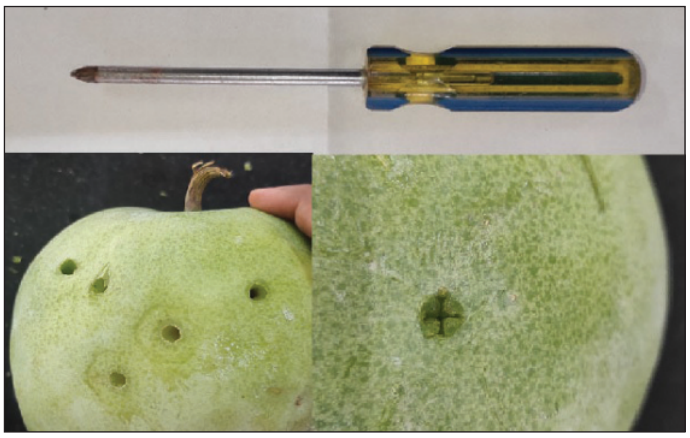

Figure 7: Multiple stab with screwdriver and cruciate pattern of entry wound.

pumpkins. A pattern highlighting the shape of the weapon [claw/peen of the hammer] was demonstrated [Figure 5]. Shifting focus on the sharp weapons a single edged sharp knife was used to inflict multiple stab over the pumpkin. The entry wounds demonstrated the characteristics dimension of the weapon (blade width and thickness) [Figure 6]. A screw driver was used to inflict multiple perforating wounds over the pumpkins. The entry and exit wounds were clearly demonstrated. The entry wound showed a cruciate pattern and while the exit wound showed everted edges.

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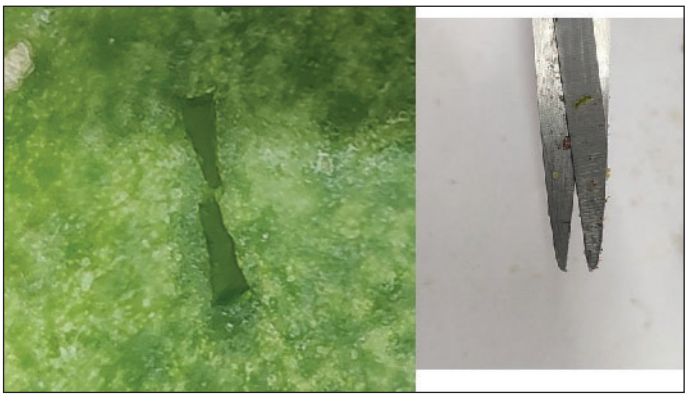

Figure 8 : Pattern created by the tip of the Scissors.

Figure 9: Chop wound pattern with minimal appreciation of beveling.

When thrusted with full force the handle pattern of the screwdriver were also faintly demonstrated [Figure 7] The Scissors created a typical entry pattern characteristic of scissor injuries that is two inverted triangles [Figure 8]. Chopper was used and multiple slashes were inflicted on the pumpkins, and the beveling feature was demonstrated [Figure 9]. The injuries that was very poorly documented were lacerations. Multiple blows were given over the pumpkin using a wooden stick, only feature that was documented were crushed margins or edges. Features such as wound gaping, fracture, contusions were minimally or not clearly demonstrated.

Discussion:

Simulation is a type of instructional strategy to teach learners or students with technical skills, procedures, operations etc, with situations that resemble reality.[1] Simulation involves the use of mannequins, devices, digital or mechanical surgical simulators, cadavers, animal organs, vegetables, fruits etc. to reproduce or represent real life like situations. Newer simulation techniques use augmented reality, virtual reality and robotics currently.[2] The current concept of hybrid simulation is also being used i.e, where in two or more simulation techniques are combined to deliver a more realistic simulation experience.[3]

Based on the level of realism or resemblance to human tissue, simulation models are of two types, high fidelity and low fidelity models. High fidelity are as real as human tissue, e.g. as live animals while low fidelity are less resemblance to human skin or synthetic models.[4] This paper focuses on low fidelity bench top simulation models such as fruits and vegetables. The low cost simulation what we have taken is a Pumpkin. Thick skinned vegetables are simple, easily available and have a low cost and act as a three-dimensional model to work with.[5]

Advantage of simulation in medical education provides students the space to acquire or perfect their skills before operating on a live patient or examining a live patient. It also increases the confidence and efficiency of the students. Simulation also allow to pre assess the students' performance and skill level.[6,7]

Focusing on simulation models in undergraduate teaching in forensic medicine the scope and availability is very minimal. Generally simulation models such as silica gel ballistics dummies are used in forensic investigation techniques rather than forensic teaching. With students being less exposed to medicolegal autopsy and clinical medical cases, the role of simulation place important role medical education. Ideally silica gel ballistics dummies should be used to demonstrate various types of mechanical and firearm injuries in a realistic manner. The cost of each ballistic dummies range between 3 to 4 lacs in Indian markets. Thus cost being an important factor, the need for cost effective and efficient simulation models are best sought after. This can be effectively addressed by using vegetables such as pumpkin or bottle gourd to demonstrate various biomechanics and features of mechanical engineers. The skin inconsistency of the pumpkin resembles features of human skin some extent thus serving as an important model of teaching. However With the word of caution, vegetable simulation models are not as realistic as silica gel ballistics dummies, but just a mere substitute. The blunt force injuries such as grazed abrasion imprint abrasion patterned contusions well demonstrated. Whereas sharp force injuries such as incised wound, stab wound, chop wound well demonstrated. The weapon characteristics such as blade margins, tips and hilt markings where well demonstrated. Injuries such as contusion and lacerations was very minimally demonstrated. Thus when an undergraduate student with the sound theoretical knowledge been exposed to such simulation model based teaching their understanding capabilities will increase. Thus it will easy for them when they examine a live trauma case in emergency set up or while conducting a post mortem examination. The rough cost of procuring 10 pumpkins was around 300 rupees, thus making it a cost effective and resourceful simulation model.

Conclusion :

The need for new teaching techniques in forensic medicine undergraduate teaching is the need of the hour. The use of simulation based teaching is an uncharted area in forensic medicine. Simulation based teaching has shown to increase the skill and performance level of the students, as per various studies conducted. However in India simulation based teaching in forensic medicine is only in the conceptual state. Employing cost effective and efficient vegetable models in undergraduate teaching will be helpful for the students. Thus various teaching methods when combined will have a great reach among the

students

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ORIGINAL ARTICLE

Retrospective Autopsy-based Profiling of Fatal Snake Bite Cases Brought to Tertiary Care Teaching Institute of Haryana

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Abstract :

Snakebite is a major public health problem throughout the world especially in tropical and sub-tropical countries. Snake venom is probably the oldest known poison to mankind and has been described in oldest medical writings and myths. Since the dawn of civilization, snakes have inspired a mystic feeling of good and evil in human mind. An authentic measure of the global burden of snakebite envenoming remains obscure despite several attempts to estimate it and, apart from a few countries, reliable figures on incidence, morbidity, and mortality remains elusive. This retrospective autopsy-based observational study was carried out in the Department of Forensic Medicine of a tertiary care teaching institute of Haryana during 8-year time span from 2010 to 2017. A total of 55 fatal cases of snake bites which included 38 males and 17 females were used to study the trend of disease. As observed in the study, maximum cases were from 21-30 years age group of rural background having male preponderance and snake bite related deaths peaked during monsoon season. The other observations noticed were, hands and feet were widely getting affected due to snake bite while swelling and cellulitis were the commonest findings seen at the local site of bite. Maximum cases had single set of fang marks seen at the site of bite while there were some cases with no visible marks. A discussion on the findings of our study could be used to formulate a rough idea of burden of this neglected disease in Haryana state and there is an urgent need to educate the population regarding the risks and create awareness regarding seeking timely treatment for the same.

Keywords : Snake bite; Fatal; Epidemiology; Distribution; Retrospective analysis; Autopsy-based.

Introduction :

Snakebite is a major public health problem throughout the world especially in tropical and sub-tropical countries. However, assessment of the epidemiological profile of true incidence of global mortality and morbidity from snakebite envenoming has been stalled by several reasons.[1,2] On reviewing the published data from several sources regarding the global burden, which used highly controversial methodologies suggested a range from a minimum of 421,000 envenoming and 20,000 deaths up to as high as 2.5 million cases and over 100,000 deaths each year.[2,3] As per WHO estimates, nearly 81,000–138,000 people die each year from snakebites worldwide, and about three times that number survive and but are left with amputations and permanent disabilities.[4] Snakebite envenoming and associated mortality are under-reported because many victims (20–70% in some studies) do not seek medical line of treatment in state sponsored hospitals and hence are not recorded. This is compounded by the fact that medical posts in regions of high incidence are unable to keep accurate records of the patients who do present for treatment, and because death certification of snakebite is often imprecise.[5,6] According to some researchers, India had estimated 1.2 million snakebite deaths (average 58,000/year) from 2000 to 2019.[7]

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Being one of the most populous state and with such wide variety of flora and fauna, there is notably conflict between humans and snakes in our country. There is significant discrepancy of data from the official hospital statistics and the actual snake bite cases which sometimes results in disability and fatality mainly due to ignorance, use of old traditional methods, lack of proper medical infrastructure or transport facility. Also, most of the construction in rural areas of India are made from mud and have many crevices where rodents flourish. Snakes are likely to approach residential areas when attracted by prey, such as mice & frogs. In cases of snake bite deaths, being a medico-legal matter, these bodies are brought for autopsy to claim compensation from government. Such reporting helps the autopsy surgeon to have the knowledge about exact number of deaths occurring in respected jurisdiction by snake bite. In this context, the present study was undertaken in our institute to study the autopsy based epidemiological profile of snake bite cases.

Materials and Methods:

The present study was conducted in the Department of Forensic Medicine of a tertiary care teaching centre of Haryana. It was a retrospective observational study conducted after taking permission from Institutional ethical committee. Due consideration was made to maintain the confidentiality of the data by making code numbers for each victim and data collection sheet. This present study was carried out in the Department of Forensic Medicine, by retrospectively analysing medico-legal

post-mortem reports of all such cases of deaths which were due to fatal snake bite injuries and were brought to the mortuary for post-mortem examination from the period of 1st January 2010 to 31st December 2017. A thorough examination of first information report or police papers and post mortem reports were done to collect the information regarding the incidence and determinants of snakebite related mortality which included epidemiological profile and circumstances surrounding the snake bite was studied for all such cases. All victims (male or female), whether hospital admitted or brought dead with a clear history of snake bite to any of the body regions were included in the study. Cases having history of unknown bite (no confirmative history of snake bite) were excluded. Putrefied dead bodies and cases where death was due to any other mechanism apart from snake bite were also excluded from the study. The details of the all cases namely; age, sex, occupation, season, place, site of bite, local changes at site of bite, manner and cause of death were recorded at the time of evaluation.

Data from the proforma was compiled, tabulated, and analysed by descriptive statistics by calculating means, percentages and proportions. Data analysis was done using Microsoft excel worksheet 2010. All the data were compared with the other research works having similar objectives.

Results :

Out of the 11895 hospital deaths, brought for medico-legal autopsies performed during eight-year study period from 2010-2017, 55 victims succumbed due to snake bite. Maximum number of fatal snakebite cases occurred in the year 2016 (30.9% cases) (Table -1). In relation to sex 69% were males and 31% females, the vulnerable age group among both men and women were those in the 21- 30 years age group (32.7%), (Table 2). By occupation, 56.4% were farmers, 20% were labourers, 16.4% were homemakers and 5.5% were students, (Table 2). In relation to season (Table 2), maximum number of deaths reported during rainy season (69.1%) and in month of July (32.7) followed by summer (27.27% each). The hands (21.8%) were the most common site of bite followed by feet (16.4%) (Table 2). Rural area (89%) was more common area of occurrence than urban (Table 2). Out of all the victims of snake bite 85.5% of cases showed fang marks and 89.4% had single set of mark (Table 3). Accidental snake bites were the prevalent manner of infliction (Table 4). Amongst all the local changes seen at local site of snake bite, swelling and cellulitis (52.7%) was more common than subcutaneous haemorrhage (18.2%) and 14.5% cases showed no changes at the site of bite (Table 2).

Table 1: Year wise sex distribution of snake bite cases.

Year (No. of autopsies)	Number of snake bite cases		
	Male (%)	Female (%)	Total
2010 (1690)	01 (50)	01 (50)	02 (3.6)
2011(1560)	04 (100)	00 (00)	04 (7.3)
2012 (1557)	01 (100)	00 (00)	01 (1.8)
2013 (1360)	03 (60)	02 (40)	05 (9.1)
2014 (1446)	07 (87.5)	01(12.5)	08 (14.6)
2015 (1491)	09 (75)	03 (25)	12 (21.8)
2016 (1483)	11 (64.7)	06 (35.3)	17 (30.9)
2017 (1308)	02 (33.3)	04 (66.7)	06 (10.9)
Total (11895)	38 (69)	17 (31)	55

Table 2 : Selected variables of the case.

Variables		Frequency (n=55)	Percentage (%)
Month of Occurrence	January	00	00
	February	00	00
	March	02	3.6
	April	01	1.8
	May	04	7.3
	June	08	14.6
	July	18	32.7
	August	07	12.7
	September	09	16.4
	October	04	7.3
	November	02	3.6
	December	00	00
Season wise Distribution	Summer (March- June)	15	27.27
	Rainy season (July- Oct)	38	69.10
	Winter (Nov- Feb)	02	3.63
Age group of deceased (years)	0-10	02	3.6
	11-20	12	21.8
	21-30	18	32.7
	31-40	09	16.4
	41-50	10	18.2
	51-60	01	1.8
	61-70	02	3.6
	>70	01	1.8
Area of occurrence	Urban	06	10.9
	Rural	49	89.1
Site of bite on body	Hand	12	21.8
	Forearm	06	10.9
	Arm with Shoulder	04	7.3
	Feet	09	16.4
	Leg	06	10.9
	Thigh with gluteal region	01	1.8
	Thorax	01	1.8
	Abdomen	01	1.8
	Back	03	5.5
	Head & Neck	04	7.3
	Bite mark absent	08	14.5
Occupation of the deceased	Farmer	31	56.4
	Labourer	11	20
	Housewife	09	16.4
	Student	03	5.5
	Others	01	1.8
Local changes at the site of bite	Subcutaneous	10	18.2
	haemorrhage	05	9.1
	Bleeding	03	5.5
	Necrosis	29	52.7
	Swelling and cellulitis	08	14.5
	No change		

Discussion :

Snake bite is one of the most common and trivial medico-legal case arriving at the emergency casualty and morgue of the hospital at many regions of our country. However, reliable data regarding the snake bite morbidity and mortality is still not available because many patients' approaches to local quacks or traditional methods for their treatment instead of institutional admission.[8] In the present study, we reviewed the autopsy reports of fatal snake bite cases that had been received at the mortuary of department of Forensic Medicine of a tertiary care teaching centre of Haryana during period of 2010-17 which were 55 in number out of total 11895 hospital death cases examined in that period. Out of all the medico-legal autopsies arrived to the morgue of the institute per year, snake bite constituted roughly

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Table 3 : Distribution of snake bite cases according to pattern of bite mark on the body.

Fang Mark (n=55)	Present (47) (85.5%)			Absent
	One set (%)	Multiple set (%)	Scratch Mark (%)	8 (14.5%)
	42 (89.4)	2 (4.3)	3 (6.4)	

Table 4: Distribution of snake bite cases according to manner of death of deceased.

Manner	Male	Female	Total
Suicide	00	00	00
Accidental	38	17	55
Homicidal	00	00	00

around 0.5% of the cases.

In the present study, male to female ratio is 2.2:1; males were more commonly affected than female due to their outdoor activities which was similar to previous studies from India[9-12] and abroad[13,14]. Out of all the age groups, 21-30 years carried the most burden while some other previous studies where 21-50 years ago group were most common age group.[15] There was steep decline in number of fatalities after the age of 50 years which is most probably due to less agricultural works and outdoor movement by the older persons after sunset.[16] With regard to monthly and seasonal variation of snake bite victims, Rainy season and July month tops the chart due to flooding of farmland and planes, increased agricultural activity along with rampant breeding of frogs, insects and rats due to flooding of their indwelling.[17,18] The same observations are noticed in the current study, when the peak incidence of snake bite seen in rainy season during the increased infestation of rats, frogs and other prey while the incidence subsides during winter season when the snakes goes into hibernation.

The incidence of snake bite was more prevalent in rural areas as compared to urban area and this trend was consistent in all the studies done in India and abroad.[2,19,20] This increased propensity of rural area dominance was studied by different researchers in the past also which included, poorly built houses, ignorance, dependence on traditional line of treatment from quacks and local healers, increased agricultural work, inadequate access to anti-venom therapy.[21] One of the few reasons is lack of medical facilities in far flung rural and tribal areas and lack of basic transportation leading to inadequate and inaccessible supply of anti-snake venom therapy. Due to above mentioned reason, farmers constitutes maximum cases of fatal snake bite victims amongst all other occupation in this study. Several other studies also concur with this finding, as due to working bare foot in farms and fields without necessary protective gears and manual agricultural work results in more chances of snake bite.[17,22] As per Suraweera et al, who estimated that 1.2 million deaths occurred in India from 2000 to 2019 and nearly half occurred at ages 30-69 years and over a quarter in children < 15 years. Most snake bite incidences occurred at home in the rural areas and half during the rainy season and at low altitude. The risk of an Indian dying from snakebite before age 70 is about 1 in 250, but notably higher in some areas.[7]

Hands and feet were the most common site of bite due to walking bare feet and working in the flooded fields with poor visibility and without protective gears leads to more chances of victims bitten by snake and the same was also noticed by earlier researchers.[15,17,23] Most of the snake bite marks in general are seen as punctured wounds which could be either two or one in number or sometimes seen as scratch marks depending on various factors like obstacle with clothing etc. It is pertinent to mention that for the identification of the species the number of puncture wounds must be related to the number of teeth, which is unfortunately not the same in all kinds of snakes. Different species of snakes can have different anatomical conformation of the teeth and fangs.[24] In the current study also, 89% of victims having visible fang marks had single set of fang marks, however, there were 14.5% of victims where the fang marks were absent which is occasionally seen in cases of krait bite.

Careful examination of the site of bite showed typical dermal or skin lesions such as oedema, cellulitis, erythema, blisters, rash or punctate haemorrhage. Dark discolorations related to the snake bites are also reported due to the bleeding into the skin, however, histopathological examination of the bite site is also endorsed to see for vital reaction and other local changes.[24] Subcutaneous haemorrhages are pretty common at the puncture skin site along with skin necrosis caused by the snake venom components. In the present study also, swelling and cellulitis was the commonest finding as compared to subcutaneous haemorrhage. Snakebite is unvaryingly an accident and was noticed in the current study also. As like accident, it can be avoided in many cases, so timely precautions can avoid the risk of snakebites. Public should be made aware of such preventive measures by educating about the local snakes, their likely dwellings, at what times of year, at what times of day or in what kinds of weather they are most likely to be active.[25]

Limitation of the study is first the small sample size. Others is that we haven't included the cases who survived after the treatment of snakebite, clinical picture during time of admission of snake bite victims, histopathological findings of different organs during autopsy of such cases, timing of snake bite and factors affecting their prospects of survival.

Conclusion :

Snakebite affected mainly the people residing in rural areas doing agricultural activities mostly. 21-30 years age group and male sex were most vulnerable whereas people more than 50-60 years are less affected. Snakebite cases were not consistent throughout the year, with most cases occurring during monsoon season. Public awareness programmes are necessary to prevent the victims from being taken initially to local traditional healers and so that the crucial first few hours can be utilized by giving appropriate care at tertiary healthcare facilities. Farmers should be encouraged to use protective gears while farming and preventive measures such as avoiding tall grassy areas, keeping storage areas clear of rodents, garbage, raising beds above floor level, avoiding areas known to be infested with snakes, covering all limbs while working outdoors, can be advised to the people along with the improvement of rural healthcare facilities.

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ORIGINAL ARTICLE

Impact of Lockdown on Autopsy Cases in a Tertiary Medical Centre in Northern India: A Retrospective Analysis

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Abstract :

2020 will be remembered not only for the COVID-19 pandemic but also for introducing some entirely new concepts like "lockdown" and "social distancing" which brought the entire world to a standstill. Lockdown approach can have a wide range of implications not just on the economy but also on the physical, mental and social well-being of the people. We investigated the impact of 78 days nationwide lockdown in 2020 on profile of the post-mortem cases being brought for autopsy to the mortuary of King George's Medical University, Lucknow, India. Further 78 days of post lockdown period in 2020 were also included in the study and compared with the corresponding time periods in 2019. A total of 3657 cases were included in the study, 2042 in 2019 and 1615 in 2020. Adjusted odds ratios (aOR) with 95% confidence intervals (CI) from logistic regression modeling were used to compare the mortality due to different causes across the four study time-periods.

Deaths due to RTAs were significantly lower in the lockdown period (aOR = 0.59, CI 0.48, 0.73, p<0.001). An increase in deaths due to drowning (aOR = 2.27, CI 1.26, 4.11, p=0.007) and hanging (aOR = 1.56, CI 1.22, 2.18, p=0.008) was detected during the lockdown period compared to 2019 while odds of burn deaths were half (aOR=0.50, 95%CI 0.34, 0.75, p=0.001) during the lockdown period in 2020, compared to the equivalent period in 2019. We have shown significant differences in deaths due to different causes as a result of lockdown. An insight into these mortality patterns during the pandemic could be beneficial in future preparedness for the containment measures.

Keywords : COVID-19; SARS-CoV-2; Autopsy; Lockdown; Mortality.

Introduction :

The deadly coronavirus disease 2019 (COVID-19), caused by SARS-CoV-2, is ravaging human lives across the globe with an estimated 15,55,06,494 confirmed cases, including 32,47,228 deaths worldwide, as on May 06, 2021.[1] India has reported an alarming 21,491,598 confirmed cases and 234,083 deaths[1] so far and these figures continue to rise further. Countries and the governments resorted to different measures to control the spread of infections in 2020 when the virus first struck. The national response to COVID-19 pandemic in India was a nationwide complete lockdown extending from March 24 to June 8, 2020 in a phased manner. The lockdown involved staying within homes, domestic and international travel restrictions, and termination of all private and public events. Similar lockdown strategies have been imposed by leaders of many different countries in order to halt the rapid transmission of the disease.[2] As there was enough evidence about person-to-person transmission of the virus, this strategy was aimed at reducing the number of infections, and thereby mitigate the hospital case load and subsequently the number of deaths.[3] Unlike some European countries, India was quick to enforce an immediate and mandatory lockdown along with its international border closure, which was appreciated by leading health organisations including WHO (World Health Organisation) as "tough and timely".[4] Although it is now established that lockdown significantly reduces the active case load[5,6] sudden enforcement of the lockdown in March, 2020 by the government led to mass inter-state movement of the migrant population causing a national crisis, along with sudden closure of all businesses which had adverse effects on the economy.[6-8] A sudden and long-term suspension of all routine activities can lead to a variety of implications at individual and population level. Besides, many physical and mental health issues could also be anticipated due to self-isolation, depression, stress, and loss of livelihood.[9,10] This study aims to analyse the impact of lockdown on profile of cases being brought for autopsy in an attempt to explore the impact of lockdown on mortality in a metropolitan Indian city.

Aims & Objectives : To analyse the profile and characteristics of the cases referred for autopsy during lockdown 2020 versus the cases during the equivalent period in 2019.

To compare the profile and characteristics of cases referred for autopsy during lockdown 2020 versus post lockdown 2020

Materials and Methods:

We collected data from the mortuary of King George's Medical University of all the cases brought in for autopsy, as warranted in a medico-legal investigation. Information pertaining to the date of death, cause of death, and other demographic details of the decedents was taken. Data was obtained for the period of complete lockdown extending from March 24, 2020 to June 08, 2020 (78 days). Data for the post lockdown period was collected for exactly 78 days (June 09, 2020 to August 25, 2020) to observe any change in pattern of cases after the lockdown was lifted. This

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Table 1 : General characteristics of autopsies conducted.

	2020		2019				
Autopsies conducted	Lock-down (n=632)	Post-lock-down (n=983)	Lock-down equi-valent	Post-lockdown equi-valent (n= 1103)	Total in 2020 (n= 1615)	Total in 2019 (n= 2042)	Total (n= 3657)
Daily Average	8.1	12.6	12.0	14.1	10.4	13.1	11.7
Gender							
Males	478 (75.6)	771 (78.4)	726 (77.3)	852 (77.2)	1249 (77.3)	1578 (77.3)	2827 (77.3)
Females	154 (24.4)	212 (21.6)	213 (22.7)	251 (22.8)	366 (22.7	464 (22.7)	830 (22.7)
Mean age (years)	38.8	36.6	36.7	37.9	37.4	37.4	37.4
Age category							
Fetus	6 (0.9)	5 (0.5)	1 (0.1)	4 (0.4)	11 (0.7)	5 (0.2)	16 (0.4)
<10 yrs	10 (1.6)	10 (1.0)	20 (2.1)	25 (2.3)	20 (1.2)	45 (2.2)	65 (1.8)
10 to <20 yrs	55 (8.7)	106 (10.8)	70 (7.5)	99 (9.0)	161 (10.0)	169 (8.3)	330 (9.0)
20 to <30 yrs	139 (22.0)	244 (24.8)	257 (27.4)	257 (23.3)	383 (23.7)	514 (25.2)	897 (24.5)
30 to <40 yrs	127 (20.1)	215 (21.9)	206 (21.9)	243 (22.0)	342 (21.2)	449 (22.0)	791 (21.6)
40 to <50v yrs	112 (17.7)	183 (18.6)	174 (18.5)	190 (17.2)	295 (18.3)	364 (17.8)	659 (18.0)
50 to <60 yrs	94 (14.9)	121 (12.3)	114 (12.1)	134 (12.1)	215 (13.3)	248 (12.1)	463 (12.7)
60 to <70 yrs	61 (9.7)	72 (7.3)	60 (6.4)	90 (8.2)	133 (8.2)	150 (7.3)	283 (7.7)
70 to <80 yrs	22 (3.5)	22 (2.2)	29 (3.1)	44 (4.0)	44 (2.7)	73 (3.6)	117 (3.2)
80 yrs	12 (1.9)	10 (1.0)	9 (1.0)	21 (1.9)	22 (1.4)	30 (1.5)	36 (1.0)

Figures represent actual numbers with column percentages in parentheses except daily average (mean daily average) and mean age (mean age in years)

data for 2020 was compared to the corresponding time periods in 2019 (lockdown equivalent: March 24, 2019 to June 08, 2019 and post lockdown equivalent: June 09, 2019 to August 25, 2019). Specific definitions were used to assign cause of death, in accordance with the post-mortem guidelines followed at King George's Medical University, Lucknow. All reported cases were assigned one of the 11 categories of cause of death.

Continuous variables were reported as means with standard deviation (SD) and categorical variables were reported as numbers and percentages. Comparison of cause of death in different time-periods was done using odds ratios (OR) from logistic regression modelling. Foetal deaths and deaths due to other causes were excluded from the regression analyses due to small numbers. Crude OR represented the results of univariate regression while adjusted OR represented logistic regression modelling, adjusted for age and gender. All statistical analyses were performed using Stata v15.1 with 2-sided significance at 0.05. The study was approved by Institutional ethics committee, King George's Medical University, Lucknow, India.

Table 2 : Distribution of the causes of death among autopsies conducted

	2020		2019				
Autopsies conducted	Lock-down (n=632)	Post lock-down (n=983)	Lock-down equi-valent (n=939)	Post lockdown equivalent (n=1103)	Total in 2020 (n= 1615)	Total in 2019 (n= 2042)	Total (n= 3657)
Cause of death							
Burn	41 (6.5)	31 (3.2)	107 (11.4)	71 (6.4)	72 (4.5)	178 (8.7)	250 (6.8)
Chronic lung disease	45 (7.1)	48 (4.9)	43 (4.6)	48 (4.4)	93 (5.8)	91 (4.5)	184 (5.0)
Drowning	27 (4.3)	51 (5.2)	20 (2.1)	38 (3.4)	78 (4.8)	58 (2.8)	136 (3.7)
Electrocution	0 0	15 (1.5)	8 (0.9)	21 (1.9)	15 (0.9)	29 (1.4)	44 (1.2)
Firearm Injury	0 0	2 (0.2)	6 (0.6)	10 (0.9)	2 (0.1)	16 (0.8)	18 (0.5)
Hanging	80 (12.7)	152 (15.5)	85 (9.1)	92 (8.3)	232 (14.4)	177 (8.7)	409 (11.2)
Homicidal Asphyxia	5 (0.8)	9 (0.9)	4 (0.4)	2 (0.2)	14 (0.9)	6 (0.3)	20 (0.5)
Multiorgan involvement	46 (7.3)	69 (7.0)	36 (3.8)	100 (9.1)	115 (7.1)	136 (6.7)	251 (6.9)
Road traffic accidents	266 (42.1)	440 (44.8)	517 (55.1)	565 (51.2)	706 (43.7)	1082 (53.0)	1788 (48.9)
Others	12 (1.9)	7 (0.7)	11 (1.2)	8 (0.7)	19 (1.2)	19 (0.9)	38 (1.0)
Cause not known	110 (17.4)	159 (16.2)	102 (10.9)	148 (13.4)	269 (16.7)	250 (12.2)	519 (14.2)

Figures represent actual numbers with column percentages in parentheses

Results:

Distribution of deaths : A total of 3657 cases were included in the study, 2042 in 2019 and 1615 in 2020. The cases represent autopsies conducted across four time periods in 2019 & 2021. There were 632 cases during the lockdown period and 983 cases during the post-lockdown period in 2020. During the equivalent period in 2019, there were 939 and 1103 cases respectively. The general characteristics of the autopsies conducted across the four time periods including age distribution of the cases is shown in Table 1. Mean age of the cases was 37.4 (standard deviation 16.2) years. 77.3% of the cases overall were males with similar distribution across the four time periods. The daily average during the lockdown period was 8.1, while that for the equivalent period in 2019 was 12.0.

Road traffic accident (RTA) was the leading cause of death, accounting for 49% of the total deaths reported (Table 2). The proportion of deaths due to chronic lung diseases, drowning and hanging were higher in 2020, when compared to 2019. No deaths were reported from electrocution and firearm injury during the lockdown period. A specific cause of death could not be ascertained in about 14% of the reported cases. Other causes included deaths due to cerebro-vascular accidents, infected pancreas, peritonitis, placenta previa, poisoning and snake bite along with stillbirths. There were significant differences in deaths

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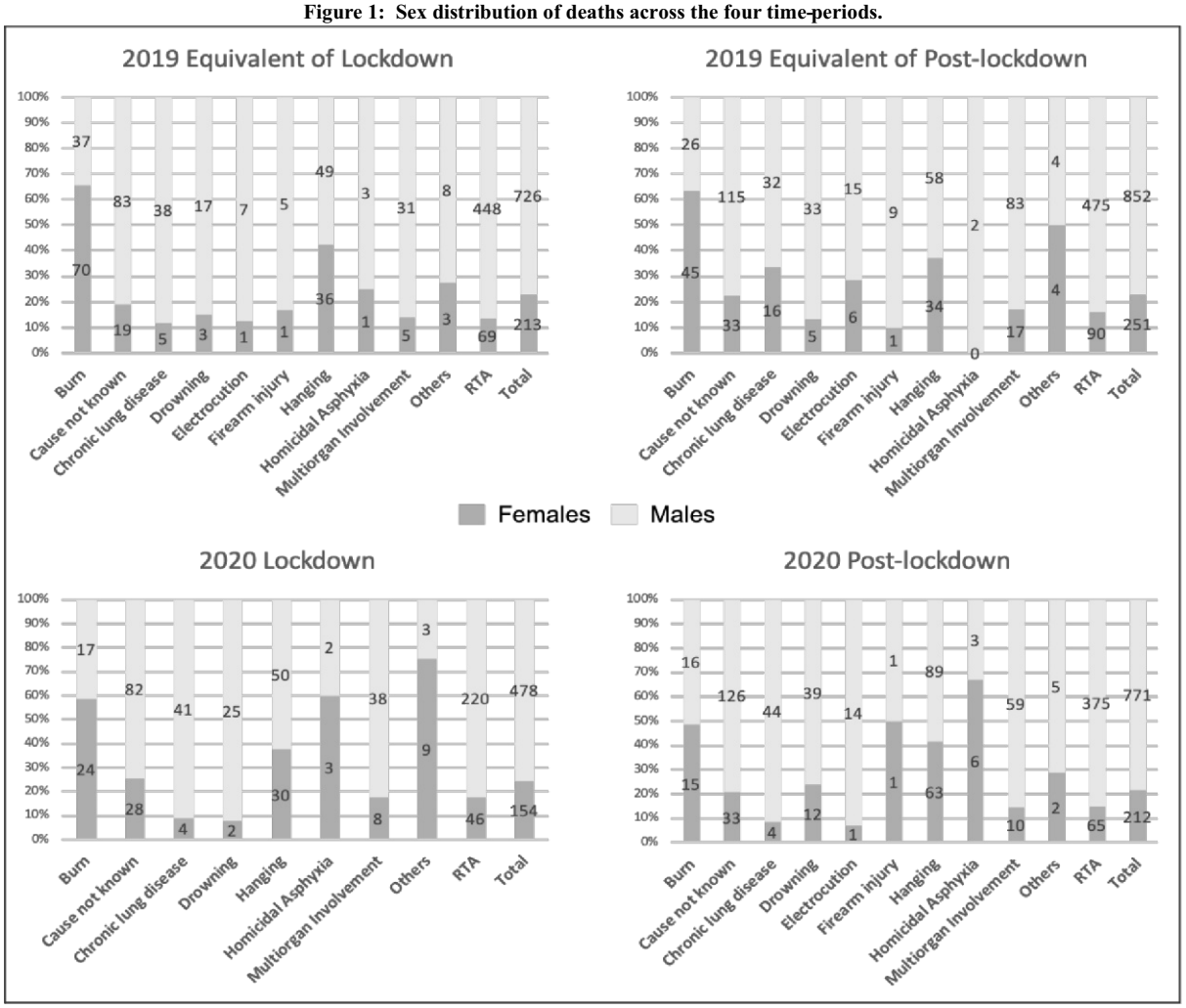
Figure 1: Sex distribution of deaths across the four time-periods.



Figures on the individual columns represent actual number of deaths in females and males; Total deaths in 2019 equivalent of lockdown (n=939), 2019 equivalent of post-lockdown (n=1103), 2020 lockdown (n=632) & 2020 post-lockdown (n=983).

Table 3: Comparison of autopsies in lockdown period in 2020 and equivalent period in 2019.

Cause of death	Crude OR	95% CI	p - value	Adjusted OR	95% CI	p-value
Burn	0.54	0.37 – 0.79	0.001*	0.50	0.34 – 0.75	0.001*
Chronic lung disease	1.61	1.05 – 2.48	0.030*	1.46	0.94 – 2.28	0.093
Drowning	2.07	1.15 – 3.72	0.015*	2.27	1.26 – 4.11	0.007*
Hanging	1.47	1.06 – 2.03	0.020*	1.56	1.22 – 2.18	0.008*
Homicidal Asphyxia	1.88	0.50 – 7.03	0.348	1.87	0.50 – 7.02	0.352
Multiorgan involvement	1.99	1.27 – 3.11	0.003*	1.89	1.20 – 2.97	0.006*
Road traffic accidents	0.60	0.49 – 0.74	<0.001*	0.59	0.48 – 0.73	<0.001*
Cause not known	1.75	1.31 – 2.34	<0.001*	1.73	1.29 – 2.31	<0.001*

* 2-sided significance at p<0.05; OR represents odds ratios comparing deaths during lockdown period (Mar-Jun 2020) to the deaths in the equivalent period of lockdown in 2019 (Mar–Jun 2019: reference group); crude OR is the unadjusted odds ratio while adjusted OR is the odds ratio after adjusting for age and gender; 95% CI: 95%.

Table 4: Comparison of autopsies in lockdown period in 2020 and post-lockdown period in 2020.

Cause of death	Crude OR	95% CI	p - value	Adjusted OR	95% CI	p - value
Burn	2.14	1.33 – 3.45	0.002*	2.16	1.33 – 3.51	0.002*
Chronic lung disease	1.50	0.99 – 2.28	0.058	1.33	0.86 – 2.05	0.200
Drowning	0.82	0.51 – 1.32	0.413	0.89	0.55 – 1.43	0.622
Hanging	0.80	0.59 – 1.07	0.125	0.81	0.60 – 1.09	0.166
Homicidal Asphyxia	0.87	0.29 – 2.60	0.799	0.81	0.27 – 2.44	0.706
Multiorgan involvement	1.05	0.71 – 1.54	0.824	0.98	0.67 – 1.46	0.939
Road traffic accidents	0.90	0.74 – 1.11	0.326	0.90	0.73 – 1.11	0.318
Cause not known	1.10	0.84 – 1.43	0.492	1.10	0.84 – 1.44	0.485

* 2-sided significance at p<0.05; OR represents odds ratios comparing deaths during lockdown period (Mar-Jun 2020) to the deaths in the post-lockdown in 2020 (Jun-Aug 2020: Reference Group); Crude OR is the unadjusted odds ratio while adjusted OR is the odds ratio after adjusting for age and gender; 95% CI: 95% confidence interval.

Table 5 : Comparison of autopsies in post-lockdown period in 2020 and equivalent period in 2019.

Cause of death	Crude OR	95% CI	p - value	Adjusted OR	95% CI	p - value
Burn	0.47	0.31–0.73	0.001*	0.45	0.29–0.71	<0.001*
Chronic lung disease	1.13	0.75–1.70	0.558	1.39	0.91–2.15	0.130
Drowning	1.54	1.00–2.36	0.050	1.51	0.98–2.32	0.061
Electrocution	0.80	0.41–1.56	0.512	0.78	0.40–1.53	0.477
Firearm Injury	0.22	0.05–1.02	0.053	0.22	0.05–1.00	0.050
Hanging	2.01	1.53–2.65	<0.001*	2.07	1.56–2.75	<0.001*
Homicidal Asphyxia	5.09	1.10 –23.64	0.038*	5.43	1.16–25.38	0.031*
Multiorgan involvement	0.76	0.55–1.04	0.090	0.82	0.59–1.15	0.251
Road traffic accidents	0.77	0.65_0.92	0.003*	0.76	0.64_0.91	0.002*
Cause not known	1.25	0.98–1.59	0.074	1.24	0.98–1.58	0.079

*2-sided significance at p<0.05; OR represents odds ratios comparing deaths during post-lockdown period (Jun-Aug 2020) to the deaths in the equivalent period of post-lockdown in 2019 (Jun-Aug 2019: reference group); crude OR is the unadjusted odds ratio while adjusted OR is the odds ratio after adjusting for age and gender; 95% CI: 95% confidence interval.

Table 6 : Comparison of autopsies in 2020 and 2019.

Cause of death	Crude OR	95% CI	p - value	Adjusted OR	95% CI	p - value
Burn	0.49	0.37–0.65	<0.001*	0.46	0.34–0.62	<0.001*
Chronic lung disease	1.32	0.98–1.77	0.070	1.38	1.01–1.87	0.041*
Drowning	1.74	1.23–2.47	0.002*	1.78	1.26–2.52	0.001*
Electrocution	0.65	0.35–1.22	0.184	0.66	0.35–1.24	0.194
Firearm Injury	0.16	0.04–0.69	0.014*	0.16	0.04–0.70	0.014*
Hanging	1.78	1.50–2.30	<0.001*	1.85	1.50–2.30	<0.001*
Homicidal Asphyxia	2.98	1.14–7.77	0.026*	3.01	1.15–7.86	0.024*
Multiorgan involvement	1.08	0.84–1.40	0.560	1.09	0.84–1.42	0.517
Road traffic accidents	0.69	0.61–0.79	<0.001*	0.68	0.60–0.78	<0.001*
Cause not known	1.44	1.20–1.74	<0.001*	1.44	1.20–1.74	<0.001*

*2-sided significance at p<0.05; OR represents odds ratios comparing deaths in 2020 (Mar-Aug 2020) to the deaths in the equivalent period in 2019 (Mar–Aug 2019: reference group); Crude OR is the unadjusted odds ratio while adjusted OR is the odds ratio after adjusting for age and gender; 95% CI: 95% confidence interval.

among males and females due to different causes (Figure 1). Burn deaths were more common in females throughout all four periods. However, we detected a comparatively higher proportion of female deaths due to homicidal asphyxia in 2020 compared to 2019. While deaths due to RTA decreased in the two study periods in 2020 compared to 2019, there was a comparative increase in deaths due to hanging in 2020 compared to 2019.

Lockdown period in 2020 vs equivalent period in 2019 : Compared to the equivalent period in 2019, chances of death due to burns in the lockdown period were half (adjusted Odds Ratio, aOR=0.50, 95% confidence interval, CI=0.34, 0.75, p=0.001) (Table 3). There were higher odds of death due to drowning (aOR = 2.27, CI 1.26, 4.11, p=0.007) and hanging (aOR = 1.56, CI 1.22, 2.18, p=0.008) while odds of death due to RTAs were significantly lower (aOR = 0.59, CI 0.48, 0.73, p=<0.001) in the lockdown period, compared to the equivalent period in 2019.

Lockdown period in 2020 vs post-lockdown period in 2020 : There were no significant differences in the odds of deaths due to different causes in the lockdown period when compared to the post-lockdown period, except for deaths due to burns which were significantly higher during the lockdown period (aOR = 2.16, CI 1.33, 3.51, p=0.002) (Table 4).

Post-lockdown period in 2020 vs equivalent period in 2019 : Comparison of the deaths in the post-lockdown period to the equivalent period in 2019 showed lower odds of death due to burns (aOR = 0.45, CI 0.29, 0.71, p=<0.001) during the post-lockdown period in 2020 and a significantly higher odds of death due to hanging (aOR = 2.07, CI 1.56, 2.75, p=<0.001) as well as homicidal asphyxia (aOR = 5.43, CI 1.16, 25.38, p=0.031) (Table 5). Odds of death due to RTAs remained lower (aOR = 0.76, CI 0.64, 0.91, p=0.002) in the post-lockdown period in 2020 compared to 2019.

2020 (both lockdown and post lockdown period) vs 2019 : When compared to the deaths in 2019, the odds of death due to burns and RTAs in 2020 (both lockdown and post-lockdown period) were found to be significantly lower (aOR = 0.46, CI 0.34, 0.62, p=<0.001; aOR = 0.68, CI 0.60, 0.78, p=<0.001 respectively) (Table 6). Deaths due to firearm injuries also had lower odds (aOR = 0.16, CI 0.04, 0.70, p=0.014) in 2020 when compared to 2019. In contrast, odds of death due to chronic lung diseases (aOR=1.38), drowning (aOR=1.78), hanging (aOR=1.85) and homicidal asphyxia (aOR=3.01) were found to be higher in 2020, compared to 2019.

Discussion:

The current study was done on the autopsies conducted in a tertiary medical institution based in one of the densely populated cities of India, with an intent to compare the distribution of cause of deaths during the lockdown and the post-lockdown period which happened in India in 2020 due to the ongoing COVID-19 pandemic. We observed an overall lower proportion of deaths in 2020 (~44%) compared to 2019 (~56%), which was clearly attributed to the restricted movement of the population in 2020, after the pandemic hit. The study has highlighted a significant decline in the deaths due to burns and transport accidents and a rise in deaths due to drowning, hanging and multiorgan involvement during the lockdown period compared to the equivalent period in 2019.

Spread of COVID-19 pandemic in India and worldwide occurred swiftly, giving a very short time for the governments to react appropriately. With limited data available on the potential spread and routes of infection of SARS-CoV-2, different strategies were adopted for containment of the virus and halt the spread of the deadly disease. Practices like social distancing, use of face-masks and regular hand-washing were implemented and soon became

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popular.[16-20] One of such measures adopted to curb the rapid transmission of the virus in the population was 'lockdown', a term synonymous with forced and emergency closure. Lockdown initially referred to intentional closure of all business activities, educational institutions & recreational facilities. Later, as the pandemic evolved, different national and state governments opted for total or partial lockdown, depending on the severity of the situation[6,21-23] Lockdown approach, though very successful in reducing the spread of virus in the community, led to an altogether new set of problems including, but not limited to, loss of economy due to closure of all businesses, social and religious restrictions causing resentment and obvious health issues due to home confinement like depression, anxiety and obesity to name a few.[24-26] Nevertheless, people were still dying due to different causes and it became imperative to investigate the impact of lockdown on cause of death.[3] Our study has shown the association of lockdown and post lockdown period in 2020 on different causes of death being reported in a tertiary institute in India.

Burn related injuries or deaths in India occur either at workplace or home. Household deaths due to burns have been predominantly reported in females and are either suicidal or homicidal while at workplace, burn related cases are accidental, usually affect males and restricted to injuries, rarely deaths.[27-29] Confinement to homes and restricted mobility could be clearly attributed to lower workplace related accidental deaths due to burns while constant presence of other family members in the premises could be attributed to lower suicidal and even homicidal deaths during the lockdown period, compared to the equivalent 2019 period. Similar rationale would apply to the lower odds of deaths due to burns in 2020, compared to 2019. However, we observed a higher odds of burn deaths in the lockdown period compared to post-lockdown period and this could be attributed to higher suicidal tendencies during lockdown which might have alleviated as the restrictions on home-confinement were lifted and social interactions among the community gradually commenced.

Several studies have shown an association between epidemics and increased suicidal tendency.[30,31] The impact of lockdown on mental health has also been a concern for global policy makers.[32-36] Social isolation, anxiety, stress, fear of contagion may exacerbate or develop suicidal ideation in not only vulnerable individuals or individuals with preexisting psychiatric disorders but also front-line health workers which would explain the surge in drowning and hanging deaths during the lockdown period, compared to equivalent period in 2019. This would also explain the higher odds of drowning as well as hanging deaths in the year 2020, compared to 2019. Our study also showed elevated odds of hanging deaths in the post lockdown period in 2020, compared to equivalent period of 2019 which could be attributed to availability of secluded space and lesser interference by family members, compared to lockdown period.

In this study, we found that lockdown implementation was associated with a sudden reduction in deaths related to transport accidents. While the number of transport accidents vary from year to year or even season to season, the variation occurring during the study period in 2020 and equivalent periods in 2019 could clearly be attributed to reduction of mobility and transit on roads.

Huge upsurge in homicidal asphyxia was noticed in the post lockdown period in 2020 when compared the equivalent period in 2019. This increase could be attributed to various reasons ranging from unemployment post lockdown or the release of undertrial or convicted prisoners to decongest prisons due to fear of spread of the virus.[37-39]

Significant reduction in deaths due to firearm injuries in 2020 compared to 2019 could also be due to lesser occurrence of crime during the pandemic since the entire population was facing the brunt and occupied with coping mechanisms and self-survival, rather than being involved in a crime. A significantly higher odds of death due to chronic lung diseases were reported during the lockdown period, compared to 2019 equivalent. Adjusting for age and sex, this association lost significance but remained significantly higher for overall comparison of deaths due to chronic lung disease in 2020, compared to 2019. Reasons for significant increase in deaths due chronic lung diseases during the pandemic period could include poor management due to clinical similarities with COVID-19, delays in seeking treatment, lesser use of invasive investigations by physicians to avoid spread of infection and poor adherence to treatment.[40] Additionally, poor access to rehabilitation therapies and minimal physical activity may also have exacerbated the symptoms in patients with chronic disease leading to higher deaths. Few of these factors could also be responsible for significantly higher deaths due to multiorgan involvement during the lockdown period, compared to 2019 equivalent.[41] It is important to understand that in medicolegal autopsies, most cases have an unknown history of past illness. Gross examination of organs is followed by histopathological examination to ascertain the specific cause of death. However, due to the nature of our study (non-interventional, record based cross-sectional study examining the impact of lockdown on mortality), we have not corroborated the findings of the histopathological examination and the categorisation is based on gross examination only.

Limitations of this study include limited data availability of the reported deaths, particularly occupation, socio-economic status, educational level and specific geographical residence of the deceased. Besides, the current analysis could only be possible for medico-legal deaths requiring post-mortem examination as mandated by the law in India. In addition, our study findings are based on the mortality data from a metropolitan city in North India. Due to differences in economic, socio-cultural and behavioral practices in different regions within India and globally, one has to cautious and mindful when generalizing the findings to other populations. Lastly, it was not possible to validate the case-definitions for every cause of death and hence the definitions might have some variability.

Strength of this study includes comparison of deaths across four different time periods which has allowed us to unravel the mortality pattern and explore the relationship between lockdown and socio-behavioral factors affecting human lives. We have shown the impact of lockdown approach on mortality data and provided an insight into the short and long-term implications of

this measure on the society. With the COVID-19 pandemic showing no signs of withdrawal anytime soon, the findings of this study would help in better planning and management of future lockdown measures. Preparedness for the impending deaths, particularly those associated with suicidal intent, could be avoided by timely interventions while implementing a lockdown. In addition, health care systems could be established in advance to cater to the impending deaths due to certain specific causes and redesigned to meet with any special requirements. While this study demonstrates the pattern of deaths in a North Indian setting during the current pandemic and highlights the impact of lockdown, further research is warranted to investigate all potential factors influencing mortality during different phases of a pandemic.

Conclusion :

This is first study highlighting impact of lockdown as well as post lockdown period on the number of deaths due to various causes with a significant difference. While deaths due to RTA decreased in the two study periods in 2020 compared to 2019, there was a comparative increase in deaths due to hanging in 2020 compared to 2019. Additional the odds of death due to chronic lung diseases, drowning, hanging and homicidal asphyxia were found to be higher in 2020, compared to 2019. An insight into these mortality patterns during the pandemic could be beneficial in future preparedness for the containment measures.

Declarations:

Ethical Approval and consent to participate :

The study was approved by Institutional ethics committee, King George's Medical University, Lucknow, India. Ref. code: 109th ECM IIA/P1 Need for consent was waived.

Consent for publication : Not applicable.

Availability of data and material : The data set generated and analyzed during the current study are not publicly available due to legal restrictions.

Competing interests : The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Author's Contributions : SR- Designed the study, drafted the article. AY analysed and interpreted the data, drafted the article. SK did the critical revision of the article. VS collected the data. AKV - conceptualised the study. All authors reviewed the final manuscript.

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List of abbreviations : COVID-19 – Corona Virus Disease 2019

SARS-CoV-2 – Severe acute respiratory syndrome coronavirus 2

WHO – World Health Organisation

SD – Standard Deviation

OR – Odds ratio

aOR – Adjusted Odds ratio

RTA – Road traffic accident

CI – Confidence Interval

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ORIGINAL ARTICLE

Study of Lip Prints Patterns as an Aid for Gender Determination in South Indian Population

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Abstract :

Lip print patterns varies among individuals hence this study aimed to identify the gender of an individual using lip print patterns and to evaluate the predominant lip print pattern in males and females in Mysorean population. Lip prints of 395 subjects (195 male and 200 female) of Mysorean population origin were included in the study. Red coloured lipstick and cellophane tape was used to collect the lip prints sample. The current study has found most frequent lip pattern type was Type I in 177 (44.8%) subjects followed by Type IV pattern in 115 (29.1%), Type II in 95 (24.1%) and Type III in 8 (2.0%) was least common pattern seen in overall subjects. In males, most frequent patterns seen was (Type IV) in 66 (33.8%) subjects followed by (Type I) in 64 (32.8%), (Type II) in 58 (29.7%), (Type III) in 7 (3.6%) subjects. In females most frequent patterns seen was (Type I) in 113 (56.6%) subjects followed by (Type IV) in 49 (24.5%), (Type II) in 37 (18.5%) and (Type III) in 1(0.5%). The study group comprised of 195 males and 200 females 73 were correctly determined as males and 150 were correctly determined as females. Type I is the most predominant pattern found in Mysorean population and lip prints are reliable tool for recognition of the gender of an individual.

Keywords : Cheiloscopy; Lips; Identification; Lip Prints.

Introduction :

Identifying individuality of a person is of paramount importance in any medico-legal investigation. It may be complete (absolute or positive), or incomplete (partial or possible).[1] Identification is required in cases such as insurance, pension and inheritance claims, marriage, disputed Gender, missing persons, absconding criminals, persons accused of assault, rape, murder, etc., impersonation and interchange of babies in hospitals.[2] Race, Gender, Age, Complexion, Hair, Anthropometry, Dactylography, Foot prints, Deformities, Scars, Tattoo marks, Occupation marks , Handwriting, Speech and Voice, Gait, Ticks, Mannerisms and Habits, Mental Power, Memory and Education, DNA profile are various feature and characteristic used for identification.[3] Among these methods, Dactylography and DNA profiling are the best, most accurate methods of identification. However even they have their disadvantages. The majority of the fingerprints at a scene of crime are insufficient smudges or fragmentary prints of dubious value and DNA matching requires body material containing nucleated cells to be left at the scene of crime, in order to compare it with a suspect's DNA. This is not possible in every case and very expensive investigation procedure.[4]

Therefore identity cannot always be conclusively established by one particular method. In instances where the more common modes of identification fail to be of use, other methods gain significance. One of these is cheiloscopy, also known as queiloscopy. It is the study of the furrows or grooves present on the red part, or the vermilion border of the human lips.[5]

The importance of cheiloscopy is linked to the fact that lip prints are unique to one person, except in monozygotic twin. Like finger prints and palatal rugae, lip grooves are permanent and unchangeable. It is possible to identify lip patterns as early as the sixth week of in uterine life. Lip prints are unique and do not change during the life of a person. It has been verified that they recover after undergoing alterations like trauma, inflammation and diseases like herpes and that the disposition and form of the furrows does not vary with environmental factors. In fact, only those pathologies that damage the lip subtract like burns, seem to rule out cheiloscopic study.[6]

In a crime scene investigation, lip prints can link a subject to a specific location if found on clothes or other objects, such as glasses, cups or even cigarette butts. Lip prints in the form of lipstick smears are frequently encountered in forensic science laboratories as one of the most important forms of transfer evidence.[7]

The present study aims to provide a deeper insight into the subject and has focused on the Gender variability in the lip print pattern of homogeneous groups of Mysore that is to evaluate the predominant lip print pattern in males and females and to identify the gender of an individual using lip print patterns.

Materials and Methods :

The present research study was conducted in the department of oral medicine and radiology, J.S.S. dental college and hospital,

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JSS university, Mysore, Karnataka. It was designed to ascertain whether the lip prints behold the potential for identification of Gender of an individual and to determine the most predominant lip patterns in relation to a specific gender.

The study subjects were taken from out patients visiting the department of oral Medicine and Radiology, J.S.S. Dental college and hospital, JSS university, Mysore. The study group comprised of 420 subjects, who were selected by simple random sampling.

Inclusion criteria: Age range: 15-55 years, subjects with absolute normal transition zone between the mucosa and the skin, lips free from any pathology.

Exclusion criteria: Subjects with any malformation, deformity of lips, subjects with any trauma or scar on the lips, subjects with any active or passive lesions on the lip, individuals with known hypersensitivity to lip sticks.

Materials were used in the conduct of the study were: Lakme lipstick red shade 353, 3M scotch transparent cellophane tape of width 1.8 Inches, scissors, A-4 size white paper and magnifying lens.

Ethical clearance was obtained from the Institutional Ethical Review Board (REF NO: JSS/ACP/Ethical/2012-13).

After obtaining consent and recording their bio data, dark colored lipstick was applied evenly on the vermillion border of the lips with a single stroke evenly on the lips. The subjects were asked to rub both the lips to evenly spread the applied lip stick. Over the lip stick, the glued portion of cellophane tape strip was placed and the subject were asked to make a lip impression in the normal rest position of the lips by dabbing in the canter first and then pressing it uniformly towards the corner of the lips.

The cellophane strip was stuck to the white paper for permanent record purpose and then visualized by magnifying lens. The lip prints obtained were coded, while noting the name and gender of the respective individuals. The lip prints were given to an independent examiner for analysis who is not aware of the subjects.

The middle part of the lower lip (10 mm wide) was taken as area of study in accordance with Sharma et al,[8] since this part of the lip is almost always visible in any trace. The number of lines and furrows, their length, branching and combinations were noted.

In this study we had followed the classification of pattern of the lines on the lips proposed by Suzuki and Tsuchihashi, as quoted by Sharma et al,[8]

Type I: Clear- cut vertical grooves that run across the entire lips.

Type I': Similar to type I, but do not cover the entire lip.

Type II: Branched grooves.

Type III: Intersected /Criss-cross pattern

Type IV: Reticular grooves.

Type V: Undetermined, grooves do not fall into any of the types and cannot be differentiated morphologically.

The Gender of the individual shall be determined as per the descriptions given by Vahanwala et. al.[9]

Type I, type I', and type II pattern dominant: Female

Type III and type IV pattern dominant: Male

All the lip prints obtained were studied and interpreted by the examiner to determine the dominant pattern and identify Gender of the subjects.

Entire data of the study was entered in Microsoft excel 2007 version and the results were evaluated for their statistical significance & specificity.

Results :

The study sample comprised of 420 subjects. 420 lip prints were taken, out of which 25 were discarded due to poor quality. Final sample consisted of 395 lip prints in which 195 were of males and 200 of females. The results were obtained; data were tabulated and subjected to statistical analysis.

Lip Patterns: Frequency of lip pattern occurrence in overall population - Type I (Complete vertical) pattern was seen in 177 (44.8%) subjects followed by Type IV (Reticular) pattern in 115 (29.1%) subjects, Type II (Branched) pattern in 95 (24.1%) and Type III (Intersected) pattern in 8 (2.0%) least common pattern seen in overall subjects and Type I' (Incomplete vertical) pattern, Type V (Undetermined) pattern were not found. (Table 1)

Chi square test was done to determine statistical difference between lip patterns. Significant difference was found between lip patterns and actual gender where x^2=148.220.

Distribution of lip patterns in males : Out of 195 males, most

Table 1 : Frequency of lip pattern occurrence in overall population.

Types of lip prints pattern	Frequency	Valid Percentage
Complete vertical(Type I)	177	44.8%
Branched (Type II)	95	24.1%
Intersected (Type III)	08	2.0%
Reticular (Type IV)	115	29.1%
Total	395	100.0%

Table 2 : Determined gender and actual gender correlation.

Determined Gender		
Gender determined as Males	123	31.2%
Gender determined as Females	272	68.8%
Total	395	

Table 3 : Determined gender and actual gender correlation.

		Actual Gender		Total
		Males	Females	
Determined Gender	Males	73(59.3%)	50(40.7%)	123 (31.2%)
	Females	122(44.9%)	150(55.1%)	272(68.8%)
Total		195(49.4%)	200(50.6%)	395

Table 4 : Validity of identified gender.

	Males	Females		
Correctly determined	73	37.4%	150	75%
Wrongly determined	122	62.6%	50	25%
Actual Gender	195		200	

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frequent patterns seen was Reticular pattern (Type IV) in 66 (33.8%) subjects followed by Complete vertical pattern (Type I) seen in 64 (32.8%) subjects, Branched (Type II) was seen in 58 (29.7%) subjects and Intersected pattern was seen in (Type III) 7 (3.6%) subjects.

Chi-square test was done to determine statistical difference between lip patterns. Significant difference was found between lip patterns and males where x^2=48.385.

Distribution of lip patterns in Females : Out of 200 females most frequent patterns seen was Complete vertical pattern (Type I) in 113 (56.6%) subjects followed by Reticular pattern (Type IV) seen in 49 (24.5%) subjects, Branched pattern (Type II) was seen in 37 (18.5%) subjects and Intersected pattern (Type III) was seen in 1(0.5%) subject.

Chi-square test was done to determine statistical difference between lip patterns. Significant difference was found between lip patterns and females where x^2=130.800.

Gender Determination : Out of 395 subjects, 123 (31.2%) were determined as males and 272 (68.8%) were determined as females based on lip print patterns proposed by vahanwala[9] (Table 2)

A total number of 123 (31.2 %) subjects were determined as males out of which 73 (18.5%) were correctly determined as males but 50 (12.7%) subjects who were actually females were wrongly determined as males

A total number of 272 (68.8%) subjects were determined as female out of which 150 (37.9%) were correctly determined as female but 122 (32.9%) who were actually males were wrongly determined as females (Table 3, Figure 1).

Chi-square value found out to be 7.121 which is statistically significant and proper gender association was found between determined gender and actual gender (p =.008) (Table 3, Figure 1)

Validity of identified gender : Out of 195 male subjects, 73 (37.4%) were correctly determined as males and 122 (62.6%) who were actually males determined as females.

Out of 200 female subjects, 150 (75%) were correctly determined as female and 50 who were actually females were determined as males (Figure 1, Table 4).

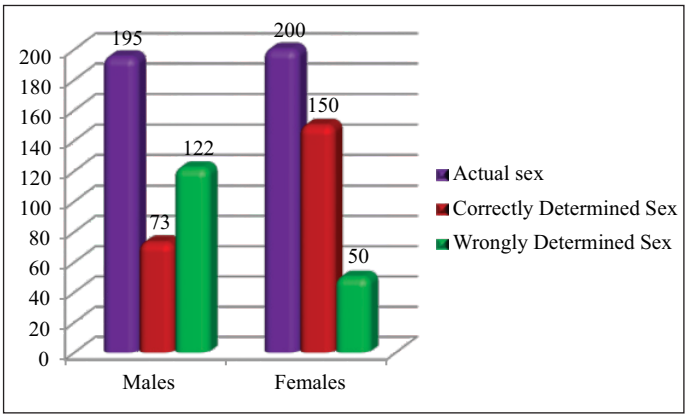

Figure 1 : Determined gender and actual gender correlation

Discussion :

Human identification is a mainstay of civilization, and the identification of unknown individuals has always been of paramount importance to the society. Identification of any individual - living or dead is based on the theory that all individuals are unique.[10] When an unidentified body or a trace is found it is assumed that it could be anybody. By classifying the individuals into groups (e.g. age, Gender, race, height), the identification possibilities are narrowed. The more unique the characteristic, the smaller the group becomes. As more unique characteristics are noted, the comparison group becomes smaller until it reaches unity. The positive identification of living or deceased person using the unique traits and characteristics of the teeth and jaws is a corner stone of forensic science.[11]

One common problem that is encountered during the cheiloscopic studies is that of smudging or spoiling of lip prints leading to unidentifiable marks.[12,13] In our study, 25 subjects lip prints were spoilt, maximum being in males which could be attributed to the presence of prominent facial hair among men. Lip print recording is technique-sensitive and can be altered due to any debris on the lip surface, application of a thick layer of lipstick and overstretching of cellophane tap.

Lip Patterns Distribution : Based on the classification proposed by Suzuki and Tsuchihashi, different types of lip patterns were interpreted.

In the present study complete vertical (type I) pattern was predominant and was seen in 44.8% followed by reticular pattern (type IV) 29.1%, branched pattern (type II) was seen in 24.1% and intersected pattern (type III) was the least with 2.0%. Incomplete vertical (type I') and Undetermined (type V) patterns were not found.

The results of our study correlates with studies done by Randhawa et al[14], Sandhu et al[15], Bajracharya D et al[16] where they found type I pattern was most predominant.

However the results of our study does not correlates with the various Indian studies done by Shivapathsundaram et al,[17] where they studied lip patterns of Indo Dravidian population and found that intersected (type III) (41.33%) pattern was predominant and least common pattern was reticular pattern (type IV) (10.7%). Saraswathi et al[13] studied lip pattern in Kanpur, Uttar Pradesh population, where they found that type III (intersecting pattern) was most common pattern among males and females with 39.5% and 36.5% respectively. Augustine et al[18] ,Verma.K et al[19] studied lip pattern in Aurangabad, Maharashtra and Harayana respectively where they found that type III pattern was most predominant in both males and females. Narang et al[20] studied lip pattern in Amritsar, Punjab population where they found that type III pattern was predominant (22.8%) followed by type I (26.6%), type I' (16%), type IV (11.6%) and type III (9.2%.,%). Gondivkar et al[10] studied lip patterns in Maharashtra population and concluded that type II (28.59%) pattern was most predominant followed by type III (27.89%), type I (19.29%), type I' (12.8%) , type IV (9.6%). Verghese et al,[21] Patil et al[22] studied lip pattern in Kerala and North Karnataka population respectively where they found that type IV pattern was predominant. Jain A A et al[23]

studied lip patterns in Gujarat population and found that most predominant pattern was type I' and type IV was least common

The reason for Non- correlation of our study with other Indian studies could be lip pattern reveals a population wise dominance and a particular population will show predominance of a particular lip pattern type.

Lip pattern as an aid in gender determination : In the present study, lip prints were classified using the classification proposed by Suzuki and Tsuchihashi[6] and gender determination was done according to vanhanwala.[9] In which type I, I', II lip patterns were consider as females and type III, IV and V lip patterns were considered as males.

In this study 73 (18.5%) males and 150(37.9%) females were identified of their Gender properly, but 50 (12.7%) females were identified as males and 122 (30.9%) males were identified as females. Statistics showed a significant association for lip patterns in males and females and can be used for gender identification.

Results of the present study correlated with studies done by Vanhanwala et al,[9] in which type I and type I' were found to be dominant in females while type III and IV patterns were dominant in males and also in other study by Sharma et al[8] studied lip prints of 40 individuals (20 males and 20 females) showed lip prints can be used for gender identification. Vijay et al[24] studied lip prints for gender identification. Lip prints showed Genderural dimorphism out of 50 subjects, 14 and 21 subjects were correctly identified as male and female respectively. Satyanarayana et al[25] studied lip prints of 40 (20 males and 20 females) participants. 17 and 18 subjects were correctly identified as males and females respectively which showed high level of accuracy of lip prints in gender determination. Studies by Sharma et al,[26] Rohit et al,[27] Bajpai et al[28] Kinra et al,[29] Xu et al,[30] Adamu et al[31] Karki et al[32] were also able to identify Gender based on lip patterns.

However results of our study did not correlate with studies conducted by Sandhu et al[15] in which 106 students comprised 56 males and 50 females were taken and the middle part of the lower lip was taken as study area and found that there is no statistical difference between males and females in lip pattern types.

In Obik et al[33] studied, lip prints of 600 subjects (257 male and 343 female) middle part of the lower lip was taken as study area and was found that there was no statistically observed difference between male and female in individual lip print types.

The results of the present study do not coincide with the above observations; this may be due to variations in geographical areas and ethnicity of the subjects recruited.

Conclusion :

The present study is able to convey that lip prints behold the potential of determination of the gender. As the table of accuracy of determining gender reveals that the female subjects were almost identified correctly about 75% out of 200 subjects. The accuracy percentage fell in identification of the males. This we reasoned out as variant types in the lower middle one third lip quadrant made decision making for the researchers difficult. Only about 37.4% were correctly identified as males out of 195 subjects. The most frequent lip pattern type in the Mysorean population is Type I pattern (complete vertical) 177 (44.8%) subjects followed by Type IV (Reticular) pattern in 115 (29.1%) subjects, Type II (Branched) pattern in 95 (24.1%) and Type III (Intersected) pattern in 8 (2.0%) least common pattern seen in overall subjects.

In males, most frequent patterns seen was Reticular pattern (Type IV) in 66 (33.8%) subjects followed by Complete vertical pattern (Type I) seen in 64 (32.8%) subjects, Branched (Type II) was seen in 58 (29.7%) subjects and Intersected pattern was seen in (Type III) 7 (3.6%) subjects. In females most frequent patterns seen was Complete vertical pattern (Type I) in 113 (56.6%) subjects followed by Reticular pattern (Type IV) seen in 49 (24.5%) subjects, Branched pattern (Type II) was seen in 37 (18.5%) subjects and Intersected pattern (Type III) was seen in 1(0.5%) subject.

Various studies have shown that the patterns formed reveal a population wise dominance, that is, a particular population will show predominance of a particular lip pattern type. Lip prints are unique for every person and show differences according to race and the ethnic origins of a person and is also a reliable tool for recognition of the gender of an individual.

Conflict of Interest :

The Authors declares that there is no conflict of interest.

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ORIGINAL ARTICLE

Knowledge and Practices regarding the Health insurances and Out-Of-Pocket Payments (OOPs) in Patients Suffering Cardiovascular Disease (CVD) and Cerebrovascular Accident (CVA) in Tertiary Health Centers of Central India

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Abstract :

Cardiovascular diseases and cerebrovascular accidents are leading cause of mortality among middle aged and older adults in India. It includes risk factors like tobacco consumption, hypertension, diabetes, obesity, unhealthy diet, alcohol consumption and socioeconomic deprivation. Moreover, stroke mortality is observed to be rising in rural compared to urban areas.

Healthcare costs in India are rising and hence there is an increase in the cost of healthcare system to the extent that specialized care is beyond the reach of every common man. Health insurance provides important and necessary changes to the current health care system and potentially improve system efficacy by helping patients to receive tertiary health care. Hence it is of utmost importance for the people of rural India to have knowledge regarding the health insurances and out-of-pocket payments (OOPs) and especially patients suffering cardiovascular disease (CVD) and cerebrovascular Accident (CVA).

The sample will be collected from the two selected cities of central India selected for the study (viz, Nagpur and Amravati). Two corporate hospitals were selected; one from each district was taken under consideration. A total of 77% of the total population suffered from OOPE (Out of pocket expenditures) where the savings, property, financial assistance from relative/friend or community organization etc. are utilized for paying for the hospital expense. This shows that the population in our region needs to be made aware about the health care expenses and the coping mechanisms in order to prevent out-of-pocket expenditures.

Keywords : Health awareness; Cardiovascular awareness; Public awareness; cardiovascular mortality; Cerebrovascular accident.

Introduction :

In 2013-14 about 2.72% of total GDP is spent on the house-hold expenditure, and about 67.74% of this accounts for total health expenditure. Out of pocket expenditures constitutes about 94.79% of total health expenditures which equates to about Rs. 2, 90,932 crores. [1]

Out of pocket (OOP) expenditure in India is over 60% which leads to nearly 6 million families getting into poverty due to catastrophic health expenditures. The expenses that the patient or the family pays directly to the health care provider, without a third-party (insurer, or State) is known as Out of Pocket Expenditure (OOP). These expenses could be medical as well as nonmedical expenditure. With the incidence of population aging, the proportion of NCDs such as cerebrovascular stroke and cardiovascular diseases continue to rise.

In the year 2015, prevalence of CVD was about 422.7 million globally. Ischaemic heart disease and cerebrovascular disease (stroke) together have accounted for more than 85.1% of all cardiovascular disease deaths in 2016. Also, NCD such as cardiovascular diseases like coronary artery disease, hypertension, and congestive heart failure and cerebrovascular diseases such as stroke are often chronic, requiring long-term treatment and resulting in long periods of disability.[2]

The financial burden of poor health can be diminished when most health-related expenditure is covered by insurance. However, over 75% of health expenditure in India is out-of-pocket expenditure.[3]

Materials and Methods:

Study settings: The sample will be collected from the two selected cities of central India selected for the study (viz, Nagpur and Amravati). Two corporate hospitals were selected; one from each district was taken under consideration.

Type of Study : Cross sectional study

Study participants: Patients affected by cardiac disease (CVD, IHD, Stroke), and hospitalized for more than 24 hours in the selected hospital.

Inclusion criteria : Patient affected by Cardiac disease (CVD, IHD, Stroke)

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Hospitalized in the IPD of the selected hospital

Exclusion criteria : Not willing to participate in the study

Not willing to give informed consent

Patient affected with another health condition

Sampling procedure : Simple random sampling

Sample size : An arbitrary sample of 100 was taken, i.e. 50 respondents per hospital in each city were taken for the study.

Data collection : It was a cross-sectional study.

The patients affected with cardiovascular disease (CVD) will be randomly selected.

The first relatives of the patients were interviewed with regards to the hospital arrival, hospital expense, awareness with regards to health insurance and whether the patient is insured or not etc.

The data was collected using the structured questionnaire.

Observations :

The total sample size was 100. Fifty respondents were selected from Amravati and fifty respondents were selected from Nagpur cities. The differential diagnosis of the patients included is as shown in the Table No.1 below.

Socio economic status and demographic profile and response of the participant and physician are shown in Table number: 2 . The

Table 1 : Showing differential diagnosis of the patients.

R.No.	Variable	CVDn (%)	CVAn (%)	CHFn (%)	Total n (%)	P value
1	Amravati	20 (40.00)	22 (44.00)	8 (16.00)	50 (50.00)	0.9629
2	Nagpur	18 (36.00)	24 (48.00)	8 (16.00)	50 (50.00)	

value of R is significant showing positive correlation ($p<0.0001$)

Results :

Out of the total study population, 65% population was aware of the hospital expense, while 35% was not aware. The family members (first contact persons) of 65% population was able to identify the emergency condition while 35% population were not able to identify the urgency of the situation.

The first care consultation was provided by family physicians (14%), private practitioner (39%), government hospital (21%) and super-specialty hospitals (26%) of the total patients.

The time lapse between the identification of symptoms and availability of medical care was 38% (0 to 30 minutes), 45% (30 to 60 minutes) and 16 % (1 to 3 hours). 61% that of study population was diabetic and was on regular medications, while, 78% was hypertensive but only 61% was taking regular medications.

Awareness of health insurance was 75% among the study population, but out of it only 31% was insured for health. Out of the total un-insured population, a part of them 23% population believed that health insurance is not needed, while health insurance was non-affording for 46% of the population.

Discussion:

Several countries have been producing and using National health

Table 2 : Showing demographic profile.

Sr. no.	Variable	CVD	CVA	CHF	Total	P value
1	Identification Of Emergency					
	Yes	26 (40.00)	31 (47.69)	8 (12.31)	65 (65.00)	0.4054
	No	10 (33.33)	14 (46.67)	6 (20.00)	30 (30.00)	
	Cannot Say	2 (40.00)	1 (20.00)	2 (40.00)	5 (5.00)	
2	First Care Consultation					
	Family Physician	6 (42.86)	7 (50.00)	1 (7.14)	14 (14.00)	0.1363
	Private Practitioner	18 (46.15)	13 (33.33)	8 (20.51)	39 (39.00)	
	Government Hospital	9 (42.86)	8 (38.10)	4 (19.05)	21 (21.00)	
	Super-Specialty Hospital	5 (19.23)	18 (69.23)	3 (11.54)	26 (26.00)	
3	Time Lapse					
	Within 30 Minutes	16 (42.11)	15 (39.47)	7 (18.42)	38 (38.00)	0.2585
	Within 60 Minutes	18 (40.00)	20 (44.44)	7 (15.56)	45 (45.00)	
	1 To 3 Hours	4 (25.00)	11 (68.75)	1 (6.25)	16 (16.00)	
	More Than 3 Hours					
4	Diabetes					
	Yes	23 (37.70)	27 (44.26)	11 (18.03)	61 (61.00)	0.822
	No	15 (38.46)	19 (48.72)	5 (12.82)	39 (39.00)	
5	Diabetes Medications					
	Not Applicable	15 (40.54)	18 (48.65)	4 (10.81)	37 (37.00)	0.3923
	Yes	21 (34.43)	28 (45.90)	12 (19.67)	61 (61.00)	
	No	2 (100.0)	0	0	2 (2.00)	
6	Hypertension					
	Yes	28 (35.90)	36 (46.15)	14 (17.95)	78 (78.00)	0.6186
	No	10 (45.45)	10 (45.45)	2 (9.09)	22 (22.00)	
7	Hypertension Medications					
	Not Applicable	12 (48.00)	11 (44.00)	2 (8.00)	25 (25.00)	0.0657
	Yes	24 (39.34)	24 (39.34)	13 (21.31)	61 (61.00)	
	No	2 (14.29)	11 (78.57)	1 (7.14)	14 (14.00)	

Accounts (NHA) as a resource tracking tool to track the flow of health care resources from various sources to the users of these resources in a specified framework, for a given period of time. NHA provides answers to questions like "who is financing health care?"; "who is receiving it?" and "for what purpose it is being utilized?" In India, Out Of Pocket Expenditure (OOPE)[4]

The increasing prevalence of cardiac diseases in the younger age groups is a highly significant finding in this study. Also, the prevalence is greater in the upper middle class population that suggests that affluence and associated lifestyle may be a causative factor attributable to cardiac morbidity.[5]

The prevalence of cardiac diseases was greater in rural populations suggests that the prevalence is increasing in the rural populations, contrary to the belief that the lifestyle diseases affect the urban populations alone. Also, it may be due to the greater

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drain of cardiac patients from rural to urban areas. Also, the prevalence was greater among the educated and upper middle class populations.[6]

The results of Global Burden of Disease study state age-standardized CVD death rate of 272 per 100000 population in India which is much higher than that of global average of 235. CVDs strike Indians a decade earlier than the western population.[7]

There is an increasing trend for reversal in the socioeconomic gradient for cardiovascular disease, with the poor and less educated having equal and sometimes higher, the burden of CVD, and its risk factors.[8] Research in this domain manifests that women with cardiovascular disease (CVD) are screened and treated less than males and are less likely to undergo cardiac procedures.[9]

The study shows that there is adequate awareness of health insurance. Despite this, a large proportion of population is not insured for health. Health insurance was non-affording for majority of the populations, while a part of populations believed that health insurance is not needed. A huge proportion of population suffered from OOPE (Out of pocket expenditures) leading to impoverishments.

Conclusion :

A total of 77% of the total population suffered from OOPE (Out of pocket expenditures) where the savings, property, financial assistance from relative/friend or community organization etc are utilized for paying for the hospital expense.

This shows that the population in our region needs to be made aware about the health care expenses and the coping mechanisms in order to prevent out-of-pocket expenditures. Out of the total study population, only one-thirds of them were insured (cashless and reimbursement), while a large proportion two-thirds of them were not insured for health. The need and benefits health insurance are not clear to our populations, and that the use of health insurance practices should be emphasized as a regular practice.

Recommendations :

Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol using population wide strategies. Interventions for modifying risk factors and implementation of therapeutic strategies for prevention of cardiac diseases is needed. The role of healthcare systems in reducing the global burden of CVD and improving cardiac care is needed. Also, awareness campaigns for regular health check-ups and the needed care for patients with existing co-morbidities need to be emphasized.

Health awareness campaigns regarding the onset, risk factors, symptoms and immediate actions for identifying cardiac conditions in the community should be undertaken. So importance of golden hour (0 to 60 min) first hour for saving the life of the patient is very crucial and the same should be emphasized and made aware to the community.

The need and benefits health insurance are not clear to our populations, and that the use of health insurance practices should be emphasized as a regular practice.

Limitations :

Due to a small sample size, the findings cannot be generalized to larger population groups.

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ORIGINAL ARTICLE

A Study on Awareness of the POCSO Act, 2012 Amongst the Parents of Teenage Children in South Bengaluru

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Abstract :

Child sexual abuse (CSA) is one of the nation's utmost serious and distressing challenges. Thousands of girls and boys from different age ranges are being sexually abused in their homes, school, playgrounds, public places and in the so called "safe places". Knowledge and perceptions regarding the same are as decisive and significant as the legal provisions available in India towards restricting the child sexual abuse and securing the childhood. The purpose of the present questionnaire-based study was conducted to gauge the knowledge and the awareness amongst parents of teenage children regarding the Protection of children from sexual offences Act 2012 as the parents play a very important role during the formative age of the children and in our study, it was revealed that even though 95.3% parents were significantly aware of the child sexual abuse, only 68% were aware of the POCSO act 2012 and the punishments prescribed and its amendments. The results of the study hint at the grave reality of lack of awareness among parents regarding the act however, what is relieving here is that, at the least the parents are aware of the concept of child sexual abuse and its consequences. The current scenario calls for the requirement of plentiful resources on awareness and application of child abuse prevention, public responsiveness and positive parenting.

Keywords : Child sexual abuse; Formative age; Gender neutral; POCSO; Parents; Recent advances in Forensic Medicine.

Introduction :

Although we are living in a refined and revolutionary world of the 21st century, refined and revolutionary in a hopeful way; violence against children, particularly Child Sexual Abuse (CSA), is a remorseless human misfortune that is still too widespread in the community.

As per the definition of child sexual abuse given by WHO, it is the involvement of a child in sexual activity that he or she does not fully comprehend, is unable to give informed consent to or for which the child is not developmentally prepared cannot give consent.[1]

Every year more than 3 million reports of child abuse are made in the United States child abuse statistics and facts.[2] According to research by Leiden University and TNO (Netherlands Organization for Applied Scientific Research) carried out in the last decade, every year an estimated 119,000 children experience sexual abuse in some forms.[3] The child sexual abuse involving physical, mental and emotional abuse of a child is widespread across India, impacting children of all ages, socio-economic strata and gender. They are abused by family members and acquaintances. However, many cases of child sexual abuse are being unnoticed and are not reported due to the fear of consequences, lack of information to file a complaint or due to ignorance. According to the World Health Organization, one in every 4 girls and one in every 7 boys is sexually abused worldwide.[1] As per Childline India Organization the child abuse was on the rise with 4,507,424 calls from children and concerned adults made in 2014 - 2015 in India.[4] The 2007 National assessment conducted by the ministry of Women and Child Development authenticates that 57% of boys have experienced one or more forms of sexual abuse. Highest sexual abuse was reported in Assam (57.27%) followed by Delhi (41%), Andhra Pradesh (33.87%) and Bihar (33.27%).[5]

Protection of Children against Sexual offences Act was passed by the Parliament of India in 2012, and thereafter it was amended in 2019. The necessity for a new-fangled law arose as a result of various lacunae in the existing laws during those days. POCSO primarily deals with the defilement of child rights specifically where their sexual dignity is compromised.

The protection of children against sexual offences Act, 2012 defines a child as any person below the age of 18 years. POCSO Act covers gender neutrality, unnatural sexual offences and is considered as non-compoundable offences.[6]

The types of sexual offences that are included under the POCSO act 2012 are (i) penetrative sexual assault, (ii) aggravated penetrative sexual assault, (iii) sexual assault, (iv) aggravated sexual assault, (v) sexual harassment, (vi) using child for pornographic purpose and (vii) trafficking of children for sexual purpose. The act provides for rigorous punishment, which has been graded as per the gravity of the offence. The punishment ranges from simple to rigorous imprisonment of varying periods with or without fine. An offence is treated as "aggravated" when committed by a person in position of trust or authority of a child

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such as a member of armed or security forces, police officer, or public servant.[4]

The Protection of Children from sexual offences (amendment) Bill, 2019 was passed with amendments in the punishment especially for child pornography, penetrative and aggravated penetrative sexual offences.[5]

As per National Commission for Protection of Child Rights (NCPCR), the role of parents is to teach their children about boundaries with respect to kinds of touch, the reliable circle, teach the child to say 'NO', work on building self-confidence.[7]

Parents and guardians must understand their responsibilities to teach their children how to protect themselves from predators before they leave home to attend school or camp or hang out with friends. Parents need to recognize that the accountability to communicate this critical information belongs only to them and no one else. Other appropriate adults can emphasize, and be supportive to the parental process, but the fair amount of responsibility rests on the parents.

This study was primarily aimed to understand regarding the awareness of child sexual abuse amongst parents of school going children.

Methodology :

After obtaining clearance from the Institutional Ethics Committee, a questionnaire-based study will be conducted amongst the parents of children in South Bengaluru. A semi structured questionnaire was framed and was validated by two validators, following which distributed amongst 384 parents after briefing them through Microsoft team meet about the purpose of the study. A detailed consent form for participation was attached along the questionnaire. The questionnaire was sent to both mothers and fathers through a shared google form link. Appropriate statistical tests were applied using SPSS software for the analysis of the results obtained.

Inclusion criteria : 1. Parents of children between the age group of 10 years to 18 years of age.

2. Both mothers and fathers, single parents, divorced parents, will be involved in the study.

Exclusion criteria : 1.Parents of children below the age group of 10 years of age.

Sample size: 384 Parents (inclusive of both mothers and fathers), out of which 252 were mothers and 132 were fathers.[6]

Sampling : Purposive sampling

Sample size calculation : The prevalence of sexual abuse amongst children in a previous study done by Charak et al in 2015 was 48%.[8] The sample size was calculated using this as the expected prevalence.

$N = (1.96)^2 * 0.48*0.52/ (0.05)^2$

$= 383.5$

$= 384$

384 was the calculated sample size for this study.

Table 1 : Sociodemographic profile.

Characteristic		Number	Percentage
Parent	Father	132	34.4
	Mother	252	65.6
Number of children	One	254	66.1
	Two	110	28.6
	Three or more	20	5.2
Age	18-24	101	26.3
	25-34	102	26.6
	35-44	129	33.6
	45-54	41	10.7
	>55	11	2.9
Education	High school	8	2.1
	PUC/class 12	43	11.2
	Bachelor's degree	189	49.2
	Master's degree	71	18.5
	Professional	73	19
Socioeconomic class	Lower class	6	1.6
	Lower middle class	63	16.4
	Upper middle class	268	69.8
	Upper class	47	12.3
Area of residence	Rural	37	9.6
	Urban	347	90.4

Table 2 : Assessment of knowledge, attitude and practices about child sexual abuse amongst parents.

Characteristics	Grade	Number	Percentage
Knowledge	Good	364	94.8
	Poor	20	5.2
Attitude	Positive	365	95.1
	Negative	19	4.9
Practices	Favourable	277	72.1
	Unfavourable	107	27.9

Results :

Table 1 shows that a total of 384 parents participated in the study, which included 252 mothers and 132 fathers. Most parents had only one child at the time of the study. Most of the parents were aged between 35-44 (33.6%), and had a bachelor's degree (49.2%). Majority of the study subjects were belonging to the upper middle-class category of Socio-economic status (69.8%). The study participants were mostly residing in an urban area (90.4%).

Table 2 Adequate knowledge about child sexual abuse was found in 94.8% (364) of the study participants. 95.3% of the study subjects were aware about child sexual abuse, whereas only 68% of them were aware about POCSO. About 79.7% of the parents were aware about the types of child sexual abuse. Most parents (94.3%) were aware that there are social organizations for fighting child sexual abuse. Most parents (95.1%) had the correct attitude towards child sexual abuse with most of them agreeing that the child was not at fault (98.2%) and that it is the duty of the parents to educate the children regarding sexual abuse (71.4%). Most parents had favorable practices (72.1%), with 66.1% of the parents having taught the children about private parts, 70.6% of the parents having taught the children about good and bad touch. The children had been taught to inform parents about any abuse by 79.4% of the parents, whereas 86.7% of the children were taught not to interact with strangers. Only 34.9% of the children were provided books regarding child sexual abuse.

Table 3 establishes the association between knowledge of the

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Table 3 : Association of sociodemographic characteristics and knowledge regarding child sexual abuse.

Characteristics		Adequate knowledge	Inadequate knowledge	chi square value	p value
Parent	Father	121	11	3.979	0.043
	Mother	243	9		
Number of children	One	242	12	1.064	0.689
	Two	104	6		
	Three or more	18	2		
Socio-economic class	Lower class	6	0	6.501	0.07
	Lower middle class	56	7		
	Upper middle class	255	13		
	Upper class	47	0		
Age	18-24	119	10	5.907	0.166
	25-34	97	4		
	35-44	100	2		
	45-54	37	4		
	55 and above	11	0		
Education	High school - till 10th	8	0	10.156	0.025
	Secondary school-till 12th	37	6		
	Bachelors degree	179	10		
	Masters degree	71	0		
	Professional degree	69	4		
Area of residence	Rural	30	7	15.59	0.001
	Urban	334	13		

parents and the sociodemographic characteristics showed that the parent (0.043), the education level of the parent (0.025) and the area of residence (0.001) were seen to be significantly associated with knowledge of the parent.

Table 4 demonstrates the association of attitude and sociodemographic characteristics showed that socioeconomic status (0.005) and educational level of the parent (0.0001) were found to be significantly associated with the attitude of the parent towards child sexual abuse.

Table 5 determines the association between sociodemographic characteristics and the practices of the parents to prevent child sexual abuse showed that the sex of the parent (0.0001), socioeconomic class (0.008) and educational level of the parent (0.0001) were found to be significantly associated with favorable practices by the parents.

Discussion:

In our study it was revealed that even though 95.3% parents were significantly aware of the Child sexual abuse, only 68% were aware of the POCSO act 2012 and its amendments. However, it was relatively better than the study done by Shruti et al which could be accredited to the pluralistic nature of the present research population.[9] To improve the awareness on POCSO act and significantly reduce the incidents of CSA, we have given some recommendations on the later part of the article.[6]

The POCSO Act 2012 defines a child as any person below 18 years of age, and regards the best interests and well-being of the child as being of supreme importance at every stage, to ensure the healthy physical, emotional, intellectual and social development of the child. The lack of awareness than expected, among the parents' hint at the enormity of the state and further need to

Table 4 : Association of sociodemographic characteristics and attitude regarding child sexual abuse.

Characteristics		Positive attitude	Negative attitude	chi square value	p value
Parent	Father	124	8	0.530	0.621
	Mother	241	11		
Number of children	One	245	9	3.415	0.139
	Two	102	8		
	Three or more	18	2		
Socio-economic class	Lower class	6	0	11.725	0.005
	Lower middle class	54	9		
	Upper middle class	258	10		
	Upper class	47	0		
Age	18-24	121	8	5.842	0.171
	25-34	98	3		
	35-44	99	3		
	45-54	36	8		
	55 and above	11	0		
Education	High school - till 10th	4	4	20.566	0.0001
	Secondary school-till 12th	39	4		
	Bachelors degree	185	4		
	Masters degree	68	3		
	Professional degree	69	4		
Area of residence	Rural	33	4	2.993	0.098
	Urban	332	15		

Table 5 : Association of sociodemographic characteristics and practices to prevent child sexual abuse.

Characteristics		Good Practice	Poor Practice	chi square value	p value
Parent	Father	80	52	13.302	0.0001
	Mother	197	55		
Number of children	One	192	62	4.797	0.093
	Two	73	37		
	Three or more	12	8		
Socio-economic class	Lower class	4	4	11.325	0.008
	Lower middle class	38	25		
	Upper middle class	205	63		
	Upper class	32	15		
Age	18-24	89	40	9.456	0.051
	25-34	70	31		
	35-44	78	24		
	45-54	35	6		
	55 and above	5	6		
Education	High school - till 10th	6	2	34.312	0.0001
	Secondary school-till 12th	15	28		
	Bachelors degree	148	41		
	Masters degree	55	16		
	Professional degree	53	20		
Area of residence	Rural	24	13	1.077	0.335
	Urban	253	94		

sensitise them. 68% of the parents were not cognizant of the chastisement prescribed for various offences described under the POCSO Act 2012. The act provides protection for children from sexual violence which includes sexual assault, sexual harassment and child pornography.

Few of the punishments listed under POCSO Act of 2012, amended to the latest developments of sexual offences against children in August 2019.

I. Penetrative sexual assault (Sec 3) on a child-not less than 7 years which may extend to imprisonment for 10 years of life (PSA in a child less than 16 years), and fine (Sec 4).[5]

ii. Adding a note on the causes of death of the child assault and during a natural calamity or in any situation of violence, the aggravated penetrative sexual assault (Sec 5), not less than 20 years which may extend to imprisonment for life and fine or with death sentence (Sec6). Sexual Assault (Sec 7) that is without penetration not less than 3 years which may extend to 5 years and fine. (Sec 8) Aggravated sexual assault (Sec9) by a person in authority -not less than 5 years which may extend to 7 years and fine (Sec 10).[5]

iii. Sexual harassment of the child (Sec 11) 3 years and fine (Sec 12).[5]

iv. Use of child for pornographic purposes (Sec 13) 5 years and fine and in the event of subsequent conviction, seven years and fine (Sec 14).[5]

Even though a vast percentage of parents (95.1%) had the correct attitude towards child sexual abuse and with most of them agreeing that the child was not at fault (98.2%), combatively lesser strength believed that it is their duty to educate the children regarding sexual abuse (71.4%). Most parents had favorable practices (72.1%), with 66.1% of the parents having taught the children about private parts, 70.6% of the parents having taught the children about good and bad touch. The children had been taught to inform parents about any abuse by 79.4% of the parents, whereas 86.7% of the children were taught not to interact with strangers.

Conclusion :

Our study is first of its sort which was aimed to assess the awareness of parents of teenage children on POCSO Act. It exposed that most of the parents are oblivious of the POCSO Act.

Parents have a crucial role to recognize child sexual abuse and provide long term support to the survivors. Parents should communicate to their children that they should be assertive in order to protect the always against abductions and misuse. A multi-faceted, multi-organisational-team and multi-staged tactic including access to psychosocial care has to be provided to deliver all-inclusive care for survivors of child sexual abuse.

Recommendations: 1. Both parents and children have to be exposed to online and offline modes to encourage them to know about their rights and the laws available for their protection.

2. More and more group discussions, panel discussions need to be arranged to educate and create awareness among the parents, teachers and the children.

3. Awareness campaigns, skits, drama, short movies using the social media can go on a long way.

4. Help line numbers have to be developed so that the children and parents and easily reach out without hesitation.

5. Create more awareness about already existent helpline numbers.

6. Encourage parent-children loving and friendly environment.

Limitations of our study : Our study was conducted in a cosmopolitan city with most of the parents who are educated and belong to upper middle class and higher class. This population represents only a part of Indian Population. Thus, it's not the representation of complete Indian Population. Such studies have to be extended to the rural population and uneducated classes and evaluate their knowledge, and awareness and work towards improving the awareness of available legal resources which ultimately can reduce the incidents of CSA.

Ethical Clearance : Obtained from the Institutional Ethics Committee.

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ORIGINAL ARTICLE

A Study of Burn Death Cases of Rural Areas of Ranchi Conducted at RIMS, Ranchi, Jharkhand: A Postmortem Study

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Abstract :

Burn injury is one of the most common cause of unnatural deaths worldwide. Survival after occurrence of burn injury has drastically increased in past decades especially in developed countries. Though both males and females may be victims of burn, females are more susceptible as they are more involved in household activities. Often the manner of burn is closed in mystery and unreliable statements, the reason behind this may be domestic, personal, occupational or social tragedy and more recently dowry deaths.

Keywords : Burn, Married, Household, Flame, Urban.

Introduction :

Burn injuries are dry thermal injuries caused due to contact with raw heat such as flame, radiant heat or some heated solid substances like metal or glass or due to some situations of electrocution and lightning to the body surface.[1] Burn deaths have remarkable medico-legal significance as it can be considered amongst most common causes of unnatural deaths in our country. Burn injuries rank among the most severe types of injuries suffered by the human body with high mortality and morbidity rate.[2] Burn injuries and their sequels pose a public health problem. Every year it was found that burns caused by fire were responsible for about 2,65,000 deaths globally.[3] The problem of death due to burns in developing countries like India is primarily due to various socio-cultural factors prevalent in the country. Some of these factors include poor housing conditions, poor maintenance of electrical appliances, and customs of wearing dresses like saree or dupatta, practice of dowry, illiteracy level and poverty. The precise numbers of burn incidence is very much difficult to arrive due to large population and lack of incident reporting. The aim and objectives of this research work is to find out reasons of death due to burns in rural areas and also suggesting measures to prevent burn injury.

Materials and Methodology :

The present study was carried out in the department of Forensic Medicine and Toxicology, RIMS, Ranchi, Jharkhand. The materials for the present study were dead body brought for medico-legal autopsy from various police stations of Ranchi district at the Forensic Medicine department of RIMS, Ranchi, Jharkhand.

Observations and Results :

During this study period 296 deaths were due to burn. Out of the 296 cases, 260 cases were from rural areas and 36 cases were from urban areas. The observations on various aspects were recorded and are being presented in the form of various tables.

Table 1 : Gender wise distribution.

Gender	No. of cases	Percentage
Male	60	23
Female	200	77
Total	260	100

Table 2 : Age wise distribution.

Age in years	Male		Female	
	No.	Percentage	No.	Percentage
0-10	3	5	2	1
11-20	4	6.7	4	2
21-30	15	25	140	70
31-40	28	46.7	28	14
41-50	3	5	12	6
51-60	5	8.3	6	3
>60	2	3.3	8	4
Total	60	100	200	100

Table 3 : Socioeconomic status.

Socioeconomic status	Male		Female	
	No.	Percentage	No.	Percentage
Upper	8	13.3	10	5
Middle	10	16.7	12	6
Lower	42	70	178	89
Total	60	100	200	100

Table 4 : Education wise distribution.

Education	Male		Female	
	No.	Percentage	No.	Percentage
Graduation/PG	7	11.7	2	1
High School	8	13.3	2	1
Middle School	3	5	12	6
Primary	10	16.7	28	14
Illiterate	32	53.3	156	78
Total	60	100	200	100

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Table 5 : Place of incident distribution.

Place	Male		Female	
	No.	Percentage	No.	Percentage
Inside house	42	70	182	91
Outside house	11	18.3	11	5.5
Work place	7	11.7	7	3.5
Total	60	100	200	100

Table 6 : Source of burn.

Source	Male		Female	
	No.	Percentage	No.	Percentage
Flame	57	95	196	98
Electric	2	3.3	2	1
Steam	0	0	0	0
Lightning	1	1.7	2	1
Total	60	100	200	100

Discussion:

The epidemiology of burns varies from one part of the world to another as it depends on the level of civilization, industrialization and culture.

I) Gender wise distribution- In the present study 77% of females suffered burn injury. Similar findings have been reported by various studies.[4-7] This can be attributed to close proximity to fire throughout the day and night.

ii) Age wise distribution- 70% of the female victims were between 21-30 years of age group and 28% of the male victims were between 31 - 40 years of age group, which is similar to other studies.[8] This is the productive age where they are generally active and are exposed to hazardous situations both at home and at workplace.

iii) Socioeconomic status- Most of the patient male (70%) and female (89%) belonged to lower socioeconomic status. Hence they used cheap and unstable pressure stoves, open fires, adulterated kerosene, floor level cooking and kerosene lamp/bottle.

iv) Place of incident - In the present study 91% of burn injuries in females occurred at insidehouse/kitchen and 5.5% outdoors, whereas in males 70% sustained burns inside house/kitchen and 18.3% outdoors. This indicates that house is a dangerous place for burn injuries to occur as appliances are continuously being used for cooking, heating and lighting purposes without proper precautions and the kitchen is a danger zone in every house where there are unsafe cooking appliances and there is a need for education in this respect. These findings were similar to a study conducted in Pune and Karnatka.[8,9]

v) Source of fire - Flame was the most common agent responsible for 95% cases in males and 98% cases in females. These findings were similar to other studies.[10,11]

vi) Education wise distribution - Majority of the burn victims male (53.3%) and female (78%) were illiterate.[12,13]

Conclusion :

Burn injuries are a serious public health problem. These injuries are preventable through design and promotion of more aggressive prevention programmes especially for flame injuries occurring in the home environment. Public and professionals should be made realize the magnitude and gravity of the problem.

Following measures are recommended -

i) Enclose fires and limit the height of open flames in domestic environments.

ii) Promote safer cookstoves and less hazardous fuels, and educate regarding loose clothing.

iii) Apply safety regulations to housing designs and materials, and encourage home inspections.

iv) Improve the design of cookstoves particularly with regard to stability and prevention of access by children.

v) Avoid smoking in bed and encourage the use of child resistant lighters.

vi) Support the development and distribution of fire resistant aprons to be used while cooking around an open flame or kerosene stove.

vii) Encourage further development of burn care systems including the training of health care providers in the appropriate triage and management of people with burns.

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Conflict of Interest: Nil

Ethical Committee Clearance : Approval letter No./Memo No.. 02, IAEC/IEC RIMS, Ranchi, Dated on 20.02.2018.

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ORIGINAL ARTICLE

A Study on Pillion Rider Fatalities in Motorised Two-Wheeler Road Traffic Accidents

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Abstract :

The number of road traffic fatalities increases each year. Many of these accidents involve riders and pillion riders of motorised two-wheelers. The study aimed to analyse fatal two-wheeler road traffic accidents and their association with regard to gender, seating position, mode of injury, the pattern of injuries and other parameters based on 73 pillion rider fatalities subjected to medico-legal autopsy. Most of the pillion decedents were females, accounting for 44 (60.27%) cases. Side-saddle was the preferred seating position in 44 (60.27%) cases, of which 43 were female. Mode of injury in 36 (49.31%) cases was due to self-fall. Fractures were predominantly present in the posterior cranial fossa in 40.9% (18) females. Many of the cases were due to sudden brake applied by the rider, putting the side saddle rider in a vulnerable position as they cannot grip anything to prevent/break their fall, causing fatalities. Valuable suggestions have been proposed to promote safety measures and reduce mortality in pillion riders.

Keywords : Road traffic accident; Pillion rider; Injuries; Autopsy; Safety measures.

Introduction :

Around the world, each year, five million people die due to injuries, of which road traffic accidents (RTAs) cause 1.2 million deaths.[1] According to National Crime Record Bureau (NCRB) data, in India in 2019, around 4,37,396 road accidents took place, leading to 1,57,732 (36%) deaths. Of which 58,747 deaths (38%) due to road traffic accidents involved riders and pillion riders of two-wheelers.[2] A few specific factors impact fatalities of pillion passengers, such as seating position, site of the accident, and body region injured.[3]

Studies have found that head and facial injuries are the most commonly sustained fatal injuries in the pillion riders of two-wheeler motorcycle accidents.[4,5] In India, female pillion riders seated in side-saddle positions on two-wheelers have a high likelihood of sustaining head injuries.[6] According to India's Motor Vehicle Act of 1988, helmet usage was made compulsory for both riders and pillion riders of two-wheelers. However, in New Delhi (1997), a new law stated helmet usage was not mandatory for all female pillions and Sikhs wearing a turban. This action showed a disastrous outcome in subsequent years, with increased head injuries and mortalities among female pillion riders of New Delhi.[7] The study aimed to analyse fatal two-wheeler road traffic accidents and their association concerning gender, seating position, mode of injury, the pattern of injuries and other parameters.

Methodology :

This was a hospital-based cross-sectional study carried out for two years between December 2019 and December 2021 in a Government tertiary care hospital in and around Puducherry, which included 73 pillion rider fatalities subjected to medico-legal autopsy. The institute ethics committee granted ethical clearance for this study(JIP/IEC/2019/395). The preliminary data (age, gender, date and time of road traffic accident, collision type, site of the accident, road type, type of two-wheeler, helmet usage, number of riders and seating position) was obtained from the inquest conducted by the police. All pillion rider fatalities in two-wheeler road traffic accidents subjected to medico-legal autopsy were included in the study. The injuries sustained were recorded as nature of the injury, site, and extent of injury, specific to each body region. The collected data were analysed using Microsoft Excel 2016 and IBM SPSS statistical software version 22.

Results :

The majority pillion decedents were females, accounting for 44 (60%) cases (Fig.1). Most two-wheeler accidents occurred on the state/national highway in 55 (75.34%) cases and 18 (24.65%) on local roads. Most motorised two-wheelers involved in road traffic accidents were motorcycles in 56 (76.71%) cases. The leading cause of accidents was over-speeding, accounting for 54 (73.97%) cases. Self-fall from a bike was the most predominant mode of injury in 36 (49.31%) cases (Fig.2); no colliding vehicles were involved in these cases. Most of the two-wheeler pillion riders were seated in a side-saddle position in 44 (60.27%) cases (Fig.3). Fractures were predominantly present in the posterior cranial fossa in 18 (40.9%) females and 7 (24.1%) males (Table 1). Subarachnoid and subdural haemorrhages were the predominant intracranial haemorrhage, seen in 70 and 62 cases, respectively. Among the study population, death due to head injury alone contributed to 54 (74%) of the cases, followed by head and thoracic injury accounting for 8 (11.0%) of the deaths. In 69 (94.5%) cases, the cause of death involved the head.

Discussion:

In our study population, the predominant gender of pillion rider decedents were females in 44 (60%) cases. The predominant mode of injury was self-fall (slide and fall) from the two-wheeler in 36 (49.31%) cases, and no colliding vehicles were involved in

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these cases. Out of those 36 self-fall cases, 29 were females. This is similar to some studies, where self-fall from the two-wheelers were the most predominant mode of injury, accounting for 45.5%, 70.5%, and 38% (92% of cases were female) in their respective study population.[8,9,10] It is assumed that the reason behind self-fall from the two-wheeler is possibly due to the side saddled seating position of the pillion riders. All 29 female decedents were in a side-saddle position at the time of the accident. Most of the self-fall cases were due to sudden brake applied by the rider, which puts the side saddle rider in a vulnerable position as they cannot grip anything to prevent/break their fall. The side-saddle position also increases the risk of ejection of the pillion rider from the two-wheeler.[11]

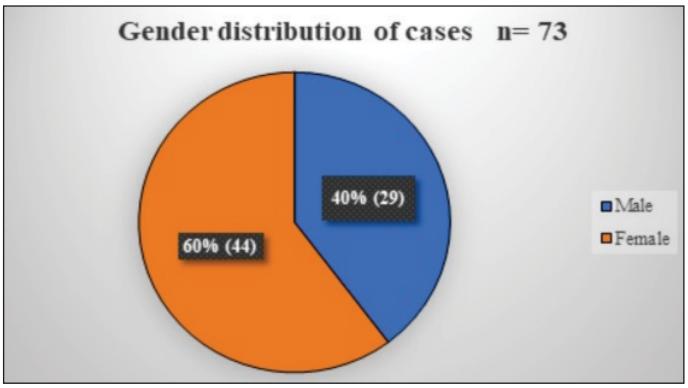

Figure 1: Gender wise distribution of cases.

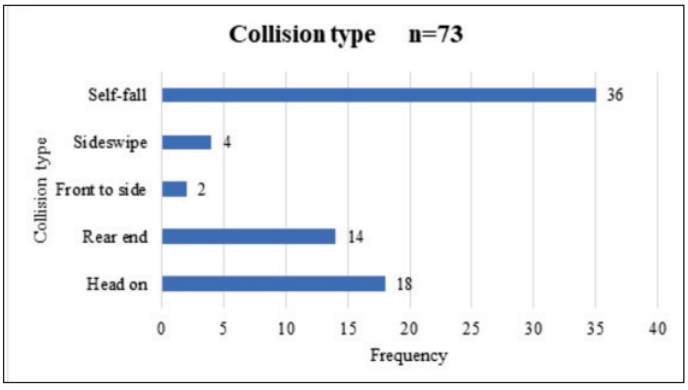

Figure 2: Distribution of cases depending on collision type.

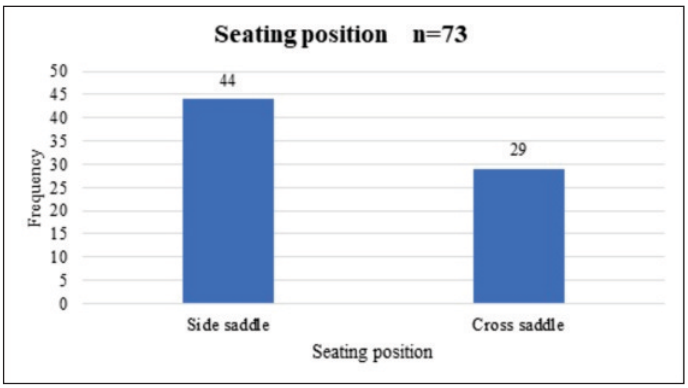

Figure 3: Distribution of cases based on seating position.

Figure 4: Inconvenient provision of handles for pillion rider (yellow circle).

Figure 5: Picture showing pillion rider holding onto attached leather grip placed behind the rider.

The preferred seating position of the pillion riders was the side-saddle position in 44 (60.27%) cases, of which 43 were females. This was similar to another study, where all 49 of their study population were sitting in a side-saddle position.[12] The probable reason for predominantly female pillion riders using the side-saddle position was due to mainly two reasons, one was the dress they wore, and another was age. In India, females usually wear traditional dresses like saree, kurti, purdah, etc. Hence, they prefer a side-saddle position while seated on a two-wheeler. Age can also play a role in choosing the side-saddle position. 28 (65.1%) of females who used side-saddle positions were above 40 years of age.

The posterior cranial fossa was the most common site of fracture in the base of the skull, seen in 40.9% of females and 24.1% of males, followed by a fracture in the middle cranial fossa seen in 27.2% of females and 27.5% of males. It is assumed that the reason behind the fracture involvement in the posterior cranial fossa of female pillion riders was due to seating position, as 99%

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Table 1 : Distribution of base of skull fracture according to site (n=73).

Site of base of skull fracture	Male (N=29)	Female (N=44)	Total (N=73)
Anterior cranial fossa	5 (17.2%)	2 (4.5%)	7 (9.5%)
Middle cranial fossa	8 (27.5%)	12 (27.2%)	20 (27.3%)
Posterior cranial fossa	7 (24.1%)	18 (40.9%)	25 (34.2%)
Intact	9 (31%)	12 (27.2%)	21 (28.7%)

of them sat in a side-saddle position. Based on the mechanism of the fall, when a pillion rider seated in a side-saddle position slides off the bike, the initial impact with the road occurs on the buttocks or side of the hips, and the momentum causes a secondary impact over the posterior or lateral aspect of the head, corroborating with the common sites of the fracture, i.e. the posterior cranial fossa and middle cranial fossa.[10]

In two cases, the female pillion rider was wearing a saree which got entangled in the rear wheel, causing the fall resulting in severe head injury. This was reported in a similar study where women pillion riders accidentally got their long scarf entrapped into the back tire of the two-wheelers, and this was seen in 66% of the study population, sustaining head, face, pelvic girdle, and extremity injuries.[12] Another study found that around 89.2% of the patients who had loose dresses at the time of the accident suffered significant injuries.[13]

The primary cause of the accidents was over-speeding in 54 (73.97%) of the accidents. Traffic rule violations led to 9.58% (7) of accidents. The rest, 12 (16.43%) of the casualties, were due to other reasons like domestic animals crossing the road, drunk driving etc. Similar studies found over-speeding, poor road conditions, inattention, etc., as the common causes of road traffic accidents.[14,15] Head injury alone was the leading cause of death,[10,16-18] in 54 (74%) of the pillion rider deaths, followed by head & thoracic injury accounting for 8 (11%) of the deaths. In 69 (94.5%) cases, the cause of death involved the head.

Recommendations :

In this study, none of the 73 pillion riders wore a helmet. Studies have found that the frequency of head injuries sustained by pillion riders was less when using helmets than non-helmeted individuals.[19-22] They found that unhelmeted pillion riders are more likely to have hospital admission, followed by in-hospital mortality compared to helmeted pillion riders.[23,24] The first and foremost safety measure for pillion riders is to wear helmets. This will reduce the severity of the head injury and reduce mortality risk.

Most of the pillion riders preferred side-saddle positions. There should be public awareness regarding safe seating positions and the risks involved when seated in a side-saddle position. Motorcycles should be equipped with a saree guard to avoid the entrapment of clothes into the back tire.

In Indian motorcycles, the handle for the pillion rider in a side-saddle position to hold onto is inconvenient (Fig.4). It makes it uncomfortable for the pillion rider to hold onto. A suggestion is to place the handle in the middle of the seat (Fig.5). This, along with a rear armrest fitted with a rubber grip, may provide support and prevent/break their fall in case of an accident. Foot rests are built to support one foot and are not large enough to accommodate both feet. Hence, motorcycles should be equipped with larger footrests to facilitate an easy and safe ride for pillions seated in a side-saddle position.

Conclusion :

This study analysed the pillion riders' fatalities of two-wheelers involved in road traffic accidents. The majority of the pillion rider decedents were female. Self-fall was the most common mode of injury and was primarily seen in female pillion riders who preferred side-saddle positions. Almost all females preferred the side saddle position. Most pillion riders had head injuries predominantly over the posterior and middle cranial fossa. Fractures in the posterior cranial fossa were mainly seen in females. This is caused by impact over the back or side of the skull in falls from a side-saddle position. Mandatory helmet usage for pillion riders will reduce mortality. Safety measures like appropriate seating position, appropriate handles and other measures have been suggested to reduce the incidence of falls from the motorcycle. This study provides the pattern of injuries of pillion riders which will help emergency trauma teams for better-segregated management.

Ethical clearance: A prior approval was obtained from the Institutional Ethics Committee (JIP/IEC/2019/395)

Conflict of interest: None to declare

Source of funding: None to declare

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ORIGINAL ARTICLE

Estimation of Stature from Coccygeal Measurements in North-West Indians

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Abstract :

Stature estimation is quintessential to identification in field of forensic medicine and chiefly involves use of long bone measurements. However, difficulties arise in cases of extremely mutilated bodies where it's hard to find intact long bones. The aim of the study is to estimate the stature of deceased from coccygeal measurements and to formulate multiple regression equation for practical usage in forensic casework. A total of 200 medico-legal autopsy cases (157 males, 43 females) representative of northwest Indian population were studied. The straight length of coccyx (CxL) and the widths of first three coccygeal vertebrae (Cx1, Cx2, Cx3) were measured using digital vernier callipers. For standardization of regression equation, 155 cases (125 males, 30 females) having only three coccygeal vertebrae were considered further. The comparison of metric measurements was done using t-test. Karl Pearson's correlation of stature with metric parameters and multiple regression analysis was performed.

The number of coccygeal vertebrae varied from 3 to 5 with only 37 cases (18.5%) and 8 cases (4%) having fourth and fifth vertebrae, respectively. The mean straight length of coccyx was significantly (p=.009) higher in males (2.95 cm ± 0.54) than females (2.67 cm ± 0.43). Highly significant Karl Pearson's correlation (p=.0001) was observed for stature with straight length of coccyx and width of second vertebra. Multiple regression equations were found to be reliable and accurate in stature estimation. The authors recommend the use of coccygeal measurements in forensic casework for stature estimation, especially in cases where intact long bones are not available.

Keywords : Forensic anthropology; Stature estimation; Coccygeal measurements; Regression analysis.

Introduction :

Any observation or measurement of skeleton or a part of it, which aid in establishing stature of an individual, is not only of interest in field of anthropology and archaeology, but also of great value in forensic medicine. Identification is the most important and challenging aspect in forensic casework. The sex, age, ethnicity and stature are the four most important parameters used by forensic experts to establish the identity of an individual. Human body starts showing the destructive effects of putrefaction following death. The osseous skeleton is the only structure to resist this effect for a longer time and therefore, retains the morphological features long after the soft tissues have been destroyed. So, the identification of the deceased in such cases depends upon the type of skeletal material available to the forensic expert.

Stature is significantly correlated with the length of long bones and can be precisely estimated if intact skeleton of known sex and ethnicity is available. However, this is a rarity in actual forensic scenario.[1, 2] Most of the existing literature on stature estimates so far is based on the long bones. The stature estimation formulae construed by Trotter and Gleser,[3] the ones which are most widely used in forensic anthropology and forensic science, are based on long bone dimensions. However, Trotter and Gleser[3] had mentioned that their formulae help in estimating stature with a standard error of 3 to 5 cm in living.

It has been well established by various researchers that in an ethnic population, the stature is positively correlated with the nutritional, genetic and environmental factors.[4] Hence population specific regression formulae should be derived to have a reliable estimate of stature in a particular population. Consequently, the estimation of stature using regression analysis became very prevalent. Many regression formulae based on metric analysis of various bones or body part dimensions were proposed. Most of these studies have estimated stature using long bones[5-11] or fragments of long bones,[12,13] metacarpals,[14,15] fingers,[16] metatarsals,[17] talus and calcaneus,[18,19] scapula,[20] sternum[21] or head,[22,23] hand & foot dimensions.[24-27]

The complete vertebral column and its cervical, thoracic, lumbar and sacral segments have also been studied by few authors.[28-31] Sacro-coccygeal measurements were used by Pelin et al[32] on MRI scans and Torimitsu et al[5] on post-mortem CT scans to estimate stature. Coccyx has remained largely untouched by forensic anthropologists and there is limited data available on its morphology and anthropometry.[33] The anatomic location and the smaller structure of coccyx favours the likelihood of finding it intact in legal settings, even in worst mass disasters or in severely burnt or mutilated bodies. The present study intends to look into the possibility of using the anthropometric coccygeal measurements for stature estimation in a representative cohort of autopsy cases of "north-west" Indian population.

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Materials and Methods:

Sample: The present prospective observational study was carried out on 200 adult subjects (157 males, 43 females) admitted at PGIMER, Chandigarh due to various medico-legal causes and died during the course of treatment. The medico-legal autopsy was carried out at the mortuary of department of Forensic Medicine. It was assured that the name, age, sex, time of death and other demographic profile of entrants were accurate. The subjects with advanced decomposition, extensive mutilation or burns, and those having fractured coccygeal vertebrae or any pathological vertebral anomalies or history suggestive of events that could have potentially affected the coccygeal vertebrae or stature in any form, were excluded from the study.

Methodology:

Measurement of the stature: For measuring stature, the body of the deceased was placed in supine position on flat platform of the autopsy table. In order to keep the vertex and the heel in straight line, a wooden log of 2.5 cm thickness was placed under the heels. Anthropometric rod was used to measure the length of the body and was held horizontal to the platform of the autopsy table in a manner that the fixed cross-bar of the rod touched the upper most point of head i.e. vertex and movable cross bar touched the lower most surface of the heels.

Measurements of the coccyx: After complete evisceration of the thoracic, abdominal and pelvic cavities during autopsy procedure, the anterior & lateral surfaces of the sacrum and coccyx were exposed. Any soft tissues or ligamentous attachments were removed with dissection. Further cleansing was done by pouring boiled water mixed with caustic soda. The straight length of coccyx, measured as the linear distance between uppermost border of first coccygeal vertebra and the tip of apex of the coccyx, was obtained in-situ using long-arm Vernier callipers from anterior approach. The sacro-coccygeal complex was then separated from the vertebral column at level of fourth sacral vertebra with the help of electric saw. Coccygeal measurements

Figure-1: Showing coccyx with five vertebrae and usage of digital vernier callipers for ex-situ measurements of coccyx to a scale of 100th of a centimetre

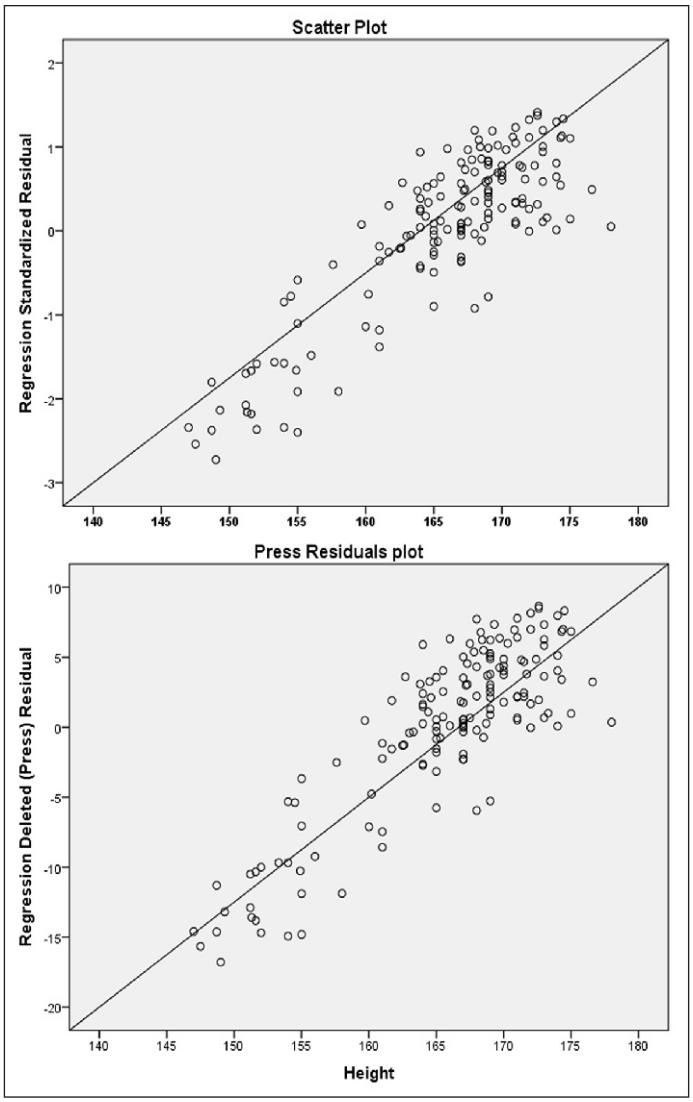

Figure-2: Scatter plot and PRESS residual plot of stature (in cm)

were obtained ex-situ using sliding Digital Vernier calipers. The width of various coccygeal vertebrae (Cx1, Cx2, Cx3) has been measured as the linear distance between fused segmental borders of the concerned vertebra, the segmental border being the mid-point of the anterior grooved inter-vertebral joint. The final straight length of coccyx (CxL) is average of its in-situ and ex-situ readings (Fig 1). All the measurements were recorded on a scale of 100th part of a centimetre.

The first three coccyx vertebrae were present invariably in all the cases. Fourth and fifth coccyx vertebrae were present only in 37 cases (18.5%) and 8 cases (4%), respectively. Therefore, for standardization of regression equation, only 155 cases (125 males, 30 females) having three coccygeal vertebrae were considered for further statistical analysis, excluding the 45 cases (32 males & 13 females) with more than three vertebrae.

Ethical Clearance : Ethics committee approval was obtained vide letter no 11/5384 dated 19.01.2011 from "Institute Ethics Committee, PGIMER (Postgraduate Institute of Medical

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Table 1 : Comparative statistics of stature and independent coccyx variables in males and females.

Measure-ments	Male			Female			t-value	Df	p-value
	Sample size	Mean (cm)	SD	Sample size	Mean (cm)	SD			
Stature	125	168.45	3.70	30	153.65	3.91	19.430	153	.0001
CX1	125	2.77	.59	30	2.67	.56	.816	153	.416
CX2	125	1.79	.47	30	1.54	.39	2.628	153	.009
CX3	125	1.20	.38	30	1.04	.35	2.039	153	.043
CXL	125	2.95	.54	30	2.67	.43	2.662	153	.009

Note: CX1, CX2, CX3 & CXL represents the independent variables - the width of first, second, third coccygeal vertebrae and coccygeal straight length, respectively.

Table 2 : Karl Pearson's Correlation Coefficient (r) of stature with various coccygeal measurements.

Correlation of stature with coccygeal measurements	Combined (n=155)		Males (n=125)		Females (n=30)	
	r	p-value	r	p-value	r	p-value
Stature with Cx1	.073	.364	.041	.646	-.002	.993
Stature with Cx2	.372	.0001**	.354	.0001**	.484	.007*
Stature with Cx3	.139	.084	.029	.751	-.105	.582
Stature with CxL	.342	.0001**	.412	.0001**	-.180	.342

Note: *significant ** highly significant
CX1, CX2, CX3 & CXL represents the width of first, second, third coccygeal vertebrae and coccygeal straight length respectively

Education & Research), Chandigarh, India prior to starting data collection."

Statistical considerations : Statistical analyses were conducted using IBM SPSS statistical package version 21.0. The mean and standard deviation (SD) were derived for all the cases, combined and separately for both the sexes. Comparison of coccyx vertebrae measurements was done using t-test (Table 1). Correlation between stature and different coccygeal measurements was assessed using Karl Pearson's correlation coefficient (Table 2). Considering stature as a dependent variable and Cx1, Cx2, Cx3 and CxL as independent variables multiple regression analysis was carried out. For estimation of stature, multiple regression equations with respective standard error of estimate (SEE), were derived separately for both the sexes and also for the combined cohort (Table 3). Scatter plot of stature with regression standardized residuals was constructed. Standardized residuals were obtained by subtracting mean and dividing by the standard deviation of residuals. The validity of the calculated regression was further evaluated by using the PRESS (predicted residual error sum of squares) residual statistics.

Results :

The number of coccygeal vertebrae in cases varied from 3 to 5. Three coccygeal vertebrae were present in all 200 cases; however, fourth and fifth coccygeal vertebrae were present respectively in 37 cases (18.5%) and 8 cases (4%). None of the cases had more than 5 coccygeal vertebrae. It was observed that mean coccygeal straight length was higher in males (2.95 cm ± 0.54) as compared to females (2.67 cm ± 0.43). The widths of first three coccyx vertebrae in males were 2.77 cm ± 0.59, 1.79 cm ± 0.47 and 1.20 cm ± 0.38 respectively and in females the respective widths were 2.67 cm ± 0.56, 1.54 cm ± 0.39 and 1.04 cm ± 0.35. Sex difference for mean coccygeal straight length was significant (p=.009). Similar significant sex differences were observed for other coccygeal measurements, except for width of the first vertebra. Stature too showed highly significant (p= .0001) sex differences with mean stature of 168.4 cm ± 3.70 in males (n=125) and 153.45 cm ± 3.91 in females (n=30) (Table 1).

Highly significant correlation of stature with coccygeal straight length and width of second coccyx vertebra was observed (p=.0001) in pooled data. However, correlation of stature with width of first and third coccyx vertebrae was observed to be non-significant (p>.05). Correlation of stature with coccygeal measurements was also calculated separately for both the sexes (Table 2). By considering stature as a dependent variable and various coccygeal measurements as independent variables, multiple regression analysis was carried out for the pooled data and separately for both the sexes. In pooled data, all independent variables Cx1, Cx2, Cx3 and CxL came out to be highly significant with SEE of 6.07 cm and multiple R value of 0.508. In

Table 3 : Multiple Regression Equations, Standard error of estimate (SEE), Multiple-R and F-value.

Dependent variable	Multiple regression Equation	Multi-ple R	See	df	F-value	p-value	t-value#	p-value$
Combined Stature	Stature = 151.453 + 8.278CX2+ 4.213CXL - 5.816CX3- 2.077CX1	.508	6.07	154	13.033	.0001**	5.314 (CX2) 3.976 (CXL) -3.214 (CX3) -2.103 (CX1)	.0001** (CX2) .0001** (CXL) .002** (CX3) .037* (CX1)
Male Stature	Stature= 159.621+ 3.479CXL - 5.841CX3 + 5.540CX2 - 1.580CX1	.656	2.84	124	22.623	.0001**	6.341 (CXL) -6.125 (CX3) +6.732 (CX2) -3.050 (CX1)	.0001** (CXL) .0001** (CX3) .0001** (CX2) .003** (CX1)
Female Stature	Stature = 147.66 + 7.954CX2- 6.062CX3	.661	3.04	29	10.476	.0001**	4.519 (CX2) -3.117 (CX3)	.0001** (CX2) .004** (CX3)

Note: *significant **highly significant #,$ represents t and p values for corresponding independent variable (in parenthesis) cx1, cx2, cx3 & cxl represents the independent variables-width of first, second, third coccygeal vertebrae and coccygeal straight length, respectively.

Table 4 : Comparative summary of Standard Error of Estimate (SEE) in previous studies on stature estimation.

Studied Bone(s)/Body part(s)	Researchers	Reference	SEE
Coccygeal length*	Pelin et al. (2005)	7	6.92 cm
Sacro-coccygeal segment*	Pelin et al. (2005)	7	6.5-7.0 cm
Sacro-coccygeal segment*	S. Torimitsu et al (2014)	8	5.8-6.6 cm
Metacarpals*	Musgrave & Herneja (1978)	19	5.5-8.1 cm
Metatarsals	Byers et al. (1989)	22	4.0-7.6 cm
Talus and calcaneus	Holland (1995)	23	4.1-6.2 cm
Coccygeal measurements	Present study		6.07 cm

Note: *studies based on metric measurements on imaging techniques

males, all the coccygeal measurements were highly significant with smaller SEE and a higher multiple R value of 0.656. However, in females, only two variables Cx2 and Cx3 were found to be highly significant with SEE of 3.04 cm and multiple R value of 0.661. The significant regression coefficients put in the respective equations are presented in Table 3.

Scatter plot of stature with regression standardized residuals was constructed, where residuals were computed by taking the difference between actual and predicted values. $e_i = y_i - \hat{y}_i$ where, e_i is residual, y_i is actual value and $\hat{y}_i$ is predicted value. After that standardized residuals were obtained by subtracting mean and dividing by the standard deviation of residuals. The scatter plot reveals that points are almost scattered around the egalitarian line (Fig 2). The validity of the calculated regression was further evaluated by using the PRESS residual statistics: $PRESS = \sum_{i=1}^{n} (y_i - \hat{y}_{-i})^2$ where, y_i is the measured stature of i^{th} individual and $\hat{y}_{-i}$ is the predicted value after deleting the i^{th} observation for stature. PRESS residuals are equally scattered around egalitarian line (Fig 2).

Discussion :

A search of anthropological and anatomical scientific literature in relation to coccyx, shows that the anthropometric work on this bone is mostly based on morphometric analysis on imaging studies (X-ray, CT or MRI).[34-36, 38,39] Only a couple of studies based on imaging scans, have attempted to estimate stature from the sacro-coccygeal[5,32] or coccygeal measurements.[32] The authors were not able to find any meaningful existing work on direct anthropometry measurements of coccyx for stature estimation. Keeping in view the limited work done on coccyx so far, the present study was undertaken to look into the possibility of using the coccygeal measurements for stature estimation. Besides, owing to its anatomic location and smaller structure,[33] the likelihood of finding the coccyx intact even in mutilated, decomposed, or severely burnt bodies is manifold. In such a scenario in legal settings, where identity is in question or needs to be established, and where it's hard to find any intact long bones, small bones like coccyx may prove forensically valuable.

Woon et al[34] in a retrospective CT-based study on 112 scans obtained from "Christchurch hospital, New Zealand; Dunedin hospital, New Zealand and Hotel-Dieu hospital, Paris, France" reported that 76% scans had 3, 13% had 4 and 11% had 5 coccygeal vertebrae. Postacchini et al[35] in a radiographic study on 120 subjects reported that 54% had 2, 34% had 3, 5% had 4 and 7% had 5 coccygeal vertebrae. Pelin et al[32] in a study based on MRI morphometric measurements on 42 Turkish subjects documented that 24 had 4, 15 had 5, 2 had 6, and 1 had 7 coccygeal vertebrae. Shalaby et al[36] studied MRI scans in 200 Egyptian subjects and reported that 68.3% subjects had 3 coccygeal vertebrae. On the other hand, in the present study 77.5% had 3, 18.5% had 4 and 4% had 5 coccygeal vertebrae.

Shalaby et al[36] reported mean straight coccygeal length in males and females respectively as 3.4 cm ± 1.99 and 3.36 cm ± 1.99 and mean curved coccygeal length as 3.55 cm ± .34 and 3.49 cm ± .39, in Egyptian population aged between 20 to 40 years. Woon et al[34] reported mean coccygeal length in males and females as 3.9 cm ± .7 cm and 3.6 cm ±.7 respectively in New Zealand and French population. Le double[37] documented the mean straight coccygeal length of 3 cm in 200 Caucasian skeletons. Oh et al[38] reported mean coccygeal length of 3.3 cm on 50 Korean subjects in a study based on metric analysis of coccyx bone, whereas a recent study on Korean population by Lee et al[39] based on 3 dimensional reconstructed CT pelvis, reported mean straight length of coccyx as 3.79 cm ± .65 and 3.43 cm ± .66 in males and females, respectively. They also documented the width of first coccygeal vertebra as 3.43 cm ± .65 and 3.09 cm ± .58 for males and females, respectively. Pelin et al[32] reported mean coccyx length of 3.1 cm ± .6. Tague RG[40] reported mean coccygeal length in adult American skeletons of males and females as 4.4 cm ± .8 and 4.0 cm ± .8, respectively. The differences in coccygeal dimensions could be attributed to ethnic, geographical and environmental factors.

Pelin et al[32] were the first ones to devise linear regression equation with SEE of 6.92 cm using coccygeal straight length and multiple regression equation with SEE of 5.67 cm using sacral and coccygeal measurements. Torimitsu et al[5] reported a SEE of 6.68 cm on Japanese cadavers. However, these studies on coccygeal dimensions in living or deceased individuals were carried out using CT scans and MRI scans. The present study obtained more accurate results (SEE) as compared to the studies by Pelin et al and Torimitsu et al who used sacro-coccygeal combined measurements for estimation of stature (Table 4).

Comparison of our regression formulae based on coccygeal measurements, with previous studies on estimation of stature from other than long bones, reveal that the SEE for combined multiple regression equation (6.07 cm) is comparable to or lesser than the SEE reported by most of these researchers,[5,32] thus showing the coccygeal measurements having a comparable or better accuracy. A comparative summary of SEE from previous studies on stature estimates from other small bones has been presented in Table 4.

Conclusion :

To the best of our knowledge, this is a pioneer anthropological study to report the usefulness of coccygeal measurements for stature estimation. It presents an easily accessible method based on regression formula for stature estimation in deceased using simple anthropometric hand tools. Standard error is largely comparable to that obtained from skeletal material other than the long bones. We, thus, propose to encourage the use of coccygeal anthropometry as a tool for stature estimation especially in cases where intact long bones are not available. As ethnic and environmental differences significantly affect the anthropometry results and consequently the stature estimation, the authors recommend similar anthropological population-specific studies in different geographical regions (especially in developing and least developed countries, where CT & MRI facilities are hardly available even to the living) for wider application of this useful methodology in forensic casework.

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ORIGINAL ARTICLE

Estimation of Redox Marker Carbonyl Compound in Subjects after Death from Various Causes - As an Important Biochemical Parameter to Estimate Time Passed Since Death.

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Abstract :

Time passed since death is the period that has elapsed between death and the actual performance of postmortem examination. There are lots of research work undertaken to estimate time passed since death based on biochemical changes of postmortem blood. After death the defence parameters which protect the human cell to maintain the redox balance alters slowly. Carbonyl compound, reactive intermediates of glucose degradation pathway generated on auto oxidation of glucose are capable of inducing cellular damage. Changes of redox marker carbonyl compound in postmortem blood are proportional to the time passed since death. It provides a theoretical basis on which time of death can be calculated.

Keywords : Carbonyl compound; Redox marker; Time since death.

Introduction :

Estimation of time passed since death is of extreme medicolegal importance, mostly in cases of homicide. This is one of the most important questions the Forensic experts has to answer how much time passed since death before conducting the post mortem examination in the interest of administration of justice. It is the responsibility of medicolegal expert to calculate time passed since death to reveal many unrevealed medicolegal mysteries.

Various postmortem changes in the body that take place after death like cooling of body, rigor mortis, changes in the eye, PM staining, decomposition etc. help to estimate time passed since death. The exact time passed since death cannot be opined by any of the methods, only a range can be opined depending on various modifying factors like age, sex, occupation, cause of death etc.

It is our responsibility to re-explore the objective methods like bio chemical, histological, serological assays. Immediately after death all the metabolic activities of the body stop. Thus defense parameters which protect the human cell to maintain the redox balance of the cell, alters slowly. There may be a change in carbonyl compound.

Low molecular weight aldehydes (glyoxal, methyl glyoxal, 3-deoxyglucosone) generated on auto oxidation of glucose under condition of carbonyl stress, the carbonyl compounds methyl glyoxal (MG) and glyoxal (GL) are reactive intermediates of glucose oxidation pathways and capable of inducing cellular damage.

Bernard Knight in changes after death provides huge data on biochemical parameters for the estimation of time since death in the early postmortem period. Some of these indices remain relatively stable during the early postmortem period, whilst others show varying degrees of change.

Flemming Nielsen[2] et al of Odense University, Odense, Denmark, in the study Plasma Malondialdehyde as biomarker for oxidative stress : reference interval and effects of life-style factors shows Malondialdehyde as a lipid peroxidation marker. Analysis of variance showed no interaction between gender and age, but separate analyses showed an independent effect of gender, but not of age. Daily smokers had a slightly higher average concentration of Plasma MDA than non smokers (P=0.05), and P- MDA correlated with daily exposure to cigarette smoke (r=0.162; P=0.03).

P. Catomeris[3] et al of department of Chemistry and Biochemistry, University of Windsor, Ontario, Canada in the study lipid peroxidation in postmortem blood of fire victims the possibility that free radicals having an important role in the victims of death due to burn and it helps to measure lipid peroxidation in the blood. The degree of lipid peroxidation was determined by measuring MDA concentration in postmortem blood using fluorometric method, based on its thiobarbituric acid reactivity. Analysis revealed that a statistically significant difference exist between the fire victim population and each of the other two population of atherosclerotic cardiovascular disease and gun shot wound victims.

Miyata T[4] et al of Molecular and cellular Nephrology, Institute of Medical Science and Department of Medicine, Tokai University School of Medicine, Isehara, Japan in the study Relevance of oxidative and carbonyl stress to long term uremic complications shows reactive carbonyl compounds formed by the oxidation of carbohydrates and lipids may indirectly lead to advanced glycation or lipoxidation of proteins. Chronic uremia is

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associated with increased modification of proteins caused by reactive carbonyl compounds derived from both carbohydrates and lipids. Increased carbonyl modification of proteins subsequently results in the rise of plasma and tissue contents of advanced glycation end products and advanced lipoxidation end products, in which the deleterious biological effects have been revealed.

Janero DR[5] in a study "Malondialdehyde and Thiobarbituric acid reactivity as diagnostic indices of lipid peroxidation and peroxidative tissue injury" showed increasing appreciation of the causative role of oxidative injury in many disease states places great importance on the reliable assessment of lipid peroxidation. Malondialdehyde is one of several low molecular weight end products formed via the decomposition of certain primary and secondary lipid peroxidation products.

Material and Methods :

This cross sectional study was done in FSM Department and Biochemistry Department of NRS Medical college and Hospital, Kolkata.

Blood sample collection was done in the mortuary from femoral vessels, common carotid vessels and chambers of heart with the help of disposable syringe and collected in plain vial. The serum was separated from the clotted blood by centrifugation 4000 round per minutes for 10 minutes. The serum was pipetted out by micropipette.

Carbonyl compound was estimated by the method proposed by Cooper RA in 1975. It was estimated by the spectrophotometrically determination with 0.1% 2,4 DNPH (Dinitro phenyl Hydrazane).

Reagent used: 1) 2,4 DNPH, 2) HCl, 3) NaOH, 4) Methyl Glyoxal as standard.

Protocol : 25 microlitre serum was added to 350 microlitre 0.1% 2,4 DNPH in 2N HCl and kept for 15 min at room temperature. The reaction was stopped by 1.5ml 10% NaOH and the volume was made up to 3 ml by adding distilled water. The optical density of Hydrazane was read at 576 nm(A) and 650nm(B) in spectrophotometer and Methyl Glyoxal was taken as standard. The test values were extrapolated from the standard graph of Methyl Glyoxal.

The calculation of measurement of carbonyl compound was (A-B). The standard graph for carbonyl compound is plotted and the test values were extrapolated from the standard graph.

Statistical analysis: collected data were analysed and statistical test were done with the help of Microsoft office Excel 2007, SPSS, Winpepi (404x version) software.

Test for statistical significant was applied by using 't' test for analyzing the difference between the two means, where p 0.05 was considered significant. The p value is a measure of the probability that an observed difference occurred by random chance. A p value is used in hypothesis for testing support or reject the null hypothesis.

Sex wise distribution.

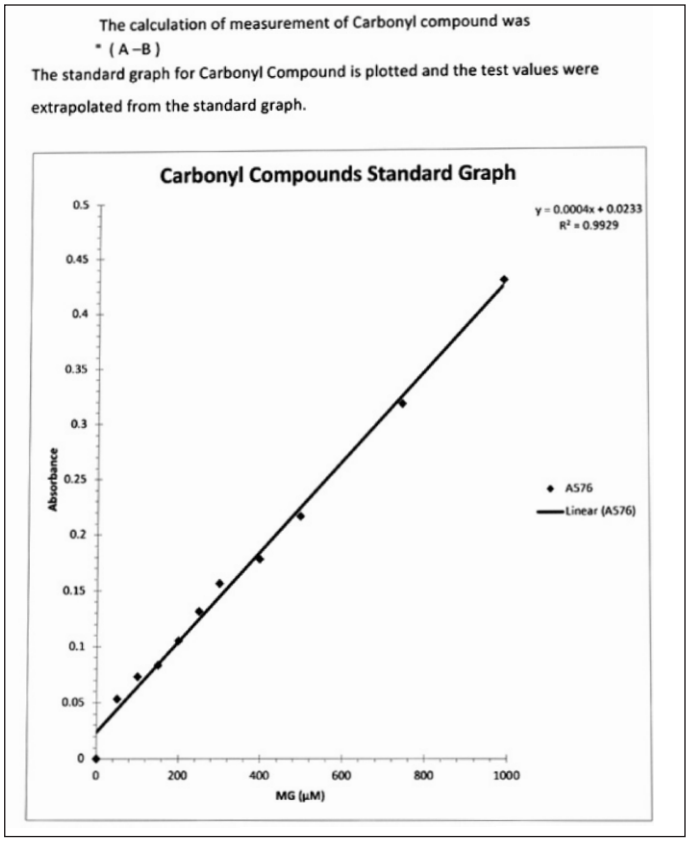
Sex	No of cases	% of cases
Male	49	58.33%
Female	35	41.67%
Total	84	100%

Distribution of cases depending on cases of death.

Cause of death	No of cases	% of cases
Burn	23	27.38 %
Asphyxia	12	14.29 %
Poisoning	17	20.24 %
RTA	16	19.05 %
Fall from height	8	9.52 %
Others (AMI)	8	9.52 %
Total	84	100 %

Distribution of cases depending on causes of death.

Cause of death	Minimum	Maximum	Mean	Standard error
Burn (N23)	95.00	500.00	296.35	19.63
Asphyxia(N12)	260.00	380.00	307.92	11.40
Poisoning(N17)	156.00	435.00	318.59	17.09
RTA(N16)	28.00	500.00	346.94	28.31
Fall from height(N8)	140.00	580.00	273.75	38.31



Results :

In the present study a total of 84 sample were collected, among this 49 males, 35 females. It is obvious that in present study males were predominant.

The value of carbonyl compound statistically significant with time passed since death.

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Discussion :

In descriptive statistics of the changes in redox parameters of the victims of asphyxia where number of cases were 12, the value of carbonyl compound statistically significant with time passed since death [t value 24.17, DF-22, p value-0.000]. It means in the victims of asphyxia where there is an oxidative stress carbonyl compound of blood increase with time passed since death.

Descriptive statistics of 17 cases of poisoning showed the value of carbonyl compound statistically significant with time passed since death. It means various poisoning has certain role in redox parameters of blood.

Descriptive statistics of 23 cases of burn victims showed the value of carbonyl compound statistically significant with time passed since death. So that smoke inhalation has certain role in the redox parameters of blood.

Descriptive statistics of 16 cases of RTA showed the value of carbonyl compound statistically significant with time passed since death. Carbonyl stress to long term uremic complication shows chronic uremia.

In descriptive statistics of the changes in redox parameters of the victims of fall from height where number of cases were 8, the value of carbonyl compound statistically significant with time passed since death. This occurs due to peroxidative tissue injury in the victim of fall from height.

Conclusion:

A research always start from an idea, a question or a previous enquiry. Various researches for estimation of time passed since death done by various researchers. Their results very much helpful to conduct a research work. The present study is extra addition to such previous researches.

In the present study highly significant changes occur in carbonyl compound, the redox parameters of postmortem blood. These changes are proportional to the time that has elapsed since death and provide a theoretical basis on which time of death can be calculated.

The present study raise a demand that should be implemented in future more research works on redox parameters in the postmortem blood as an important data for estimation of time passed since death.

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Conflicts of interest: The authors declared no conflict of interest. This research work is a part of Dissertation submitted at The West Bengal University of Health Sciences for MD Examination.

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Ethical Clearance : The study was approved by the Institutional Ethical Committee, vide order No.NMC/ Ethi/ Gen-25/87 Dated: 04.01.2010

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ORIGINAL ARTICLE

Reconstructions of Length of Humerus from it's Fragments - A Preliminary Study in Eastern Indian Population

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Abstract :

In a demographically diverse, vast and densely populated country like India, the establishment of identity of a deceased assumes great medico-legal importance. It also poses a true challenge to the forensic scientist working in an environment where decomposition and taphonomic process are rapid. Structurally bones resist common degradation and putrefactive changes and remain longer as material for evidential value. Human skeletal remains are found under suspicious circumstances and doctors examining them need to give an opinion in the court of law. One of the important data for identification is the stature. Henceforth, a technique is needed for reconstruction of total length of long bones from their fragments. The current investigation was designed to estimate the total length of humerus using its fragmentary length in a population specific study to employ them in stature formulae for population specific cases and finally to estimate the stature of the individual. After getting institutional ethical committee clearance, the study over 79 humeri revealed linear equation where total length of humerus was used as dependent variable and the different fragmentary length being the independent variables.

Keywords : Reconstruction; Humerus fragments; Total humerus length; Forensic anthropometry.

Introduction :

In a demographically diverse, vast and densely populated country like India, the establishment of identity of a deceased assumes great medico-legal importance. It also poses a true challenge to the forensic scientist working in an environment where decomposition and taphonomic process are rapid. Structurally bones resist common degradation and putrefactive changes and remain longer as material for evidential value. Human skeletal remains are found under suspicious circumstances and doctors examining them need to give an opinion in the court of law. Forensic experts are often consulted regarding identification of skeletal remains.

One of the important data for identification is the stature. The estimation of skeletal samples, for age, sex and stature are vital when found from sites in mixed lot. For this purpose, a technique is needed for reconstruction of total length of long bones from their fragments.

This investigation was designed to estimate the total length of humerus using its fragmentary bone length in a population specific study. Secondly, the goal was to employ them in stature formulae for population specific cases and finally to estimate the stature of the individual.

When dismembered human body parts are available, it is of an even greater challenge for the forensic experts. To reconstruct the length of long bones from their fragmentary remains has always been of immense interest and is attempted by numerous anatomists, anthropologists and forensic experts. Studies have established the method with varying degrees of precision. All such calculations depend on the fact that the fragmentary parts show evidence of consistent ratios relative to the total length of long bones. This plays a vital role in the identification of individuals from their skeletal remains. Of all the mathematical methods used, Regression formulae based on long bone measurements is the appropriate and trustworthy method that yields consistent and accurate results.

In India unidentified dead bodies are often mutilated by wild animals. Gnawing the skeletal remains leads to loss of structural integrity and makes identification difficult. Bone fragments often with destroyed ends are brought for forensic case works. In both anthropological and forensic practice, fragments of long bones are often presented as the only available source to establish identity. In cases where the entire long bone is not available, one can apply the desired method to the available bony fragments to reconstruct its total length.

Reconstruction of total length of long bones from their fragments have been published earlier on different populations. Several attempts have been made by researchers from different continents to establish authentic population related models for practical use in forensic anthropology. Studies from India are also significant in number and relevance.

Mukhopadhyay et al (2010) presented a useful insight on the stature estimation from maximum femoral length and the epicondylar breadth. The study was conducted among the Indian Bengali male's population for which the authors presented a correlation between the aforementioned parts of the bony fragments. Specimens consisted of 65 adult male human femur bones (23 taken from the right side and 42 from the left side)

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which were dried and ossified. Anthropometric set consisting mainly of Osteometric board and Callipers were used to take the measurements of the specimens. In this work, the maximum length had been defined as the distance between the highest point on the head of the femur to the lowest point on the distal condyles. The epicondylar breadth has been defined as the distance between the two most laterally projecting points on the epicondyles. Software used in this study was the SPSS statistical software for windows 10. The regression equation obtained was y=7.02 + 4.83x, where the dependent variable (x) is the epicondylar breadth (cm) and the independent variable (y) is the maximum femoral length (feet). 95% confidence interval with a p-value of less than 0.001 was obtained with Pearson's coefficient of 0.85, a standard error of 1.68 and R squared value of 0.722. The mean value of femoral length and the epicondylar breadth were found to be 41.82 and 7.16 respectively. A correlation was done between the epicondylar breadth and the maximum femoral length. Regression equation was obtained using the epicondylar breadth as the independent variable and the maximum length of femur as dependent variable with a total sample (N=65). The multiplying factor of 3.82 was used after suitable conversion of the units. From the above measurements it was seen that the maximum length of the femur correlated well with the epicondylar breadth.[1]

A study conducted by Lakshmi Kantha B.M et al estimated the total length of humerus from its fragments in South Indian population. Here 150 (75 left and 75 right) adult, fully ossified, dried and processed humeri were taken and the morphometric details of the humeral segments were analysed and measured using osteometric board and scale. The humerus was divided into 6 segments; wherein segment 1 represented the most proximal point in the head to most distal point of the circumference of the head; and segment 6, from lower margin of olecranon fossa to most distal point on the trochlea. Measurements were taken to the nearest millimeter. The mean value and SD of the 6 segments were calculated. Independent 't' tests were used to compare the length of these segments of both left and right sides. The results, thus obtained were divided into 4 tables.[2]

Table1: showed the mean lengths of the left and the right humerii having F value of 3320.499 (left humerus) and 3019.392 (right humerus) and p-value of <0.001 for both.

Table 2: calculated the proportion between the mean length to the total length of humerus. F value for left humerus is found to be 6542.695 and for right humerus 5252.313 with a p-value of <0.001 for both.

Table 3, 4: showed comparison between the mean lengths of left and right humerus segments and comparison between mean proportions of the left and right humerus segments respectively.

Another attempt had been made by authors Meena M Meshram, et al to estimate the stature from the length of humerus in Vidharba region of Maharashtra. The materials used in the study consisted of 116 fully ossified humerii belonging to 58 cadavers, from Government Medical College Nagpur, out of which 42 were males and 16 were females of known sex and stature. It was observed that the mean living stature in males was 158.93 cm and in females was145 cm, which was calculated after deducting 1.5 cm in males and 2 cm in females from the measurement of cadaveric stature. The multiplication factor was 5.1 in the humerus of Vidharba region. The Regression formulae for both males and females were derived and tested by applying chi-square test (3). The formula obtained were as follows:

For males

S = 46.05+3.58xH;X2=6.23; P>0.05 (right);

S = 45.17+3.64xH;X2=6.07; P>0.05 (left).

For females:

S = 123.325+0.76xH;X2=1.30; P>0.05 (right);

S = 99.315+1.62xH;X2=1.055; P>0.05 (left).

Author Phalguni srimani, et al also laid emphasis on the usefulness of the biccipital groove of humerus in the morphometric analysis. The paper highlighted its clinical implications through its study in West Bengal population. The study was conducted on 107 dried cadaveric humeri (59 of right side and 48 of left) of unknown age and sex ,collected from different Medical colleges of West Bengal. The total length, antero-posterior and transverse width of humeri at the surgical neck along with length, width, depth, medial wall and opening angles of Biccipital groove were measured, with the help of ruler and vernier callipers. The length of BG was determined as the maximum distance between the most proximal and distal point of the groove. Width was calculated as the maximum distance between medial and lateral lips of the groove. Similarly depth was estimated as the distance between the greater /lesser tuberosity to the floor of the groove. The medial wall angle and the opening angle were computed as image analysis technique. All the parameters were measured by two observers separately and average values were taken. Data thus obtained were tabulated as Mean ± SD and statistically analyzed using SPSS software, version 16. The total length of the right humerus was found to be 303.71 ± 21.25 mm, the antero-posterior width of the right humerus was found to be 22.39 ± 1.35 mm and the right humerus transverse width was found to be 24.89 ± 2.00 mm. Similarly for the left humerus, the total length was found to be 294.69 ± 24.39 mm, the antero-posterior width was found to be 21.60 ± 1.38 mm and the transverse width was found to be 24.01 ± 1.62 mm. The measurements of the length of the Biccipital Groove for the right humerus was found to be 71.59 ± 3.78mm and that for the left side was found to be 70.78 ± 5.04 mm which results ina mean length of 23.84% of total length of the humeri. The corresponding measurements of the width of the Biccipital Groove for the right and left humerus was found to be 71.59 ± 3.78 mm and 70.78 ± 5.04 mm respectively which results in a mean length of 33.22% of transverse width of the humeri. Finally the measurements of the depths of the Biccipital Groove was found as 4.63 ± 0.38 mm for the right humerus and 4.45 ± 0.30 mm for the left humerus which was found to be 20.65% of antero-posterior width of humeri. The average medial wall and opening angles of BG were found to be 50.22 + 5.350 and 81.41 + 10.900 on the right side. On the left side the corresponding measurements were found to be 53.83 +6.800 and 79.31 + 11.320 mm. Besides the non-existence of the supratubercular ridge of Meyer in some specimens, significant statistical differences were found in length, width, depth and medial walls angles of BG between right and left sides

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($p<0.005$).[4]

In the same study it was also aimed the study was to predict the total length of humerus from its fragments in West Bengal population. Each bone was divided into five segments (H1, H2, H3, H4 and H5) by taking predetermined points on it. Such five parameters along with the total humeral length were measured to the nearest millimetre. The values were presented as mean and SD (separately for each side). The proportion of each segment to the total length was calculated. Simple linear regression was used to correlate the length of each segment with the total length. Later on multiple stepwise regressions were used. He observed that the H2 segment was most significant in estimating the total length of humerus in case of both right and left sides. Therefore this study attempted to estimate different segmentary lengths of humerus and then reconstruct the total length in West Bengal population, using standard regression formulae.[5]

Reviewing the literature, similar study on morphometric estimation on the humerus fragments on Turkish population was performed by S. Deniz Akman, et al 120 adult humerus bones (64 right, 56 left) were collected from Cukurova University. The bone was divided into 6 segments. Statistical analysis was done using SPSS software version 9. The distances in maximum humeral length, H1, H2, H3, H4 and H5 segments were found to be 307.1 ± 20.8 mm, 6.5 ± 1.6 mm, 41.0 ± 5.1 mm, 24.2 ± 2, mm, 20.0 ± 2.2 mm and 23.9 ± 2.6 mm, (on the right side) and 304.8 ± 18.9 mm, 6.6 ± 1.3 mm, 40.9 ±3.9 mm, 40.6 ± 3.3 mm, 19.7 ± 2.5 mm and 39.7 ± 3.4 mm (on the left side), respectively. No significant difference was found in the morphometric measurements between left and right side specimens. The results thus obtained in this study on Turkish population were similar to that of population of other countries.[6]

Materials and Methods :

After getting the clearance from the institutional ethical committee, examination and measurements of all the fully ossified, dried and processed humerus bones (79 in number from the departmental archive of Forensic Medicine, Burdwan medical college, Burdwan for the teaching programme of undergraduate and postgraduate students (museum specimens) were done to conduct a cross-sectional study. Using anthropometric set consisting of osteometric board, electronic digital Caliper, measuring tape, flexible tape, Dusting brush, pencil, OHP marker, standard prepared master charts for data recording. All the 79 humeri were arbitrarily divided into different fragments by taking important anatomical landmarks on the bones, on the basis of their morphological characters. Measurements were taken using anthropometric set consisting mainly of Osteometric Board and Electronic Digital Calipers. The author along with other three observers took four readings, and the mean value of these readings was recorded to minimize the inter-observer biasness. Record was taken in centimetre (cm) and the measurement was up to one decimal place (nearest millimeter).

The maximum length of the humerus was the distance measured from the most proximal point on the head to the most distal point of the trochlea, using an osteometric board. The trochlea of the humerus was placed against the vertical endboard while applying the movable upright to the humeral head. The different fragments were measured with the help of digital caliper.

The measurements obtained were initially inserted in the excel sheets and were later analyzed using SPSS statistical software for windows version 10.0. Metric data was reported as mean, standard deviation, median and 95% confidence interval. P value of <0.05 was taken as significant Pearson's correlation to examine the association between the total lengths of humerus and their fragmentary lengths.

After finding a positive correlation between length of humerus and their respective fragments, Regression equation was obtained for the humerus with the fragmentary lengths as the independent variable and the maximum length as the dependent variable, using the total sample (N= 79 humerus).

The humerus bone was divided into 6 segments where measurements were taken from the pre-determined anatomical points which are as follows-

1) a = Most proximal point on the head
2) b = Most distal point on the circumference on head
3) c = Convergence of two areas of muscle attachments, just below the major tubercle
4) d = lower end of deltoid tuberosity
5) e = Upper margin of olecranon fossa
6) f = Lower margin of olecranon fossa
7) g = Most distal part of trochlea

The measurements obtained were analyzed using SPSS statistical software for windows version 10.0. Metric data was recorded as mean, standard deviation, median at 95% confidence interval with P value less than 0.05. The different measurements were analyzed and tabulated in Tables 1 to 3

Results :

The descriptive statistics of the humerus showing their total lengths and the individual fragmentary lengths of all the 79 humerii (n=79), included in our study are shown in Table 1. The mean value of humeral length was 29.2696 and the mean values of each of the segments are noted in the said table.

Table 2 depicts the model summary R squared values and standard error of estimates of the six humeral fragments. The table shows the R squared values of the different fragments in increasing order of the values and the standard errors of estimate in the reverse order.

Table 3 highlights the regression coefficients of the different humeral fragments, with the total humeral length as the dependent variable and the individual fragmentary lengths as the independent variables. As per the table, the standardized regression coefficient of the segment (d to e) i.e. the bony segment between the lower end of deltoid tuberosity to the upper margin of olecranon fossa, was the greatest (0.368) at a significance level (1-tailed) of more than 95%. This indicates that this segment bears a good correlation and regression with the total humeral length.

Table 1 : Descriptive statistics of humerus, showing its total length and fragmentary lengths of its six segments.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Total Length	79	24.80	34.00	29.2696	2.25987
a to b	79	2.30	3.90	2.9747	.36108
b to c	79	2.20	4.80	3.6215	.89796
c to d	79	6.90	10.40	8.0633	.97733
d to e	79	8.40	11.70	10.4835	.74532
e to f	79	.80	2.80	1.5063	.33640
f to g	79	.70	2.60	1.3696	.35818
Valid N (list wise)	79				

Table 2 : Model summary depicting the r-squared values and standard error of estimate of the different humeral fragments.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.940[a]	.885	.883	.77293
2	.959[b]	.920	.918	.64583
3	.964[c]	.930	.927	.61161
4	.974[d]	.945	.945	.53011
5	.976[e]	.953	.949	.50873
6	.977[f]	.955	.952	.49722

Table 3 : The Regression Coefficients of the Different Fragmentary Segments of The Humerus.

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.760	.726		16.193	.000
	a to b	5.886	.242	.940	24.285	.000
2	(Constant)	13.528	.678		19.960	.000
	a to b	4.337	.333	.693	13.015	.000
	b to c	.785	.134	.312	5.856	.000
3	(Constant)	9.865	1.338		7.375	.000
	a to b	4.225	.318	.675	13.302	.000
	b to c	.507	.155	.202	3.275	.002
	d to e	.477	.153	.157	3.121	.003
4	(Constant)	2.581	1.843		1.400	.166
	a to b	2.674	.411	.427	6.508	.000
	b to c	.999	.165	.397	6.037	.000
	d to e	.987	.166	.326	5.940	.000
	c to d	.591	.116	.256	5.083	.000
5	(Constant)	1.172	1.844		.636	.527
	a to b	2.261	.423	.361	5.349	.000
	b to c	1.073	.161	.427	6.660	.000
	d to e	1.066	.162	.352	6.575	.000
	c to d	.685	.117	.296	5.862	.000
	e to f	.522	.193	.078	2.711	.008
6	(Constant)	.953	1.805		.528	.599
	a to b	2.469	.425	.394	5.812	.000
	b to c	1.005	.161	.399	6.244	.000
	d to e	1.114	.160	.368	6.960	.000
	c to d	.625	.118	.270	5.304	.000
	e to f	1.028	.305	.153	3.365	.001
	f to g	-.680	.324	-.108	-2.102	.039

a. Dependent Variable: total length.

Discussion :

Regression equation with the six humeral fragments as the independent variable and the total length of the humerus as the dependent variable was obtained using the total sample (N=79). The measurements obtained were analysed by SPSS Statistical software for Windows version 10.0. P value of less than 0.05 was considered significant, and 95 % confidence intervals was employed in this study. Pearson's correlation was used to study the degree of association between the total humeral length and the individual fragmentary lengths. The predicted cum observed lengths were calculated and they almost tallied and thus the results proved accurate and consistent.

Conclusion :

The present investigation was a preliminary work and can be considered as a pilot study for estimating the regression equation to estimate the total length of humerus from its fragmentary lengths. In a population specific sample. Being population specific, it can be applied in case studies pertaining to identification of human remains of that geographic domain when grossly mutilated bodies or bony fragments are sent for forensic autopsy.

Our study revealed the Regression equation of Humerus as follows:

Total length of humerus = 0.95+2.46AB+1.00BC+1.11DE +0.62CD +1.02EF-0.68FG

R Squared value =0.95

This research work was an exciting opportunity to delve deeper into the world of uncertainties in developing models for human identification. It was aimed at developing proper technique where correct estimation will provide justice to the deceased. Also, this study helped in going through all the recent works in this field thereby giving additional dimensions to the review of current research work.

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ORIGINAL ARTICLE

Knowledge, Understanding and Handling of Medicolegal Issues among Different Cadres of Allopathic Practitioners in a Tertiary Care Hospital of Tamil Nadu

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Abstract :

Increasing literacy rate, the social exchange of information on various forums, and online readily available data have raised awareness about patients' rights among the public, resulting in more legal suits being registered against the medical fraternity. Nearly one-third (75%) of doctors faced workplace violence at least once in their lifetime in India. Based on this background study has been conducted with the objectives to assess the knowledge and perceptions of the medical code of ethics and standard basic legal fundamentals and to find out the level of understanding on handling different legal situations and medical laws among doctors in a tertiary care institution. An institutional-based cross-sectional study was conducted. Out of 120 participants, 68 (56.6%) were male and the remaining 52 (43.3%) were females. Nearly half of them were not aware of the importance of consent (49%), and the majority of the participants, 67 (5%) were not aware in which form the consent must be obtained. Overall, 63% of the participants examined the sexual assault cases at least once. Irrespective of the specialty and cadre, allopathic practitioners are grossly deficient in medicolegal knowledge, which is a primary concern and needs to be addressed urgently. It requires regular reinforcement training and workshops to update the medicolegal issues from time to time, at least annually. Concerned National organizations must introduce an accredited certificate course on Basic Medico legal laws (BML) and Advanced Medico legal laws (AML) to make literate doctors in medicolegal laws.

Keywords : Brought dead; Consent; Medico-legal laws; Poisoning case; POCSO Act; Sexual Assault.

Introduction :

Increasing literacy rate In India and social exchange of information on various forums, media, and online readily available information leads to growing awareness among the general public regarding patient rights, resulting in more legal suits being registered against the medical fraternity.[1] Nearly one-third (75%) of doctors faced workplace violence at least once in India and 70% in the USA.[2,3] Unfortunately, the medical undergraduate and the postgraduate curriculum have ignored the teaching of ethics to the health Professionals due to this, many medical professionals face dilemmas in treating the medicolegal cases and a significant deficit in practicing the medical ethics in their daily practice.[4] In India, for the last two decades, medical negligence cases have almost doubled.[5] Doctors in casualty are the point of contact for most people seeking medical assistance in hospitals.[6] It is paramount for medical practitioners to be aware of and understand everyday medical ethics, medicolegal principles, and practices evens, particularly in the current climate of increased awareness, expectations, and violence against doctors.[8]

In recent years there has been a steady rise in breaching the doctor-patient relationship, leading to confident stakes negligence globally has assumed great paramount concern, the medical malpractice suits are rocketing in various countries like USA, Europe, Asia, and India.[7] In India, the lack of knowledge on medicolegal laws in the last two decades, resulting in assaulting or interfering the duties of the doctors by patients and their attendees, has been rising, which led to increased apprehension and anxiety among the practitioners. With this background, this study was conducted with the objectives to assess the knowledge and perceptions of the medical code of ethics and common medicolegal issues among doctors in a tertiary care institution, and to find out the level of understanding on handling different medicolegal situations and medical laws among the other cadres of doctors. This study provides valuable input for the administrators and national association bodies to plan & implement awareness augmentation programs for medical professionals.

Material and Methods :

An Institutional based cross-sectional study was conducted to assess the medicolegal literacy among the doctors having the recognized qualification as per the National Medical Commission (NMC) and practicing in various specialties of modern allopathic medicine. Doctors practicing different cadres, including the general practitioners and specialists from General Medicine, General Surgery, Paediatrics, Obstetrics & Gynaecology, etc., in a tertiary care medical institution and willing to participate

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included in the study. The sample size was determined based on the previous research conducted by CS Makhani et al[4] in Indore city, which noticed that medicolegal literacy was 52.9% among the medical practitioners. The minimum sample size was calculated using the 4pq/d2 formula where p=52.9, q=47.1, and d2 allowable error was taken 20% of the p and 10% added for non-response error the sample size 105 was determined. A total of 170 MBBS and above qualified doctors are working in this institute; all doctors working in this institute considered to be included in the study; those who were on long leave during the study period and unwilling to participate were excluded from the study. Out of the 170 practitioners, 38 were either on an extended vacation or reluctant to participate in the study, they were excluded, and the remaining 132 were included. Data was compiled using MS Excel and analysed using SPSS 21. The categorical data were analysed in proportions, and appropriate statistical tests were applied to test the significance. If the p-value less than 0.05 was considered significant at a 95% confidence interval. This study obtained informed Consent after explaining the nature of the study, assuring the confidentially of the information following the Declaration of Helsinki. Institutional Ethical approval (IEC/2019/2/4) was obtained from the Institutional Ethics Committee at ESIC Medical College & PGIMSR, Chennai, India.

The self-designed and self-administered study instrument was circulated to all the participants. Out of 132 participants, 12 submitted incomplete forms so were excluded from the final analysis. Finally, a total of 120 participants were included. After a careful literature review, the two Forensic experts formulated a

Table 1 : Distribution of subjects based on academic position Vs genera legal aspects.

Academic Position	Total	What is Medico legal case		Autho-rised person to conduct autopsy		H/o medico legal cases Handling		Re-sponse to MLC as a CMO		First action to MLC as a CMO	
	No	No	%	No	%	No	%	No	%	No	%
Prof & HOD	8	5	63%	6	75%	4	50%	5	63%	6	75%
Professor	11	7	64%	6	55%	8	73%	6	55%	7	64%
Associate professor	19	11	58%	12	63%	10	53%	9	47%	9	47%
Assistant professor	36	15	42%	12	33%	16	44%	13	36%	14	39%
Post-graduate student	10	4	40%	4	40%	5	50%	3	30%	5	50%
MBBS doctor	36	25	69%	24	67%	27	75%	26	72%	28	78%
Total participants	120	67	56%	64	53%	70	58%	62	52%	69	58%

Table 2 : Distribution of study subjects based on professional level V/s consent.

Academic Position	Total	Owner of medico legal documents		Do preserved Medico legal documents		The best form of medical Consent		signi-ficance of blanket consent & validity		Is Consent essential in MLC cases	
	No	No	%	No	%	No	%	No	%	No	%
Prof & HOD	8	4	50%	5	63%	6	75%	5	63%	4	50%
Professor	11	8	73%	6	55%	8	73%	7	64%	6	55%
Associate professor	19	12	63%	11	58%	12	63%	9	47%	10	53%
Assistant professor	36	13	36%	16	44%	11	31%	12	33%	13	36%
Post-graduate student	10	6	60%	4	40%	3	30%	4	40%	5	50%
MBBS doctor	36	22	61%	21	58%	27	75%	23	64%	21	58%
Total participants	120	65	64%	63	53%	67	56%	60	50%	59	49%

Table 3 : Distribution of study subjects based on academic position V/s practicing causality services.

Academic Position	To-tal	Hand-ling of injured person		Correct types of mechani-cal injuries		Correct types of simple injury		Stable & conscious poisoning patient medical & legal duties		What will be the response If encounter poisoning case		Correct sequence of Collection of body fluids & its subsequent processing	
	No	No	%	No	%	No	%	No	%	No	%	No	%
Prof & HOD	8	5	63%	6	75%	4	50%	5	63%	6	75%	4	50%
Professor	11	6	55%	6	55%	8	73%	9	82%	7	64%	6	55%
Associate professor	19	11	58%	12	63%	8	72%	11	58%	12	63%	12	63%
Assistant professor	36	15	42%	16	44%	17	47%	14	39%	12	33%	17	74%
Post-graduate student	10	3	30%	4	40%	6	60%	5	50%	4	40%	5	50%
MBBS doctor	36	23	64%	22	61%	26	72%	24	67%	25	69%	25	69%
Total par-ticipants	120	63	53%	44	37	69	58%	68	57%	66	55%	69	58%

Table 4 : Distribution of study subjects based on academic position V/s handling of brought dead cases.

Academic Position	Total	Action to be taken by a doctor when a brought dead Case received in casualty		What will be your response when an impending death is received		Death certificate for the Brought dead case issue/not		Are you aware of issuing a medical certificate for cause of death	
	No	No	%	No	%	No	%	No	%
Prof & HOD	8	7	88%	7	88%	8	100%	7	88%
Professor	11	10	91%	9	82%	10	91%	10	91%
Associate professor	19	15	79%	15	79%	14	74%	15	79%
Assistant professor	36	21	58%	20	56%	21	58%	19	53%
Post-graduate student	10	4	40%	4	40%	5	50%	4	40%
MBBS doctor	36	18	50%	18	50%	17	47%	19	53%
Total participants	120	75	63%	73	61%	75	63%	74	62%

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standardized self-designed questionnaire. It had 30 questions on various medicolegal aspects. The questionnaire was pretested before being administered and validated by the community medicine experts. The questionnaire includes two parts part 1 consists of the demographic profile of the participants. Part 2

Table 5 : Distribution of study subjects based on academic position V/s sexual assaults.

Academic Position	Total	Ever handled a case of sexual violence		Examination of the sexual violence victim		Examination of the sexual assault accused		Objectives of the examination of sexual assault accused	
	No	No	%	No	%	No	%	No	%
Prof & HOD	8	7	88%	7	88%	7	88%	6	75%
Professor	11	9	82%	9	82%	9	82%	9	82%
Associate professor	19	15	79%	14	74%	14	74%	14	74%
Assistant professor	36	24	67%	21	58%	21	58%	21	58%
Post-graduate student	10	6	60%	4	40%	5	40%	4	40%
MBBS doctor	36	15	42%	14	39%	14	39%	13	36%
Total participants	120	76	63%	69	58%	69	58%	67	56%

consists of general questions about medicolegal aspects, Consent, ethics, casualty brought dead / dead on arrival, sexual assault cases, POCSO Act other legal services were collected from the participants.

Results :

This study was carried out on 120 different cadres of doctors to find the medicolegal literacy status among them. Out of 120 participants, 68 (56.6%) were males and 52 (43.3%) were females. Nearly half of them 56 (47%) were having more than 10 years of experience, followed by one third of them 44 (37%) were having less than 5 years of experience and remaining 20 (17%) were having 5-10 years of experience in their medical career. The medicolegal literacy was slightly lower in the male practitioners 35 (51.5%) than that of female practitioners 32 (61.5%), and there is no statistical difference (x2 value 3.74 p=>0.05) between male and female doctors in medicolegal literacy. The medicolegal knowledge among participants 67 (56%) were having enough knowledge on a medicolegal issue while treating the patients. Only 64 (53%) doctors know which specialists can conduct the autopsy. Among the 120 doctors, only 70 (58%) completed at least one medical-legal case. Out of 120 participants, only 69 (58%) doctors gave the correct response for the first action after receiving the Medico-Legal Case (MLC). The details of medicolegal knowledge and perceptions are provided in Table 1.

Among 120 medical practitioners, nearly half of them were not aware of the importance of the Consent 59 (49%) and in which form the Consent must be obtained 67 (56%). This is mainly observed in the young and early period of a career. Half of the doctors 60 (50%) know about the blanket consent and its validity.

Table 6 : Distribution of study subjects based on academic position V/s Legal acts.

Academic Position	Total	POCSO act & its implications		will you report MLC to police even unwilling by victim/relatives		Do acquainted with medical evidence in the court of law?		Do you feel MLC knowledge adequate	
	No	No	%	No	%	No	%	No	%
Prof & HOD	8	5	63%	6	75%	5	63%	4	50%
Professor	11	8	73%	9	82%	7	64%	7	64%
Associate professor	19	11	58%	9	47%	10	53%	11	58%
Assistant professor	36	14	39%	13	36%	13	36%	14	39%
Post-graduate student	10	4	40%	6	60%	5	50%	7	70%
MBBS doctor	36	21	58%	25	69%	23	64%	23	64%
Total participants	120	63	53%	68	57%	63	53%	66	55%

Details have been provided in table 2.

Regarding record preserving, 63 (53%) responders opined that maintaining records of Medicolegal cases (MLC) till the point is disposed of by the court, and 27 (23%) expressed it to be preserved for five years. Concerning ownership of the MLC document, 65 (54%) of them felt that the MLC document was the patient's legal property, while 27% thought it was the property of the Hospital. The remaining 39% were not having a clear idea about the ownership. Among 120 participants, only 44 (37%) were known for the correct injury classification, and 69 (58%) doctors could differentiate grievous injury from superficial damage. Sample collection for chemical analysis during MLC/autopsy of poisoning cases, slightly higher than half of the doctors, 66 (55%) were aware of preservatives to be used for chemical analysis of various samples like gastric lavage, blood, urine, etc. Most of the doctors, 69 (57.6%), are aware of brought dead cases, and the steps to be taken when brought fatal cases come across in their practice. Details have been provided in table 3.

The current study revealed that only 63% practitioners were aware that death certificate should be issued or not and what must be done if relatives insist for it in brought dead cases. Around 73 (61%) doctors gave the correct answer for the response after the impending death was received. Details have been provided in table no 4.

Overall 63% practitioners handled the sexual assault cases and among them 53% were well aware how to examine victim and accused, collect evidence etc.. Details have been provided in table 5.

This study measured the participants' knowledge about the POSCO Act and other medicolegal acts. It was noticed that the understanding of Medicolegal acts was not up to the mark; it is just above the half 63 (53%); details have been provided in table 6.

Discussion:

In the recent past, many doctors were facing medicolegal issues in the court of law. Some were asked for a considerable amount of money to compensate the victims who could not prove themselves. This might be due to increasing public awareness of medicolegal issues and an awareness of the ethical conduct of medical professionals. The legal litigations against medical doctors are on an upward trend which is need of the hour to discuss. To overcome these litigations, doctors need to be more aware of medicolegal problems, especially medical laws and regulations that concern their practice. All doctors must be literate in medicolegal laws and acts which will make them deliver their services ethically, morally, and legally.

In this study, among 120 participant doctors, 56.6 % were males, and 43.3% were female; in a similar survey conducted by Abdelmoneim et al in Sudan[5] and 2014 by Haripriya et al. in Bilaspur[9,] similar gender groups were included. This study observed that just above 50% of the participants were given correct answers for the general medical-legal procedure like identifying the Medico-Legal Case (MLC), who must handle the MLC, and other functions. The knowledge level is a little low among the middle-level cadre. Similar studies conducted in different parts of India and the globe found little higher knowledge than this study.[5, 10- 12] The MLC record ownership and the preserving the record is very important; MLC record is the evidence for the court of law, knowledge on the record-keeping majority were unaware that how many years has to be preserved the records, similar study conducted in Indore the majority of the respondents were aware of the knowledge of record-keeping of the patients and results were higher than the study done in 2009 by Makhani in Indore[2] and 2014 by Haripriya et al in Bilaspur.[9] In India, commonly, the patient keeps all the records with them. In government hospitals, whoever availed health services, the documents will be with the respective hospitals, and only the discharge summary is given to the patient. In the corporate hospitals, the patient's records are with the hospital, and treatment summary copies are given to the patient if they insist photocopies of the entire file are given to the patients.[13]

Informed consent from the patient must be obtained before medical examination and interventions are mandatory; a valid consent is necessary for medical treatment. Only half of 50% of them know the importance and correct way of obtaining informed consent, whereas, in other similar studies, the findings contradict our findings. They determined almost every participant in this study has knowledge of informed Consent, and this is following the study carried out by Nandimath et al. and Heywood et al. The difference may be due to the different setups of the study.[14, 15]

The issue of injury certificates was critical to the victim in various cases as evidence for the legal proceedings. Classification of wounds and injuries is very crucial to issuing the certification. This study observed that more than 50% of medical practitioners have sufficient knowledge of the classification of mechanical injuries and mention the sub-headings of injury certificates correctly. 58% practitioners were aware of dealing with the poisoning cases and sequence of collection of body fluid. Issue of the cause of death certificates only 63% of the participants knew the correct method of writing the cause of death certificate and the situation when to issue the death certificate; this knowledge was more among experienced doctors than the less experienced doctors, especially those doctors on their early carrier were lacking the adequate knowledge. The study conducted by Pratibha et al. on the interns and residents and Khandekar et al. also observed similar findings.[1,16]

Examination of the sexual assault cases and making out the findings and collecting specimens for the evidence are one of the prime duties of the specialists. The current study determined that only 63% of the participants have experience in handling the sexual assault cases and examining the accused. 58% participants had experiience of examining sexual assault victim. Other similar studies also in line with our study have a Study conducted by Pratibha et al on the interns and residents, Kyada et al study on the obstetricians, and Khandekar I et al. also observed similar findings.[1, 16, 17]

Knowledge about the medicolegal laws and acts will be useful for medical practitioners; this study observed that act like POCSO Act, only 53% of doctors have an idea what is the act and other details, and different medicolegal laws like the consumer protection act (CPA), Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, medical establishment laws, essential services maintenance laws and MTP act, etc. not having sufficient knowledge that leads to legal encounters against many of the practitioners in the recent past. Similar studies conducted by Singh et al in the state of Maharashtra[9] and Katya in Rajkot city in the form of Gujarat, India, also observed the lacking the knowledge on the medicolegal aspects among the practitioners.[17]

Limitations: This study is done with a very limited number of doctors and limited to only one institute. Similar studies must be conducted at various levels of health care centres in different parts of the country to extrapolate the results better. This study has given scope to implement a similar survey by the government on larger groups at various levels of institutions, including private organizations, to better understand the situation.

Conclusion :

The study was a sincere effort to assess the medicolegal literacy about various medicolegal aspects among medical doctors of a different cadre. This study observed some junior staff had adequate knowledge of some legal procedures, and many senior specialists' medicolegal literacies were grossly inadequate. There is an urgent need to improve the knowledge about various medicolegal issues, to reduce problems and errors in dealing with medicolegal procedures, and to avoid suits in the court of law. It requires arranging reinforcement training and updating knowledge from time to time, at least annually.

National organizations like the Indian Medical Association/ National Medicolegal centre of excellence must plan to introduce national accredited certificate courses on Basic medicolegal laws (BML) and Advanced medicolegal laws (AML) certificate courses like Basic Life Support (BLS) and Advance Cardiac Life Support (ACLS). Indian Medical education controlling organizations National Medical commission of India (NMC) /Universities to think of introducing the course in internship

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(BML) and Postgraduate level (AML). This will enrich the medicolegal laws knowledge, benefit the doctors, and save the precious time, services, and tension-free minds of doctors from legal procedures.

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Conflict of interest: The Author(s) declare(s) that there is no conflict of interest

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ORIGINAL ARTICLE

A Record Based Study of Electrocution Cases Brought at Mortuary Complex of Tertiary Care Center, Bhavnagar

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Abstract :

Electrical appliances have become a part of our living. In modern era, persons of different professions are daily handling electricity and its related appliances' while performing their day-to-day duties and activities. Although people are aware of the danger caused by non-protective contact with electricity, but very few really understand that even a minute quantity of electrical energy is sufficient to cause electrocution-related fatalities. In this record study, an attempt being made to study the electrocution fatalities that were autopsied at tertiary care center, Bhavnagar during 1 year. During study period, 18 deaths (1.97%) due to electrocution were accidental in Nature. Majority of the people belonged to age group 21-30 which constituted 33.33 % (6 out of 18 cases) of the total cases studied. 15 (83%) cases were male and 3 (17%) cases were females. Hand was the most frequently involved electrical wound 12 deaths (66.67%). Out of 18 cases, 11 cases have occurred outside the home out of which, 10 cases occurred at work places. Out of 18 cases, 16 cases were dead on the spot. It signifies that work-related electrocution deaths require multidisciplinary attention and awareness.

Keywords : Electrocution; Accidental deaths; Work site.

Introduction :

In recent time, electricity has become an integral part in to the human life as electrical power is the basic need for the development of the country. Sometimes, the use of electricity may result morbidity or mortality and most of these cases are accidental in nature.[1-5] But there are few cases which were reported as homicidal and suicidal in various literatures.[6-11] Death by electric currents are usually accidental from a faulty line, while working with an electrical cooking heater, room heater, the bathroom from a heating coil or defective electrical appliances.[12] As per NCRB [National crime report bureau] -2019 data 13432 electrocution deaths reported in 2019.

Supply of electricity : 1) Alternating Current - It is used for domestic and commercial purposes. Appliances like domestic lighting, cooler, fan, air conditioner, refrigerator etc.

2) Direct Current - It's used for charging of stored batteries, electroplating, refining of copper and aluminum, production of gases, metal rolling mills etc.

Death due to electrocution involves both High and low voltage currents and most of the deaths are due to low voltage currents used in houses and minor industrial settings. The type of power system employed in our country is an AC 220–240 V, 50 A.[4]

This study highlights the magnitude of the problem of occupational and domestic accidental electrocutions in Bhavnagar, identifies potential risk factors for fatal injury and provides recommendations for developing effective safety programs to reduce the risk of electrocution.

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Materials and Methods :

This record study was conducted at government medical college and Sir. T. general hospital, Bhavnagar. Ethical clearance taken from Institutional Ethical Committee before starting the study. All electrocution deaths that were brought for autopsy during the period from 1st September 2019 to 31st August 2020 were included. It was a retrospective study. Total 18 cases were included in the study.

Data collected from the Hospital record section - police Papers, Autopsy Reports. The data collected were entered into MS – Excel spread sheet, analyzed and evaluated in terms of Age, Sex, Place of event, Month, Site wise distribution and Wound wise distribution of electrocution related death cases.

Results:

Out of 914 cases which were brought for autopsy during the study period, electrocution related deaths contributed 18 cases (1.97%), out of which 15 (83%) were male and 3 were female (17%). Male outnumbered female (5:1). In our study, age group of 21-30 year constituted 6 cases (33%) followed by 11–20 year group (4 cases, 22%) of total case studied. Majority of the electrocution occurred related to outside-work which are 11 cases (61%). Only 7 cases occurred in household accident (39%). Electrocution related mortality occurred mostly in month of June to September in our study (11 cases, 73.33%). Entry wound is seen in 12 cases which constitutes 66.67 % of total cases. Among that Entry in right upper limb 7 cases (58.33%), entry in left upper limb constitutes 4 cases (33.33%). And entry in lower limb constitutes 1 case (8.33%). Exit wound seen only in 3 cases (16.67 %), in right lower limb. Among the 18 cases, 16 cases were brought as "brought dead" to causality which is 88.89 % of the total cases.

Discussion :

Electrocution is an uncommon cause of death and the most commonest manner is accidental. In our study electrocution deaths were found to account for 1.97% of all medico legal deaths in our region. In various studies, electrocution death rate is ranging from 1.90% to 3.33% which is similar to our study.[13-15]

All electrocution fatalities in our study were accidental and no case of suicidal and homicidal electrocution observed compare to other authors study.[8,9,10,11] The main reason for accidental deaths in our study is as follows: electrocution from tree trimming, contact with an electric switch board of the motor pump, overheating, aging of the material and use of sub-standard quality of electrical gadgets have been the main factors contributing to the increasing electrical fire accidents in factory, electrical short circuit etc.

Due to more exposure of men to electrical hazard among 18 cases seen in our study, 15 cases were male (83%). Studies conducted in different parts of our country also showed a similar male preponderance.[13, 15, 16, 20]

Most of the deaths occurred in the rainy season (June – September) followed by summer (March–May). The high rate of rainy season where similar to the findings of Northern India.[17]

Table 1 : Age wise distribution of electrocution deaths.

Age Group	No.of cases (n)	Percentage (%)
0-10	1	5.5%
11-20	4	22.2%
21-30	6	33.33%
31-40	3	16.66%
41-50	2	11.11%
51-60	0	0.0%
61-70	1	5.5%
71-80	1	5.5%
Total	18	100%

Graph 1 : Sex wise distribution of electrocution deaths.

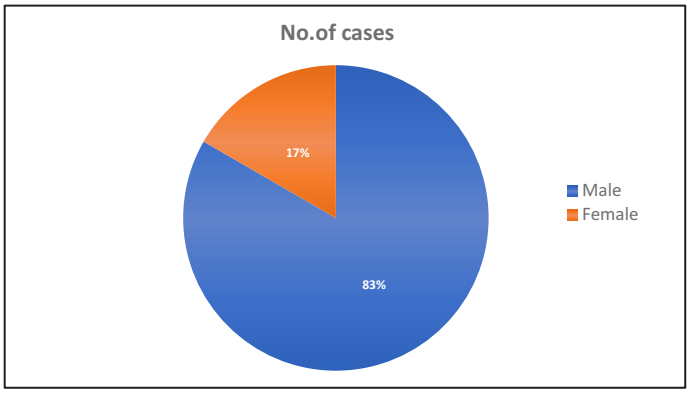


Table 2 : Manner of death wise distribution of electrocution deaths.

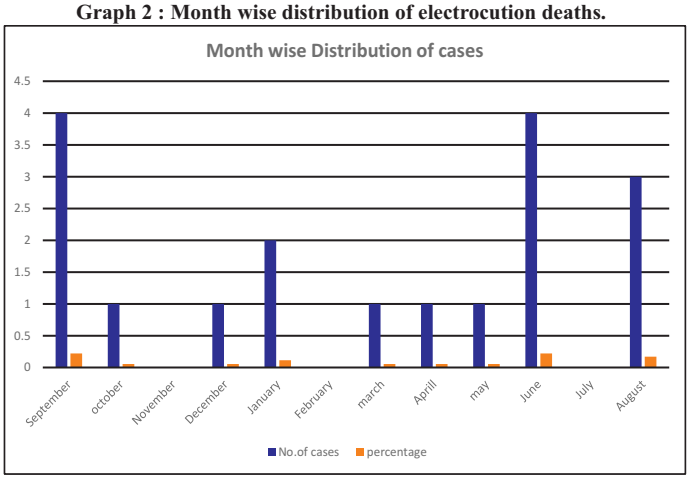
Manner of death		No. of cases(n)	Percentage (%)
Accidental	Outside - work related	11	61%
	Household	7	39%
Suicidal		0	0
Homicidal		0	0
Total		18	100%

Persons in second to third decades (21- 30 year) were found to be more engaged in electricity dependent work, either at work place or at home. Hence, they are more prone to electrocution. These results were consistent with the findings of Northern India.[17]

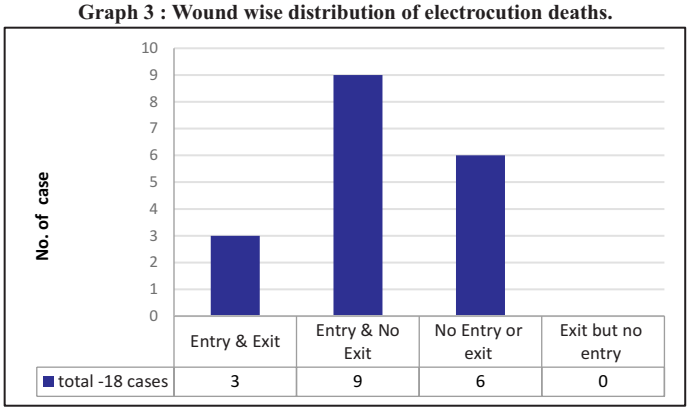
No entry wound is seen in 6 cases (33.33%) Similar finding of increased incidence of entry wound in upper limb was observed in study conducted in Lucknow (61%)[17] and Manipur (56%)[19] In our study, no entry or exit wound was found in 5 cases (27.78 %), which is in contrast to another study from India in which no such case was reported.[13]

The most of the electrical entry wound were located on the upper

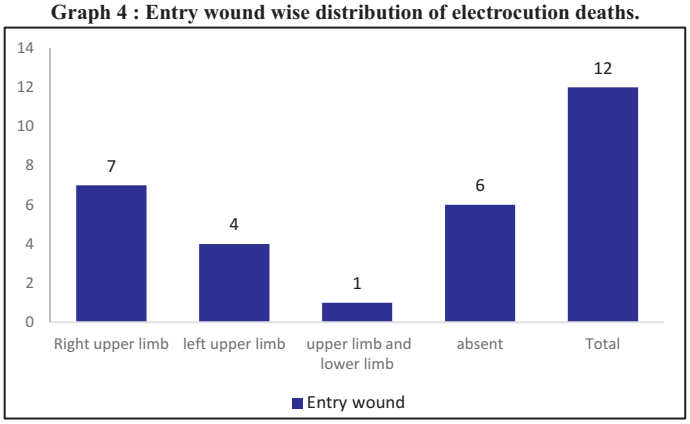
Graph 2 : Month wise distribution of electrocution deaths.



Graph 3 : Wound wise distribution of electrocution deaths.



Graph 4 : Entry wound wise distribution of electrocution deaths.



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limb (over hands and fingers), while exit wound were commonly located on the lower extremities (Foot). Similar finding were reported from other studies.[1,13,19]

The study conducted in Gujarat documented 96.07% cases of electrocution brought as brought dead, Manipur documented 80%, Chennai documented 51.28% brought as "Brought dead" and in our study 88.89% cases were reported brought dead.[19-21]

Conclusion :

Death due to electrocution draws close attention not to watch documentation of the true cause of death of the unfortunate victims but also to detect conditions which should be responsible for electrocution deaths. Usually, such deaths are accidental which can be prevented if proper safety measures are adopted. Proper care should be advised while using electronic malfunctioned equipment, uninsulated wiring, damaged appliances etc. Electric equipment should always be kept away from the reach of children. In our study, electric motor was found to be a growing electrical hazard. This can be easily prevented by proper repairing and use of it. Young adults who were forced into the most dangerous jobs without effective safety measure should be educated. So, these contacts should be avoided. In the rainy season, more deaths occurred so, if we can practice safety measures during for handling electrical instruments, we can remain safe.

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ORIGINAL ARTICLE

Association of Menstrual cycle with Suicide in Female of Reproductive Age Group : A Hospital based Prospective Study using Histological Technique

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Abstract :

Suicide attempt and suicidal death among women of reproductive age group are very common in INDIA. Different socio-economic factors along with psychological ups and downs are leading cause. Aims of the study is to find out relation between female suicide and various demographic factors like age, marital status, time of attempt and also to find out association between female suicide and phases of menstrual cycle by histological study of uterus. Hormonal changes throughout menstrual cycle leading to premenstrual syndrome can be a precipitating factor. A prospective cross sectional observational study conducted on 91 women who committed suicide between 15 to 45 years age group. Tissue from uterus collected, processed, sectioned, stained and examined under microscope to identify phase of menstrual cycle. Data is expressed in frequency distribution table and chi-square test done to detect statistical significance. Most of the women were between 18 to 30 years age group, married, committed suicide between 6 am to 6 pm and adopted burn for the purpose. 63.8% (approximately 2/3rd) women committed suicide during secretory phase. Association between phase of menstrual cycle and age of victim, marital status was statistically significant (P value < 0.05). Suicidal rate can be minimized by proper education, counselling, psychiatric evaluation, psychosocial group therapy and also by reducing domestic violence and substance abuse.

Keywords : Histological technique; Menstrual cycle; Proliferative phase; Secretary phase; Suicide

Introduction :

Suicide is nothing but taking away someone's own life. Though males both and females are victims of this unnatural form of death, gender variation in suicidal attempt and suicidal deaths exist. According to Jennifer Langhinrichsen[1] and Ahuja N,[2] females attempt suicide 3 times more than males while suicidal deaths are 3 times more common among males. In present scenario, suicidal attempts amongst young and middle-aged females (both married as well as unmarried) have alarmingly increased which may be due to many a factor like mental depression, familial or social disharmony or some sort of provocation either alone or in combination of more than one such factors. During a menstrual cycle hormonal changes occur both in proliferative phase (1st day of menstruation to ovulation) and secretory phase (after ovulation till next menstruation starts). This hormonal change leads to mood swing, depression which may play a role in suicidal ideation. In a systematic review done by Wetzel RD, McClure JN,[3] suicidal death in secretory phase was more common in 5 studies whereas it was more common in proliferative phase in 6 studies. Dogra T.D et al,[4] Baca-Garccia E et al[5] and Caykoylu A et Al[6] also claimed that suicidal death is more common in proliferative phase. Still there is lack of conclusive and authentic data regarding this matter. Our objectives of this study are directed from preventive point of view through finding out association between female suicide and various demographic factors like age, marital status and also to establish any association between female suicide and different phases of menstrual cycle by histological study of uterus. Treating premenstrual blues with hormones may be a preventive aspect in high-risk women.

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Material and Methods :

Sampling : This was a cross sectional observational study conducted in the dept. of Forensic Medicine and Toxicology and Pathology of a tertiary centre of West Bengal, India. It was one-year long study. Ethical clearance was obtained from the Institutional Ethics Committee (Ref No NMC/Ethi/Gen-25/63 dated 03.01.2010). Sample size was calculated as 91 considering reference prevalence p = 0.52 and allowable error l = 20% of prevalence using the formula 4pq/l2.[7] Subjects were brought dead suicidal deaths within their reproductive age group (15 to 45 years). Details about the victims regarding the age, address, marital status, date and time of suicidal attempt and menstrual history where available, were obtained from police requisition and inquest, and also from victim's available close associates. Consent was taken from the keens before collecting the tissue from the body. Unnatural deaths which were suicidal in manner were included whereas decomposed bodies, pathological samples of uterus were excluded. Tissue was collected and fixed in 10% formol saline for 24 hours. Then it was processed through the stages of dehydration, clearing, impregnation, block formation, sectioning by microtome and staining using haematoxylin and eosin stain. Stained slides were examined under microscope to identify the stage of menstrual cycle from histological appearance of endometrium. Endometrium in different stages of menstrual cycle.[8,9]

Assessment tools : Data was entered in Microsoft Excel Office 365. SPSS Version 21 was used for statistical analysis. All data (categorical) were expressed by frequency or percentage.

Phase	Days	Thickness of endometrium	Epithelium
Menstrual	1 - 4	Thin	Absent
Proliferative	5 - 14	Intermediate	Columnar
Secretory	15- 28	Thick	Columnar. Also visible are helicine branches of uterine artery

Comparison study was done by Chi-square test. Any P value < 0.05 was considered as statistically significant.

Results :

Histology of uterine endometrium of 91 individuals were studied (n=91). Suicidal rate in relation to different demographic and other parameters and various phases of menstrual cycle were observed. Most of the victims were between 18 to 30 years age group (58.2%) followed by 30 to 45 years (31.9%) and 15 to 18 years age group (9.9%). The study was conducted among married and unmarried women. Prevalence of suicide was more than double among married women (68.1%) than unmarried ones (31.9%). Among various methods of commission of suicide, burn was the commonest one (54.9%) followed by poisoning (27.5%) and hanging (17.6%). Suicide was committed in different time of the day. Approximately 2/3rd of the victims committed suicide in the day time i.e. between 6am to 6 pm whereas it was little more than 1/3rd between 6 pm to 6 am. Considering histological appearance of endometrium, it has been observed that most of the women (63.8%) committed suicide in secretory phase of their cycle i.e. between 15th to 28th day. 23.1% and 13.2% women did the same in the proliferative and menstrual phase respectively. Late secretory phase was more frequently chosen time than early secretory phase. In Table-1, all these parameters have been distributed in frequency [Table 1].

Among 62 married women, 75.8% committed suicide in secretory phase whereas among unmarried women prevalence of suicide in secretory and proliferative phase is more or less same (37.9% and 34.5% respectively). 27.6% of unmarried women committed suicide during their menstruation. [Table 2].

Association between phase of menstrual cycle according to histology of endometrium and marital status of the women was significant statistically (p value < 0.001)

Almost 2/3rd of the subjects who committed suicide between 6am to 6 pm was in secretory phase of menstrual cycle, 10.3% were in menstrual phase and 22.4% were in proliferative phase. Out of 33 women who committed suicide between 6pm and 6am, 57.6% were in secretory phase, 18.2% were menstruating and 24.2% were in proliferative phase. P value was 0.697 and was not statistically significant [Table 3].

Those who committed suicide in secretory phase, most were in the age group of 18 to 30 years followed by 30 to 45 years and 15 to 18 years. Similar frequency was also observed among women who committed suicide during proliferative phase. Out of 12 women who attempted suicide while they were menstruating, 41.7% were between 15 to 18 years of age, 33.3% between 18 to 30 years of age and 25% between 30 to 45 years of age [Table 4].

Association between phase of menstrual cycle according to histology of endometrium and age group of the of the women was significant statistically (p value = 0.012)

Discussion:

All over the world, there is variation in the incidence of suicidal deaths amongst women, in reference to their relation with different age group (particularly between 15 to 45 years of age), marital status, religion, manner of commission of suicide, time of suicidal attempt and different phases of menstrual cycle. Factors responsible for such variation may be socioeconomic, psychological, educational, cultural and geographical differences. In present study, it is observed that incidence of commission of suicide was most common (53 out of 91 i.e.,

Table 1: Percentage distribution study population according to different parameters (n=91).

Age in years	Number	Percentage
15-18	09	9.9
18-30	53	58.2
30-45	29	31.9
Total	91	100
Marital status		
Married	62	68.1
Unmarried	29	31.9
Total	91	100
Method of suicide		
Burn	50	54.9
Hanging	16	17.6
Poisoning	25	27.5
Total	91	100
Time of attempt		
6am to 6pm	58	63.7
6pm to 6am	33	36.3
Total	91	100
Phase of menstrual cycle		
Earlysecretory	17	18.7
Latesecretory	41	45.1
Proliferative	12	13.2
Menstrual	21	23.1
Total	91	100

Table 2 : Relation between Marital status and phase of menstrual cycle according to histology of endometrium (n = 91).

Phase of menstrual cycle	Married	Percentage	Unmarried	Percentage
Earlysecretory	13	21	04	13.8
Latesecretory	34	54.8	07	24.1
Proliferative	02	3.2	10	34.5
Menstrual	13	21	08	27.6
Total	62	100	29	100

Table 3 : Relation between Time of attempt and phase of menstrual cycle according to Histology of endometrium (n = 91).

Phase of menstrual cycle	6 am to 6 pm		6 pm to 6 am	
Earlysecretory	12	20.7	05	15.2
Latesecretory	27	46.6	14	42.4
Proliferative	06	10.3	06	18.2
Menstrual	13	22.4	08	24.2
Total	58	100	33	100

Table 4: Relation between Age of individual and phase of menstrual cycle according to Histology of endometrium (n= 91).

Agein years	Early secretory phase		Late secretory phase		Menstrual phase		Proliferative phase	
15-18	01	5.9	02	4.9	05	41.7	01	4.8
18-30	11	64.7	24	58.5	04	33.3	14	66.7
30-45	05	29.4	15	36.6	03	25	06	28.6
Total	17	100	41	100	12	100	21	100

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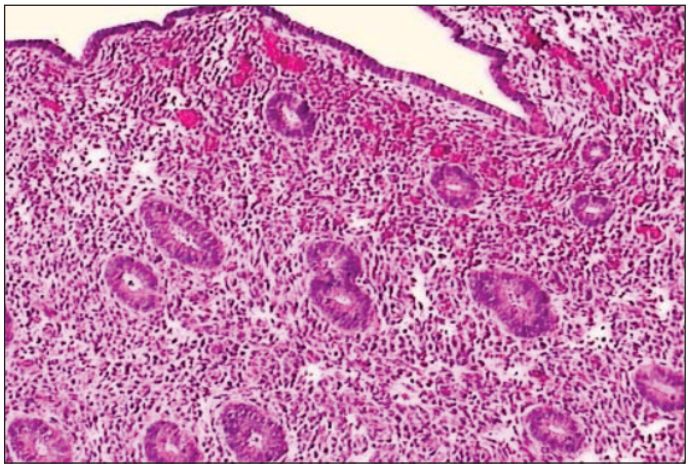

Figure 1: Uterus in proliferative phase.

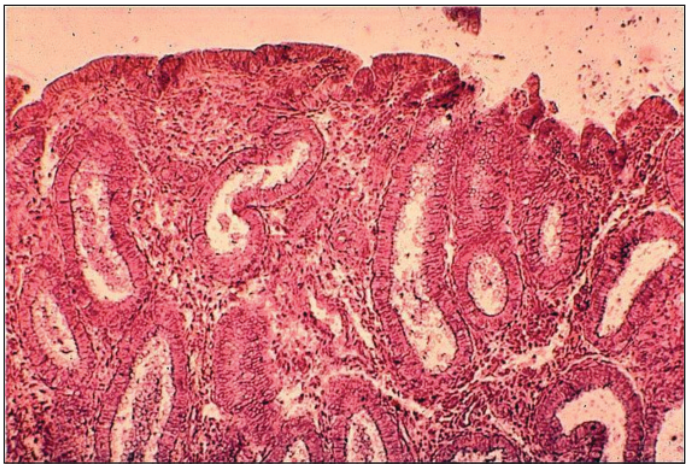

Figure 2 : Uterus in secretary phase.

58.2%) among young adult women between 18 to 30 years of age. This finding is in concurrence with the statistics brought by AASRA 2010, where it was observed that 139 women committed suicide per day within 30 years, whereas 123 committed suicide between 30 to 40 years per day.[10] This observation also corroborated with the study of Patel V published in Lancet, 2010, according to which women between 15 to 29 years of age are mostly vulnerable to commission of suicidal attempt.[11] Loneliness, isolation, increased hormonal changes and other physical ailments with progression of age, have been explained as factors responsible for commission of suicidal attempts in middle aged and elderly women, whereas non - cooperation from society, familial disharmony, marital disadjustment, domestic violence and psychological imbalance aggravate suicidal attempts in young adult women in India.

In the present study, it is observed that 62 women out of 91 (68.1%) were married whereas 29 (31.9%) were unmarried. This is at par with observation of AASRA where it was reported that out of 130 women, who commit suicide every day, 69 are housewives.[10] The present observation is also consistent with the observation of Patel V in 2012, published in Lancet, where it was concluded that marriage is a risk factor for depression, which is of course the commonest psychological factor associated with suicide.[11] Observation of Randy A. Sansone et al in 2007 is also in concurrence with the observation of present study.[12] According to the author, 64.5% women were married, 29.2% were unmarried and 3.5% did not indicate any marital status. For many women, marriage is not out of choice and they find themselves trapped in very difficult and stressful social circumstances and of course there lies the huge issue of domestic violence.

Demand for dowry contributes important role in such domestic violence. Suicide may be committed by various means. In this study burn, hanging, poisoning have been considered as manner of suicidal attempt. Here it was found that 54.9% (50 out of 91) women preferred burn, 27.5% (25 out of 91) women preferred poisoning whereas 6% (16 out of 91) women have chosen hanging for commission of suicide. AASRA reported that 33.1% of suicide victims consumed poison, 31.4% died by hanging, 10% by burning and 4% by drowning in 2010.[10] As India is an agriculture-based country, most common suicidal technique in India is poisoning by agricultural poisons like pesticides and insecticides. In this study, most cases were studied from those parts of West Bengal (Kolkata, North 24 PGS, South 24 PGS, and Nadia) which do not form any large agricultural belt. Therefore, commission of suicide by poisoning is less frequent here. Burn is very common, as substances required to set fire are available in every home.

In present study, commission of most of the suicide took place between 6 am to 6 pm (58 out of 91 i.e., 63.7%) and rest 33 (36.3%) took place between 6pm to 6am. This indicates the diurnal variation of suicidal tendency. According to the observation of Preti A & Miotto P, suicidal attempt was more common in day time, particularly during late morning (8 am to 11 am) and late afternoon (4 pm to 7 pm) only in cases of young age group whereas the incidence subsequently decreased in night hours.[13] This part of the observation to some extent is similar with the present observation. In the same study, it was also noticed that in case of adults (25 to 44 years) there was a less pronounced peak between morning and early afternoon hours. So, this part of the observation does not agree with present finding.

While the relation between rate of commission of suicide and phase of menstrual cycle is studied, it was observed that among those who committed suicide, 18.7% (17 out of 91) were in early secretory phase, 45.1% (41 out of 91) were in late secretory phase, 13.2% (12 out of 91) were in menstrual phase and 23.1% (21 out of 91) were in proliferative phase. So, it can be concluded that secretory phase dominated over proliferative and menstrual phase in these 91 women. As per the review of Weztel and Mc Clure on suicide completion, suicidal attempt and suicidal threat, in 5 of the studies over a period of past 40 years, observed that the suicidal attempt during 4th week i.e. in secretory phase of menstrual cycle was more frequent; in another 5 studies, it was revealed that suicidal attempt or completion is more common during menstrual phase and proliferative phase; in other 2 studies, it was observed that such incidence occurs more frequently during 1st week (proliferative phase), 4th week (late secretory phase) and perimenstrual week (menstrual phase) whereas in rest 6 studies, it was not possible to find any relation between these two parameters.[3] Glass et al and Tonks et al observed that the premenstrual phase is a period of increased vulnerability to

suicidal attempts.[14] According to Dogra TD et al, 54.46% out of their 217-study population committed suicide in menstrual phase.[4] According to Caykoylu A et Al suicide completion and suicidal attempt are more common during proliferative or preovulatory phase which is not in concurrence with the observation of present study.[6] Premenstrual syndrome (PMS) which is characterised by anxiety, irritability, mood swing, insomnia and other psychological symptoms, starts during second half of menstrual cycle, i.e. secretory phase. It lasts till the onset of menstruation or 1 to 2 days after onset. Symptoms worsen as the secretory phase progresses. Sometimes symptoms become very severe which is known as Premenstrual dysphoric disorder (PMDD). When such symptoms combine with various social, cultural and socio-economic factors may aggravate suicidal ideation. Though exact cause of PMS or PMDD is not known, decreased serotonin, fluctuation of estrogen and progesterone level may have some role in causation of such symptom complex. During secretory phase, this fluctuation is well noticed. During this phase progesterone level increases and it falls just before onset of menstruation whereas oestrogen first falls, then rises and thereafter again falls immediately before menstruation. Lesile C Botha explained that decreased serotonin is responsible for depression. Oestrogen blocks MAO which degrades serotonin leading to elevated mood whereas progesterone increases MAO concentration leading to depression.[15] In secretory phase, progesterone level remains high for most of the period and oestrogen level fluctuates. This combined effect ultimately decreases serotonin level, and depression results leading to suicidal ideation.

On the basis of Chi-square test, associations have been found between phases of menstrual cycle with marital status of the women and age of the women (P value in both the cases were bellow 0.05) whereas no such association was found between phases of menstrual cycle with other parameters of the study.

To conclude, various studies on the same aspect revealed different views. Some were in favour of proliferative phase, some favoured secretory phase and some could not establish any relationship. Present study establishes a positive relationship between suicidal attempt and secretory phase, particularly late secretory one. Though definite biological explanation is till now a mystery, possible explanation has been discussed. On the basis of Chi-square test, associations have also been noticed between phase of menstrual cycle with marital status and age of individual. All the relations established from this study, need further researches to find out any hormonal or other biological variations in young adult married women and in different period of day and night hours on the background of various phases of menstrual cycle which increase depression and mood swing, leading to increased incidence of suicidal attempt.

As suicide is becoming a leading manner of death in India at present particularly among women, aim of medical science should be to bring forward some suggestions to reduce the incidence. Prevention is better than cure to achieve the goal. Prevention can be done by following means -

1. Education about suicide including risk factors, warning signs and the availability of help.
2. Reducing access to convenient means of suicide.
3. Measures like psychosocial, psycho-educational group therapy.
4. Counselling of vulnerable group of women.
5. Reduction of domestic violence and substance abuse to reduce many mental health problems.

If these measures can be taken at the time when women remain more vulnerable to attempt suicide (secretory phase, according to present observation), the incidence can be reduced to some extent. In this way, this present study may help the women having suicidal tendency and serve the society.

Conflict of interest : The Authors declare that there is no conflict of interest.

Ethical clearance : Ethical clearance was obtained from the Institutional Ethics Committee (Ref No NMC/Ethi/Gen-25/63 dated 03.01.2010)

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CASE REPORT

Cross Dressing: Forensic Analysis of a Unique Case with Review of Literature

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Abstract :

Cross-dressing is the act of wearing garments not commonly linked with one's sex. Cross dressing is done by various persons irrespective of their biological sex for various reasons which may or may not be linked with promiscuous sexual activity. However when such person are found in dead condition, it causes suspicion in the minds of investigating agencies.

In the present case we discuss a case of cross dressed person who was found hanged in female attire. There was no evidence of any autoerotic activity nor did he cross dressed for other nonerotic activities such as in movies or theatre acting. In reality he had a desire to be cross dressed as female due to his inclination as a transgender towards it.

The current case study and review of literature highlights the importance of recognising cross dressing in the light of various circumstances so as to reach a proper conclusion in various medicolegal cases.

Keywords : Forensic medicine; Forensic psychiatry; Transgender; Transvestism; Autoerotic asphyxia; Cross dressing.

Background:

Cross-dressing : Cross-dressing is the act of wearing stuff of garments not commonly linked with one's sex.[1] Cross-dressing is worn for disguise, comfort and self-expression. Cross-dressing had been seen in Greek, Norse and Hindu mythology and had appeared in form of many historical figures who have cross-dressed in varying degrees. Women's had also cross dressed as men to participate in the society which was particularly reserved for males. Margaret King cross-dressed in the early nineteenth century to attend medical school, as traditionally female students were not allowed to attend it. A young female Vita Sackville-West dressed as a soldier to walk out with her girlfriend Violet Keppel in order to avoid the street harassment from orthodox society who will not accept such relationship at that time.[2]

In the present case study we will discuss a case of crossdressed person who was found hanged in female attire. We will also discuss various aspects of cross dressing with their types, reasons, behavioural aspects, suicidal tendencies, socioeconomic status, discrimination in society, associated mental disorders and various ethical issues that are relevant to it. The current case study and review of literature will highlight the importance of recognising cross dressing in the light of various circumstances so as to reach a proper conclusion in various medicolegal cases.

Case presentation:

A 25 year old male was found dead in hanging condition at his home. He was bachelor living alone in his house. As per history given by relatives and police, he was labourer by profession and was very quiet and soft in behaviour. At the scene of incidence the male was found suspended by multicoloured bandhini print oodhni (scarf like cloth) to the wooden block of ceiling. Strangely to the investigating officer the deceased was found to be wearing a multicoloured bandhini saree with pink blouse (traditional Indian female attire), white coloured padded brassier, shiny golden colour synthetic beaded necklace around neck (usually worn by females) and red coloured female underwear (panty). His feet were touching cotton mattress spread on floor. Over the mattress there was a blue colour cylindrical plastic drum (of height 3 feet) lying horizontally beside the deceased feet. There was a white plastic carry bag containing female clothing's lying adjacent to victim. On one side of room there were different clothing's hooked to the wall nails. Of these almost all clothing's were of female containing one green kurta, one white saree with blue border, a yellow saree, another dark green saree and a grey blouse. There was black pyjama hooked to the back of the door. Another light cream coloured saree was found lying over the cotton mattress away from the body. A 2.5 feet x 1.5 feet sized mirror was present on opposite wall facing the victim. A matchbox was lying over the mattress on backside of the victim. [Fig No 1 and 2]

After removing the body from site it was brought for medicolegal post-mortem at our tertiary care centre. On examination the deceased was an average built brown coloured male having unshaved beard with female clothing's worn as mentioned above. Ligature material was present insitu around neck which was multicoloured bandhini print odhni having single loop with running noose with lower point of suspension present over right mastoid region. The ligature mark was seen over neck corresponding to ligature material removed running obliquely upwards towards right mastoid completely encircling the neck and forming an inverted V mark over right mastoid region. Maximum width of 2 cm was present over left anterolateral aspect of neck. Periligature abrasion of size 1cm x 0.5 cm was present over the right side of neck near lower margin. There was no evidence of other external bodily injuries. There was evidence of cyanosis of nails and lips. There was an old healed linear scar in front of lower half of neck transversely placed of size 3 cm x 0.2 cm suggestive of previous cut mark.

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On internal examination there was no evidence of haemorrhages or damages to internal structures of neck. All internal visceral organs were congested. There was marked congestion to cerebrum and lungs. There was evidence of multiple petechial haemorrhages to surface of heart and lungs. Stomach contained semidigested food materials.

On toxicological analysis there was no evidence of any toxicological substances. The opinion as to the cause of death was given as hanging.

Discussion :

Person dying in cross dressed manner is a uncommon phenomenon. Various factors might be present for a person to be found in cross dressed manner. Such factors are important to have a fair idea regarding the purpose and manner of causation of death. Not all cross dressed people might be indulged in autoerotic activity. Hence such cases need to be assessed at broader details before reaching to a fair and reasonable conclusion.

Types of Cross Dressing : There are various types of cross dressing like gender disguise, movies and theatre, sexual fetischism, passing or not passing, transgender and transsexual (Table No 1). There is strong wish to be recognized as opposite sex in transgender and transsexual. Transsexuals seek surgery for anatomical alteration due to them having an obsessional desire to be recognized as opposite sex. Barring transgender and transsexual individuals in all the other types of cross dressing there is no physiological or psychological deviation to be identified as opposite sex. Hence it is very important to classify the cross dressed person before reaching to any conclusion. In present case the person was inclined to be recognised as female and hence was a transgender.

Reasons of Cross Dressing : There are various reasons for cross dressing. Some do it for disguise, some do it for occupation purposes, and some do it for obtaining sexual gratification while some others do it so as to be identified as opposite sex (Table No 2). Such identification of reasons is very important. If correctly identified the actual reason it will mitigate errors while framing opinion which will not cause embarrassment to the near and dear of the deceased or living one.

Table 1 : Types of cross dressing.

Sr. No	Types of crossdressing	Description of Types of crossdressing
1	Gender Disguise	Gender disguise is used by women and girls to pass as male, and by men and boys to pass as female.[3]
2	Movies and Theatre	Early movies female characters were played by male actors, as women working in movies were not acceptable in society. Cross-dressing of males wearing female dresses is sometimes used for comic effect.[4]
3	Sexual fetischism	A transvestic fetishist is a person who cross-dresses as part of a sexual fetischism. Eonism also known as transvestism, is a sexual perversion wherein sexual gratification is achieved by wearing the dress of the opposite sex.[5]
4	Passing or not	"Passing or trying to pass" are cross dressers whose mannerisms, speech patterns and emulation of sexual characteristics are as of belonging to opposite gender.[6]
5	Transgender	Transgender people have a gender identity or gender expression that varies from their sex given at birth.[7] About 0.5% of the population is transgender.[8]
6	Transsexual	Transsexualists are persons who seek surgery for anatomical alteration due to obsessional desire to be recognized as opposite sex.[9]

Table 2 : Reasons for cross dressing.

Sr. No	Types of cross dressing	Reasons for crossdressing
1	Gender Disguise	Gender disguise is used by womens to take up male-dominated or male-exclusive professions. Similarly mens may cross-dress to avoid compulsory military service. Undercover journalist may cross-dress, as was done by Norah Vincent's project Self-Made Man.[2] Some girls are disguised as boys by t heir families in Afghanistan. This is known as bacha posh.[10] Recently a famous yog guru of india cross dressed to avoid arrest from police during a nationwide agitation against government policy.
2	Movies and Theatre	In early era of movie making womens were hesitant to work in it. Even womens working in movies was unacceptable in cultural practises of society. However in later periods Cross-dressing was used by mens and womens for comic effect in movies.[4]
3	Sexual fetischism	In transvestism to obtain sexual gratification the person does cross dressing. It is particularly more prevalent in males than in females.[5]
4	Passing or not	Here the person tries to show off the general population that how he/she might look when adopting a cross dressing practise.[6]
5	Trans gender	Transgender people have desire to become members of the opposite sex and hence they usually cross dress.[7]
6	Trans sexual	Transsexual refer to the subset of transgender people but they desire to transition permanently to the gender with which they identify and they seek medical assistance (for example, sex reassignment surgery) for achieving it.[8]

3.3. Behavioural aspects in various types of cross dressers : Various types of cross dressers like person impersonating or working in movies & theatres or passing have normal behaviour and normal mental status. There is no deviation in their general attitude towards opposite sex. They usually cross dress for only a particular time and for a particular reason.

Transgender have normal behaviour and normal mental status. However they have a desire and deviation towards being recognised as opposite sex in which they are cross dressing.

Transsexuals also have normal behaviour and normal mental status. However they have strong obsessive desire and deviation towards being recognised as opposite sex in which they are cross dressing.

Transvestites have normal behaviour and normal mental status. But they have sexual perversion and they obtain sexual gratification by cross dressing. Hence a person who is transvestite may indulge in any freaky dubious activities.

A transvestite (trans = opposite; vesta = clothing) is a person whose whole personality is dominated by the desire to be identified and thought of as a member of the opposite sex. His dress, manner, occupational interests and associations are all designed to increase his feeling of being a woman. Sexuality with him is relatively unimportant except as it promotes his feelings of

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feminity. There are varying degrees of transvestism. It is usually found in the males who obtain sexual pleasure by wearing female dress. Only small percentages are homosexuals. Rarely, it develops out of a fetishist interest in clothing or some part of opposite sex. Many cases are associated with sadomasochism. There is no hormonal disturbance or genital abnormality.[11]

In present case the victim was having normal behaviour and normal mental status. In day to day life outside his home the victim dressed, behaved, worked and has relationships with his male and female friends as normal male. However when he was in secured and secluded place like his home or place of residence he would dress, behave like a female. This can be ascertained by the amount of female dresses found in his room though he was living alone without any female company. In our society and country which is dominated by male, he was afraid to showcase his affinity towards being recognised as female. This caused lots of mental agony to him and was the reason for his growing depression. Though suffering from such mental turmoil he never spoke himself out to his near and dear nor did he take any medical assistance for same.

Suicidal tendencies in cross dressers : Suicide is a complex behaviour which results from the complicated interaction of biological, psychological, cognitive, and environmental factors.[12]

In a study it was found that over 10% of transgender people were susceptible for attempting suicide. Similarly 22% to 43% of

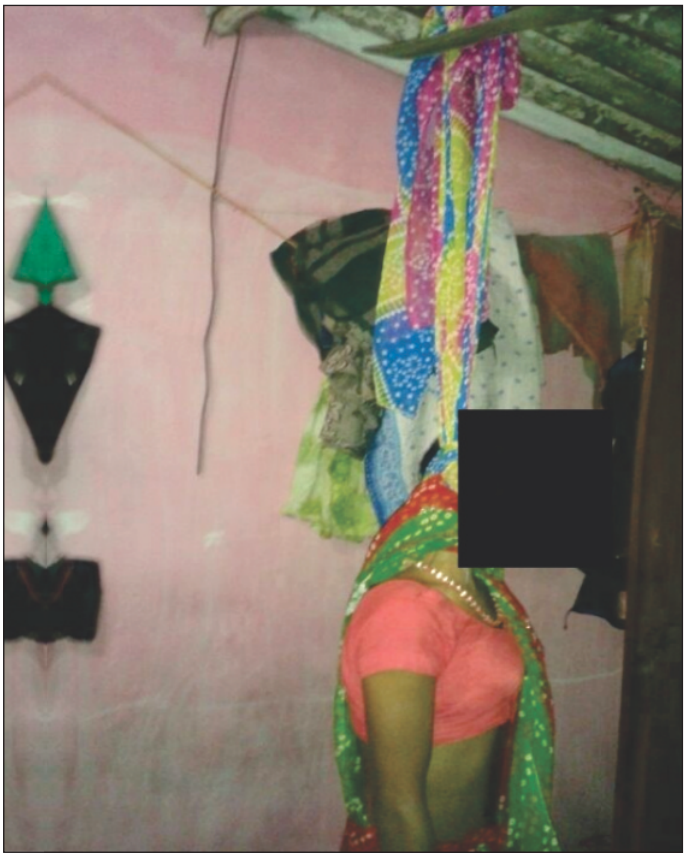

Figure no 1

Figure no 2

transgender people have attempted suicide in their lifetime.[13] 2/3[rd] of trans-youth report recent self harm[14] Trans-people are 2 times more likely to think about and attempt suicide than lesbian, gay or bisexual people.[15] 41 % (United States), 51 % (Australia) and 48% (England) transgender persons had attempted suicide at least once in their lives.[16-18]

In the present case barring one incidence of incision over his neck suggesting self harm there was no other available history regarding any other form of self harm by the victim. This shows that though he had hidden his transgender identity from the society. He was not suffering from any mental illness to an extent to cause self harm before the last unfortunate fatal event.

Pattern of suicide in cross dressers : Various types of self-harm committed by the transgender are wounding the wrists and other parts of the arms, blazing oneself, pouring gasoline on self but not setting fire to it, self hanging, breaking glasses, cups and other items on one's head, fists and body, banging one's head to the wall, too much drinking, eating and drug abuse, getting involved in dangerous sexual behaviour, crime, street gang and violent activities to decisively drop-out from the general life and society, etc.[19]

In the present case the victim died due to suicide by hanging himself with saree. There were no other forms of self harm activities either over body or at crime scene. The self harm by hanging might be due to easy availability of ligature material, ease to perform the procedure and so called painless form of death.

Socioeconomic status of cross dressers: Socioeconomic status (SES) includes income, educational accomplishment, financial protection, and subjective perceptions of social status and social class. Socioeconomic status includes quality of life attributes as well as the prospect and privileges given to people within society. Poverty, particularly, is not a single aspect rather is considered by several physical and psychosocial stressors. Additionally, SES is a consistent and reliable forecaster of an immense range of results across the life span, comprising physical and psychological health.

Research has revealed that LGBT people and same-sex/ gender couples are more susceptible to circumstances of poverty as compared to heterosexual people and couples.[20,21] Low-income LGBT individuals and same-sex/gender couples were observed to have greater chance of receiving cash assistance and food stamps benefits compared to heterosexual individuals or couples. 29% of bisexual women and 23% of lesbians are living in poverty, in contrast to 21% of their heterosexual counterparts in the age group of 18 – 44 years. 20% of gay men and 25% of bisexual men were living at or below the federal level of poverty, in contrast to 15% of heterosexual men in same age group. A study of transgender adults in the United States observed that transgender were 4 times more likely to earn household income of less than $10,000 per year compared to the general population. [20,21]

In the present case the victim was a labourer by profession and was of low socioeconomic background. Being a young adult, facing poverty may influence the final outcome of his gender identity either by acceptance or sheer rejection by the society. In current scenario an affluent class transgender might get more recognition regarding their rights, privileges and autonomy. However a transgender like in our case belonging to a low socioeconomic status may become a target of condemnation, humiliation and discrimination.

Discrimination Due to Sexual Orientation and Gender Identity in cross dressers. An individual's socioeconomic place may also be related to occurrences of discrimination. Facts have shown that gay and bisexual men who have higher incomes were significantly less likely to report discrimination in contrast to those of lower socioeconomic position. Pointing discrimination to one's socioeconomic position was also linked to higher depressive symptoms and anxiety scores.[22]

Legal system of various countries including United States does not forbid discrimination at workplace on the basis of sexual orientation and gender identity. Discrimination against LGBT persons in the workplace is an important issue in causing socioeconomic differences for them.[23]

Studies have revealed that 42% to 68% of LGBT individuals report discrimination during employment.[24,25] 90% of transgender reported harassment, mistreatment, or discrimination at work due to their gender identity.[21] 47% of transgender individuals also reported being discriminated against in hiring, firing, and promotion; over 25% reported they had lost a job due to discrimination on the basis of their gender identity.[21]

In the present case fearing the usual discrimination the victim didn't revealed his true sexual orientation and gender Identity. Due to this a crisis situation in the form of mental trauma and agony might had been experienced by the victim during his day to day affairs. Though the deceased identified himself as transgender, he didn't have any normal interaction with male/females related to forming at least a friendly relationship. This caused a feeling of guilt in his mind. Not able to reflect his emotion to his near and dear friends and society in lieu of discrimination contributed further for taking extreme stance in life.

Various ethical issues in cross dressers : The authentic determination of cross-dressing is mainly socially constructed. For instance, in Western society, trousers have long been accepted for usage by women, and are no longer regarded as cross-dressing. Cultures where men have customarily worn skirt-like garments which are not seen as women's clothing and wearing them is not considered as cross-dressing for men. With globalisation both men's and women's are adopting styles of dress related with other cultures.

Presently a woman dressing in men's clothing and a man dressing in women's clothing induce different response. The activity of a woman dressed in men's clothing is more acceptable. On the erotic side of a couple a women wearing her husband's shirt is considered attractive while a man who wears his wife's night garments may be considered transgressive.

Men embracing feminine clothing is considered a downgrading in the gendered social order whereas a women embracing men's clothing has been considered as modern and has little impact on societal relationship. This is because women have been considered subordinate to men customarily and thus are unable to change this through dress. Hence if a male cross-dress, he becomes an embodiment of the conflicted gender dynamic.

Various legal systems had now recognised a third gender as separate entity having separate identity. Supreme Court of India in April 2014 declared transgender to be a 'third gender' in Indian law.[26]

Hijras and others such groups form transgender community in India and they have a long history in hindu mythology. Though they were usually part of Zenankhanas (place where wives and concubines reside) of various kings and monarchs. They were not accepted in the mainstreams as special person. However there may be some respectable exception to be noted. Hijras face discrimination while obtaining driving licenses and accessing various social benefits. They are also commonly displaced from communities at large.

In the present case looking at the age of the victim there is an increased pressure of getting married and settling in life by his parents, relatives, friends and all the well wishers. Usually such coxing may cause more anxiety to the person particularly who has sexual orientation of being identified as female. The dilemma caused in such a situation may cause the victim more trauma, agony and pain. Though he is unable to speak up for himself the relatives and his peer group never realised the agony and turmoil which he might be suffering.

Day to day lifestyle of cross dressers and occupations involved About 62% of the transgender have problems with their family

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members or some may not have any contact with them. Hence mostly they are living away from their families and had left them because of ill-treatment, non acceptance as transgender and embarrassment while living in the community. 56% of transgender discontinued their education at either primary or secondary level. Most of the transgender persons have pick sex industry and begging for their survival. 54% of transgender have the habit of consuming alcohol.[27]

Transgender persons who are adolescents, having history of suicide attempt, working in bar, entertainment and sex industries and who are survivors of violence perpetrated by intimate partners or family members, are potentially in higher risk for suicide. [27]

In the present case the victim went away from his family and was living separately in different places. He had taken the occupation which was least concerned regarding his gender identity. His day to day lifestyle was simple and had no close relationship with his peer groups.

Social life (Whether living alone or in group or in family): Stigma associated with transgender lead a lot of transwomen to experience rejection or abuse during childhood and adolescence at the hands of their parents and primary caregivers. Parental Acceptance–Rejection (PAR) theory suggests that a child's feeling of rejection have a significant impact on their adult lives. Majority of transwomen confronted opposition and violence. Neglect and undifferentiated rejection were also common. Many transwomen were also forced to leave out of their homes as adolescents or they themselves chose to leave their home. Thus there is increased prevalence of homelessness, poverty and negative sequelae in them.[28]

In the present case for the purpose of employment and earning livelihood, the victim left his village and came to our metropolitan city. Though he might have accompanied with his friends for his endeavour, he was living alone with least contact with other peer workers and their families. The victim used to remain alone, didn't wander in the society and also remained quiet throughout the days

Autoerotic activity in cross dressers: Autoerotic activity by hanging is the most frequent form followed by use of anaesthetic agents and a variety of volatile substances.

Asphyxia by hanging, ligature, plastic bags, chemical substances, or a mixture of these is the commonest means used in autoerotic deaths. 10.3% of cases were of atypical methods of autoerotic activity. These atypical methods were electrocution (3.7%), overdressing/body wrapping (1.5%), foreign body insertion (1.2%), atypical asphyxia method (2.9%), and miscellaneous (1.0%). [29]

Autoerotic practices are thought to be rarer among females than in males. In female asphyxiophilia the person immobilise themselves by self-tied ropes, string or handcuffs. Women who were alone at the time of death died of lethal paraphilia. Autopsies found asphyxiation as the cause of death. Suffocation as a result of hanging and strangulation, suffocation by plastic bags placed over the individuals head, inhalation of substances like ether were described as accidental autoerotic deaths (AAD).[30]

In a typical form of sexual asphyxiation, complex sexual scenes were created by male subject. Consideration of the death scene is significant in understanding the motive and behaviour of the deceased.[31] Investigation of the scene, autopsy findings and the examination of the medical history are necessary to classify such cases as suicide, homicide or accidental. Accidental death due to autoerotic manoeuvre has high prevalence in men.[32]

In the present case there was no evidence of victim being found nude or semidressed nor were any pornographic materials recovered, suggesting that he was not involved in any form of autoerotic activities.

Associated mental disorder: Cross-dressing is not considered a psychological problem by psychoanalysts unless it interferes with one's life. Cross-dressing is considered a mental disorder in the Diagnostic and Statistical Manual of Mental Disorder if it causes significant distress or impairment in the behaviour for a period of at least six months and the psychiatric diagnosis "transvestic fetishism" is used.[5]

Transgender people may meet the criteria for diagnosis of gender dysphoria "only if [being transgender] causes distress or disability.[33] This distress may manifest as depression or inability to work and to form healthy relationships with others.[34] Transgender people who are comfortable with their gender and whose gender is not directly causing inner frustration or impairing their functioning do not suffer from GD. Moreover, GD is not necessarily permanent and is often resolved through therapy or transitioning.[35]

Transvestic fetishism is considered as a paraphilia and a psychiatric diagnosis in the DSM-5 version of the Diagnostic and Statistical Manual of Mental Disorders.[5] Dual-role transvestism (non-sexual cross-dressing) and fetishistic transvestism (cross-dressing for sexual pleasure) were listed as disorders in 10th edition of the International Statistical Classification of Diseases and Related Health Problems. However they both were removed from list in the 11th edition. The legitimacy of the diagnosis in the ICD-11 is debated.[5,34]

France removed gender identity disorder as a diagnosis by judgment in 2010.[36] Danish parliament abolished the F64 Gender identity disorders in 2017.[37] Transsexualism is not classified as mental disorder in International Statistical Classification of Diseases and Related Health Problems (ICD). It is classified as a sexual health condition.[38]

In our case the deceased was in depression and was unable to form healthy relationships with others which might be suggestive of Gender Dysphoria. However as there were no history or signs of obtaining sexual pleasures by cross dressing he might not be suffering from transvestic fetishism.

Conclusions :

From above case study and review of available literature, it can be concluded that if the person is found with cross dressing and in circumstances of death such as hanging etc, the first impression that comes to one's mind is that he is a transvestite and he might

have died accidentally while getting sexual gratification by wearing female attire and performing act of hanging. However, on investigation and in the light of other facts the cross dressed victim was a transgender who might be suffering from gender dysphoria. Being transgender caused mental distress to him which manifested as depression and inability to form healthy relationships with others. The resulting mental agony and distress might lead to his suicide. Thus the current case study highlights the importance of recognising cross dressing in the light of various circumstances so as to reach a proper conclusion.

Abbreviation : Not applicable.

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CASE REPORT

Sudden Death due to Spontaneous Rupture of Amoebic Liver Abscess: a case report

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Abstract :

In the tropical countries about 5 % of the population infected with amoebiasis suffers from hepatic complications. However, in present era sudden deaths due to rupture of amebic liver abscess are rare in occurrence.

A twenty-two years old man under trial was lodged in jail in stable condition. After 12 days of lodging there he died suddenly. A magisterial inquest was conducted as the case was of death in custody. The forensic autopsy on the body revealed rupture of a large amebic abscess in the peritoneal cavity was the primary cause of death.

Sudden deaths from spontaneous rupture of amoebic liver abscess are fairly uncommon. We report a novel case of fatal spontaneous amoebic liver abscess rupture while in judicial custody. The case initially presented with vague complaints and the proper diagnosis and treatment were missed. Such preventable deaths could be avoided by careful clinical examination followed by proper investigations and timely treatment.

Keywords : Sudden death; Liver abscess; Custody death.

Background :

In the tropical countries about 5 % of the population infected with amoebiasis suffers from hepatic complications. More than half of them present without a history of amoebic dysentery. Literature suggests that right sided amoebic liver abscess (ALA) may rupture spontaneously either externally or internally into the lungs, pleural cavity, diaphragm or peritoneal cavity.[1] According to global burden of disease 2015 study, amoebiasis accounts for 67900 all age deaths.[2]

In the modern era involvement of peritoneum due to rupture of ALA is quite uncommon.[3,4] Cases are reported from surgical specialties and are well known for their morbidity. However, the present case involved a man in judicial custody whose clinical condition was vague prior to his sudden death.

Case Report:

A twenty two years old man under trial was lodged in jail in stable condition. After 12 days there he died suddenly. During his stay he made vague complaints of headache, pain in chest and abdomen and was treated symptomatically at the prison hospital. On the event night a call was received by the prison hospital to immediately attend him, but by the time the doctor reached his cell, he showed no signs of life. A magisterial inquest was conducted as the case was of death in custody. Body was taken to the mortuary of the department of forensic medicine. A medical board was constituted consisting of all the authors who conducted the postmortem examination the day following his death.

Autopsy findings : The body was of a thin built, malnourished male with post mortem staining over back, yellowish discoloration of sclera and skin. All external orifices were normal except blood stains around anal orifice. Three small linear fresh scratch abrasions were present in the upper abdomen. No other significant finding observed.

On opening the abdomen, the subcutaneous fat was yellowish in colour. The peritoneum was inflamed and peritoneal cavity was containing about one quarter litre of chocolate colour pus. Liver along with gall bladder was weighing 2325 gms, enlarged and a large abscess cavity of size 18.0 x 11. 8 x 5.0 cm in the right lobe (Figure 1 and 2) along with chocolate colour pus, which was oozing out through a small circular rent of about one cm diameter in anterior surface. The liver consistency was soft and friable. The spleen was congested and enlarged (wt. 230 gm). Other internal organs were unremarkable, however longitudinal superficial tears were present at 11 "O" clock and 1"O"clock position with anal tag in between in the anal canal. Rectal mucosa was having prominent capillaries. There were no other traumatic systemic injuries in the body. Thus the cause of death was described as shock due to spontaneous rupture of an amoebic liver abscess and confirmed by microbiology.

Discussion:

The term "amoebiasis" has been defined by World Health Organization as the condition of harboring the protozoan parasite Entamoeba histolytica with or without clinical manifestations. The symptoms develop only in less than 10% of infected individual.[5]

ALA is rare in Europe and the USA, but very prevalent in Mexico, Central and South America, India, South East Asia and Africa. ALA is more common in males (male/female ratio is 10:1) and affects young patients in the age group of 18 to 50 years.[6]

ALA is caused by extraintestinal spread of Entamoeba histolytica. E histolytica is spread by fecal-oral transmission and

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typically colonizes the gastrointestinal tract. After ingestion of contaminated food and water. Entamoeba histolytica trophozoites adhere to epithelial cells of colon, through the galactose/N-acetylgalactosamine specific lectin.

After adhesion, the parasite releases cysteine proteinases which digest extracellular matrix proteins. This facilitate trophozoite invasion into submucosal tissue through amoebapore leading to activation of amoebic virulence program. The extracellular amoebic cysteine proteinase converts pIL-1β (precursor interleukin 1β) to active IL-1β. The chemokines and cytokines released from epithelial cells attract macrophages and neutrophils to the site of infection.

Neutrophils transmigrating to the epithelial surface facilitate E histolytica invasion by creating channels. Cysteine proteinases digest extracellular matrix protein, causing epithelial cells to break from the villi, which also aid in the parasite's direct invasion into submucosal tissues.

It is diagnosed based on imaging and the mainstay of treatment is metronidazole. Only about 15% of cases require percutaneous drainage. The prognosis is good, with almost universal recover.[7]

In a study on 20 cases in clinical practice, only one case had rupture of liver that too was managed medically.[8]

The case of ALA usually present with pain and tenderness in the right hypochondrium due to stretching of liver capsule. Sometimes the pain is referred to right shoulder area as a result of irritation of phrenic nerve. Other clinical features include fever, jaundice, and generalized weakness.

In the course of disease a right sided ALA may rupture either externally (through skin) or internally into lungs, pleural cavity or peritoneal cavity.[3] Whereas the left sided ALA may rupture either into stomach, pericardial cavity, left pleural cavity or externally. ALA situated on inferior surface can either rupture into bowel or peritoneal cavity, while ALA situated on the posterior surface may rupture into inferior vena cava.[9,10] Other uncommon sites reported in literature include common bile duct, pelvis of kidney and perinephric tissue. The mortality rate in developed countries due to ALA is less than 1 %.[6]

Figure 1

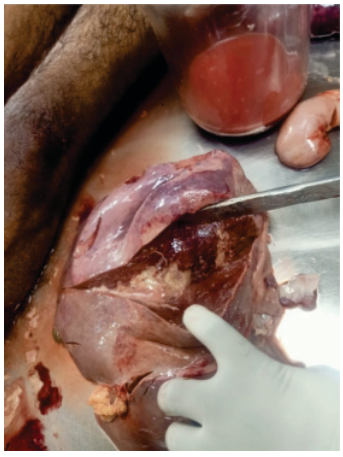

Figure 1

Figure 1 - 2 : Liver with abscess cavity on anterior Surface.

In an autopsy study on 20 cases of ruptured ALA mean age was found 32 years (range: 14-45). Four cases (20%) presented with jaundice. Another four (20%) had continuous fever with abdominal pain. Six had loose motions with blood and mucus in the stools. The mean duration of illness was 7.2 days. All cases were thin and emaciated. Liver was grossly enlarged (mean weight: 2680 g). The abscess was single in all cases except one. The right lobe was involved in 15 cases, the left in four and both in one. The average size of abscess was 13 cm. The abscess had ruptured in the abdomen in 3 patients, for which laparotomy was performed.[11]

Sudden death in cases of ALA is rarely reported, more so in forensic practice. This peculiar case suggest that a forensic pathologist should keep this etiology in mind when dealing with a case of sudden death where the cause of death was shock as a result of peritonitis following spontaneous rupture of ALA. Further message for clinicians is to avoid such preventable deaths by careful clinical examination followed by proper investigations and timely management.

List of Abbreviations: ALA- Amoebic Liver Abscess

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CASE REPORT

Autopsy in a Suspected Case of Food Poisoning - Approach and Challenges

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Abstract :

Food poisoning outbreaks are very common place world over. These epidemics are however preventable to some extent by safe food handling practices. The major reason for such mishaps in rural parts of our country is illiteracy and poverty among the masses. In this article, we report an outbreak of food poisoning and also describe our approach towards conducting autopsy of index case in the same suspected food poisoning epidemic. Investigating food poisoning epidemics are fraught with several challenges for the clinician, microbiologist and the pathologist in resource limited settings. Autopsy in these cases of food poisoning generally involves carrying out several ancillary investigations which demand a very high discipline during sampling at autopsy, transportation of specimens to the laboratory and also during the actual analysis. A note was also made at the end of this case report regarding an appropriate approach of a Forensic pathologist towards food poisoning deaths.

Keywords : Food poisoning; Ecotoxicology; Chemical poisoning; Bioterrorism; Forensic epidemiology.

Introduction :

The air we breathe, the water we drink and the food we eat are the most essential things in our lives. In today's scenario, there is a lurking threat for our lives because of inadvertent or anthropogenic contamination of these pristine things. In the recent past, around 600 people developed self-limiting seizures in a purportedly food contamination incident in Andhra Pradesh. In the aftermath of that mysterious Eluru city ecotoxicology[1] outbreak supposedly because of remnant organochlorine substances on the surface of fruits and vegetables, environmental toxicology has gained importance in both academic and political circles across the country. All incidents of food poisoning epidemics are to be meticulously investigated by the government to mitigate loss of life which will also further aid in channelizing the resources appropriately in dealing the situation. However, the existing public health machinery is generally more concerned with clinical management of such cases and the investigations in to the root cause for outbreaks remain elusive most often. There are good enough incidents cutting across cultures wherein criminal poisoning angle of these epidemics cannot be brushed away. Similarly, with many global experiences ranging from 1951 Pont-Saint-Esprit mass poisoning[2] to the recent 1984 Rajaneeshee bioterrorism attack,[3] every suspected food poisoning epidemic needs to be viewed with public health eyes yet always using a forensic lens having the chance of a sabotage in mind.

Case report :

A 47 year old male individual was brought dead to our casualty early in the morning with alleged history of multiple episodes of vomiting and diarrhoea during the past 6 hours after having meal the previous night. A total of 50 batch cases with similar history were referred for management from a local community health centre. Meanwhile a public health expert team was deputed by the district authorities for investigating the suspected food poisoning epidemic. A medico legal case was registered and autopsy was requested in the index food poisoning fatality. The history of medical comorbidities of the deceased was not ascertainable prior to autopsy.

The corpse showed an emaciated constitution with marked bony prominences, sunken eye balls and dry skin. There were no ante-mortem injuries on the body. Brain was congested and oedematous. Both lungs were partially collapsed and lower lobes of both lungs were oedematous. About 70 cc of brown colour fluid was present in stomach, emanated foul smell, gastric mucosa showed areas of haemorrhages and was grossly congested. Fluid and pasty whitish acholic stools were present in large intestine and rectum. About 200 cc of straw coloured urine was present in urinary bladder.

Gastric contents, blood, urine, stool, and few glass slides smeared with cut surface of spleen (for gram, Hematoxylin & Eosin, Giemsa staining to identify any overwhelming blood stream infection) were preserved for relevant microbiological analysis. Representative histo-pathological sections were taken from heart, lung, liver, kidney, brain.

Viscera were preserved for chemical analysis. Water sample from a suspected source of poisoning was sent for chemical analysis at rural water supply and sanitation department laboratory. Left-over food sample from suspected source of poisoning was not available for sampling and analysis.

The public health team opined the following as possible causes for outbreak of diarrhoea.

I. Consumption of contaminated stored food containing fish and rice (which was prepared and brought from their native

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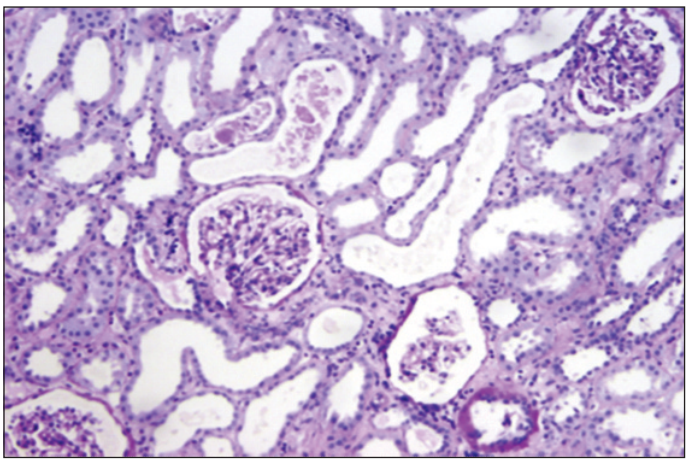

Figure : 1 Acute tubular injury.[11]

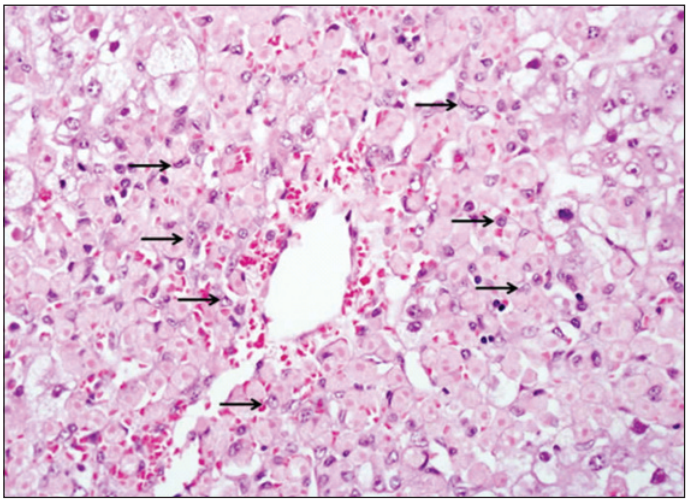

Figure : 2 Acute liver injury with steatosis.[12]

place and is allegedly 2-3 days old) along with freshly cooked food comprising rice, dal, and eggs etc.

ii. Over Crowding and poor ventilation at the ware house where they stayed.

iii. Inhalation of fumes of super phosphate fertilizers stored in the ware house.

All the laboratory investigations carried out in this autopsy case yielded no positive results. Histo-pathology of Kidney showed acute tubular injury (Figure 1) and liver showed acute hepatic necrosis & cholestasis. (Figure 2) . The other batch cases treated at our hospital also had raised liver enzymes and raised serum creatinine levels warranting dialysis also in a few. Eventually among all 51 cases of food poisoning only one individual died and the rest of them recovered fully.

Taking in to account all the findings with respect to the incident, it was opined that the cause of death in the case was due to some unknown/undetected poisoning unless proved otherwise. However, it was really tough for us to comment upon the nature of poisoning whether it was criminal or accidental! These are obviously some of the inherent limitations faced by all of us who are working in resource limited settings.

Discussion:

In the present case, the latency period between suspected poisoned meal and onset of symptoms was about 6-10 hours as per history elicited from all the subjects. However, it was alleged that they also consumed a part of stored food which was stored for a total duration of 2-3 days. Hence a large list of organisms was considered for evaluation by the microbiologist in accordance with the published scientific data as stated in Table 1.

Considering the fact that stored fish was consumed, Vibrio parahaemolyticus was suspected and giving due importance to water contamination, Aeromonas was also in consideration by the microbiologist. Moreover, preformed toxins in the food were also suspected, however no food sample was available to carry out relevant ELISA tests to identify preformed food toxins. However the most sinister botulinum toxin was considered only as a remote possibility as the clinical picture didn't warrant so. As already stated, in most of the individuals the food borne illness was self-limiting except for one casualty.

Contact with or consumption of contaminated water, especially in summer, is a major risk factor in Aeromonas-associated gastroenteritis. Aeromonas-contaminated foods may also be vehicles of infection.[7] Vibrio parahaemolyticus is undoubtedly emerging as one of the potential causes for food borne gastroenteritis due to stored sea food consumption worldwide.[8]

On the chemical poisoning side, phosphate fumes or contamination can cause acute hepatitis because it is a protoplasmic poison.[9] Organochlorine compound poisoning was also one of the differential diagnoses from the toxicology side because they are the most common persistent organic pollutants in rural ground water and surface streams, all thanks to the irrational use of pesticides in agricultural practices.[10]

Unfortunately, the ancillary investigations didn't bring forth anything fruitful towards a positive conclusion but however ruled out few common possibilities. Molecular tests for identifying bacteria, virus or parasite species were not carried out due to lack of resources.

In all suspected cases of food poisoning, gastric lavage contents or stomach contents at autopsy, unconsumed suspected food substance and vomitus are to be sent to the microbiology lab as early as possible for culture and other relevant investigations.

10 cc of stool sample should be sent stored at $4^{O}C$ for identification of viruses (do not freeze). Two rectal swabs are to be taken by dipping the swabs in Cary Blair Media or 10 cc of stool is inoculated in Cary Blair Media and stored at $4^{O}C$ for identification of bacteria. If analysis cannot be done immediately the sample should be frozen at $-70^{O}C$.

10 cc of stool sample in 10% formalin and polyvinyl alcohol preservative at the ratio of 1 part stool to 3 parts preservative stored at $4^{O}C$ is to be sent for identification of parasites. Alternatively stool sample preserved in normal saline at subnormal room temperatures can be sent for immediate wet film microscopy.[9]

Blood from a peripheral vein or heart can be inoculated in brain-

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heart infusion agar at the time of autopsy itself for blood culture. Urine can be collected by cystotomy after opening the abdomino-pelvic cavity. Urine samples are to be submitted for analysis within 3 to 4 hours at subnormal room temperatures. Cerebrospinal fluid collected at autopsy needs to be submitted for analysis within 24 hours at subnormal room temperatures for relevant microbiological investigations.[10]

All the above mentioned samples are to be collected under strict aseptic precautions. Bile may also be subjected to chemical analysis if a necessity arises.

Every food poisoning case has social-medical, forensic and public health ramifications and is always to be properly investigated into.

Table 1 : Symptoms, onset of symptoms and responsible microorganisms or toxin for the major foodborne illnesses.[4, 5,6]

Approximate onset time to symptoms	Predominant symptoms	Associated organism or toxin
1–7 h, mean 2–4 h	Nausea, vomiting, retching, diarrhoea, abdominal pain, prostration	Staphylococcus aureus and its enterotoxins
8–16 h (2–4 h if emesis predominant)	Vomiting or diarrhoea, depending on whether diarrheic or emetic toxin present; abdominal cramps; nausea	Bacillus cereus (emetic toxin)
12–48 h	Nausea, vomiting, watery non-bloody diarrhoea, dehydration	Norovirus
2–36 h (mean 6–12 h)	Abdominal cramps, diarrhoea, putrefactive diarrhoea (Cl. perfringens), sometimes nausea and vomiting	Clostridium perfringens
6–96 h (usually 1–3 days)	Fever, abdominal cramps, diarrhea, vomiting, headache	Salmonella spp., Shigella spp., E. coli
6 h to 5 days	Abdominal cramps, diarrhea, vomiting, fever, malaise, nausea, headache, dehydration	Vibrio cholearae (O1 and non-O1), Vibrio parahaemolyticus
1–10 (median 3–4) days	Diarrhea (often bloody), abdominal pain, nausea, vomiting, malaise, fever (uncommon with E. coli O157:H7)	Enterohaemorrhagic E. coli, Campylobacter spp.
3–5 days	Fever, vomiting, watery non-inflammatory diarrhea	Rotavirus, Astrovirus, enteric Adenovirus
3–7 days	Fever, diarrhea, abdominal pain	Yersinia enterocolitica
1 to several weeks	Abdominal pain, diarrhea, constipation, headache, drowsiness, ulcers, variable—often asymptomatic	Endamoeba histolytica
3–6 months	Nervousness, insomnia, hunger pains, anorexia, weight loss, abdominal pain, sometimes gastroenteritis	Taenia saginata, Taenia solium
2 h to 6 days, usually 12–36 h	Vertigo, double or blurred vision, loss or light reflex, difficulty in swallowing, dry mouth, weakness, respiratory paralysis	Clostridium botulinum and its neurotoxins
4–28 days	Gastroenteritis, fever, oedema around eyes, perspiration, muscular pain, chills, prostration, laboured breathing	Trichinella spiralis
7–28 days	Malaise, headache, fever, fever, cough, nausea, vomiting, constipation, abdominal pain, chills, rose spots, bloody stools	Salmonella Typhi
10–13 days	Fever, headache, myalgia, rash	Toxoplasma gondii
Varying periods	Fever, chills, headache, arthralgia, prostration, malaise, swollen lymph nodes and other specific symptoms of disease in question	Listeria monocytogenes, Campylobacter jejuni

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CASE REPORT

Strike of a Bolt: A Case Report

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Abstract :

One of the most common causes of death when the nature is involved is by lightning strike. A minor proportion of the electric current is strong enough to create a magnetic field which commonly affects the CNS, CVS and Musculoskeletal system. Overall mortality rate is up to 30% while 70% of the cases survive with chronic sequelae. A varied number of mechanisms of energy transfer and numerous factors like current intensity, path of its course in the body, activity and the position of the person at that moment etc. are involved in the effects of lightening on the human body. It essentially encompasses in multisystem dysfunction. While cardiac arrhythmias are suspected to be the principal cause of death, respiratory paralysis due to CNS involvement is considered as secondary cause and circulatory arrest, injuries of internal organs are some other causes of death listed.

Keywords : Contact voltage; Direct strike; Ground strike; Lightning death; Medicolegal autopsy; Side splash; Post mortem examination.

Introduction :

Amid the several environmental phenomena Lightning is known to have distressing effect on human body and is a part of global electric circuit.[1] It signifies one of the prime causes of cardiac arrest and death from an environmental phenomenon.

Most of the times, the lightning takes the shortest pathways between the contact points in the human body and impairing almost every organ along its path.[2] Over 2360 people on an average die every year In India as per the NCRB records due to lightning, while overall approximately 42500 lives have been lost in India over last 20 years since 2001.[3] Latest being 2019, among the Indian states UP, MP, Jharkhand, Odisha and Bihar reported relatively higher number of cases when compared with the other states.[3] In 2018 lightning deaths accounted for the largest share of more than 7000 accidental deaths due to forces of nature. Karnataka reported 136 deaths due to lightning in the year 2009.[3]

Lightning basically involves in multisystem dysfunction while the cardiovascular and central nervous systems are usually the most considerably affected systems.[2] Primary cardiac arrest or hypoxia induced secondary cardiac arrest is the commonest cause of cardiac death due to lightning. Lightning being a form of direct current acts similarly to cardioversion and causes cardiac standstill.[4] In many cases, cardiac automaticity may restore organized cardiac activity and asystole may be followed by return of spontaneous circulation. However, concomitant respiratory arrest due to paralysis of the medullary respiratory center is frequently prolonged and may outlast cardiac arrest.[5] Unlike electrical shock, lightning seldom results in extensive tissue destruction or significant burns, although superficial linear or feathery burns or classic feather-like skin markings (Lichtenberg flowers) are commonly observed.[5]

Lightning strikes – in contrast to other high-voltage accidents – are characterized by an extremely strong current and an extremely short exposure period. If death occurs immediately after a lightning strike the primary cause of death is usually cardiac arrythmias and/or the explosive power of the blast.[6]

Lightening deaths cannot be anything other than accidental death and provide no challenge for the Forensic experts to diagnose it. However, at times, the nature of death may be indeterminate if the body was found in the open with no injuries on it and may pass across as an obscure autopsy. It is in fact a known phenomenon that lightening injuries are capricious and unpredictable.[2] Two individuals can stand side by side during a flash and one may be killed while the other remains unscathed. The gross finding in a fatal lightning strike can vary form no findings to burning, fractures, extensive tissue destruction and so on.[2]

In most of the cases of unnatural death it is very rare to find almost all the "typical textbook findings" on a body. Below is one such "typical textbook case" of death due to lightning strike which has been well documented for future references.

Case Report :

During the early month of April in a village near to Bengaluru, as a 52 years old female was walking towards her home along with her sister in the late evening, through an open paddy field, a bolt of lightning hit the deceased and she dropped dead immediately, while the sister who was walking right next to her remained unharmed. As per the history provided by the sister and the local villagers, heavy downpour had just stopped 5-10 minutes before the time of incident. This was also later confirmed by the local weather department.

The body was brought to morgue and following were the positive findings noted. The clothes appeared to be frayed apart during the intensity of lightening, as seen in the photographs 1 and 2. The ripped edges were found to be burnt. The defects in the clothing were corresponding with the external injuries on the deceased body. Post mortem lividity was present on the back aspect of the body and was fixed. The body was cold and stiff (body kept in the cold chamber). The conjunctiva of both the eyes

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Photograph 1

Photograph 2

were pale. Cornea on the left eye was hazy. Oral mucosa and the finger nail beds of both the hands were pale. The hairs in the front aspect of the scalp, left eyebrow, left eye lash, pubic hairs and body hairs on the left leg were singed as shown in photograph 3 and 4. Blood was oozing out of the left ear indicating the ruptured tympanic membrane as per photograph 5. Diffuse superficial burns were present over an area of 50cm x 48cm extending from a point 8cm outer to the glabella on the left side to a point 8cm outer to the left anterior superior iliac spine vertically, from 10cm outer to sternum on right side crossing the midline to the anterior axillary line on left side; involving the anterior aspect of the neck,

Photograph 3

Photograph 4

Photograph 5

Photograph 6

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left aspect of the neck, left shoulder, left chest, and the left aspect of the abdomen as per photographs 5 and 6. All the internal organs were intact and congested. Organs were sent for toxicological examination to FSL and the report was negative to any poisons and heart was preserved for pathology to rule out remote possibility of MI. The findings in the histopathology report were inconsequential. Subsequently, a final opinion was drafted as,

"There is nothing to suggest that the deceased died due to anything other than complications of lightening. However, weather conditions prevailing at the time of the incident and other pertinent circumstances have to be investigated by the investigating officer**.** (Which was investigated and matched with the findings)

Discussion :

Lightening may be defined as a transient, high current electric discharge (DC 30,000 -50,000) whose path length is generally measured in kilometre.[7] It consists of several successive processes. Some of which occur in times of the order of microseconds, while the discharge as a whole occupies an appreciable part of a second.[7]

Rakov and Uman differentiate four types of cloud to ground lightening discharges:[1]

1. Downward negative lightning
2. Downward positive lightning
3. Upward positive lightning
4. Upward negative lightning

Out of which the downward negative lightning flashes account for more than 90% of global cloud to ground lightning and increased fatality.[1]

Six mechanisms are usually advocated in medical journals regarding the lightening injuries which are as follows:[8]

1. Direct lightning strike
2. An indirect lightning strike caused by contact with an object
3. A side flash that could occur from a struck object
4. A person or animal standing near a struck object or close to a flash of lightning to ground, could be injured by step voltages produced by a lightning current flowing through the resistance of the soil beneath.
5. Bodies could become sufficiently charged during the lightning leader development process to cause upward streamers to be initiated from them, leading to injuries.
6. Lightning explosive barotrauma.[5]

The severity of the lightning injuries is dependent on the 'dose' of lightning to which the sufferers are exposed and it can vary from minor lightning injuries to severe lightning injuries. However, the 'dose' is purely dependent on the above mechanisms.

Most of the mortalities from lightning strikes befall among individuals who are involved in outdoor activities. Most injuries occur in rural areas, people walking home during late afternoon which is when thunderstorms occur.[9] The various injuries in victims are due to the different components of lightning like; the light component can cause cataract, blindness or even optic nerve injuries; heat component can affect clothing, ornaments, skin and hair; electrical component can cause burns, Lichtenberg figures, neurological effects like cerebral salt-wasting syndrome, hyponatraemia, cardiac arrhythmias etc; barotrauma component causing perforation of tympanic membrane and audio-vestibular abnormalities.

Following are the few measures (out of numerous) which can be engaged to lessen the mortalities during lightning or thunderstorm, which has to be also communicated and taught to the villagers effectively.[10]

a. Be extremely careful after a rain.
b. Avoid being outdoors.
c. Do not take shelter under a tall tree.
d. Avoid being in open grounds, fields, and at high altitudes.
e. Do not lie down on the ground.
f. Avoid fences and wires.
g. Switch off and unplug all the electronic devices.
h. Avoid telephonic calls.
i. Stay away from large water sources.

Conclusion :

Due to the relative uncommonness of lightning strike death, and due to the non-specific findings or no findings in majority of lightning fatalities, such deaths need to be very judiciously gauged by the doctors' conducting autopsies. Autopsy surgeons should preferably make an effort to attend the scene of death. Discussions with other specialists, such as weather experts augments the value of the diagnosis. Thus, it is obligatory upon the medical examiner to seek out and certainly report and document such cases.

Internal Ethical Committee Approval: obtained.

No Funding

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CASE REPORT

Suicidal Smothering with Gagging: A case report

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Abstract :

A rare case of violent death by asphyxia which is of mechanical form in nature, reported in a teenager involving unusual combination of gagging and smothering. In this peculiar case oral cavity of the deceased was stuffed with multiple pieces of tissue paper soaked in saliva and crumbled handkerchief. Accidental, suicidal or homicidal nature common type of manner of death involving mechanical form of asphyxia. Clinching to manner of death by crime scene investigation and thorough psychological autopsy. Suicidal gagging has been reported many a time, whereas accidental gagging is relatively a rare event. Cause of death was determined by meticulous post-mortem examination.

Keywords : Asphyxia; Death; Gagging; Smothering.

Introduction :

Suffocation generally means an oxygen free environment that leads to the death of an individual or to the obstruction of the external air passages including nostrils and the mouth. Any situation that interferes with the exchange of oxygen is termed as asphyxia. It is applied to a variety of conditions which interfere with respiratory exchange.[1] Mechanical asphyxia refers to any situation where there is some form of mechanical interference with the access of oxygen to the tissues. Types of mechanical asphyxia include ligature strangulation, hanging, gagging, smothering etc.

Gagging is a type of asphyxia in which a piece of cloth, paper is forced into the mouth and the nose may be closed by tying a cloth or a similar material around them. This rolled up cloth is called a gag.[2] Plastic bag smothering could be a challenge for forensic pathologists as in most of the cases the classical signs of asphyxia and histopathological findings would be absent or non-specific. Manner of death can be homicidal, suicidal or accidental. We report a combined case of gagging and smothering.

Case Report :

18-year-old girl who was found dead at her residence. As per the police inquest, the dead body was found with a polythene bag covering her entire head and mouth of the bag was secured with a lace. Investigating officer upon removal of the polythene bag found that the nose and oral cavity were sealed off with a transparent duct tape. Autopsy was conducted at the general hospital, Ernakulam on the same day.

The height of the decedent was 172 cm and weight was 54 kg. Face was congested. Rigor mortis was fully established and retained all over the body. Lips were showing signs of cyanosis. Oral Cavity was stuffed with multiple pieces of tissue paper (soaked in saliva), followed by a crumbled handkerchief (figure1). Multiple healed linear parallel scars on the front aspect of the lower one-third of the left forearm, total 14 in number (figure 2). Two abrasions were seen, each measuring 0.5cm in length and breadth on the bridge of the nose, and a contusion 1cm in diameter was placed below the lower lip. On examination of the oral cavity, multiple tiny contusions were present on the soft palate. The stomach was empty, mucosa was normal. The uterine cavity was empty and the external genitalia were normal. Cause of death was consistent with suffocation; the manner of death being consistent with that of suicide.

Discussion :

Asphyxia can result from physical obstruction of the mouth and nose and from decreasing oxygen concentration in the available inspired air.[3] Gagging is a form of asphyxia which results from forcing a gag deep in to the mouth or oropharynx. Gagging is a type of mechanical asphyxia, where a pad or gag is fixed over the face or sometimes a gag is thrust into the mouth. This foreign material blocks the orifices.[4] Death usually occurs due to asphyxia less commonly sudden death may occur due to reflex vagal inhibition.[5]

Plastic bag smothering is a combination of oxygen depletion and the increase of carbon dioxide concentration, which leads to loss of consciousness. When a plastic bag is placed over the head and in close contact with the face, sympathetic nervous system is rapidly stimulated resulting in arrhythmias such as ventricular fibrillation.[6] This results in lack of typical pathological signs of asphyxia, as observed in cases of plastic bag suffocation.

Plastic bag suffocation is challenging to forensic pathologists as there are few specific external/internal or pathognomonic histopathological findings, and this makes determining the cause of death extremely difficult. Cases of suicidal suffocation with a pillow being wrapped around the head, using adhesive tape, obstructing the mouth and nose without the assistance of another individual or mechanical device has been reported.[7]

Smothering is probably more homicidal, rather than suicidal in

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manner.[8] Suffocation using plastic bags constitutes 59% of all smothering forms.[9] The most common form of suicidal smothering has been described as a plastic bag being placed over the head; all the remaining types of smothering being homicidal in manner.[10] To determine the manner of death in combinations of gagging and smothering a multi disciplinary approach is required. A well conducted crime scene investigation is of paramount importance in reaching the manner of death. Along side, cooperation of the investigating officer is required to ensure that all the available evidence and situational data are secured properly. This includes CCTV foot ages, fingerprint evidences, and personal hand written diaries (with suicide note/s). In addition, conduct of a psychological autopsy is a requisite to throw light into the manner of death.

Psychological autopsies are carried out in cases of unclear suicidal deaths. It is one of the most valuable tools of research for concluding a case of suicide. This method involves collecting all the available information on the deceased via structured interviews of family members, relatives/friends, and attending health care personnel. The effective time period between the suicide and the interviews for obtaining quality information is said to be between 2-6 months following death.[11]

Figure 1 : Antemortem injury (Red arrow)
Oral cavity stuffed with tissue paper (Blue arrow).

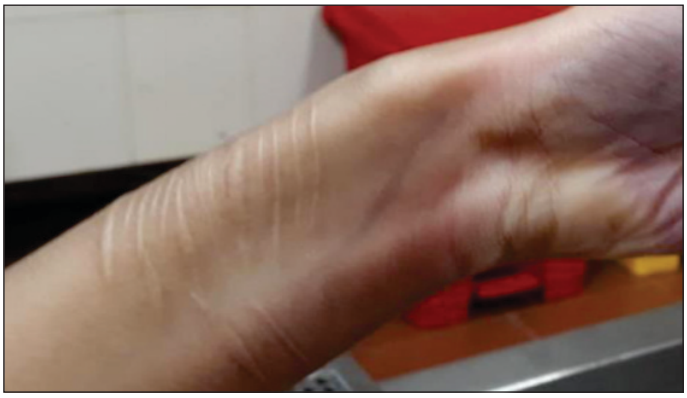

Figure 2 : Multiple healed linear parallel scars.

The above discussed case is a rare presentation of death by asphyxia. Similar scenario when presented will arouse suspicion of homicide. It is always important to approach such situations without a prejudiced mind to find out the correct manner of death. The manner of death must be established after detailed analysis of circumstantial evidence, information obtained from the witnesses, meticulous post-mortem examination and psychological autopsy. Ancillary investigations such as histopathology or toxicology should be a part of the routine protocol. We believe that the presented case could be of interest for the readers as for the uncommon means used in the suicide.

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CLINICAL BRIEF

Hutchinson - Gilford syndrome (Progeria): Clinical and Postmortem Findings

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Abstract :

Hutchinson-Gilford Progeria syndrome, a rare genetic syndrome is being reviewed in this communication. It has striking features resembling premature aging. In most patients, Hutchinson-Gilford Progeria syndrome is caused by new genetic changes that occur randomly for unknown reasons. These changes (mutations) are transmitted as an autosomal dominant trait. Involving aberrant splicing of the LMNA gene, resulting in the production of a disease-causing mutant lamin A protein called progerin. Because neither parent carries or expresses the mutation, each case is believed to represent a sporadic, new mutation that happens most notably in a single sperm or egg immediately prior to conception. Children with progeria usually have a normal appearance in early infancy. At approximately six months of age, there are profound growth delays, resulting in low weight, premature bodily aging (progeria) and dwarfism. They have a birdlike, "wizened old man" facial appearance. These individuals die because of atherosclerosis and myocardial infarction. In this review article, we have reviewed several studies and reports regarding the genetic basis, diagnoses with characteristics and development of Hutchinson - Gilford syndrome (HGPS) or progéria. This review summarizes the clinical characteristics of this disease, the underlying mutation in the lamin A (LMNA) gene that results in this phenotype and PM findings through articles found in the databases: PubMed Central, Scielo, BVS, Bireme, Scientific Electronic Library Online etc.

Keywords : Progeria; Genetic; Mutation; Atherosclerosis.

Introduction :

Hutchinson-Gilford Progeroid syndrome in human is a rare inheritable condition which has fascinated a lot of attention due to features of premature aging. Hutchinson or progerioid syndrome word is derived from Greek words "progeros" meaning prematurely old ("pro" means before and "geras" means old age). It is a rare fatal pathology of genetic cause of autosomal dominant whose main characteristic is premature aging. It occurs in childhood. The first case reported in 1754 was of a child weighing only 17 pounds who died subsequently.[1] Later in 1886, a three and a half year old boy detected to have progeria was revealed in clinical literature.[2] The author of that literature, Dr. Jonathan Hutchinson, validated the disease and suggested that it was a type of ectodermal dysplasia. After that, in 1895, Hutchinson mentioned another patient but the disorder was described in detail by Hastings Gilford,[3] who followed the patient for 17 years. Gilford provided the data which matched with that of the patient described by Hutchinson who underwent vivid premature aging. He then used Progeria word for this disease, in which Pro means before and geras in ancient Greek means old age.[4]

In 1886 it was described and validated by the scientists Jonathan Hutchinson, Hastings Gilford in which he studied this case and another child with the same characteristics, giving it the name of race or premature aging. This lethal disease involves premature aging, which normally leads to death due to stroke or myocardial infarction.[5,6] This disorder has low incidence rate, persisting in one per four million live births.[7] Almost 100 cases have been recognized in the medical history.[8] Progeria patients normally live for thirteen years, although many have been identified to live into their late teens and early twenties.[9,10] Very few reach to their forties. It is a genetic condition which is caused by point mutation and probably not inherited, though there is an exceptionally inheritable form.[11]

Currently, the prevalence of children with HGPS per total population is one in 20 million.[12] The estimated birth incidence for HGPS is one in four million births with no observed differences based on ethnic background.[7] With a prevalence of 350-400 affected children worldwide.[12-15] They begin to display many characteristics of accelerated aging by 18-24 months of age, or even earlier. Both boys and girls have an equal risk of having progeria. Remarkably, the intellect of children with progeria is unaffected,[9-10] and despite the physical changes in their young bodies, these extraordinary children are intelligent, courageous, and full of life. On average, death occurs at the age of 13, with at least 90 % of subjects dying from progressive atherosclerosis of the coronary and cerebral arteries, with tissues such as bone and skin also prominently affected. Scientists are particularly interested in progeria because it may help in understanding the heart diseases and normal process of aging. Majority of affected patients show an autosomal dominant inheritance, although some cases of autosomal recessive inheritance are also reported.[16-21]

Hutchinson-Gilford syndrome is caused by a silent mutation in the LMNA gene that affects MRI slicing and leads to truncated pre-amnine A expression (progerin) in the nucleus. Thus resulting in the production of progerin. Protein that impairs

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nucleocytoskeletal coupling in endothelial cells, causing compromises of the components of the nuclear envelope. In general such changes can make cells more susceptible to damage suffered by mechanical stress. Thus, it hinders cellular mechanotransduction and, consequently, alters the responses to stress, thus being able to explain the effects on progerin tissue.[1,13,22] At the molecular level such changes in genomic instability and defects in nuclear architecture, can cause telomere wear; epigenetic changes and chromatin remodeling, loss of proteohomeotase, detection of deregulated nutrients, mitochondrial dysfunction, cellular senescence, aberrant stem cell depletion, and intercellular communication. Thus, the most serious damage to the homeotase of carrier systems is undoubtedly undoubted. Thus, patients with HGPS die before reaching 20 years, because this pathology contributes to the excess of fibrosis and development of cardiovascular disease, along with atheosclerotic and stroke. In addition, several authors indicate early presence in these patients of systemic alterations, such as abdomen with hyperpigmentation, abnormal dentition, hair, nails, orthopedic disorders, bone deformity, pathological fractures, osteoporosis and osteolysis among others.[1,13,23-25] Osteolysis is always present, in the distal phalanges, clavicles, mandible, neurocranium, and viscerocranium. It causes a reduction in size of the chin during the first 2 years of life and characteristic narrow shoulders with a gradual narrowing of the upper part of the thorax. As the mandibular osteolysis is greater than that of the viscerocranium, retrognatia also occurs.[26]

In addition, the presence of multisystemic premature aging, children with HGPS do not seem to have cognitive deterioration, suggesting that some aspects of brain function can be protected from the deleterious effects of progerin, the protein causing the disease. Because there is no gene expression in neurons in the hippocampus. Therefore, psychomotor development is adequate and have normal intelligence. Due to this, it is essential to establish therapeutic strategies to improve the quality of life of HGPS patients.[12,14] Therefore, it is of paramount importance to emphasize that this ailment does not yet have a cure, but in recent years, there is a great advance in some therapies, showing promising results in the pre-clinical stages. Thus, we will address in this review the causes of genetic changes of the slides in HGPS syndrome and their structural and functional consequences in the carrier's.[27]

Materials and methods:

This literature review was elaborated from a survey of studies published in the databases Scielo, PubMed, Biremee Google Acadêmico. A bibliographic survey was conducted using a search strategy based on the terms: "Hutchinson" 'Gilford' and "progeria". Considering the scientific bases analyzed, 68 references related to the theme met the established selection criteria.

Discussion :

The incidence of HGPS has no relation to gender, geographic or ethnic inclination, thus considered to be sporadic. HGPS occurs by a mutation in the LMNA gene, which encodes blade A which is an intermediate filament-type protein.[28]

The most common cases of mutation are related to incorrect splicing, ARNm and produces a mutant protein blade A, called progerin. Biochemically, the de novo heterozygous mutation in the base cytosine at position 1824 of the nucleotide sequence for a thymin, (1824C> T, p.G608G). This substitution located in exon 11 of the LMNA gene activates an alternate encrypted splicing site, which generates an internal delete of 150 base pairs. Transcription of this mutant gene generates a protein called progerin that has a 50 amino acid extraction at the end of terminal C, which includes the site of recognition and cleavage of protease ZMSPTE24.[29] A researcher Shao H. Yang opined that progerin affects the properties of the nuclear envelope, due to the presence of a farnesil group on blade A, causing it to thicken and increase its stiffness, thus acquiring a form and polylobulated, with an increase in the number of nuclear pores.[30] But according to Araujo Varela, chromatin disorganization, genomic instability, and changes in signaling pathways, such as mechano transduction, hindering the mechanism by which the cell converts a mechanical stimulus into chemical activity are the possible mechanisms of the disease. Therefore, in addition to leading to aberrant regulation of adult stem cells, defective production of the extracellular matrix and premature cellular senescence will affect bones, skeletal muscles, heart or blood vessels.[6,31,32] Currently, studies prove that a dose-dependent effect of the amount of progerin expressed in fibroblasts and the penetrance of the HGPS phenotype shows that the decrease in progerin levels may be sufficient to reduce the severity of the pathology.[33]

Clinical features : The symptoms of Hutchinson Gilford Syndrome (HGPS) are not initially apparent, as new-borns with HGPS have an outwardly normal pattern with only somewhat smaller stature.[34] However, only after a few months of birth particularly at the end of the first year of life some peculiarities can be perceived.[28] The diagnosis of progeria is based on recognition of the following clinical features and is confirmed with molecular genetic testing.[26]

Effect on Growth : Growth in patients with Hutchinson–Gilford progeria syndrome is abnormal. Growth rate is decreased. HGPS children grow 3.58 cm per year where as healthy children grow 5.84 cm per year.[6] These patients are usually short and underweight. Weight is even more affected.[34]

Effect on Dermatological Features : The first noticeable signs of HGPS are a blue tint to the skin surrounding the lips) and a visible vein across the nasal bridge.[6, 7] Typical dermatological features include desiccated, crumpled skin, caused by the toughening of connective tissue and the loss of subcutaneous adipose tissue, as well as the patchy thickening of the skin due to the presence of scar tissue-like lesions.[34,35] The skin is initially thick and swollen, with pitting oedema seen in the lower abdomen, upper gluteal area, genitalia, and anterior thighs.[6,7] The skin becomes thin, dry, and atrophic with fine scaling or hyperkeratosis.

The skin over the phalanges usually becomes red and swollen and the nails become dystrophic. Loss of subcutaneous fat in 3 years of age. This fat loss occurs first in the limbs, then in thorax, neurocranium and face, with the buccal and pubic fat disappearing the last. Less intra-abdominal fat causes the

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characteristically prominent abdomen seen in nearly all children with HGPS. The disappearance of subcutaneous and intra-orbital fat and 'thinning' of the skin, cause the underlying blood vessels to be more clearly visible and the eyes to appear more prominent.[7] The eyebrows and eyelashes also vanish.[3] The hair usually becomes light in colour.[35-37] Body hair become scarce or completely fall off. This makes patients almost bald by 2-3 years of age, and wide veins became clearly visible on the scalp.[6]

Effect on Facial Features : There is proportionally big cranium, slim nose, narrow nasal bridge, and prominent veins on the scalp.[19] There is disproportion in the face, in the jaw micrognathia, mandibular hypoplasia, narrow and high palate, are the peculiarities observed. Other facial features are: thin skin around the mouth; irregular teeth with increased decay, dental crowding due to the limited size of both the maxilla and mandible.[38] Oral abnormalities such as hypodontia, ankyloglossia, ogival palate, double rows of teeth, vertical chewing where rotatory chewing should normally develop,[6] and difficult dental care due to a small oral aperture.[39] HGPS patients also have small chin, prominent pinna that lack lobules.

Effect on Musculoskeletal Function : Osteolysis in the distal phalanges, clavicles, mandible, neurocranium, and viscerocranium is present. It causes characteristic narrow shoulders with a narrowing of the upper part of the chest. At birth joint mobility is normal. Worsening in joint mobility in the knees, ankles, wrists, shoulders, and hips is observed with age. The clavicle has a small and tapering lateral end, the angle between the head and neck of the femur and its shaft are considerably increased (an extreme coxa valga), and the vertebral bodies are ovoid with a 'fish-mouth' appearance.[7] In one recent study in observation of various patients, everyone displayed an unusual range of movement in at least three peripheral joints and developed a wide based, waddling gait, resulting from joint disfigurements.[6] Radiologically, with age osteopenia of the long bones develops. The long bones are bowed.[40-42]

Effect on Cardiovascular System : Cardiovascular complications are usually cause of death in Hutchinson–Gilford progeria syndrome. Autopsy reports have defined varying degrees of atherosclerosis, mainly involving the larger arteries. Cerebral vascular lesions are less frequent than Coronary occlusions with myocardial infractions.[43] Blood vessels become rigid with raised systolic and diastolic blood-pressure levels and an increased arterial augmentation rate. Thickening of the coronary arteries occurs in many cases. Diseased children gradually develop shortness of breath with exertion and easy fatigability beginning at 6-8 years of age. Pulse rates and blood pressure also rise. A hypertrophy of myocardial cells and frequently interstitial fibrosis occurs.[44-47] Hypertrophy of the pulmonary arteries with thickening of intima which resulted in fatal pulmonary hypertension has been also testified,[47] after age of seven[48] but transient ischemic attacks can occur at an age of four.[49] Thus, these individuals suffer from hardening of the arteries. major causes of death of these individuals is myocardial infarction. The latest cohort of patients with HGPS, it was observed that LV diastolic function was the most predominant cardiac anomaly, appearing and affecting almost all patients of more than 6-7 years. Other cardiac anomalies, including valve abnormalities, manifested in the second decade of life and were less common.

Effect on Genital System : Genitalia are normal or small penis may be there. Testes is descended usually. No spermatogenesis,[44,50] incomplete spermatogenesis,[51] normal spermatogenesis,[52] and nocturnal emissions.[3,53] have been testified. Progress of secondary sexual characteristics is infrequent, but some of the oldest children have initial appearance of pubic hair, breasts, and slight enlargement of penis and testicles. Female genitalia have been testified to be normal, except for hypoplastic labia in grown-up females,[54] and multiple follicular ovarian cysts of different sizes have been reported.[55] Most of them do not attain sexual maturity and do not reproduce.[56] In a case of 32-year-old female with progeria had menarche at 12 years and gave birth to a healthy child at the age of 23 years; however no male patient is known to have fathered a child.[6,57]

Radiological findings : A review of the previously reported radiography findings in skeletal system in affected individuals with progeria disclosed a notable similarity.[58] Diffuse osteopenia, prominent vascular markings in skull, thin and large calvarium with shallow diploic space, multiple wormian bones, small mandible with infantile obtuse angle and short ascending rami, hypoplastic facial bones, open cranial fontanelles, thin short clavicles, dwarfism, abnormally gracile ribs involving the posterior segments of the upper ribs, slender long bones, kyphosis, coxa valga, and progressive acroosteolysis of the terminal phalanges were the major roentgen findings previously reported. Bilateral coxa valga deformity with bizarre greater trochanters and shallow acetabulum with bilateral hip dislocation were seen in many patients. Coxa magna, coxa valga, acetabular dysplasia, hip subluxation, and dislocation are the common orthopaedic hip manifestations which have been previously reported.[59] Avascular necrosis of the head of femur, flared long bone metaphysis/epiphysis, enlarged capitulum of the distal humerus have also been reported.

These radiological findings consistent with those of which were present in more than fifty percent of cases of a largely appreciated study by Cleveland et al. on HGPS.[60,61]

Relation of Findings in Autopsy and cause of death of the patient : Autopsy reports of children with progeria has been presented by various scientists. From their reports they correlated it with cause of death. Main pathological findings of most of the autopsy cases of progeria show that the cardiovascular damage is one of the most important findings in autopsy cases. [62] Most of the cases died of congestive cardiac failure or coronary heart disease. Some cases were accompanied with interstitial fibrosis.[63] Though moderate or mild atheromatous changes were seen in the aorta of many autopsy cases, arteriosclerotic changes of the arteries were described in about a half of the cases and intimal calcification in coronary artery and in other arteries in some other cases.[64] Cortical atrophy of the anterior central gyrus and cerebral infarct of the certain gyri was described in some autopsy cases.[65] Myocardial damages and cerebral infarct, which may be the main cause of death are not specific pathological findings for progeria,

but are secondary to severe intima1 thickening of the arterial system.[62] It is accepted that the most important characteristic of progeria is an abnormal increase of collagen in the connective tissue.[62] In other reported cases of progeria, traumatic epidural hematoma, [66] general convulsions [67] and peritonitis were proved to be the cause of death.[68]

Conclusion :

This review pursued to assemble the knowledge attained over the years about Hutchinson-Gilford Syndrome, an extremely rare genetic disease which makes it challenging to gain a quick and precise diagnosis. As it is incurable disease, it makes treatment just a palliative in order to promote an improvement in the quality of life of these patients. For these intentions, it is essential that health experts are better prepared to identify a prompt and more specific diagnosis. In addition to the necessity for a larger number of research intended for this pathology, so that, within coming years, treatment with better proficiency may come up, aiming at enhanced quality of life for Progeria children.

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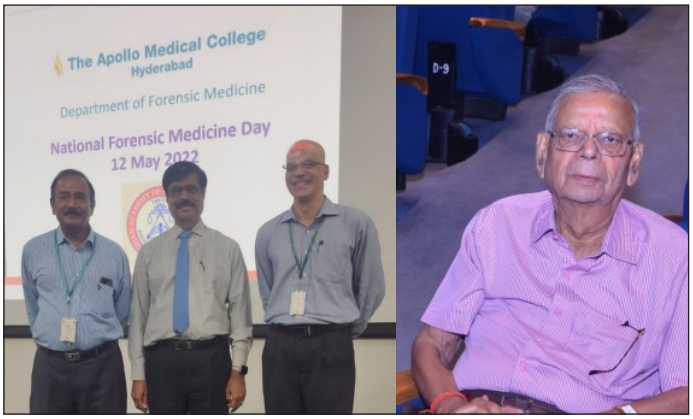


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