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Medicolegal Aspects during Mass Casualty Due to Road Traffic Accidents in the Era of Covid: A Tertiary Care Institutional Experience

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Abstract

Background: In March 2020, the world health organization declared COVID-19 a world wide pandemic. Countries introduced public health measures to contain and reduce its spread. The effect of mandated societal lockdown to reduce the transmission of corona virus disease 2019 (COVID-19) on road traffic accidents is not known. For this we performed an in-depth analysis singdata of emergency and trauma centre UPUMS, Saifai. As most of the manpower was involved in managing Covid patients directly or indirectly, it was a challenge to manage these mass casualty patients who require intensive care as well as Medicolegal documentation, record keeping, Consent for life saving procedures in absence of Relatives.

Materials and Methods: We reviewed data on total 2876 road traffic accident records in UPUMS, Saifai from January 1, 2020 through September 30, 2020. We treated March 20th as the first day of mandated societal lock down and 1st July as the first day of re-opening.

Results: We have found that the reis increase in road traffic accidents resulting in serious or fatal injuries during lockdown and post-lockdown period. There was increased Medicolegal burden in spite of the decreased medical resources, manpower as most of manpower and resources were being utilized for covid patients.

Conclusion: Road traffic accidents are a prominent contributor to hospitalization and may negatively impact the existing hospital resources directed towards COVID-19.

Keywords: COVID-19 Pandemic, Mass Migration, Medicolegal aspect, Road Traffic Accidents

Introduction

In December 2019 in Wuhan China, a cluster of cases of 'pneumonia of unknown origin' was reported which subsequently was confirmed (Hui et al, 2020, sohrabi et al, 2020) and named corona virus disease 2019 (COVID-19) by the world health organization, 2020). By march 2020, the WHO declared COVID-19

a world wide pandemic with 216 countries, area or territories showing 10,719,646 cases and 517,337 death combined as of July 2, 2020 (WHO 2020).

The effect of mandated societal lockdown to reduce the transmission of corona virus disease 2019 (COVID-19) on road traffic accident has been identified as an important issue with direct

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implications for public safety (ching and Miranda-moreno, 2020)

Despite the initial expectation that road traffic accidents will decrease during the COVID-19 pandemic, the preliminary results are variable. The estimates of road traffic accidents varied between states. Shillong and walteen (2020) found a 50% reduction in total casualty collisions in California from march 1, 2020 to April 30, 2020 but some region show very little reduction.

Road traffic accidents are a prominent contributor to hospitalization and may negatively impact the existing hospital resources directed towards COVID-19.

We studied the effect of mandated societal lockdown in UPUMS, Saifai, Etawah on road traffic accidents. UPUMS, saifai is situated at Lucknow-Agra express way which is approximately 300 km road, our institute caters to most more than 150 km stretch and we receive major road traffic accidents cases almost daily and mass casualties on regular basis.

Due to constrained medical facilities & infrastructure during these covid times managing these mass casualty patients requiring treatment which included ICU care, Emergency Surgeries and above all very detailed Medicolegal documentation, record keeping as well taking consent for emergency procedure especially in absence of no known patient relatives.

Result

We reviewed data on total 2876 road traffic accident records in UPUMS, saifai from January 1, 2020 through September 30, 2020. We treated March 20th as the first day of mandated societal lockdown and 1st July as the first day of re-opening.

The total number of road traffic accidents range from 5 to 35 per day. The number of serious or fatal crashes ranged from 0 to 18 per day. Among these RTAs, 1972 were associated with minor injuries and 878 were associated with serious or fatal injuries. Overall, the total daily number of RTA patients varied from 11.5 (mean before lockdown) to 12.0 (mean during lockdown) and 12.4 (mean after lockdown).

There is increase in RTA during and post lockdown due to interstate mass movement by the labourers during and again after lockdown.

Incidence of mass casualties is increased many folds during the COVID-19 times because of mass migration, uncertainty, fear for life and rumours.

Patients were most often received in shock condition and most cases were of polytrauma type which require immediate resuscitation and then further definitive management. Many crush injury, orthopaedic injury and Vascular injury patients who needed emergency procedures, who required emergency amputations needed Detailed Consent but it was a big challenge and tricky condition to decide upon the course of treatment following the Medicolegal aspects in every step, as there was definite constraint in the manpower, unavoidable delays due to lack / decrease in the resources.

Discussion

We observed that there is increase in road traffic accidents resulting in serious or fatal injuries. There is behind lack of reduction in RTA fatal or serious injuries during mandated societal lockdown is unclear. Potential reason includes increase speed of traffic due to lower congestion, greater number of drivers under the influence of alcohol, interstate mass migration by the labourers. The findings are based on data from RTA that occur within state of Uttar Pradesh and may not be generalizable to other states.

Medicolegal Aspects in Road Traffic Accidents mandate immediate resuscitation, most often proper history was not available, due to sudden influx of hundreds of patients in critical condition, even triaging was challenge due to decreased manpower & resources, all these patients essentially needed proper description of injury after resuscitation, most patient required multidisciplinary care as most were of poly trauma nature.

Our restructured trauma & Emergency department as well as its building during this period was functioning in such a way that patient receiving from ambulance to operative room/ICU takes only a few minutes and on the way only patient is being resuscitated, radiological investigations are performed and depending upon the condition of

patient, either they are shifted directly to Operation theatre or ICU For definitive management.

Conclusion

The mandated societal lockdown policies led to reduction in road traffic accidents resulting in minor injuries but not road traffic accidents resulting in serious or fatal injuries.

Road traffic accidents are a prominent contributor to hospitalization and may negatively impact the existing hospital resources directed towards COVID-19 they adversely affected the Medicolegal aspect of record keeping, Proper consent is almost impossible due to the excessive number of very sick patients, most often absence of patient relatives, requirement / availability of ventilator, requirement of emergency life saving procedures like tracheostomy / Amputation to save life.

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The Study of 'Preparation Guidelines' Towards Phetchabun Government Officers and Health Massage Establishments

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Abstract

The purpose of research was to study practices, barriers, and solutions of Phetchabun health massage establishments under COVID-19 situation. Non-participant observation, informal interview, in-depth interview, and participation observation were carried out respectively. Purposive sampling was used with 15 health consumer protection officers in charge; 11 district level, 2 provincial level, 2 regional level as well as each representative of 11 districts. Results after implementation of "Preparation Guidelines for Health Spa, Health Massage, and Beauty Massage to Promote Health Tourism During COVID-19 Pandemic" were categorized into two sections. Firstly, the practices, barriers, and solutions of government officer performances included preparation for reopening, monitoring of the provider practices, and performance report. Secondly, the provider operations consisted of doing "Self-Assessment of Health Establishment", logging-in webpage before reopening, and practices for clients included screening and report of patients under investigation, establishment monitor, service, and establishment cleaning. In summary, the preparation guidelines were purposed to reopen their business with numerous contents and messages written by official language, it caused establishment providers and practitioners difficultly understood when applying. LINE Application and making calls were easy and accessible methods for their communication to reach current data and to ensure exact information. Various encouragements and having compliments were also considerable to form trust and confidence among them, they also raised their proud.

Keywords: Health massage establishments, Government Officers, COVID-19

Introduction

When Coronavirus Disease 2019 (COVID-19) was widely spread, outside China, Thailand was the first country to report a symptomatic case in January 2020¹. By late March 2020, number of reported cases was soared up, epidemic was also widespread throughout Thailand². Afterwards, Centre for the Administration of the Situation due to the Outbreak

the Communicable Disease Coronavirus was created, and it announced multiple public health and social regulations seriously implemented in order to take the outbreak under control. Consequently, various social and economic activities were restricted; for example, people were advised not to gather in public areas and travel across provinces². Moreover, non-essential business such as bars, gyms, and barbershops were

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closed. Health establishments were considered risk areas for contracting refer to Regulations; therefore, they were forced to shut down during the pandemic³.

Department of Health Service Support (DHSS), Ministry of Public Health, as a public central organization, was authorized to regulate health establishments, and it provided authorities to provincial and district agencies to control them which were classified into 3 types including health spa, health massage and beauty massage under Health Establishment Act B.E. 2559⁵. The DHSS realized impacts on the crisis towards practitioners and service providers; as a result, a series of measures and regulations for the establishments to loosen restrictions was provided. Later, "Preparation Guidelines for Health Spa, Health Massage, and Beauty Massage to Promote Health Tourism During COVID-19 Pandemic" was issued and granted which they were required to strictly accomplish before reopen business³. The Preparation Guidelines were implemented throughout the country that Phetchabun, a province in north-central region, was included. Division of Consumer Protection and Pharmaceutical, is a major agency to promote, enhance and regulate the health establishments in Phetchabun throughout 11 districts divided into three zones. The Division authorized district and provincial officers to provide knowledge, to improve service provider potential, to develop connection and participation, and to receive and deal with complaints. However, it was assumed a type of the establishments in the region which was health massage establishments.

However, after the Preparation Guidelines for Health Spa, Health Massage, and Beauty Massage to Promote Health Tourism During COVID-19 Pandemic was implemented, researcher purposed to study practices, barriers, and solutions of Phetchabun health massage establishments under COVID-19 situation.

Methods

This research adopted non-participant observation, informal interview, in-depth interview, and participant observation, respectively. Purposive sampling was used and data collection was carried out with 15 health consumer protection officers in charge; 11 district level, 2 provincial level, 2 regional

level as well as each representative of 11 districts. Validity and reliability of instruments were also assessed. Later, content analysis was conducted and triangulation method was used for data validation.

Results

Along with the Preparation Guidelines, officials of Consumer Protection and Pharmaceutical performed based on Provincial Orders and Notifications of the Communicable Disease Committee so that it was suitable in their circumstances. Results were categorized into officials and establishment providers sections. To begin with, the official practices were divided into 3 steps. Firstly, preparation for reopening: official information forwarded to involved officials was from DSHH webpage and Provincial Centre for COVID-19 Situation Administration webpage. Afterwards, the provincial officers (POs) summarized present data and practical guidelines, then they introduced concerned and useful information to district officers (DOs) and establishment providers (EPs) by both official letters mailing and chatting via LINE Application (LA). Secondly, monitoring of EPs practices: the EPs were required to send their site preparation photos via LA to the POs for examination, both also had discussions by calling. Next, the POs, Dos, and involved officers from local organizations had a fieldwork to randomly inspect the sites. Thirdly, performance report: the EPs holding licenses who purposed to reopen their establishments were asked to access <http://spa.hss.moph.go.th/Self/> of DHSS. The webpage was classified into 2 phases: pre-reopening, they were required to register and do "Self-Assessment of Health Establishments in order to Protect and Control the COVID-19 Outbreak", the POs examined later. Additionally, during reopening: they were required to input data of customer screening before service and screening register once a week at least, the POs investigated then.

Nevertheless, the officers found some barriers and solutions when implemented as follows:

Step 1 preparation for reopening: first of all, numerous data was not input instantly resulted in information was late forwarded to involved people, so the POs informally inquired officers of legal affairs division to get exact answers. Moreover, writing official letters with complicated procedures took

much time and were sent later caused members in the community were unable to up to date existing situation. Therefore, essential information was announced via LA before official letters mailing. In addition, the EPs were unable to directly access ongoing information with their smartphones caused they had to wait for the mailing which were certainly delayed. Thus, after receiving the mails, they were required to unseal the latest one to acquire recent messages. Besides, the EPs difficultly understood main points of the self-assessment because of formal language. As a result, the POs informed the EPs with informal language by LA then they were provided to have discussions by calling to ensure after reading. Furthermore, the POs were confused because of different closure measures in different areas. Hence, they investigated exact regulations and measures by calling the DOs, and they were required to focus the latest news in their region.

Step 2 monitoring of EPs practices: Firstly, site photos could not really show authentic activities and practices whereas any instruments in the sites might be setup. Likewise, phone conversation without face-to-face interaction was assumed mistakes since they were unable to feel their exact feelings and emotions. Consequently, informal communication with positive encouragement was provided, the POs were also able to hear their opinions and expressions. Similarly, surveillance fieldwork during the outbreak was regarded a contracting risk. The fieldwork plan then was designed under Provincial Orders while the POs strictly followed guidelines of the Communicable Disease Committee.

Step 3 performance report: the EPs were unable to access the webpage on their smartphones; in the meantime, they did not clearly understand explanation by calling. So, the POs summarized the main points then logging-in steps were post through LA with obvious photos. Their relatives also became their assistants when assessing the webpage.

Nevertheless, the providers of health massage establishment who required to reopen were asked to seriously follow the Preparation Guidelines. The establishment providers (EPs) practices were classified 3 steps. Firstly, doing the Self-Assessment of Health Establishments: the EPs studied throughout the Guidelines themselves, site preparation was then

conducted. Secondly, logging-in webpage before reopening: the EPs were required to register and were provided usernames and passwords, they did the self-assessment as well. While reopening, screening data and number of clients were input. Thirdly, practices for clients: this step was divided into 4 parts. Part 1 screening and report of patients under investigation: the clients were screened using the assessment before service. They were advised to put on their masks while service, 1-meter distancing at least was managed as well. Part 2 establishment monitoring, client register was done by writing down their notebooks before input to the webpage. Site, instrument, and disinfectant preparation was also hygienically and safely arranged. Part 3 service: the EPs strictly cleaned their hands before and after service and put on both masks and face shields while service. The clients were asked to clean their hands before entering and to inform exactly health information. Part 4 establishment cleaning: bed sheets, pillow cases, and towels were changed after service a client. Bathroom and washbasin were washed, garbage bags were also completely sealed.

However, the establishment providers discovered some obstacles and solutions when implemented as follows:

Step 1 Doing the Self-Assessment: The Preparation Guidelines were hard to understand with plenty of contents, so the EPs inquired provincial officials through LA or making a call.

Step 2 logging-in webpage before reopening: The EPs were unable to login and register themselves; therefore, their friends and relatives became assistants. In addition, DHSS system was failed sometimes, they then examined the POs via LA or calling.

Step 3 practices for clients: First of all, while doing the assessment, some clients did not pay attention and felt wasting their time. Some were also inadequate reading and writing competency. So, they were investigated rather than reading. Besides, there were a lot of walk-in clients resulted in it was crowded; as a result, they were required to make an appointment in advance. Additionally, limited areas in the establishment were insufficient to provide 1.5-meter distancing; therefore, "Not Available" and "Red Cross" signs were obviously managed for

notification. Correspondingly, the EPs were difficultly breathe whereas they put on both masks and face shields when service. Consequently, windows and doors were opened to ventilate. Likewise, the clients improperly placed their belongings; as a result, "For Your Belongings" sign was done to exactly show position. In addition, after service the EPs removed pillowcases and bed sheets with improper methods caused disease spread, so they were asked to frequently practice how to remove them correctly. Lastly, the EPs were not sure and confused when mixing sterilizing solutions; therefore, they studied carefully how to mix them and wrote down their notebook to remind.

Besides, positive reinforcement which was a certificate was also underlined when the EPs followed the Preparation Guideline and achieved. They were self-confident receiving the certificate and were proud of it so that they were able to safely service. Being certified and being complimented were also stimulations for development. Nevertheless, the EPs proposed that public organizations were required to provide and advertise knowledge about standards of health establishment so that clients could be assured of standardized service.

Discussion

The Preparation Guidelines was issued by Health Establishment Division, Department of Health Service Support, so that the health establishments were able to reopen which included numerous inexplicit statements with formal language; as a result, the officers difficultly understood especially the establishment providers and practitioners. Also, the Guidelines were inappropriate and impractical practices for all environments. When implementation, the officers were required to particularly adapt for different context which was consistent with Phuwanai Phetprai's (2022) proposed the preventative resolution with government measures were extensively issued with inoperative practices that both officers and providers were required to apply for their circumstance⁷.

When government officers both provincial and district level performed, they were required to seriously follow a series of law, rules and measures with a plenty of complex procedures such as order

issuing and official letter writing that affected their operations. Similarly, any approvals were taken much time and their performance efficiency and operation agility were declined that Chatsuda Chaichom et al. (2021) stated that bureaucracy included various and complicated processes with a lot of regulations and in order to regulate their operations⁸. Also, it was mentioned that red tape on public employees was risen because of chain of commands in government organizations with over regulation⁹.

After the establishments were reopened, it was found that additional cost especially cleaning was obviously increased such as establishment disinfections, strict tools and cleaning instruments. It was supposed the providers were provided supporting budget from government organization so that they were able to maintain standards as well as safety service which was consistent with Kornkanok Jirasathitpornpong's study (2021) proposed that the government specified relievable measures by providing support budget and enhancing health measures¹⁰. Although webpage and application were channels to directly communicate between the officials and the providers, some providers were unable to access electronic devices or Internet, and some were inadequate technology skill. It was assumed that training with simple, practical, and useful knowledge or skills was continually arranged which was consistent with Somchai Punyajaroen (2020) mentioned that it was needed to promote skill and knowledge of public and private members to resolve problems in collaborative governance between public and private sectors¹¹.

Both district and provincial officers had their fieldworks with involved organizations for surveillance under the regulations. It was found that the district officers were welcomed, but establishment providers disbelieved any advices or suggestions because their visit aimed to expressly complete the fieldwork plans. Furthermore, they spent less time with the providers while visit in that case friendliness between them was not risen. Consequently, the providers were not open-minded to express their opinions, nor were their problems solved in the environment. After the district officers left, the providers chatted to the provincial officers via LINE Application or calling for consult. Siriluk

Khumphiranont and Anchana NaRanong (2020) proposed that untrustworthiness of inter-sector is an obstacle towards successful collaboration¹². They did not understand each other and felt distrustful to work together. Sirinthip Srisawangwong and Piyanus Ngernklay (2021) suggested that government officer inspection was required to be friendly visit with creative practices whereas meeting for exchange was continuously and formally managed with informal conversation which both officers and providers received mutual benefits¹³.

Recommendations

Policy recommendations: any authorities and participants for legislation and guidelines for disease control and prevention were advised to especially emphasize on people capability of perception of news.

Recommendations for further studies: first of all, action researches should be conducted to collect quantitative and quality data towards development factors for health establishment. Secondly, evaluation researches should be managed for implementation of government policy contributes health providers. Finally, information system development for health should be particularly studied so that people were able to easily access during the crisis.

Conclusion

Health massage establishments, as a type of health establishments, were a risk business for disease spread during COVID-19 situation then they were considered to temporarily shut down based on the Regulations. After health establishment division under Department of Health Service Support was aware of service providers and employees, the Preparation Guidelines were enforced so that they could reopen their business. While implementation, performances of government officers were divided into preparation for reopening, monitoring of establishment provider practices, and performance report. In addition, doing the Self-Assessment, logging-in webpage before reopening, and practices for clients were practices of the providers.

The Preparation Guidelines included various contents and messages written with formal language. People in communities were unable to understand;

as a result, the government officers had to summarize into informal or local language. Moreover, LINE Application was considered as an easy channel to communicate among them for providing useful advices and suggestions. Besides, phoning was a convenient way when having discussion or problem solving. In addition, encouragement significantly influenced towards trust and confidence.

Ethic

The study was approved by the Ethics Committee for Human Research, Phetchabun Provincial Public Health Office 2/2564 Project number: Sor Sor CHor.2/64-14-25/06/64. All participants gave written informed consent.

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Conflict of Interest: None

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Unintentional Deaths among Adolescents in the Age Group of 10 to 19 Years: An Autopsy Study

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Abstract

Introduction: Adolescence is commonly regarded as a healthy time of life, with a peak in strength, speed, fitness, and many cognitive abilities. However, major shifts in health take place around puberty as new health risks with potentially life-threatening consequences become prominent. Unnatural deaths are the leading killer of today's teenage and adolescent generation, as the patterns have changed from infections to social aetiologies during the last decades. The unnatural deaths may be due to unintentional or intentional injuries. Unintentional injuries are mainly accidents. Intentional injuries are mainly suicides and homicide.

Aims and Objectives: To know the type, incidence, and sex wise distribution of unintentional deaths of adolescents in the age group of 10 - 19 years.

Material Methods: Department of Forensic Medicine, BMC & RI (Victoria & Bowring and Lady Curzon Hospitals) is a postgraduate institute that conducts autopsies of all sudden, suspicious, unnatural deaths which occur in and around Bengaluru. The present study is a descriptive study of unintentional unnatural death cases of Adolescents (10 to 19 years) which were autopsied at BMC & RI, Bengaluru for a period of 18 months from Dec. 2014 to May 2016.

Results: Out of 148 cases of unintentional injury, 109 cases were males (73.64%) and 39 cases were females (26.36%). Among unintentional deaths majority were due to RTA 58 cases (39.19%), Accidental Scalds / Burn injuries 30 cases (20.27%), Accidental drowning 18 cases (12.16%), Electrocution 14 cases (9.45%), Accidental railway injury sustained 15 cases (10.13%), Accidental fall 11 cases (7.43%), Snakebite 1 case (0.67%), Blast explosion 1 case (0.67%).

Conclusion: Adolescent age is an important stage in development. Death in adolescence is a potential life loss to family and society to some extent and reflects socioeconomic and Medical Health Care status at the National and Regional levels. Accurate legal investigations are essential in increasing awareness among National policymakers and educators/caregivers, to prevent adolescent deaths. To conclude useful and informative determinants of adolescent death were identified in this study. Since there is very little information regarding adolescent death in developing countries like ours. This suggests that each and every center conducting autopsies should come up with such studies to reflect the magnitude of the occurrence of unnatural adolescent deaths.

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Keywords: Unnatural deaths, Adolescent deaths, unintentional injuries.

Introduction

The World health organization (WHO, 1998) defines Adolescence as the period of life between 10 to 19 years of age. Adolescents are an interesting group, as they enter the period as children dependent on their families and leave as self-sufficient young adults. Around 1 in 6 persons is an Adolescent: that is 1.2 billion people aged 10 to 19 years and make up about 20% of the World's population. Adolescence is commonly regarded as a healthy time of life, with a peak in strength, speed, fitness, and many cognitive abilities. However, major shifts in health take place around puberty as new health risks with potentially life threatening consequences become prominent.¹⁻² Unnatural deaths are the leading killer of today's teenage and adolescent generation³, as the patterns have changed from infections to social etiologies during the last decades. The unnatural deaths may be due to unintentional or intentional injuries. Unintentional injuries are mainly accidents. Intentional injuries are mainly suicides and homicide. During the last decade, unnatural deaths were more common than natural deaths (disease) among adolescents⁴. Unnatural deaths are known to claim a substantial number of lives all over the world, with vehicular accidents accounting for a lion's share. The vehicular accident rate per thousand vehicles is greater in developing countries than in developed. In India, one person dies in less than every five minutes due to vehicular accidents and the accident rate i.e. the number of accidents per hundred thousand population is 24.3. The increased pace of mechanization, increasing the number of fast-moving vehicles, unskilled or semi skilled drivers, drunken drivers, and the woefully inadequate road system have ushered in this man-made epidemic in India. Ignorance and intentional violation of traffic rules, and encroachment of the roads by shopkeepers, hawkers, and stray animals play an important role in contributing to the increase of vehicular accidents.⁶

Poisoning is a major problem all over the world, though the type of poison and the associated morbidity and mortality varies from place to place and changes over a period of time. The use of poisons for suicidal and homicidal purposes dates

back to the Vedic era in India. The exact incidence of this problem in India remains uncertain, but, it is reported that 1 to 1.5 million cases of poisoning occur every year, of which nearly 50,000 die.⁷ The last quarter of the century has seen tremendous advances in the fields of agriculture, industrial technologies, and medical pharmacology. These advances have been paralleled by remarkable changes in the trends of acute poisoning in developing countries, including India.⁸

Fire and its searing/cleansing powers have been held in great reverence and fear in the Indian psyche. This extended to the cleansing and blessing of human bonds and relationship soverit. Even Shushruta's ancient medical treatise gave it the final sterilizing/cleaning authority. From this background, setting oneself on fire may have been arrived at, as an Indian means of Honorable Suicide.⁹ The burn fatalities in India go beyond the meaning implied in the term "accident and the impact they cause, no longer remains confined to the family but spreads far wide to be aptly termed as a Social Calamity."¹⁰ The prevailing system of Dowry, which is mainly responsible for all such deaths, is a product of emerging capitalist ethos - the offshoot of an unequal society, a result of rampant consumerism, aided and abetted by the black market economy. Its increasing incidence is symbolic of continuing erosion and devaluation of women's status in independent India.¹¹

Aims and Objectives: To know the type, incidence, and sex-wise distribution of unintentional deaths of adolescents in the age group of 10 to 19 years.

Materials and Methods

Source of data:

Department of Forensic Medicine, BMC & RI (Victoria & Bowring and Lady Curzon Hospitals) is a postgraduate institute that conducts autopsies of all sudden, suspicious, unnatural deaths which occur in and around Bengaluru. The present study is a descriptive study of unintentional unnatural death cases of Adolescents (10 to 19 years) which were autopsied at BMC & RI, Bengaluru for a period of 18 months from Dec 2015 to May 2016.

Ethical clearance:

Ethical clearance for the present study was obtained from the institution's ethical committee, Bangalore Medical College & Research Institute, Bengaluru.

Method Of Collection Of Data

Department of Forensic Medicine, BMC & RI (Victoria & Bowring and Lady Curzon Hospitals) is a postgraduate institute that conducts autopsies of all sudden, suspicious, unnatural deaths which occur in and around Bengaluru. The present study is a descriptive study of unintentional unnatural death cases of Adolescents (10 to 19 years) who were autopsied at BMC & RI, Bengaluru for a period of 18 months from Dec. 2014 to May 2016.

All unintentional unnatural death cases of the age group 10 to 19 years autopsied at Bangalore Medical College and Research Institute, Bengaluru were included in the study. Relevant autopsy findings related to each of these cases were taken for analysis. Further, the details of clinical data of the victim including the investigations and procedure, survival period, time, and cause of death were ascertained from hospital records. Information pertaining to the time and manner of death was sought from the police personnel in vestigating the case. Some of the particulars like reasons for the death were also obtained from direct interrogation with relatives, friends, and other along with the police. The various epidemiological factors involved such as age sex, socio economic status, and others were noted down. These were then correlated with the post-mortem findings to conclude the analysis of each case. All the findings thus obtained were noted down in a separate Performa for each.

Inclusion Criteria:

1. All cases of unintentional unnatural deaths in the age group of 10 to 19 years
2. Both males and females

Table 2. Age Incidence Of Victims.

Age(Yrs)	Male	Percent	Female	Percent	Total	Percent
10 to 14 years (Early Adolescence)	36	18.5	37	18	73	18.3
15 to 19 years (Late Adolescence)	158	81.5	168	82	326	81.7

Exclusion Criteria:

1. Decomposed dead bodies of the age group 10 to 19 years.
2. Unknown dead bodies where the exact age is not clearly established
3. Mass disasters.

Results

Department of Forensic Medicine, Bangalore Medical College and Research Institute, Bengaluru is a postgraduate Institute that conducts autopsies of sudden, suspicious, unnatural deaths which occur in and around Bengaluru. The present study is a descriptive study of unintentional unnatural death cases which was autopsied at Victoria and Bowring & Lady Curzon hospitals, Bengaluru for a period of 18 months from December 2014 to May 2016 which form the material of the study.

During this period 7219 cases were brought for post-mortem examination out of which 5522 deaths (76.5%) were due to unnatural causes. Out of 5522 cases of unnatural deaths 399 deaths (7.22%) were of adolescents of the age group 10 to 19 years.

In this study among 399 of Unnatural deaths among adolescents in the age group of 10 to 19 years. 251(62.90%) cases were intentional deaths and 148 (37.10%) cases were unintentional deaths

Table 1. Type Of Unnatural Death

Type of unnatural deaths	No of cases	Percent
Intentional Death	251	62.9
Unintentional Death	148	37.1
Total	399	100

Out of 399 cases of Unnatural deaths among adolescents in the age group of 10-19 years 73 cases(18.3%) were in the early adolescent age group (10 to 14 years)[M; F ratio was 36:37] and 326 cases were of late adolescent (15 to 19 years) age group [M: F ratio was 158:168].

Out of 148 cases of unintentional deaths 58 cases (39.19%) were due to road traffic accidents, 30 cases (20.27%) were due to accidental alburn/scald injury, 18 cases (12.16%) were accidental drowning, 15 cases (10.13%) were due to accidental railway injuries, 14 cases (9.45%) due to electrocution, 11 cases (7.43%) due to fall/wall collapse. 1 case (0.67%) due to snake bite and 1 case (0.67%) of blast explosion.

Table 3. Type Of Unintentional Deaths

Unintentional Death	No of cases	Percent
Road Traffic Accidents	58	39.2
Accidentalburn/Scald	30	20.3
Accidental Drowning	18	12.2
Accidental Railway Injuries	15	10.1
Electrocution	14	9.4
Accidental fall from height	11	7.4
Snake Bite	1	0.7
Blast Explosion	1	0.7
Total	148	100

Out of 148 cases of unintentional injuries 109 cases were males and 39 cases were females.

Table 4. Type and Sex Wise Distribution of Unintentional Death

Unintentional Death	Male	Female	Total
Road Traffic Accidents	49	9	58
Accidental Burn/scalds	13	17	30
Accidental Drowning	16	2	18
Accidental Railway Injuries	11	4	15
Electrocution	10	4	14
Accidental Fall from Height	9	2	11
Snake Bite	0	1	1
Blast Explosion	1	0	1
Total	109	39	148

Discussion

Death is unnatural when caused prematurely against the order of nature by injury, position, or other means of violence. Unnatural deaths claim a substantial number of lives in developing countries like India. Many cultural and socio economic factors in a country are usually related to the causation

of unnatural deaths. The aim of this study is to investigate teen age and adolescent deaths due to unintentional unnatural causes in the city of Bangalore. This particular section of society is very much needed for building the nation in the future. There is limited data on teen age and adolescent mortality, particularly from developing countries with unreliable death registration systems. This calls for the use of other sources of data to ascertain the cause of teen age and adolescent mortality.

Adolescence is an important stage in development, death among the mis the important reason for potential life loss to the family and society, and to some extent, it reflects a national, regional, social, and economic situation and medical health care level. Especially, the juvenile victims of those homicide cases directly reflect the area's social order and stability situation.

Out of 5522 cases of unnatural deaths, 399 cases (7.22%) were of adolescents belonging to the age group 10 to 19 years, the incidence correlates with most of the previous studies.¹²

In this study among 399 deaths 251(62.90%) cases were intentional and 148 (37.10%) cases were unintentional.

Out of 148 cases of unintentional deaths 58 cases (39.19%) were due to road traffic accidents, 30 cases (20.27%) were due to accidental burn/scald injury, 18 cases (12.16%) were accidental drowning, 15 cases (10.13%) were due to accidental railway injuries, 14 cases (9.45%) due to electrocution, 11 cases (7.43%) due to fall/wall collapse. 1 case (0.67%) due to snake bite and 1 case (0.67%) of blast explosion. Out of 148 cases of unintentional deaths 109 (73.64%) were males and 39 (26.36%) were females. Previous reports show that among unintentional injuries, fatalities from road traffic accidents (RTA) are quite prevalent.¹²

Other causes of injuries leading to death among adolescents cited in the literature are drowning, hanging, firearms, and stab wounds and burns. Among adolescents, traffic injuries and burns are responsible for maximum injury-related mortalities in males and females, respectively. More injury reducing measures are required for effective reduction in traumatic deaths.

Conclusion

Teenage and adolescence are important stages in development. Death among them is the important reason for potential life loss to the family and society and to some extent it reflects the socio-economic and medical health care status at national and regional levels. It is essential to establish a protective system and enhance the education level among teenagers and adolescents to prevent them from unnatural deaths. Infact, the public health burden of all unnatural deaths needs to be estimated to provide a rational basis for policy decisions to implement necessary interventions.

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Conflict Of Interest: None declared

Ethical Clearance: Taken from the Institutional Ethics Committee.

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An Autopsy Based Retrospective Study on Pattern of Thoraco-Abdominal Injuries in Fatal Road Traffic Accidents of Kolar, South India

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Abstract

Background: India is experiencing increasing road traffic accidents (RTA) amidst increasing motorization and infrastructure growth in recent years. Every day, nearly 400 road deaths occur on Indian roads and several thousands are hospitalized due to road crashes. WHO estimates the incidence of road deaths to be 16.6 per 100000 population in India¹. With the aim of studying pattern and exploring various epidemiological characteristics of RTAs, this retrospective study of medico-legal autopsies was conducted.

Aims & Objectives: 1 To study the pattern of thoraco-abdominal injuries (TAI) in fatal road traffic accidents in Kolar. 2. To describe demographic profile and create public awareness on road safety.

Material & Methods: A retrospective autopsy based study of pattern of thoraco-abdominal injuries in victims of fatal road traffic accidents was conducted in Sri Devaraj Urs Medical College, Kolar (South India) from 1st January 2014 to 31st December 2014. A total of 192 RTA victims were referred for autopsy during the period of which 100 cases sustaining thoraco-abdominal injuries were studied.

Results: A total of 192 medicolegal autopsies were conducted on victims of road traffic accidents (RTA) during the study period. Among them, 100 victims suffered thoraco-abdominal injuries, which accounted for 52.08% of the cases. The highest number of victims belonged to the age group of 20-40 years, accounting for 48% of the cases. In terms of gender distribution, males constituted 62.0% of the victims while females constituted 38.0%. The most common injuries were to the liver, accounting for 37.75% of the total injuries. Other frequently affected body parts included the spleen, lungs, thorax, abdomen, pelvis, and spine.

Conclusion: The analyzed data provides clear evidence that road accidents are foreseeable and avoidable. To make substantial improvements in road safety throughout India, it is essential to establish a robust and effective national and state-level road safety authority, foster intersectoral coordination, and secure regular funding. Our aim in sharing this article is to increase public awareness of the significance of road traffic injuries from a public health perspective and to alleviate the weight of fatalities and injuries on our communities.

Key words: road traffic accidents (RTA), thoraco-abdominal injuries (TAI), autopsy.

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Introduction

Millions of fatalities and injuries occur globally every year due to road traffic accidents, making it a substantial public health concern. The World Health Organization (WHO) defines a Road Traffic Accident (RTA) as an incident that takes place on a public thoroughfare or roadway involving at least one vehicle and resulting in the injury or death of at least one person². Road Traffic Accidents (RTAs) make up 1.7% of the worldwide death toll, with 91% of fatalities occurring in low-income and middle-income nations³. Every day, around 400 individuals lose their lives on Indian roads while several thousands are admitted to hospitals for road accidents¹. According to WHO, India witnesses an estimated 16.6 road fatalities per 100000 population. In countries like India, with middle-income and developing statuses, the expenses linked to Road Traffic Accidents or RTA account for 3 to 5% of the gross domestic product^{1,3}. In 2019, the National Crime Records Bureau (NCRB) reported 437,396 road accidents in India, resulting in 154,732 deaths and 439,262 injuries⁴. One common injury sustained in these accidents is thoraco-abdominal injury (TAI), which affects the chest and abdominal areas and can lead to severe complications and even death if left untreated⁵. Although the Ministry of Road Transport and Highways in India recorded 449,002 road traffic accidents in 2019, resulting in 151,113 deaths and 451,361 injuries, there is no readily available data on the number of deaths specifically caused by TAI in road traffic accidents in India⁶.

Reports of Motor Traffic Accidents are increasing nationwide, with thoraco-abdominal injuries accounting for a significant proportion of these deaths. Although this is not limited to India and is a worldwide issue, India has the highest rate of road traffic accidents globally. Understanding the patterns of thoraco-abdominal injuries in road traffic accidents is critical for improving prevention and treatment strategies. In this project, we aim to analyze the patterns of thoraco-abdominal injuries in road traffic accident deaths, including the types and severity of injuries, the demographics of the victims, and the circumstances surrounding the accidents. By doing so, we hope to contribute to the development of more effective measures for reducing the incidence and impact of these injuries.

Material and Methods

This retrospective study was carried out at the Department of Forensic Medicine and Toxicology of Sri Devaraj Urs Medical College and R.L. Jalappa Hospital & Research Center, Kolar (Southern Karnataka) between January 1st, 2014 and December 31st, 2014. The study included all cases of confirmed fatal road traffic accidents where the victim died either before hospitalization or during treatment. Cases where the cause and manner of death were unclear, unclaimed or unknown bodies without relevant history, and decomposed bodies were excluded from the study. Information on various study variables like sex, age, time of RTA, type of vehicle (light vehicle like two wheelers, three wheelers, four wheelers) and position of the victim during RTA (occupant/ pedestrian/ driver), nature of injury, victim was under the influence of alcohol/ not and cause of death was collected. Data was obtained from various sources, including the investigating officer, first information reports, reliable attendants of the deceased, inquest reports, hospital case sheets, death summaries, post-mortem examination reports, and forensic science laboratory reports. Out of 192 autopsies conducted during the study period, 100 cases of thoraco-abdominal injuries in all age groups were studied. Descriptive analysis of the data was done using SPSS software and presented in the form of text, tables, and graphs.

Results

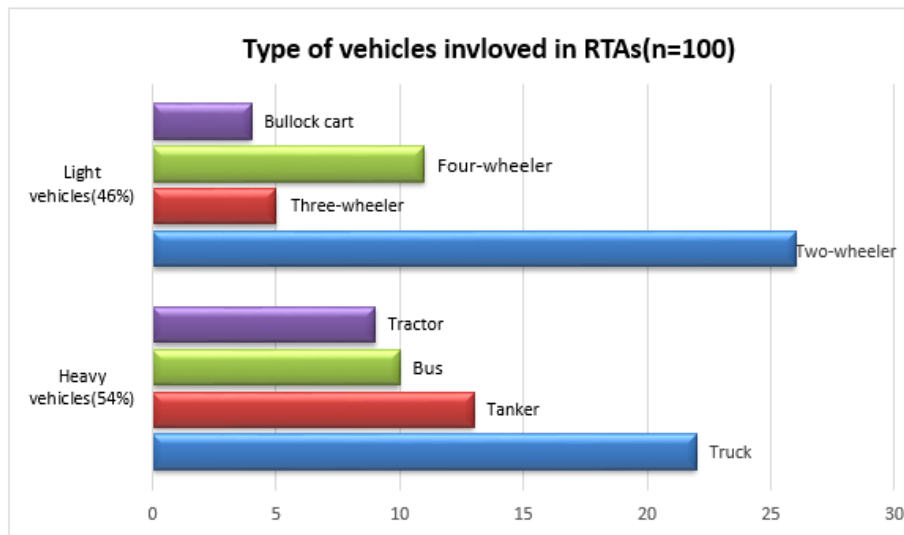
During the study period January 1st and December 31st, 2014, a total of 192 individuals who were involved in road traffic accidents (RTAs) underwent autopsy, out of which 100 cases that sustained thoraco-abdominal injuries were included in the study. The age distribution of the victims revealed that 48 (48.00%) were between 20-40 years of age, while only 6 (06.00%) were below 20 years (refer to Table 1). Males constituted the majority of the victims at 62.00% (refer to Table 1). On considering the type of vehicles involved, it was found that for 54 % of RTAs were caused by heavy vehicles (truck, tankers, bus, tractor), while the remaining accidents resulting in fatalities were caused by light vehicles (two-wheeler, three-wheeler, four-wheeler, bullock cart) (refer to Graph 1).

Most RTAs occurred during the daytime, with 64.00% of the accidents happening during this time (refer to Table 2). National highways were the location of 60.00% of the RTAs (refer to Table 2). A total of 249 injuries affecting various organs, including the liver, spleen, lungs, thorax, abdomen, pelvis, and spine, were reported in the 100 victims (refer to Graph2).

The liver was the most commonly injured organ, accounting for 94 (37.75%) of the total injuries. The remaining injuries involved the spleen, lungs, thorax, abdomen, pelvis, and spine. Knockdown kinematics caused a total of 44 casualties (44.00%) in RTAs, with two-wheeler drivers being the most commonly affected group among the victims (refer to Table 3).

Table 1. Age-group and gender-wise distribution

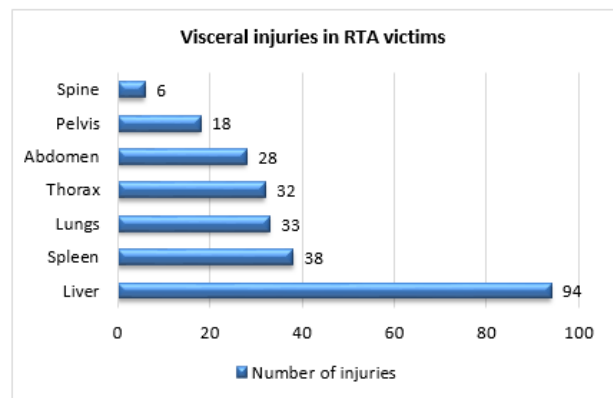
Age Group	Male	Female	Total	Percentage
20 and below	04	02	06	6.0%
21-40	33	15	48	48.0%
41-60	20	16	36	36.0%
61 and above	05	05	10	10.0%
Total	62	38	100	100%



Graph 1. Type of vehicles involved in RTAs

Table 2. Place and Time of RTAs (n=100)

Variables		Number of Victims in RTAs (%)
Place (n=100)	National Highways	60
	State Highways	16
	Rural & Urban roads	24
Time (n=100)	Morning (8.01 AM to 4.00 PM)	42
	Evening (4.01 PM to 12.00 AM)	22
	Night (12.01 AM to 8.00 AM)	36



Graph 2. Visceral injuries in RTA victims(n=249)

Table 3. Manner of production and type of vehicle involved in RTAs (n=100)

Manner of production	Number of cases	Type of vehicle involved				
		Victims				
		Pedestrian	Two wheeler driver	Pillion rider	Four wheeler driver	Occupant
Knocked down	44	09	12	16	03	04
Run over	06	04	01	01	00	00
Head on collision	22	00	10	00	10	00
Self-accident	28	06	12	02	07	03
Total	100	19	35	19	20	07

Discussion

Road traffic accidents (RTAs) are a major public health problem in India, with a high incidence of fatalities and disabilities. The present study aimed to investigate the demographic and injury pattern of individuals involved in RTAs who underwent autopsy during the year 2014. The study found that thoraco-abdominal injuries were the most common type of injury sustained by the victims, with males constituting the majority of the victims. This finding is consistent with previous studies that have shown that males are at a higher risk of RTAs than females⁷⁻¹⁰.

The age distribution of the victims in this study revealed that individuals between 20-40 years of age were most commonly affected, which is in agreement with previous studies that have reported a higher incidence of RTAs in the younger population^{11,12}. The finding that a majority of RTAs occurred during the daytime is consistent with previous studies conducted in India^{11,12,13}. The study also found that heavy vehicles were responsible for a majority of the RTAs resulting in fatalities, with national highways being the most common location for these accidents. These findings highlight the need for stricter traffic regulations and enforcement to reduce the incidence of RTAs on highways^{13,14}. In terms of injuries sustained by the victims, the liver was found to be the most commonly injured organ, followed by the spleen, lungs, thorax, abdomen, pelvis, and spine. These findings are consistent with previous studies that have reported liver injuries as the most common injury sustained in RTAs¹⁵⁻¹⁹. The study also found that knockdown kinematics caused a significant number of casualties, with two-wheeler drivers being the most commonly affected group. This highlights

the need for stricter regulations and enforcement of traffic laws related to two-wheelers to reduce the incidence of RTAs^{20,21}.

Overall, the findings of this study provide valuable insights into the demographic and injury pattern of individuals involved in RTAs in India. The results can help in the development of targeted interventions and policies aimed at reducing the incidence and severity of RTAs, especially on national highways.

Conclusion

The increasing occurrence of Road traffic accidents is a global cause for concern. A significant number of these accidents can be prevented by implementing measures such as controlling speed, wearing helmets, avoiding driving under the influence, and enforcing road safety regulations. Emergency medical services must be improved alongside road safety education to increase emergency treatment procedures. Moreover, the high number of pedestrians and two-wheelers on Indian roads and non-compliance to road safety laws are additional problems. World Health Organization (WHO) has even stated that India's ambition to become a superpower is jeopardized due to the severity of the issue. Unfortunately, the government's inattention to road safety remains a central issue. The responsibility for road safety falls under numerous departments leading to the infamous saying - everyone's responsibility is nobody's responsibility.

Ethical clearance: Obtained from Institutional Ethics Committee, Sri Devaraj Urs Medical College, Kolar.

Conflict of Interest: Nil

Source of Funding: Nil

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Study of Elbow Joint for Estimation of Age in 11 to 18 Years in both Sexes of Andhra Pradesh

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Abstract

Background: Age determination of individual is important in number of opportunities like education, sports, and medico-legal factors. Ossification centres of bones play vital role in age determination. It is accepted in court of law.

Method: 45 Boys and 45 Girls (total 90) children aged between 11 to 18 years were studied radiologically and classified their numbers as per age and sex, Appearance and fusion of bones of elbow joints.

Results: Equal number of boys and girls were selected from 11 years to 18 years of age. Appearance of trochlea at 11 years appeared only in girls. Fusion of trochlea was 14 to 15 years in boys, 12 to 14 years in girls. Appearance of lateral epicondyle was 11 to 12 year in boys and 11 year in girls. Fusion of lateral epicondyle was 13 to 16 years in boys and 13 to 14 years in Girls. Fusion of medial epicondyle 14 to 16 years in boys, 11 to 15 years in girls. Fusion of head of radius 11 to 16 years in boys and 11 to 13 in girls. Appearance of olecranon process- 11 to 13 years in boys and 11 years in girls. Fusion of olecranon process 17 to 18 years in boys and 15 to 16 years in girls.

Conclusion: This pragmatic radiological study of elbow joint between 11 to 18 years has regional, environmental, anatomical, anthropological and medico-legal importance because morphometric values of mesodermal origin are uncertain.

Keywords: Ossification, Elbow joint, age, medico-legal, radiological

Introduction

Age is an important demographic parameter in many fields yet the documents used to prove age such as birth certificates and national identity cards are liable to forgery. In medico-legal field, age is determinant in crimes committed by children or against children because punishment based on

criminal responsibility determined by age ⁽¹⁾. Such cases involve rape, kidnapping, marriage, and in establishing competency of witness. Accurate age estimation, ensures authorities fulfil obligation in providing support to vulnerable groups especially below 18 years of age ⁽²⁾. Age is likewise significant in sports mainly in the design of competitions according to age groups to guarantee equal chances.

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Ossification centres are reliable age indicators due to definite sequence and time of their appearance and fusion ⁽³⁾. The scientific study of maturation of ossification centres is accepted by the law court globally as a method for age determination ⁽⁴⁾.

The appearance and fusion of ossification centres are influenced by geographical, ethnic, climatic and nutritional factors hence attempt was made to evaluate the bones of elbow joint for estimation of aged between 11 to 18 years.

Material and Method

45 Boys and 45 girls at different age groups (between 18 years) visited to GSL medical college along with their parents or as attenders to patients admitted in GSL medical college hospital Rajahmundry. Andhra Pradesh - 533296 were studied.

Inclusion Criteria: Well-built healthy volunteers were selected for study.

Exclusion Criteria: Boys and girls with any apparent body physical disabilities, non-operative deformities, malnutrition, or prior fractures were omitted from the study.

Methods

The ossification of elbow joint was studied radiologically. Antero - posterior (AP) view was taken by placing the upper limb in full extension and supine position to visualise medial, lateral epicondyle and humero - radial joint. Lateral view was taken by flexing the elbow at 90° degree and forearm in semi-pronated position to visualise olecranon process and Humero-radial joint.

The duration of study was July-2020 to December-2022.

Statistical analysis: Distribution of different age groups in both sexes were classified with percentage. Different ossification centres of elbow joint was noted and compared in both sexes. The statistical analysis was done using SPSS software.

The ratio of Boys and girls was 1:1.



Figure 1: Yellow arrows show the appearance of the ossification centre at the lateral epicondyle of the humerus.



Figure 2: Yellow arrows show the epiphyseal union of the lateral epicondyle of the humerus



Figure 3: Yellow arrows show ossification centre at medial epicondyle and olecranon process (right).

Discussion

Present study of elbow joint of estimation of age in 11 to 18 years in both sexes of Andhra Pradesh. 45 boys and 45 girls elbow joints were studied radiologically. Equal number of boys and girls were selected from 11 years to 18 years of age (Table-1). Trochlea appeared in girls around age 11 but not in boys. Fusion of trochlea was 14 to 15 years in boys and 12 to 14 years in girls, Appearance of lateral epicondyle was noticed in boys aged 11 to 12 years and 11 years in girls, Fusion of lateral epicondyle 13 to 16 years in boys and 13 to 14 in girls, Fusion of medial epicondyle 14 to 16 years in boys and 11 to 15 years in girls, Fusion of Head of Radius 14 to 16 years in boys, 11 to 13 years in girls, Appearance of olecranon 11 to 13 years in boys and 11 years in girls, Fusion of olecranon 17 to 18 years in boys and 15 to 16 in girls (Table-2) (Figure-1 and 2). These findings are more or less in agreement with previous studies^{(5) (6) (7)}.

Table 1: Distribution age in both sexes

Total No: 45 Boys & 45 Girls

Age in year	Boys (45)		Girls (45)		Total	
	No	%	No	%	No	%
11 year	5	11.1	5	11.1	10	11.1
12 year	7	15.4	7	15.4	14	15.4
13 year	9	20.1	9	20.1	18	20.1
14 year	7	15.4	7	15.4	14	15.4
15 year	3	7.3	3	7.3	6	7.3
16 year	5	11.2	5	11.2	10	11.2
17 year	4	8.4	4	8.4	8	8.4
18 year	5	11.1	5	11.1	10	11.1

Table 2: Appearance of ossification centres in Bones of Elbow joint

Appearance of Trochlea		Fusion of trochlea		Appearance Of Lateral Epicondyle		Fusion of Lateral Epicondyle		Fusion of Medial Epicondyle		Fusion of Head of Radius		Appearance olecranon		Appearance of olecranon	
B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
-	11 yrs	14 to 15yrs	12 to 14yrs	11 to 12yrs	11yrs	13 to 16yrs	13 to 14yrs	14 to 16yrs	11 to 15yrs	14 to 16yrs	11 to 13yrs	11 to 13yrs	11yrs	17 to 18yrs	15 to 16yrs

B = Boys, G = Girls

It has been noted that female bones ossify before male bones do. The ossification of bone in bilaterally

symmetrical variation is a heritable feature.⁽⁸⁾ Earlier fusion in female than male bones occurs because centres of fusion act according to the state of endocrine secretion, health and nutrition of individual.

Undoubtedly there are racial, geographical and hereditary differences. All these factors have not been adequately determined ⁽⁹⁾. A youngster who is larger than average or obese is often subjected to unwarranted epiphyseal stress. His/ Her bulk may give rise to a false impression of degree of bone maturity. Earlier fusion of epiphysis in female is observed in previous studies of India and abroad. The probable reasons could be (a) the rate of bone growth fusion (maturation) is influenced not only by age and sex but by socio-economic status, the individual total body weight and possibly by function. Therefore racial difference is also required to be taken into account. (b) The internal structure of bone is adapted in a very remarkable way to resist the various stress to which it is subjected to during the life. Hence tubercles and tuberosities are formed in direct response to pull of tendons and ligaments ⁽¹⁰⁾. (c) The process of ossification is associated with appearance, not directly determined by any local cellular elements but controlled by extrinsic chemical factors related to general metabolism of the body and local variations in the blood supply ⁽¹²⁾ because until maturity is reached at the epiphysis, the growing ends of the bones are the seat of great proliferative activity.

Summary and Conclusion

The present study was done to estimate the age by using radiographs of elbow joint in the age group 11-18 years in Andhra Pradesh. Age determination based on appearance of ossification centres and epiphyseal union of bones radiologically is accepted scientific method worldwide. However geographical location, diet, race, ethnicity and hormonal factors could ensure the accuracy in age determination. The present study demands further embryological, genetics, nutritional, hormonal, environmental studies because the greater activities of osteocyte and osteoclast cells still remain uncertain. Moreover all the factors which determine the time of ossification are still obscure.

Limitation of study – Owing to tertiary location of research centre, we have our own limitations regarding sample size and access to latest technology which can have a bearing on the results.

Ethical Clearance: This research paper work approved by Ethical committee of GSL Medical College and hospital Rajahmundry, Andhra Pradesh-533293.

Conflict of Interest: NIL

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Epidemiological Profile of Medico-Legal Autopsy Cases Reported at a Tertiary Care Center

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Abstract

Aim: The objective of medical legal post-mortem examination is to establish the identity of a body when not known to ascertain the time since death and the cause of death; and whether that the death was natural or unnatural, and if unnatural whether it was homicidal, suicidal, or accidentally.

Material and Methods: The Present study is conducted in 200 corpses reporting for postmortem analysis over a period of one year above 18 years of age presenting to the Department of Forensic Medicine and Toxicology. The corpses are randomly selected and are assessed for the statistics regarding the epidemiology based on the autopsies performed. The Autopsy reports are anonymized with the patient code number, and sex, time of death, manner of death, pattern of death and cause of death data is documented.

Results: Male predominance was observed among the sudden death cases. Sudden death is more common among the cases brought from urban residential areas, with 136 out of 200 cases (68%). Among the causes of sudden death, the most commonly involved organ system was the cardiovascular system (46%), followed by the gastrointestinal system (20%), respiratory system (18%), central nervous system (14%) and genitourinary system (2%).

Conclusion: Our strongest conclusion is that male/female differences in medicolegal autopsies are highly dependent on historical time and geographic location. Increased frequency of sudden deaths among urban, married and adult male populations might be due to sedentary lifestyles in urban areas and increased stress among married individuals due to workload and family responsibilities, indicating a physical and mental disequilibrium in modern times resulting in this type of unexpected deaths.

Key Words: Body mass index, Forensic Medicine, Medicolegal Autopsies, Natural death

Introduction

Medicolegal autopsies form an integral and indispensable part of an investigation of sudden suspicious death. The profile of medico legal autopsy cases is important in order to know the death statistics in a region due to unnatural causes and also help to address the demographic needs according

to the mortality statistics specific to that region. It is also necessary in order to prevent the preventable casualties in future and to study the genuine crime rate in the area.¹

The objective of medical legal post-mortem examination is to establish the identity of a body when not known to ascertain the time since death and

the cause of death; and whether that the death was natural or unnatural, and if unnatural whether it was homicidal, suicidal, or accidentally. Basically, a post-mortem examination means only when the body was examined after death and that the physician merely looked at the body fully clothed, or that he viewed the body at a Funeral Home, or in a mortgag. A complete autopsy involves opening of all the body cavities in all organs of the trunk, chest, and head. In most cases, it is complete and not a partial examination is more necessary on account of the imperfective evidence of the preliminary examination to assess the possible cause of death.^{2,3}

Aims and Objectives

The study was conducted: To evaluate profile of medico-legal autopsies and to find remedial measures to bring down the incidences.

Material and Methods

The present study is a retrospective study of autopsies performed in the Department of Forensic Medicine and Toxicology at Tertiary care institute of India.

Inclusion criteria

1. Corpses who will undergo post-mortem examination is included in the study
2. Manner of death is suggestive for autopsies due to suspicion

Exclusion criteria

1. Corpses with deformed or malformed body and with congenital abnormalities during the death
2. Non-suspicious manner of death without needs for postmortem examination

Relevant information like age, sex and cause & manner of death was collected from Post mortem registers/records, Inquest papers and Post mortem reports. The information was compiled, tabulated and analyzed.

The study is conducted in 200 corpses reporting for postmortem analysis over a period of one year above 18 years of age presenting to the Department of Forensic Medicine and Toxicology. The corpses are

randomly selected and are assessed for the statistics regarding the epidemiology based on the autopsies performed. The Autopsy reports are anonymized with the patient code number, and sex, time of death, manner of death, pattern of death and cause of death data is documented. All the data is documented in the Proforma during the study.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

During the study period total of 3210 cases were brought for medicolegal autopsies to Hospital mortuary, out of which 200 cases were found to be sudden natural death constituting an overall burden of 6.2%. Male predominance was observed among the sudden death cases as out of 200 cases, 158 cases (79%) were male, and 42 cases were female. (Table 1)

The age and gender distribution of the cases showed that most of the cases were reported from the adult age group and the commonly involved age group was 31 to 40 years (34%) followed by 41 to 50 years (30%) in both male and female. (Table 2)

The majority of the cases were average body mass index (BMI) with 122 (61.0%) cases. Out of the 200 cases, 25% (50/200) were obese, and only 12% had low BMI.

Among all cases, 62% of cases were brought dead to the hospital (Table 3). Among the causes of sudden death, the most commonly involved organ system was the cardiovascular system (46%), followed by the gastrointestinal system (20%), respiratory system (18%), central nervous system (14%) and genitourinary system (2%).

Among the cardiac causes, chronic coronary insufficiency is the most common cause. Among the gastrointestinal causes, chronic liver disease was reported in most cases. While among the respiratory causes, pneumonia was mainly observed.

Table 1: Age wise distribution of cases

Age (Years)	Number	Percentage (%)
0-10	1	0.5
11-20	8	4
21-30	36	18
31-40	68	34
41-50	60	30
51-60	20	10
61-70	6	3
71-80	2	1
81-90	1	0.5
>90	0	0
Total	200	100

Table 2: Gender wise Distribution of Cases

Gender	Number	Percentage (%)
Male	158	79
Female	42	21
Total	200	100

Table 3: Distribution of cases according to the place of Death

Place of death	Number	Percentage (%)
Brought dead	124	62
Hospital	30	15
Roadside	8	4
Home	38	19
Total	200	100

Discussion

Deaths of unnatural, suspicious and unexpected manner necessitate an autopsy as a portion of the evidence-gathering process.⁴ In sudden death investigation, sequential autopsy examination investigates the underlying cause of death and answers the suspicion of foul play regarding those unexpected deaths.⁵

Among 3210 autopsies during the study period, 200 were sudden natural deaths implying an overall burden of 6.2%. Other studies from northeast India reported the incidence of sudden natural death of 8.6% to 9.2%.^{6,7} Meanwhile, the incidence of sudden natural death in other parts of India is reported as low as 0.74 to as high as 13.5%.^{1,2,8-10}

Among all cases, males are seen to be affected

mostly. Male predominance in sudden natural deaths was observed in many other similar studies from India and around the globe.¹¹⁻¹⁴ The reason being men have more lethal conditions, whereas women have more disabling chronic conditions. Men and women have somewhat different psychological health problems; one gender cannot be characterized as having better psychological health hence the postmortem rate is low. Our strongest conclusion is that male/female differences in medicolegal autopsies are highly dependent on historical time and geographic location.

The majority of the deaths were observed among married males and from urban areas. A recent study reported marriage dissatisfaction as a significant risk factor of sudden cardiac deaths among males.¹⁵ Urbanization as a factor of cardiovascular mortality was reported in a study from Brazil.¹⁶ This might be due to an increasingly sedentary and stressful urban lifestyle. Maximum cases of sudden death in both sexes were in the 31 to 40 years age group followed by 41-50 years. Several studies reported a higher incidence of sudden natural deaths among young adults in the 30-50 years age zone.^{3,4,9-11}

Most cases were reported in average BMI persons followed by obsessed persons. A similar finding was observed in the study of Tyagi et al.¹⁷ According to the present study; most cases were brought dead to the hospital followed by death at home. The majority of the sudden natural deaths in the present study were related to the cardiovascular system. Various studies reported cardiac origin as the most common cause of sudden deaths in both genders, specifically among the adult male population.^{3,4,18,19} Several studies^{11,12,14,18-20} reported respiratory system ailments as the second prevalent cause of sudden death; however, in the present study, gastrointestinal system problems, particularly chronic liver diseases were reported second most cause of death.

Conclusion

The maximum incidence of the postmortems was reported in the male population compared to the female population. Our strongest conclusion is that male/female differences in medicolegal autopsies are highly dependent on historical time and geographic location. Increased frequency of sudden deaths among urban, married and adult male populations

might be due to sedentary lifestyles in urban areas and increased stress among married individuals due to workload and family responsibilities, indicating a physical and mental disequilibrium in modern times resulting in this type of unexpected deaths. A thorough postmortem and histopathological examination can solve most of the doubts arising from sudden death among the common population.

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Correlative Study of Diameter of Carotid Canal with Cranial Index in Maharashtra Population

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Abstract

Background: Diameter of carotid canal is very much important because hypo-plastic of CC leads to multiple of neuro vascular complications, passing through these CC.

Method: 45 male, 30 female adult non-pathological, dried crania were studied. The cranial Index was measured by winged calliper and diameter of CC by digital vernier calliper. The obtained values were correlated statistically.

Results: Mean value of CI 64.09 (± 0.35) in male, 70.06 (± 0.98) in females crania Diameter of rt. Cc 0.76 (± 0.14) in male, 0.67 (± 0.09) in female crania, 0.74 (± 0.10) diameter of cc in males, 0.54 (± 0.08) in cc of females crania and correlation coefficient of both male and female with CI and CC were highly significant ($p < 0.001$).

Conclusion: Correlative coefficient study of CI and CC in both gender crania will be useful neuro-physician, neuro-surgeon, radiologist, medico-legal expert, anthropologist and anatomist because morpho-metric values of mesodermal derivatives are uncertain.

Keywords: Vernier Calliper, Winged calliper, cranial Index, carotid canal, Maharashtra

Introduction

Carotid canal (CC) is located within the middle cranial fossa at the bone ⁽¹⁾. It is delimited by the posterior margin of the greater wing of sphenoid bone anteriorly and the basilar aspect of is divided into posteriorly ⁽²⁾. CC is divided into three characteristic parts viz. ascending petrous, transverse petrous and ascending cavernous. The internal and external apertures, which constitute the CC are situated in relation to other foramina, grooves and impressions containing a number of neuro vascular and labyrinthine structures in close proximally ⁽³⁾.

CC transmits Internal carotid artery (ICA) which

is the major other deeper regions of head such as the eye, accessory organs and the nose. The CC also transmits the sympathetic nerve plexus and the internal carotid venous plexus, a venous network around ICA connecting with the cavernous sinus and the internal jugular vein ⁽⁴⁾.

All through skull base anatomy is regarded as the central determinant of sex in forensic medicine, the role of foramina as neuro vascular routes is especially important in surgical environment. Since hypo plastic carotid canal are considered to be moyamoya disease early detection of such changes may prevent ICA stenosis and subsequent stenosis of carotid canal itself. Hence attempt is made to correlate the

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non-pathological dried CC with CI so that this study will be beneficial to neuro surgeon, anthropologist, medico-legal expert and anatomist.

Material and Method

45 male and 30 females adult crania available in Anatomy and Forensic department of SSPM Medical college, Padave, Sindhudurga Maharashtra-416534 were studied.

Inclusive Criteria: Non pathological dried adult after confirmation of gender differences were selected for study.

Exclusion Criteria: Broken, pathological crania were excluded from study.

Method

Each cranium was put in anatomical position cranial Index was measured was measured by winged calliper from Nasion to Inion and one supra mastoid crest to another supra mastoid crests and divided by 100.

Diameter of carotid (CC) and left were measured by digital vernier calliper. The obtained results were correlated.

The duration of study was from June-2020 to July-2022.

Statistical analysis: The correlated values of cranial Index and diameter of CC in both sexes were correlated by coefficient and regression equation method and mean values of both sexes by t test. The statistical analysis was carried out in SPSS software.

Observation and Results

Table 1: Mean values CI and diameters of CC in both sexes

In males CI = 64.09 (\pm 0.30) right CC 0.76 (\pm 0.14), 0.74 (\pm 0.10) in left CC.

In females - CI 70.6 (\pm 0.98), 0.67 (\pm 0.09) diameter of rt. CC 0.54 (\pm 0.08)

Table 2: Correlation between CI with diameter of CC in male crania -

$r=0.64$, t test 5.46 and $p<0.00$, CT - verses right CC

$r= 0.63$, t test 5.31 and $p<0.01$ in CI versus left CC

Table 3: Correlation between cranial Index with diameter of right and left carotid canal in females.

$R=0.66$ is correlation, t test 4.64 and p value is $p<0.001$ in CI versus right carotid canal (CC) female

Similarly, $r=0.62$, t test 4.18 and $p<0.01$ in versus left CC in females

Table 1: Average values of cranial index. Diameter of cranial canal in Male and female

	Cranial index (Mean \pm SD)	Diameter of right carotid (cm) (Mean \pm SD)	Diameter of left carotid canal (cm) (Mean \pm SD)
Male	64.09 \pm 0.35	0.76 \pm 0.14	0.74 \pm 0.10
Female	70.06 \pm 0.98	0.67 \pm 0.09	0.54 \pm 0.08

Table 2: Correlation between Cranial index with diameter of right and left carotid canal in male

Male	N	Correlation coefficient	Test statistic and P value
Cranial index V/s diameter of right carotid canal	45	$r = -0.64$	$t = 5.46$, $P<0.01$
Cranial index V/s diameter of left carotid canal	45	$r = -0.63$	$t = 5.31$, $P<0.01$

Statistically there is significantly negative correlation observed between Cranial index and

diameter of right and left carotid canal ($P<0.01$) of male.

Table 3: Correlation between Cranial index with diameter of right and left carotid canal in female

Female	N	Correlation coefficient	Test statistic and P value
Cranial index vs diameter of right carotid canal	30	r = -0.66	t = 4.64, P<0.01
Cranial index vs diameter of left carotid canal	30	r = -0.62	t = 4.18, P<0.01

Statistically there is significantly negative correlation observed between Cranial index and diameter of right and left carotid canal ($P < 0.01$) of female.

Discussion

Present correlative efficient study of diameter of CC with CI in Maharashtra Population. Mean values of CI in 64.09 (± 0.35) in male crania, 70.06 (± 0.08) in female crania, Diameter of right CC 0.76 (± 0.14) in male, 0.67 (± 0.09) in females Diameter of left CC 0.74 (± 0.10) in male crania, 0.54 (± 0.08) in female crania (Table-1) In the correlation of CI with diameter of right and left CC in male crania corrective co-efficient was $r = 0.64$, t test -5.46 and $p < 0.001$ in right CC. In left CC $r = -0.63$, t test 5.31 and $p < 0.001$ (Table-2). Correlation between CI with diameter of CC in right and left CC in female $r = 0.66$ correlative coefficient, t test 4.64 and $p < 0.01$. In diameter of left CC $r = 0.62$ was correlative coefficient, t test was 4.18 and $p < 0.001$ (p value was highly significant). These findings are more or less in agreement with previous studies ⁽⁵⁾⁽⁶⁾⁽⁷⁾.

It is interesting note that CI of female is larger than CI of female crania but diameters CC is smaller in female crania than male crania. The probable reason could be hemodynamic presage is more in males than females than it CC again it confirms that hemodynamic pressure is more on right side of the body as compare to left side. The diameter of CC is the land mark for neuro surgeon, neuro physician, and radiologist. During neuro surgery diameter of CC predicts the involvement of ICA bleeding ⁽⁸⁾. The increased diameter of CC in males than females is a pedomorphictendency of human skull ⁽⁹⁾. Hormonal, nutritional and environmental factors also play vital role for the increased diameter of CC and CI as well.

In addition to this skull itself have become thinner and larger as a result of reduced masticatory musculature and enlargement of brain, might have erased density of Normabasalis to house the bigger brain ⁽¹⁰⁾ which might have resulted into smaller

diameter of CC in female crania. It is established factor that, bone is highly plastic tissue next to blood.

Normal growth of bone is depending on anterior pituitary which stimulates the cell division in the cartilaginous growth plates. It is ineffective in the absence of sufficient thyroxin Giant and dwarf results from abnormal activities of these glands. The sex hormones and the hormones of adrenal cortex antagonize the action of growth hormone and thyroxin for the proper secretion of these hormones, proper nutritional status and environmental factors also necessary for normal growth the crania.

Abnormalities in diameter of CC could be an indicator of cerebral vascular abnormalities and variations. The increased incidence of aneurysm of internal carotid artery occurs ⁽¹¹⁾.

Summary and Conclusion

The correlative study of diameter of CC with CI in Maharashtra population is useful in advanced microsurgical techniques for the removal advanced lesions or widening the diameter of CC which were once assured inoperable. By these normal values neuro surgeon, radiologist can explore the exact diameter of CC before assessing to surgical procedure and successful to perform micro surgery without injuring adjacent blood vessels, nerves. But this study demands further hormonal, embryological, nutritional, environmental, genetic studies because development of crania is more complicated, the mechanism of formation of complete crania is still unclear, because factor determine the time of ossification are still obscure.

Limitation of study: Owing to limited samples and lack of latest technologies, we have limited findings and results.

- This research paper is approved by Ethical committee of SSPM Medical College Padave, Sindhudurga, Maharashtra - 416534
- No Conflict of Interest
- Self-Funding

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Post-Mortem Findings in Deaths due to Drowning, a Study on Autopsied Cases at Government Medical College Hospital Jammu: A Retrospective Study

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Abstract

Background: Drowning is a significant public health problem globally. It is the third leading cause of unintentional injury death, the post-mortem diagnosis of drowning is a challenge to medico-legal experts as the exact cause of deaths due to drowning is not very clearly understood.

Method: 100 dead bodies aged between 10-75 years death due to drowning (60 male and 40 females) were studied by autopsy. The places of drowning external and internal post-mortem findings were recorded in both sexes.

Results: 60 drowning deaths occurred in Lakes Rivers 12 in wells, 24 in house tanks, 4 in swimming pools. In the study of external post-mortem 41 cases had froth around mouth /nostrils, 4 cadaveric spasm, 25 mud/sandy body, 2 cases had mud/sandy in nails, 38 had sign of asphyxia, 50 had sign of injury. In internal findings of post-mortem, 34 had forth larynx trachea, 57 had mud/sand/salt in larynx, 83 had voluminous lungs, 23 had stomach content water, 24 had stomach content food, 10 had injury.

Conclusion: The present pragmatic study of autopsy will certainly help to medico-legal expert to differentiate homicide and suicide in drowning deaths.

Keywords: Drowning, froth, asphyxia, suicide, homicide

Introduction

India is a vast country having plenty of water resources like rivers ponds lakes, wells, house Tanks, swimming pools etc. The drowning is a significant health problem worldwide and the WHO reported that, drowning is world's third leading unintentional injury death ⁽¹⁾. Nevertheless there is still uncertainty

regarding the estimate of local and global drowning deaths. In addition, the post-mortem diagnosis of drowning is challenging and the physiological mechanisms of death by drowning are complex and not very well understood.

Drowning is the process of experiencing respiratory impairment from submersion /

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immersion in liquid. It is essentially an asphyxial death (2). The WHO's goal is to implement strategies for prevention in order to decrease these deaths particularly in children and young people(3). Drowning deaths usually exclude intentional drowning deaths (suicide or homicide) and drowning deaths caused by flood disasters and water transport incidents(4)(5). Hence attempt was made to evaluate the post-mortem examinations to rule out the cause of drowning deaths.

Material and Method

100 (one hundred dead bodies, 60 males and 40 females) aged between 10 years to 75 years were brought to the Mortuary, Department of Forensic Medicine and Toxicology Government Medical College Hospital Jammu were studied.

Method

Detailed information pertaining to epidemiological factors, external and internal findings such as the presence of froth, signs of asphyxia, cadaveric spasm, presence of mud/sand on body/nail in larynx and trachea, changes in the lungs were observed and noted.

Duration of study was from July-2018 to December-2021

Statistical analysis

Various places of drowning, external post-mortem and internal post-mortem findings in both sexes were recorded. The statistical analysis was carried out in SPSS software. The ratio of male and female was 2:1.

Observation and Results

Table 1: Study of places of occurrence of Drowning

- 60 cases in lakes / rivers, 12 in wells, 24 in house tank, 4 in swimming pools

Table 2: Study of external post-mortem findings

- 38 cases had froth around mouth / Nostrils in males and 3 in females
- 4 cases had spasm in cadavers

- 23 cases mud/sandy Body in males and 2 I females
- 1 had mud / sandy in nails in male and 1 in female cadaver
- 35 cases had sign of asphyxia in male and 3 in female
- 48 had sign of injury in males and 2 in females

Table 3: Study of internal post-mortem findings

- 31 cases had forth larynx / trachea in males and 3 in females
- 53 had mud / sand / salt etc in larynx in males and 4 cases of females
- 78 had voluminous lungs in male and 5 cases of females
- 20 had stomach content water in male and 3 in female
- 24 had stomach with content of food in males only
- 10 Internal injury observed in females

Table 1: Study of places of occurrence

Sl No	Places of occurrence	No. of cases	Male	Female
1	Lakes / Rivers	60	40	20
2	Wells	12	10	2
3	House Tanks	24	14	10
4	Swimming pools	04	02	02

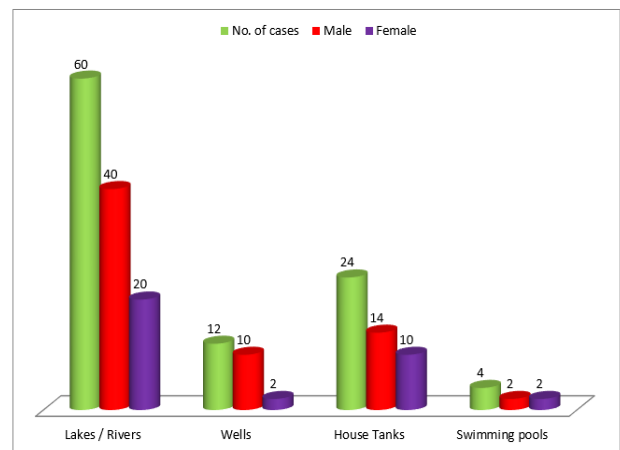


Table 2: Study of external post-mortem Findings

Sl. No	External Findings	Male (60)	Female (60)	Total (100)
1	Froth around mouth/Nostrils	38	3	41
2	Mud/Sandy Body	23	2	25
3	Mud/sandy Nails	1	1	2
4	Sign of asphyxia	35	3	38
5	Sign of injury	48	2	50

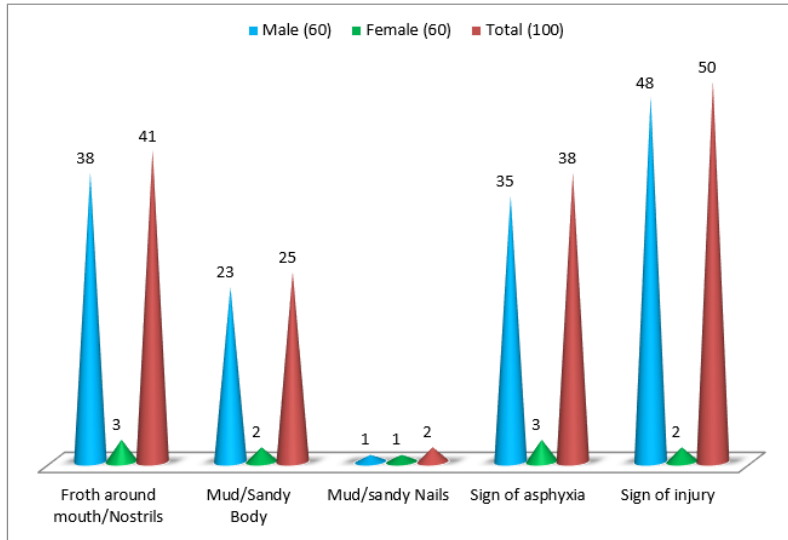
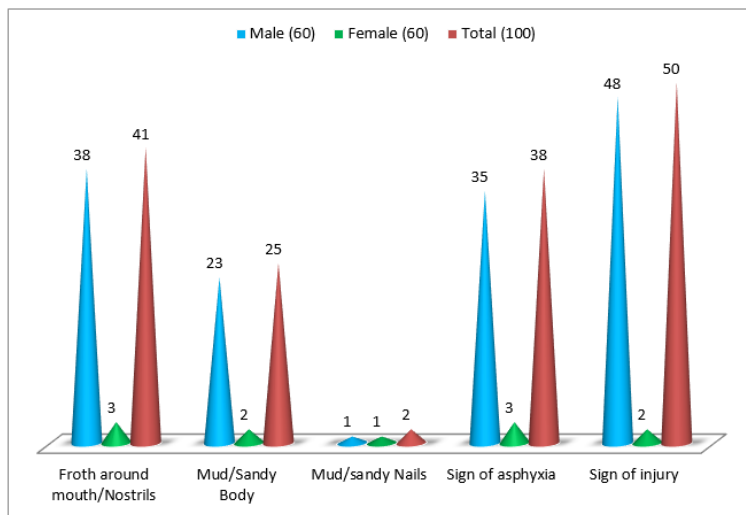


Table 3: Study of internal post-mortem findings

Sl. No	Internal Findings	Male (60)	Female (40)	Total (100)
1	Forth larynx / trachea	31	3	34
2	Mud / sand / salt etc in larynx	53	4	57
3	Lungs voluminous	78	5	83
4	Stomach content water	20	3	23
5	Stomach content Food	24	--	24
6	Injury	10	--	10



Discussion

Present study is post-mortem findings in deaths due to drowning in Jammu. The places of downing were 60 in lakes / rivers, 12 in wells, 24 in house tanks, 4 in swimming pools (Table-1). The external post-mortem findings were 41 cases had froth around mouth / nostrils, 4 cadavers had spasm, 25 had mud / sands on their body, 2 had mud in their nails, 38 had signs of asphyxia, 50 had signs of injury (Table-2). In the study of internal post-mortem 34 cases had froth in larynx / trachea, 57 had mud / sand / salt in larynx, 83 cases had voluminous lungs, 23 had stomach contents water, 24 had stomach content food, 10 had internal injury (Table-3). These findings were more or less in agreement with previous studies (6)(7)(8).

Drowning is mainly an asphyxial death with effects on multiple organ system. Nevertheless physiological mechanisms of deaths by drowning are complex and not well understood (9).

It is also reported that the effects of the resulting hypoxia on tissues, other possible mechanisms responsible for cardio-vascular alterations have been proposed, such as electrolyte changes with possible different effects between hypotonic fresh water and hypertonic salt water immersion. It is also noted that, the role of cold water is in relation to hypothermic cardio-vascular effects⁽¹⁰⁾. In small percentage of cases of drowning, deaths without apparent inhalation of water were reported⁽¹¹⁾.

Male's deaths were predominantly reported as compared to females as males committed more number of suicide cases. Suicide and homicidal drowning represent significant segment of drowning deaths, suicidal drowning are uncommon and percentage of suicide depending upon the geographic location and access to location to water with lakes river, wells are common locates. History of psychiatric illness and post-mortem detection of variable levels of psychiatric medications and ethanol have been reported⁽¹²⁾. Moreover homicidal asphyxia deaths such as strangulation were also a major cause of drowning deaths. Drowning deaths is a largely asphyxial deaths which effects on multiple organs systems include respiratory system lungs. Respiration is an involuntary process of central Nervous system

in response to changes in blood and tissue oxygen and carbon dioxide levels and blood PH.

The extent of purification in any death is largely driven by time and temperature. Water, compared to the air tends to slow the decomposition process. The time factor depends upon how quickly the body is recovered. Because most of the bodies will sink, there may be delay in recovery. If a person is not witnessed to submerge or if the submerged body is not visible, the body may be only be found many days after putrefication results in gas formation in the body by the proliferating micro organism. The gas will increase the body's buoyancy and it will float to the surface. It is then more likely to be discovered.

Summary and Conclusion

Drowning is more frequently observed in men than women except for suicide where there is only a slight difference among sex. Weight of the brains, lungs are higher in salt water although these organs weights are mostly dependent on other variables such as BMI and decomposition. There are some drowning deaths with normal organ weight, heavy lungs, cerebral oedema, however continue to be identified in numerous drowning deaths. Therefore these anatomical findings must still be interpreted in the context of the entire case investigation. This study may help the medico legal expert to diagnose drowning and also help to identify risk factors to prevent drowning deaths.

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An Evaluation of Profile of Medico-Legal Autopsy Cases Reported at Department of Forensic Medicine & Toxicology in A Government Medical College of Garhwal Region, Uttarakhand: A Retrospective Study

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Abstract

Background: The profile of medico-legal autopsy cases is crucial to determining the mortality rates in a specific location owing to new causes and also aids in addressing the demographic demands in accordance with those rates.

Materials and Methods: The present study is a retrospective study of autopsies performed at Department of Forensic Medicine & Toxicology, VCSGGIMS & R, Srikot, Srinagar, Pauri Garhwal, Uttarakhand, from 1st January 2020 to 31st December 2021. During this period a total of 156 autopsy cases were conducted. Relevant information and subjective data like age, sex, marital status & manner of death have been collected from medico legal autopsy register.

Results: Out of 156 cases analysed, maximum number of autopsies were in the age group of 21-30 years with 41 cases (26.28%) and majority of were males 119(76.2%). Accidents accounted (58.3%), suicide (24.3%) and sudden death (17.3%) cases. Maximum number of deaths were due to road traffic accidents with 82 cases (52.5%) followed by natural death with 27 cases (17.3%).

Conclusion: In our study we found that majority of cases were in 3rd and 4th decade of life, majority cases were males as compared to females, and Hindus being majority in number formed bulk of cases.

Keywords: Drowning, Medico-legal Autopsy, Natural death, Road traffic accidents.

Introduction

Unnatural fatalities in India made up 10.3% of all deaths, and they were more common among people between the ages of 10 and 45. India had a 0.67 unnatural mortality rate per 1000 people, with 0.84 unnatural deaths per 1000 men and 0.49 unnatural deaths per 1000 women.¹

When a death is sudden, mysterious, unnatural, contentious, or illegal, a medical-legal autopsy is conducted on the request of the legal authorities, and the information obtained is used for legal purposes to aid the administration of justice.²

The goal of a medico-legal post-mortem examination is to determine the cause of death,

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whether it was suicidal or accidental or homicidal, and the time since the death. It also aims to determine the identity of the deceased, when identity is not known. The profile of medico-legal autopsy cases is crucial to determining the mortality rates in a specific location owing to new causes and also aids in addressing the demographic demands in accordance with those rates.³

The results of this study will raise public awareness and assist law enforcement organisations in developing efforts to reduce similar incidents.

Aims and Objectives

The study will be conducted to

1. To assess the profile of medico-legal autopsies.
2. To find preventable measures to reduce the incidences.

Methods/ Methodology

- **Study design:** Retrospective, record-based study.
- **Study population:** It is a record-based study including post-mortem reports of all dead bodies brought to department of Forensic Medicine & Toxicology in VCSGGIMS & R, Srinagar, Pauri Garhwali, Uttarakhand.
- **Place of Study:** Department of Forensic Medicine & Toxicology, VCSGGIMS & R, Srinagar, Pauri Garhwal, Uttarakhand.
- **Sampling Technique:** Continuous Sampling method.
- **Period of study:** 1st January 2020 to 31st December 2021
- **Inclusion criteria:** Post-mortem reports of all dead bodies brought for medico legal post-mortem examination to department of Forensic Medicine & Toxicology in VCSGGIMS & R Srinagar, Pauri Garhwal, Uttarakhand.
- **Method of Collection of Data:** Data was collected and processed at Department of Forensic Medicine and Toxicology. The data is collected as per the predesigned proforma from post-mortem register /record and post-mortem reports, maintaining at most

confidentiality. Data like age, sex, religion, marital status, causes of death & manner of death is compile and analysed. Causes of death will grossly classified as road traffic accident, thermal injuries, natural causes etc.

- **Statistical Analysis:** The data analysed by using SPSS Statistics for Windows software package (Version 1.0.0.1406, IBM® SPSS® Statistics 21).
- **Statistical tests:** Descriptive statistics with percentile strengths is calculated.

Results

A total of 156 medico legal autopsies were conducted during the study period from 1st January 2020 to 31st December 2021. Out of the total 156 cases the maximum incidence 26.2% was reported from 21 to 30 years aged group and minimum incidence 1.9% from 71 to 80years aged group. (Table-1)

Maximum incidence 76.2% was reported from male population and incidence of 23.7% from female population. (Table-2)

Out of the total 156 cases the maximum incidence 92.3% was reported from Hindus population and incidence 4.4% from Muslim population and 3.2 cases reported from other religion population. (Table-3)

Out of the total 156 cases the maximum incidence 66.6% was reported from married population and incidence of 33.3% from unmarried population. (Table-4)

Out of the total 156 cases the maximum incidence 58.3% was reported from rural area and incidence of 41.6% from Urban. (Table-5)

Out of the total 156 cases the maximum incidence 58.3% was reported from Accidents group followed by suicide 24.3 5 and minimum incidence 17.3% was reported from Natural death group.(Table-6)

Out of the total 156 cases the maximum incidence 52.5% was reported by RTA group followed by disease like cardiac pathology liver cirrhosis, oesophageal varices etc... 17.3% and drowning 13.4%, hanging 7.6%, fall from height 5.7%, poisoning 1.9% and minimum incidence 1.2% were reported from burns group. (Table-7)

Table 1: Distribution of cases based on age

Age	No. of cases	Percentage (%)
0-10	5	3.2
11-20	11	7
21-30	41	26.28
31-40	30	19.2
41-50	29	18.5
51-60	22	14
61-70	10	6.4
71-80	3	1.9
81-90	5	3.2
Total	156	100

Table 2: Distribution of cases based on gender

Gender	No. of cases	Percentage (%)
Male	119	76.2
Female	37	23.7
Total	156	100

Table 3: Distribution of cases based on Religion

Religion	No. of cases	Percentage (%)
Hindu	144	92.3
Muslim	7	4.4
Other	5	3.2

Table 4: Distribution of cases based on marital status

Marital status	No. of cases	Percentage (%)
Married	104	66.6
Unmarried	52	33.3

Table 5: Distribution of cases based on Place of incidence

Place of incidence	No. of cases	Percentage (%)
Rural	91	58.3
Urban	65	41.6

Table 6: Distribution of cases based on manner of death

Manner of death	No. of cases	Percentage (%)
Accidents	91	58.3
Suicide	38	24.3
Sudden death	27	17.3

Table 7: Distribution of cases based on cause of death

Cause	No. of cases	Percentage (%)
RTA	82	52.5
Natural death	27	17.3
Drowning	21	13.4
Hanging	12	7.6
Fall from height	9	5.7
Poisoning	5	3.2
Burns	3	1.9

Discussion

- During the study period a total of 156 medico legal autopsies were performed at Department of Forensic Medicine & Toxicology, VCSGIMS & R, Srinagar, Pauri Garhwal, Uttarakhand, during the period of 1st January 2020 to 31st December 2021. In our study, maximum number of autopsy cases were in the age group of 21-30 years i.e., 41 (26.28%), followed by in 31-40 years i.e., 30 cases (19.01%). These findings are in consistency with findings of Kumar Pramod R et al², Junaidi, Khaja et al⁴ and Anand et al⁶ and Manish K et al⁷, Shrivastava P et al⁸, Kartikeyan et al⁹, Agrawal R et al¹⁰.
- The present study majority of victims were male 119 (76.2%) as compared to female 37 (23.7%). Similar findings were seen in studies done of Kumar Pramod R et al² Junaidi, Khaja et al⁴, and Anand et al⁶ and Manish K et al⁷ Shrivastava P et al⁸, Kartikeyan et al⁹, Agrawal R et al¹⁰. The reason being that as males are bread earners and females usually doing household work, which makes the males more vulnerable to accidents, violence and stress & also males predisposed for risk taking behaviour.

- In our study 92.3% were Hindus, and 4.4% were Muslims. Similar findings are observed in study by Kumar Pramod R et al².
- Out of the total 156 cases the maximum incidence 66.6% was reported from married population and incidence of 33.3% from unmarried population. Similar findings are observed in study by Manish K et al⁷.
- In our study majority of the cases were from rural background i.e., 91 cases (58.3%). These findings are in consistency with findings of Junaidi, Khaja et al⁴ and Manish K et al⁷, Shrivastava P et al⁸.
- In our study most common manner of death was accidental 91 (58.3%), followed by suicides 38 (24.3%) which was consistent with the study conducted by Kumar Pramod R et al² and Chandru K et al⁵ and Manish K et al⁷, Shrivastava P et al⁸, Kartikeyan et al⁹, Agrawal R et al¹⁰.
- In present study major causes of death comprises RTA 82 (52.5%) followed by disease 27(17.3). Which was consistent with the study conducted by Kumar Pramod R et al² and Chandru K et al⁵ and Manish K et al⁷, Shrivastava P et al⁸,Kartikeyan et al⁹,Agrawal R et al¹⁰.

Conclusion

Study conducted at Department of Forensic Medicine & Toxicology, VCSGGIMS &R, Srinagar, PauriGarhwal,Uttarakhand, to know the profile of medico legal autopsies during a period of 2 year from 1st January 2020 to 31st December 2021 comprising a total of 156 medico-legal autopsies. In our study we found that majority of cases were in 3rd and 4th decade of life, majority of victims were males as compared to females, rural residents were more in number, and Hindus being majority in number formed bulk of cases. RTA, Diseases, drowning and hanging were seen as leading cause of death. In our study most common method of suicide was found is drowning followed by hanging. The results of this study will raise public awareness and assist law enforcement organizations in developing efforts to reduce similar incidents.

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Profile Study of Railway Fatality Cases Brought for Postmortem Examination at SMS Medical College, Jaipur

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Abstract

Background: A train accident is defined as a “collision, derailment, or any other event involving the operation of on-track equipment.” Train accidents can beget ruinous damages and particular injuries including the death of the person.

Methods: In the present study, the majority of victims were between 21- 40 years of age. There was a rural preponderance in our study population with 34.13% victims from urban regions and 48.41% victims from rural regions. Students comprised the largest section (33.33%) of railway related deaths followed by self employed people (30.17%). The maximum numbers of railway fatalities in this study were accidental (67.46%) followed by suicides (27.78%). The victims of fatal railway related deaths mainly succumbed to Hemorrhage & shock, injuries to vital organs and head injuries.

Conclusion: Public awareness about safety measures and existing laws will also alleviate some of the fatalities. The railway authorities must take steps to prevent the accident by acknowledging the safety engineering, training, awareness among staff and strict law enforcement.

Keywords: Railway injury, Jaipur

Introduction

Indian Railway provides the most important mode of public transport in India which is the most commonly used and cost effective long distance transport system in the country. Railways have also played a significant role in the development and growth of industries. India carries one of the world's largest railway networks and accidents from rail operations may not be unexpected¹.

A train accident is defined as a “collision,

derailment, or any other event involving the operation of on-track equipment.” Train accidents can beget ruinous damages and particular injuries including the death of the person. Apart from mass casualties due to the derailment of a train, individual incidents either accidental or suicidal also cause death. The bodies of the victims are often mutilated severely. Decapitation and dismemberment of the body is frequently².

Trains are also a common means of committing suicides owing to easy availability and higher

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chances of mortality. Apart from this, train accidents can also be used as a means of masking homicidal deaths to mimic the event as an accidental or suicidal railway death. Thus, cases of deaths due to railway injuries are important with respect to medico-legal investigation to find out the underlying cause and manner of death.

Jaipur, being the capital of the state of Rajasthan is an important junction as regards train traffic; Like railway stations all over the country, and also in Jaipur, people are frequently found crossing the rail-tracks near the platforms to save time instead of using the over- bridges/ under-bridges at railway stations, which might have ended in a fatal accident. Moreover, in India, mostly trains are overcrowded and hence prone to meet with fatalities. The increasing use of mobile phones and headsets, especially by the younger generation is also responsible for incremental trends in railway fatalities.

Aims and Objectives

To assess the load and analysis of the cases of fatal railway injuries brought for medicolegal autopsy at the Department of Forensic Medicine, SMS Medical College & Hospital, Jaipur during the year 2014-15.

1. To study a load of railway fatalities during the study period.
2. To study the medico-legal profile of railway fatalities.
3. To study the socio-demographic profile of victims of railway fatalities.

Material and Methods

A descriptive observational study of all railway tract deaths brought for medicolegal autopsy at the Department of Forensic Medicine, SMS Medical College & Hospital, Jaipur during the period from May 2014 to November 2015.

All the cases of railway fatalities, irrespective of age, gender, socio-economic status, and precipitating event autopsied at the mortuary of SMS Hospital, Jaipur were included in the study. The cases were included in the study only after receiving informed consent from the attendants of the deceased for the same if they fulfilled the proposed inclusion and exclusion criteria. All details pertaining to the

socio-demographic profile of the deceased and the precipitating event were noted along with the detailed recording of the external and internal findings during the post mortem examination. All the observations were recorded in the pre-proposed Performa.

The recorded observations were then transferred to a Microsoft Excel data sheet to generate quantitative data which was statistically analyzed using statistical software. Further, the observations were subjected to statistical tests for correlation to deduce conclusions.

Result

Table 1: Age-Wise Distribution of Victims of Railway Fatalities.

Age Group (in years)	No. of cases	Percentage
11 to 20	20	15.87
21 to 30	38	30.16
31 to 40	31	24.60
41 to 50	18	14.29
51 to 60	09	07.14
61 to 70	06	04.76
>70	04	03.17
Total	126	100.00

The majority of victims were between 21- 40 years of age. These were followed in numbers by the second and the fifth decades of life. The least affected age groups were more than fifty years of age. The eldest victim was 80 years of age and the youngest was 16 years.[Table 1]

Table 2: Distribution of the Victims of Railway Fatalities According to Domiciliary Status.

Domicile	No. of cases	Percentage
Rural	61	48.41
Urban	43	34.13
Unknown	22	17.46
Total	126	100

There was a rural preponderance in the study population with 34.13% victims from urban regions and 48.41% victims from rural regions. The domiciliary status was unknown for the rest of the 22 victims (17.46%); although there were 23 unknown victims the domiciliary status was apparent as rural in one of them. [Table 2]

Table 3: Distribution of Victims of Railway Fatalities according to Occupational Status.

Occupation	No. of cases	Percentage
Students	42	33.33
Self employed	38	30.17
Agriculture	10	7.93
Housewife	06	4.77
Retired	04	3.17
Govt sector	01	0.79
Unemployed	01	0.79
Unknown	24	19.05
Total	126	100.00

Students comprised the largest section (33.33%) of railway related deaths followed by selfemployed people (30.17%). Surprisingly only one victim was unemployed. The occupational status remained unknown in 24 (19.05%) victims of railway fatalities amongst which 23 were unidentified victims. Six females were housewives and among the rest one was selfemployed and the remaining four of them were students. 10 victims (7.93%) were agricultural workers. Retired personnel comprised 3.17% of cases and only one victim was in a job in the government sector probably owing to their belief in job security. [Table 3]

Table 4: Distribution of the Railway Fatalities According to the Manner of Incidence.

Manner	No. of cases	Percentage
Accidental	85	67.46
Suicidal	35	27.78
Unknown	06	4.76
Total	126	100

The maximum numbers of railway fatalities in this study were accidental (67.46%) followed by suicides (27.78%). In six cases (4.76%), the manner of the incidence remained undetermined. No case of homicide in a railway related event was established in this study. [Table 4]

Table 5: Distribution of the Railway Fatalities According to the Cause of Death.

Cause of Death	No. of Cases	Percentage
Coma	34	26.98
Hemorrhage & Shock	46	36.50
Injury to Vital Organs	42	33.34
Septicemic Shock	04	3.18
Total	126	100

The victims of fatal railway related deaths mainly succumbed to Hemorrhage & shock, injuries to vital organs and head injuries. Only a few late survivors succumbed to the development of septicemia. [Table 5]

Discussion

The cases of railway fatalities autopsied during the study period ranged from **16-80 years** of age with a mean age of **33.27 years**. The maximum number of victims was in **21-40 years** of age (**54.76%**); the peak occurred in the age group of **21-30 years (30.16%)**. The least affected age group was more than 60 years of age (08.93%). No railway fatality was seen in children less than 16 years of age. Similar results have been reported by other authors with slight variations viz. Peak incidence in **21-30 years** of age [Kumar A et al³, Puttaswamy et al⁴, Tyagi Set al⁵]. The peak has been reported in **31-40 years** by other authors [Wasnik RN et al⁶ and Das G et al⁷]. These trends are due to the fact that young people belong to the active sections of society with more mobile lives as compared to other age groups. Moreover, the young population, being more active may also try to take more risks like boarding running trains, hanging on doors or bars and traveling on roofs of overcrowded trains.

In our study, 48.41% of victims of railway fatalities belonged to rural regions and 34.13% were from urban regions. The majority of the deaths are brought dead cases from Jaipur city and adjoining nearby regions but they came from different areas of the country at times traveling from one place to another or settling in this metropolitan city in search of livelihood. Our results are quite variable for rural populations as compared to Wasnik RN et al⁶ probably due to variations in the cities of study and the population catered to by the tertiary care centers in both studies. But our results are quite similar and comparable to

those of **Kumar A et al**³. The variation in the urban population in this study is again explainable by the regional and geographical variations in the areas of study and the study populations.

In the present study, Considering the study population according to their occupational status, surprisingly there were 33.33% students and 30.17% self employed people among railway deaths. The factors which are responsible for higher incidences of railway fatalities in these sections of society are that these people are more in need of leading an active life and have to commute from one place to another for their profession and as the train is the cheapest mode of transportation in our country, it is most widely used by frequent travelers who adopt it to make to and fro to their outstation studying and working places. The rest of the victims were agricultural workers from rural regions, housewives, retired and employed (job) people. 06 out of 11 females were housewives, quite prone to stressful environments and exaggerated reactions to them.

This study revealed that accidental railway fatality was the commonest manner (67.46%) followed by 27.78% suicidal deaths due to railway fatalities. None of the railway related death was found to be homicidal in the present study, although the manner of incidence remained unknown in 4.76% of cases. Our results are similar to **Wasnik RN et al**⁶, **Kumar A et al**³ and **Tyagi S et al**⁵ (90% accidental & 2% suicidal). None of the three studies have reported a single homicidal death as the present study. The results of this study are slight variations from those of **Das G et al**⁷ which can be attributed to variations in regions and populations under study and may also be attributed to the unrevealing of the truth of incidences in unknown deaths where in spite of police investigation, the manner remains undetermined. Sometimes, the expression of heroism in youngsters compounded by the use of psychoactive substances also potentiates the incidences of occurrence of accidental as well as suicidal deaths in them. Accidental deaths are also commoner in males due to the higher spurt of activity for livelihood in their lives. Suicidal deaths were also commoner in victims of 21-40 years age groups. The proportion of suicidal cases is quite higher in the present study as compared to the others. Regional population variation is the

probable cause. Apart from this, these sections of society are also the most vulnerable to stressful episodes in life, thus more prone to suicidal episodes for which railways are a preferred mode due to the high fatality.

The most common cause of death in the present study was shock and hemorrhage (36.5%) either alone along with injuries to internal organs (33.34%) followed by cranio-cerebral injury (26.98%) due to blunt trauma from primary and secondary impacts. There were very few cases (3.18%) of death due to septicemia. Our results are in accordance with those of **Das G et al**⁷ and **Wasnik RN et al**⁶ but they are slightly variable to those of **Tyagi S et al**⁵ who reported head injury to be the commonest cause of death followed by shock and hemorrhage, and, injuries to internal organs.

Conclusion

The increasing population, overcrowding of trains, careless behavior of passengers, pedestrians & train drivers towards safety norms; along with increasing use of mobile and earphones are the constant causes of railway fatalities. This necessitates the need for attention to accidental control measures. Public awareness about safety measures and existing laws will also alleviate some of the fatalities. These can be prioritized towards vulnerable sections of society by the administration, social activists and non-governmental organizations. The railway authorities must take the following steps to prevent accidents by railway injuries.

- A boundary wall on both sides of the track wherever possible would be erected and the existing wall be repaired.
- Fencing should be done around the rail track and between the two railway tracks, especially within city limits to prevent suicides from having easy access to it.
- The railways must build sufficiently broad and strong footbridges/subways for crossing the tracks and also close the crossing points, frequented by the pedestrians for crossing the tracks with fending, etc.
- By means of posters and advertisements in

the media, people should be encouraged to use over-bridges/under bridges at railway stations instead of using shortcuts of crossing rail tracks.

- The slum areas around the rail tracks should be shifted to the appropriate place.

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Ethical Clearance- It is taken from the Ethical committee of SMS Medical College, Jaipur before starting of study.

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