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Original Article

Nursing Students' Perceived Attitudes towards Death: A Cross-Sectional Survey

Senthil P. Kumar*, Eva Chris, Maria Pais***, Vaishali Sisodia****, K. Vijaya Kumar*******

Abstract

Background and Purpose: Nurses, both as part of a multidisciplinary healthcare team or as individual service/care providers to patients with terminal illness and critical illnesses, are posed with imposed demands to understand, evaluate, document and communicate events leading to and the event of death investigations done by forensic medicine and pathology.The objective of this study was to assess the attitudes towards death in a sample of Indian nursing students.

Materials and Methods: A cross-sectional study was performed on 52 nursing students (all female) who were recruited on convenient sampling. The survey instrument used in this study was Death Attitudes Profile-Revised (DAP-R) which was a 32-item scale with responses on a 7-point Likert scale and five distinct dimensions- Fear of Death (7 items), Death Avoidance (5 items), Neutral Acceptance (5 items), Approach Acceptance (10 items) and Escape Acceptance (5 items). Descriptive analysis was done using frequencies for each of the items and item-responses of the DAP-R and study participants' demographic variables. Comparison of total scores and subscale scores between age and religion were done using independent t-test and one-way analysis of variance respectively. All analyses were done at 95% confidence interval using Statistical package for social sciences (SPSS) version 16.0 for Windows.

Results: Fear of Death score was 32.78 ± 4.02 (4.68 ±.57%), Death Avoidance was 23.78 ± 4.03 (4.75 ±.80%), Neutral Acceptance was 24.96 ± 4.53 (4.99 ±.90%), Approach Acceptance was 47.82 ± 5.77 (4.78 ±.57%), Escape Acceptance was 21.44 ± 4.92 (4.28 ±.98%). Overall DAP-R score was 150.78 ± 17.48 and it was found that Death avoidance and Escape acceptance was significantly higher ($p<.05$) in younger students and Christian students respectively.

Conclusion: Nursing students had fairly neutral attitudes towards death, while death avoidance was common in younger students and escape acceptance was higher among Christian students.

Keywords: Self-esteem; Self-concept; Nursing profession; Nursing education; Personality development.

Introduction

Human death is a unitary phenomenon that physicians can determine in two ways: (1) showing the irreversible cessation of all brain clinical functions; or (2) showing the permanent cessation of circulatory and respiratory functions.[1] Most definitions of death—whether cardiopulmonary, whole brain and brain stem, or just upper brain include an irreversibility condition. Cessation of function is not enough to declare death. Irreversibility should be limited to an organism's ability to 'restart' itself after vital organs have ceased to function.[2] Thus controversies exist over the proper definition of "irreversible" in criteria for death[3] to who is held responsible for defining death whether the clinician[4] or the individual person/ patient.[5]

Whilst the clinical definition of death in itself posed a significant legal threat[4], there are many other medico-legal issues[6] associated with death ranging from certification/

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registration,[7,8] classification,[7] organ donation,[9] living will[10] and physician-assisted suicide/euthanasia.[11] Healthcare management system presently works on a strong multi-disciplinary contribution from various medical, nursing and allied health disciplines when it comes to medico-socio-legal issues related to death.[12] The field of Forensic Pathology inherently is dependent upon teamwork and communication which are implemented through explicit documentation and ethical guidelines on death.[13]

However, implementation of guidelines would not be a reality in face of healthcare professionals' knowledge, attitudes and beliefs built upon experiences and inter-personal interactions.[14] Nurses, both as part of a multidisciplinary healthcare team or as individual service/care providers to patients with terminal illness and critical illnesses, are posed with imposed demands to understand, evaluate, document and communicate events leading to and the event of death persent both in hospital-based[15] and in community-based settings[16] respectively. Such qualities are determined in turn by their attitudes towards death and studies reported previously on nurses' attitudes towards death[17-24] and its associated organ donation[25-7] were on staff nurses in various countries.

Studies on student nurses would provide invaluable information on the development of such attitudes right from their foundational aspects. Early identification of inappropriate attitudes might indicate educational interventions or modifications of the nursing educational curricula. Previous studies on death-related attitudes in student nurses[28-30] and a few other studies on comparison between student nurses and staff nurses[31,32] were from other countries with no retrievable information on our country. In India, cultural and ethnic influences may a major role in attitudes and beliefs in general and in specifically amongst nurses. Hence there is a dearth need to evaluate the attitudes towards death in Indian nursing students. The objective of this study was to assess the attitudes towards death in a sample of Indian nursing students.

Materials and Methods

Study Approval

The ethical approval for the study was obtained from the principal of Dhanvantari College of Nursing, Udupi, Karnataka. Participation was wholly voluntary and all volunteers were required to provide a written informed consent.

Study Design

A cross-sectional survey.

Participants

The study was conducted on first-year baccalaureate nursing students who were recruited on convenient sampling. Participants were included if they could understand written and spoken English.

Survey Questionnaire

The survey instrument used in this study was Death Attitudes Profile-Revised (DAP-R).[33] The DAP-R is a 32-item multidimensional scale that measures participants' attitudes toward death using a seven-point scale (1 = strongly disagree to 7 = strongly agree). This measure consists of five subscales: (a) FD- fear of death (seven items that measure negative thoughts and feelings regarding death), (b)DA- death avoidance (five items that measure attempts to avoid thought of death), (c) AA- approach acceptance (10 items that measure to what extent a person views death as an entry point to a happy afterlife), (d) EA- escape acceptance (five items that measure the extent to which a person views death as an opportunity to escape from a painful existence), and (e) NA- neutral acceptance (five items that measure the extent to which a

person views death in a neutral way, neither welcoming nor fearing death). Each option is scored from 1-7 for SD to SA respectively to score each of five subscales or dimensions. Each subscale was scored individually by adding the respondents' scores on each of the items and then dividing the total by the number of items in that subscale.

Data Collection

In addition to the survey items, personal information such as age, gender and religion of the participant were collected. Participant anonymity was maintained by coding the questionnaires. One of the author (MP) personally approached the institutions and collected the data. Participants were free to ask for clarifications to the author and the author was required to provide suitable non-leading explanations.

Data Analysis

Descriptive analysis was done using frequencies for each of the items and item-responses of the RSES and study participants' demographic variables. Comparison of total scores and factor scores between institutions, age, gender and religion were done using independent t-test or one-way analysis of variance as applicable. All analyses were done at 95% confidence interval using Statistical package for social sciences (SPSS) version 16.0 for Windows.

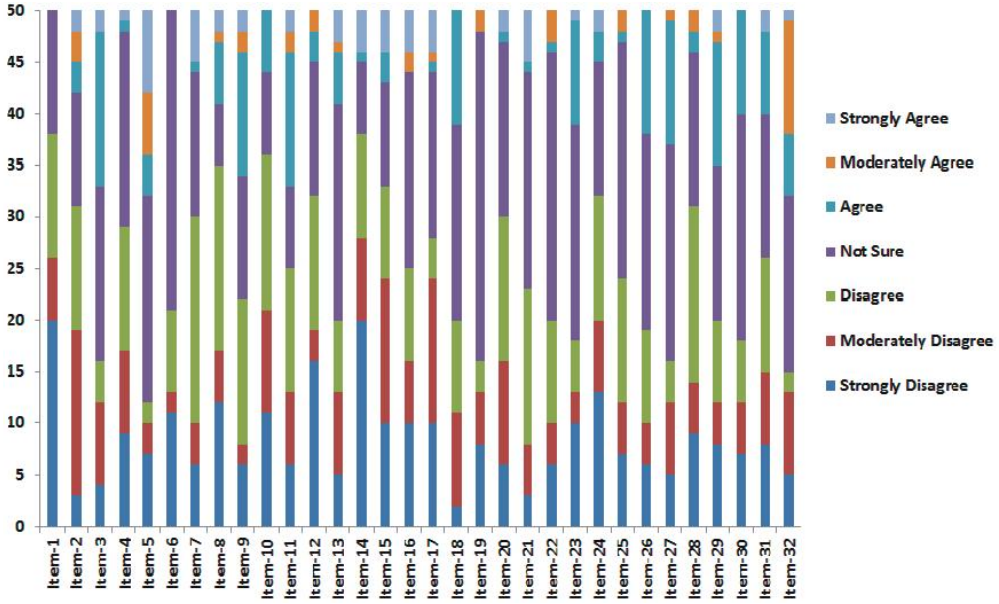
Results

The demographic and overall data of the participants is shown in table 1. Out of the total 66 questionnaires distributed and 58

Table 1: Demographic Data of the Study Participants

Variables	Values	
Total sample size, N	50	
Age (years)	18-19 years	44 (88%)
	20-21 years	4 (8%)
	22-23 years	2 (4%)
Religion	Hindu	27 (54%)
	Muslim	2 (4%)
	Christian	21 (42%)
Gender	Male	0
	Female	50
Provided care for a terminally ill patient	Yes	3 (6%)
	No	47 (94%)
Witnessed death of a person	Yes	5 (10%)
	No	45 (90%)
Family member's death	Yes	7 (14%)
	No	43 (86%)
Death Attitudes Profile - Revised (DAP -R) total score (32-224), Mean ± SD /224% /32%	150.78 ± 17.48 67.31 ± 7.8% 4.71 ± .54%	
Subscales' scores, Mean ± SD (%)	Fear of Death (7 items)	32.78 ± 4.02 (4.68 ±.57%)
	Death Avoidance (5 items)	23.78 ± 4.03 (4.75 ±.80%)
	Neutral Acceptance (10 items)	24.96 ± 4.53 (4.99 ±.90%)
	Approach Acceptance (5 items)	47.82 ± 5.77 (4.78 ±.57%)
	Escape Acceptance (5 items)	21.44 ± 4.92 (4.28 ±.98%)

Figure 1: Comparison of Item-responses for DAP-R in the Study Sample



received, 50 were selected as eligible for consideration with an overall response rate of 75.75%.

Item-Responses for the DAP-R

The comparison of item-specific responses for all the items of the DAP-R scale is shown in figure 1.

Comparison of Total and Subscale Scores between Age-Groups

Between-group comparison for total score of DAP-R (F=0.336, p=0.717) and FD (F=0.586, p=0.561), NA (F=0.433, p=0.651), AA (F=1.722, p=0.190) and EA (F=0.008, p=0.992) was not statistically significant. DA was significantly different between groups (F=3.212, p=0.049) with 18-19 years groups having higher score than 22-23 years (mean difference= 7.06 ± 2.79) Figure 2.

Comparison of Total and Subscale Scores

Figure 2: Comparison of DAP-R Total Score and Subscale Scores between Age Groups

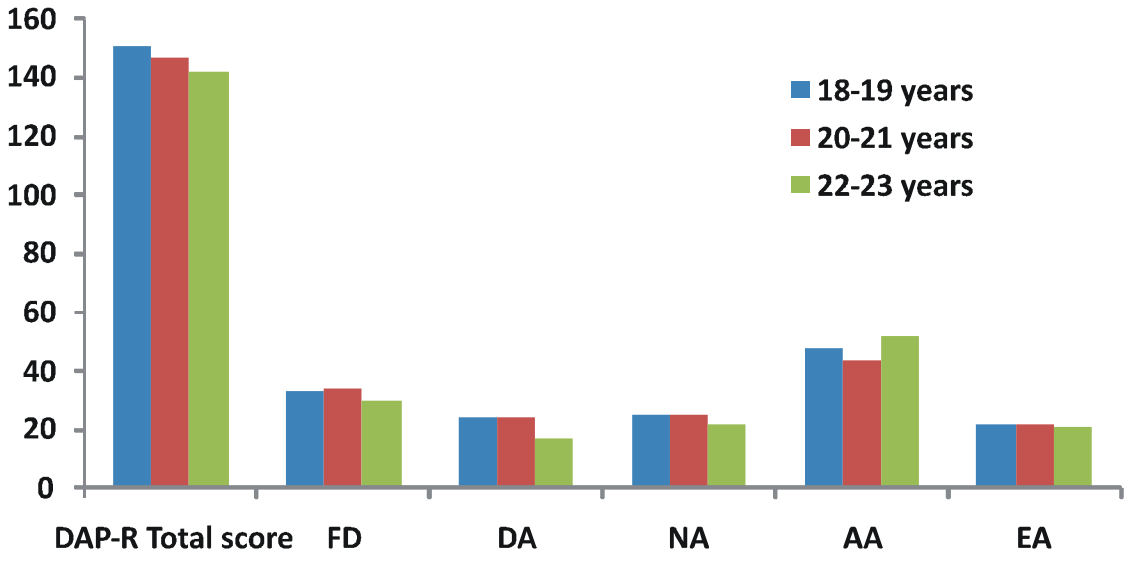
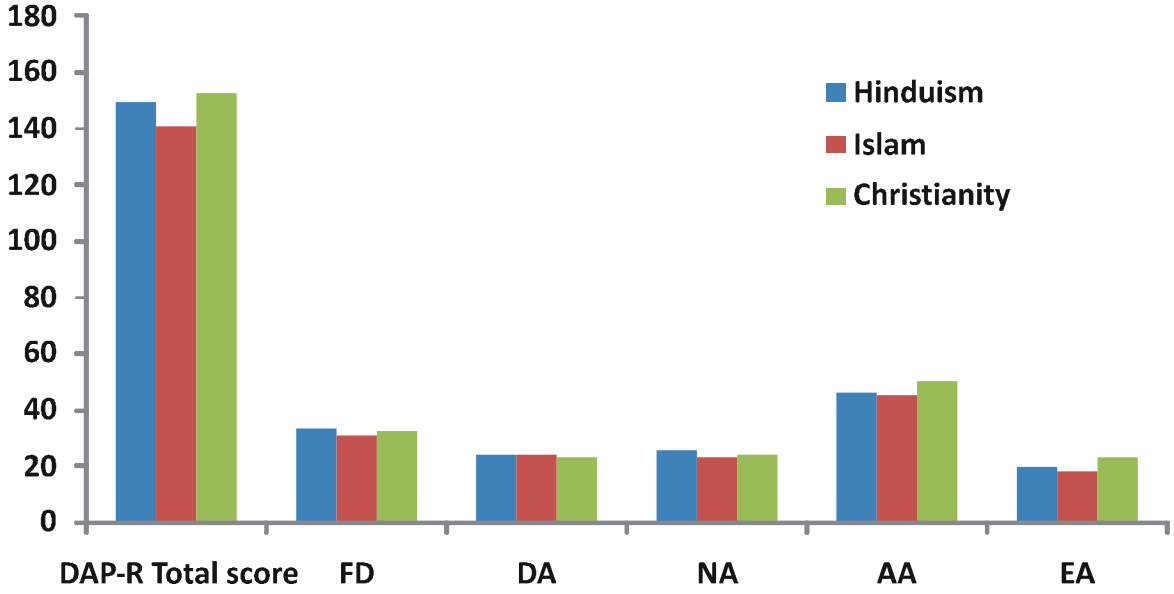


Figure 3: Comparison of DAP-R Total Score and Subscale Scores between Religions



between Religions

Between-group comparison was not statistically significant for the total score of DAP-R (F=0.584, p=0.561), and also for its subscales- FD (F=0.321, p=0.727), DA (F=0.047, p=0.954), NA (F=1.727, p=0.189), and AA (F=2.7, p=0.078). EA was significantly different (F=3.615, p=0.035) between groups with Christian students having higher scores than Hindus with a mean difference of 3.36 ± 1.36 (p=0.05) Figure 3.

Comparison of Total Score and Subscale Scores between Exposures to Terminally Ill Patients

Between-group ('yes' versus 'no') comparison for total score and subscale scores was not statistically significant- FD (t= -0.050, p=0.960), DA (t=-0.637, p=0.527), NA (t=0.145, p=0.885), AA (t=-1.18, p=0.241), EA (t=-1.25, p=0.215) and Total score of DAP-R (t=-0.861, p=0.394). Total DAP-R score, AA, DA and EA were higher among the 'no' group (151.32 ± 17.89, 48.06 ± 5.86, 23.87 ± 4.13, 21.65 ± 4.98) compared to 'yes' group (142.33 ± 4.04, 44, 22.33 ± 1.15, 18 ± 1.73) Figure 4.

Figure 4: Comparison of Total Score and Subscale Scores between Exposures to Terminally Ill Patients

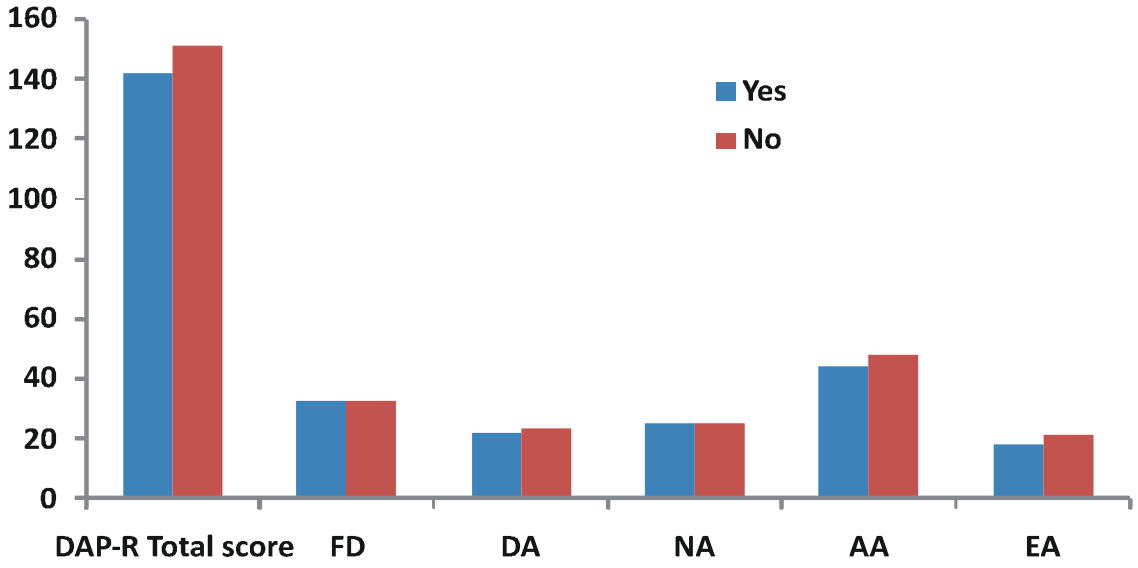
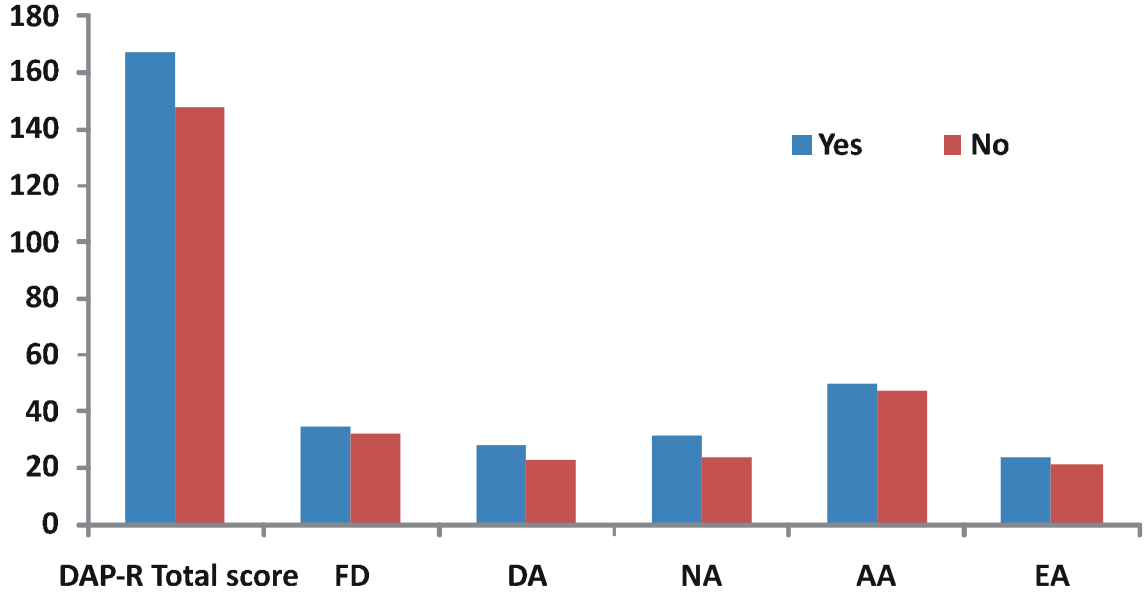


Figure 5: Comparison of DAP-R Total Score and Subscale Scores between Exposure with Death



Comparison of DAP-R Total Score and Subscale Scores between Exposure with Death

DAP-R total score, DA and NA were significantly higher in 'yes' group (167.60 ± 13.20, 28.2 ± 3.56, 31.4 ± 2.5) compared to 'no' group (148.91± 16.99, 23.28 ± 3.8, 24.24 ± 4.14). FD (mean difference= 1.8 ± 1.89), AA (mean difference= 1.97 ± 2.73) and EA (mean difference= 2.84 ± 2.3) scores were also higher among the 'yes' group insignificantly (p>0.05) than 'no' group (Figure 5).

Comparison of DAP-R Total Score and Subscales' scores between Experiences with Dying Family Member

Between-group ('yes' versus 'no') comparison for total score and subscale scores was not statistically significant- FD (t=0.255, p=0.800), DA (t=-1.163,p=0.251),NA (t=0.203, p=0.840), AA (t=0.439, p=0.663), EA (t=-0.915,p=0.365) and Total score of DAP-R (t=-0.265, p=0.792) Figure 6.

Figure 6: Comparison of DAP-R Total Score and Subscales' Scores between Experiences with Dying Family Member

Overall Comparison between the Subscale Scores

The percentile scores (raw score/ number of items) when compared amongst themselves, the order of scores were highest for NA, followed by AA, DA and FD with EA being the least. Between-subscale scores comparison was significant (p=0.000).

Discussion

The study was aimed to study the attitudes towards death among first-year nursing students and we found that overall attitudes were fair and it was influenced by a complex interaction of individual and professional variables. The study had some expected and unexpected interesting observations. Expected observation includes higher scores of death avoidance amongst younger age groups while unexpected observation was the higher approach acceptance score amongst Christian students. According to Christian mythology, approach acceptance or neutral acceptance was more expected than other subscales of death.

For the total score of DAP-R, significant differences were observed between those students who had exposure to death versus those who did not. This was understandable with subscale scores of NA and DA also being significantly higher in 'yes' group. Increase in NA after prior exposure to death event is a subject to be explored in future longitudinal studies. Similar influence of previous experience with death event was reported by Hurtig and Stewin.[34]

Though significant differences were not observed for total scores of DAP-R, the subscales were significantly different and were evidently influenced by a number of variables-age, previous exposure to death and religion. This poses a clear explanation of the greater influence of such confounding factors more on DA, AA, NA and FD.

Despite unavailability of data on existence of death education in nursing curriculum[35,36] in India, present study's sample of nursing students had fairly better attitudes towards death which highlighted the influence of other factors than educational curricular influences.

One of the few limitations of this study was the small sample size which limited its statistical power, participants were from a single institution, one geographical location and thus cannot be a representative of Indian nursing students, relationship with curriculum could be determined if longitudinal studies are carried out, relationship with academic achievement and/or clinical decision-making or attitudes on caring for the dying people was not explored, and future studies addressing these issues are warranted and comparison between pre-clinical and clinical nurses may indicate better suggestions for educational interventions towards reinforcement of positive attitudes towards death.[37] Such educational interventions not only reduce their anxiety but also improve their locus of control.[38]

The study findings are of significance being the first study on Indian nursing students and it explored the relationship of death attitudes with individual,[39] professional and environmental variables. Death-related attitudes might be one of the building blocks for development of professional self-concept amongst the nurses[40] and it may be a very important attribute in settings such as palliative care or with experience and/or exposure to life's stressful events such as death. Future studies may address these intricate inter-relationships in palliative care management settings.

Conclusion

Overall scores for death attitudes were favorable in the study sample of nursing students. Age and religion played an important role on death avoidance and escape acceptance scores respectively.

Acknowledgments

The study participants for taking their time and providing their valuable opinion on their own self-esteem. The principal, Dhanvantari college of Nursing for granting permission for conducting this survey.

Conflicts of Interest

None identified and/or declared.

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Original Article

Medico-legal Evaluation of Asphyxial Deaths in Akola District of Western Vidarbha Region

Hussaini S.N.*, Kulkarni C.S., Mukharjee A.A.***, Singh B.****, Batra A.K.*****

Abstract

Background: In forensic practice , violent asphyxial deaths are common incident and determination of manner of violent asphyxial deaths by Post Mortem examination is of utmost significance. This study is conducted to know the status of mode of violent asphyxial deaths in this region of India. **Materials & Method:** It is a retrospective study conducted at Department of Forensic Medicine and Toxicology, Government Medical College, Akola during the period of Jan 2011 to Dec. 2012. The information was collected from the police inquest, post mortem reports and hospital records. **Result:** Total 2602 autopsies were carried out during the study period and out of which 261 cases were of violent asphyxial deaths (10.03%). The males were outnumbered the females. Hanging was the commonest method of violent asphyxial deaths (72.41%) followed by drowning (23.37%). Only 2.68% of cases were of strangulation. Majority (63.21%) of victims of violent asphyxial deaths were belongs to rural areas. **Conclusion:** The majority was males (75.09%) from age group of 21-30 years (30.65%) and hanging was the most common mode of violent asphyxia death.

Keywords: Asphyxia; Hanging; Strangulation; Drowning; Suffocation; Akola; Maharashtra; Vidarbha.

Introduction

The term "Asphyxia "derived from Greek terminology that literally means without heart beat or stopping of pulse.[1] Asphyxia is a state in which body lacks oxygen because of mechanical interference with the process of breathing. In forensic practice, asphyxial deaths are common incidents. In modern India too increase in stress is being seen due to work, poverty, crime, debt ridden farmers due to monsoon dependant cultivation and irrigation in agricultural sector and also drought like situation in most of the part of the country and especially in Western Vidarbha region. The incidences of suicide and accident are increasing day by day not only in urban areas but also in rural areas and this can be seen from increased incidences of such cases from those areas. According to WHO report in 2000 the 86000 people died due to drowning in India.[2] Hanging is one of the most commonly used methods for suicide worldwide and strangulation is one of the common method of homicide.[3] In this study an attempt has been made to gain further knowledge and to study various epidemiological aspects of asphyxial death in Western Vidarbha region with an aim to identify the methods, if any, to reduce the morbidity and mortality and also to help in the process of administration of justice more effectively.

Material and Methods

It is a retrospective study conducted at the Department of Forensic Medicine and Toxicology, Government Medical College, Akola. Material of present study comprises of all the cases of violent asphyxial deaths of two years autopsied in mortuary of Government Medical College, Akola during period from 1st

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Jan 2011 to 31st Dec 2012. The necessary information regarding study like incidence of asphyxial deaths, their manner, age and sex wise distribution and area (rural or urban) to which they belong were obtained from the police inquest, post mortem reports and hospital records of admitted cases from record section of hospital. Data collected was analyzed and results were drawn, discussed and compared with other similar studies.

Results

Total 2602 autopsies were carried out in two years i.e. from 1st January 2011 to 31st December 2012 in Department of Forensic Medicine and Toxicology, Government Medical College Akola, out of which 261 (10.03%) cases were due to violent asphyxial deaths.

Fig 1: Distribution of Total Cases (n=261) of Asphyxia, Sexwise

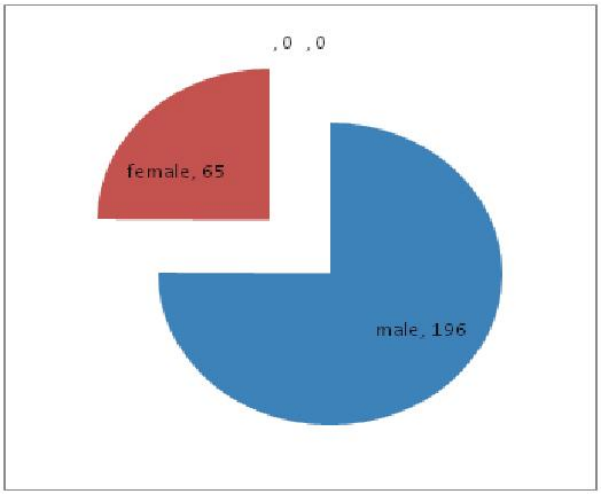


Table 1: Distribution of Cases in Different Age Groups

Age groups	No. of cases	Percentage
0-10	5	1.91%
11-20	23	8.81%
21-30	80	30.65%
31-40	60	22.98%
41-50	31	11.87%
51-60	20	7.66%
61 & above	42	16.09%

Fig 2: Percentage of Cases in Different Causes of Death

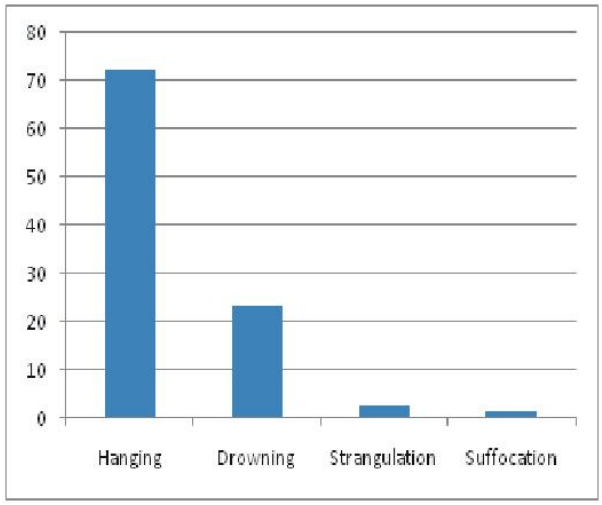


Fig 3: Percentage of Cases in Different Localities

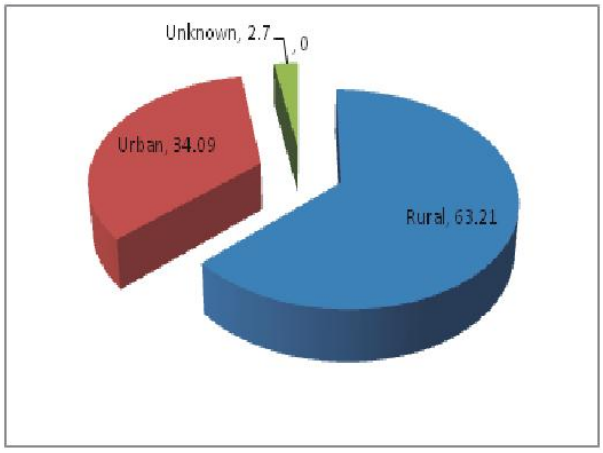
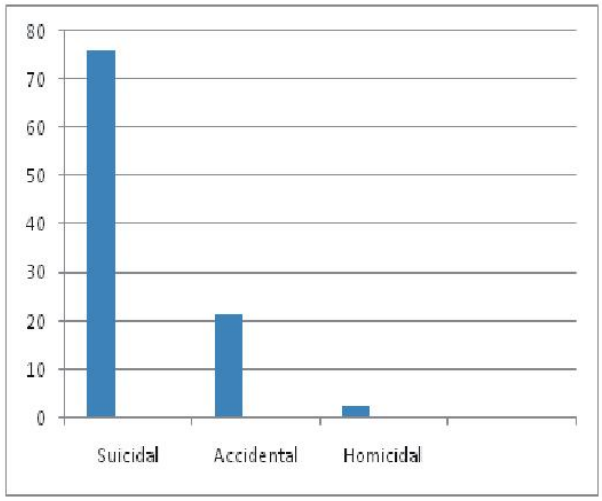


Fig 4: Percentage of Cases in Different Manner of Death



The present study shows that maximum numbers of victims were males 196 (75.09%) followed by females 65 (24.93%). Among the age groups majority of victims were from age group 21-30 years comprising of (30.65%) followed by age group 31-40 years (22.98%)

Among incidence of violent asphyxial deaths, Hanging was found to be commonest (72.41%) followed by Drowning (23.37%) and Strangulation accounts for 2.68% of the total cases.

Study also reveals that majority of the victim's belonged to rural area, comprising 63.21% of the total asphyxial cases followed by urban population, 34.09%

Study also reveals that suicide is the manner of death in majority of the cases (75.86%) followed by accidents (21.45%) and only 2.68 % cases were Homicidal.

Discussion

The incidence of death due to violent asphyxia in this study is 10.03% of total autopsies conducted during the study period. Chaurasia Neha *et al*[2] reported incidence of violent asphyxial deaths 6.95% and Amandeep *et al* reported 5.26%. The higher incidence in the present study may be due to fact that Akola is a Tertiary Care Centre for 3 district of Western Vidarbha Region catering the demand of patients from these areas and main occupation of people of this region is farming and agricultural labour who work in farm and as Vidarbha region is drought affected because of which number of suicide in this region is more by farmers.

Among the types of violent asphyxial deaths, Hanging was the commonest, accounts for (72.41%) of the cases followed by Drowning (23.37%), Strangulation (2.68%) and Suffocation (1.53%). The finding of our study is consistent with findings of Chaurasia Neha *et al*[2] and David Gunnell *et al*.[3] But Singh Amandeep *et al* reported in their study that the commonest violent asphyxial death was drowning, this discrepancy might be due to fact that study was conducted in Punjab which is highly irrigated, have more water resources than this part of country which leads to increase number of incidences drowning.[1]

Our study showed maximum numbers of victims were males (75.09%) as compared to females (24.93%). Similar findings reported by Amandeep *et al*[1], Gargi *et al*.[4] Those studies cited the reason that males are earning members in most of the families so this makes them more vulnerable to stress, also exposes them to risk of accidents. the present study also consents with that observation.

In our study maximum number of victims were in the age group of 21-30 years (30.65%) followed by 31-40 years (22.98%) means about 53% of victims were of age group 21-40 years. Similar findings were reported by Amandeep *et al*[1], and Sharma *et al*.[5] It is proposed that this is because persons in this age group are working and because of work they are exposed to accidents, suicide and sometimes to homicide also.

Present study revealed that a large number of victims (63.21%) were from rural areas compared to urban population (34.09%). This may be due to fact that Akola is surrounded by rural area of three district of western Vidarbha region and drought like situation existed in last few years further worsening the situation because debt ridden farmers and agricultural workers are more prone to commit suicides in this region.

Present study showed that among manner of violent asphyxial deaths suicide (75.86%) was commonest manner followed by accident (21.45%) and homicide accounts for only 2.68% of the cases, similar findings were reported by David Gunnell *et al*[3] , Chaurasia Neha *et al*[2] this may be due to fact that hanging is mostly suicidal in nature and present study consist of maximum number of cases of hanging.

Conclusion

Violent asphyxial deaths are one of the most important causes of deaths among violence deaths. Observations made by us in present study suggest that violent asphyxia deaths accounts for (10.03%) of total autopsies conducted, males out of numbering (75.09%) the females, 21-30 years of age group is commonly affected (30.65%) & Hanging was the commonest type of violent asphyxia death. The mortality due to violent asphyxiation can be reduce by understanding the predisposing factors ,increasing awareness among the rural & Urban Population and more studies should be carried out in different region and states to formulate preventive strategies to reduce morbidity and mortality. Improving the irrigation status, assisting the farmers during crop season and providing them better crop price are few measures, which if taken in the area of present study, can help to reduce the mortality and morbidity due to violent asphyxia deaths by suicide by hanging.

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Original Article

Dermatoglyphics and Dental Caries: A Cross Sectional Study among 12 Year Old School Children in Mangalore, India

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Abstract

Aim: To determine if an association exists between dermatoglyphic patterns and occurrence of dental caries among 12 year old school children in Mangalore. **Settings and Design:** A cross sectional study conducted in school settings. **Methods and Material:** A total of 183, 12-year old school children were selected using simple random sampling. Dental caries experience was assessed using the Decayed, Missing and Filled Tooth index. Dermatoglyphic patterns of the fingers and the total ridge count were recorded using the ink stamp pad method and analysed using a 2x magnifying glass. **Statistical Analysis Used:** Chi-square test and one way ANOVA were used for statistical analysis of collected data. **Results:** The mean DMFT score of this population was 2.83 ± 2.53 whereas mean dmft score was 0.84 ± 1.64. Chi-square analysis showed a statistically significant frequency of whorls in the 2nd finger in children with a dental caries experience of more than 3 ($p<0.05$). The total ridge count also showed a statistically significant relation with dental caries experience, when the one way ANOVA test was used ($p<0.05$). In children with higher dental caries experience, the total ridge count was less and vice versa. **Conclusions:** Dermatoglyphic patterns and total ridge count could be a novel method to determine the population at risk for dental caries, thus providing a vital component in the search for an acceptable, accurate and cost-effective predictor for identifying high risk individuals.

Keywords: Caries risk assessment; Dermatoglyphics; Dental caries; School children.

Introduction

For ages, features of hands have fascinated scholars, sages, theologians, doctors and laymen alike. Dermatoglyphics, a terminology coined by Harold Cummins and Charles Mildo in 1926, is a science, which involves the study of fine patterned dermal ridges on digits, palms and soles.[1]

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The pattern of ridges formed on the tips of human fingers has long been regarded as unique to each individual. These dermal patterns once formed, remains constant throughout the life of an individual.[2] Dermatoglyphic patterns have proved to be of diagnostic value in certain disorders like mongolism, Turner's syndrome, cardiovascular disease, diabetes, bronchial asthma and schizophrenia.[3-6]

Genetic contribution to the development of dental diseases has been an area of interest for many years. Dental caries is the major disease of dentistry and genetic factors play an appreciable part in determining individual resistance against dental caries. Studies have provided convincing evidence for a marked genetic component to dental status and dental caries experience.[7-15]

The basis of considering dermatoglyphic patterns as a marker for dental caries is that in the embryonic period, tooth formation and the formation of finger ridge patterns begins

and ends at about the same time. The dermal ridges of the hand take their origin from the foetal volar pads which appear in the 6th-7th week of embryonic life, at the same time as that of tooth formation in intraembryonic life. They occur as mound-shaped elevations of the mesenchymal tissue situated above the proximal end of the most distal metacarpal bone on each finger, in each interdigital area. The type of arrangement of ridge patterns on the fingers is determined by the size and position of these volar pads.[2]

The ridge patterns are completed by 12th-14th week of gestation, i.e. at the same time as that of tooth formation completion in the embryonic life.[6] Therefore it may be hypothesised that hereditary and environmental factors leading to dental caries may also cause peculiarities in fingerprint patterns.

This led to the conception of the present study with the aim of determining if dermatoglyphic patterns are associated with the occurrence of dental caries among 12 year old school children.

Materials and Methods

The present study was a cross sectional descriptive study conducted on 183, 12 year old school children of Mangalore, a coastal city of India, which has a high prevalence of dental caries.[16]

Ethical clearance to conduct the study was obtained from the Institutional Ethics Committee of Manipal College of Dental Sciences, Manipal University, Mangalore (Ref No: 11076 dated4 August 2012). Permission to conduct the study was acquired from the head of the institution and the principal of the selected schools and informed consent was taken from the parents of the participants.

The sampling frame consisted of all the schools in Mangalore out of which 5 schools were selected by simple random sampling technique (lottery method).

Calibration was done with an expert in forensic medicine, to assess the inter-examiner reliability in identification of dermatoglyphic patterns using the Kappa statistic.[17] The Kappa values obtained were 0.937 for fingerprint pattern identification and 0.784 for Total Ridge Count (TRC) calculation.

All the children aged 12 years of age as on their last birthday present in the selected schools on the day of examination, formed the sample. Children with special health care needs and those with genetic disorders (including cleft lip and palate syndromes) were excluded from the study.

The selected children were divided into three groups based on their highest Decayed, Missing and Filled Tooth Index[18] score for permanent (DMFT Index) and primary teeth (dmft Index).The division was done into following groups: Group A (Index score 0), Group B (Index score 1-3) and Group C (Index score more than 3).[19] Data collection was done over a period of 4 weeks in the month of September 2012.

An interview schedule was used to obtain information about dietary preferences and the oral hygiene practices followed by the children. These were elicited by face to face interview during the examination at school.

The caries experience of the children was recorded using the DMFT/dmft Index. The WHO criteria[20] was used for diagnosing dental caries. Examination was carried out beginning from the maxillary right quadrant and proceeding in a clockwise direction to the mandibular right quadrant. A trained recorder helped in recording the data.

Dermatoglyphic patterns of the digits of both hands were recorded using the Cummins and Mildo method.[21] Children's palms were scrubbed thoroughly with an antiseptic solution and were allowed to dry. The digits were then pressed firmly on an ink pad with the little finger first followed by the ring finger, middle finger, index finger and finally the thumb for each participant. Prints were obtained on bond paper by applying stable and adequate pressure. The same process was repeated for the left hand on a different sheet

of paper. Using this method three recordings were done to get acceptable and legible prints.

The dermatoglyphic patterns were then analysed to determine the loops, arches, whorls and the total ridge count.[22] The Total Ridge Count was determined by drawing a square of 5 mm X 5 mm on a thin transparent sheet which was placed on the recorded fingerprint (Figure 1). It was then observed under a magnifying glass and the number of ridges passing through the square drawn on the sheet is counted. The drawn box (25 mm^2) was placed on the same area of all the recorded digits to obtain standardised readings.[23-26]

The data was coded and analysed using the SPSS version 11.5. The level of statistical significance was kept at $p \leq 0.05$. Chi-square test and ANOVA were used for statistical analysis of collected data.[27]

Table I: Descriptive Statistics of the Study Population

Gender	
Male	97(53.1%)
Female	86(46.9%)
Brushing with toothpaste	
Once a day	92 (50.3%)
Twice a day	91(49.7%)
Diet	
Veg	37(20.2%)
Mixed	146(79.8%)

Results

The study was conducted on 183, 12 year old school children of Mangalore. Gender wise distribution of the population showed that the number of males and females in this study were 97 (53%) and 86 (47%) respectively. All the participants used toothbrush and toothpaste with half of the subjects brushing once a day and the other half brushing twice a day. Almost 80% of the subjects belonged to the mixed diet group and the remaining 20% were vegetarians (Table I).

The mean DMFT score of this population was 2.83 ± 2.53 whereas mean dmft score was 0.84 ± 1.64. The mean number of decayed teeth were 2.77 and the mean number of filled teeth were 0.05 in the permanent dentition and the mean number of decayed teeth and filled teeth were 0.81 and 0.02 in the deciduous dentition respectively. No subject had teeth missing due to caries. The prevalence of dental caries was found to be 84%.The study sample was divided into three groups based on their dental caries experience. A total of 29 children with no dental caries were categorized into group A, 77 children with a dental caries experience of 1-3 to the group B and 77 children with a dental caries experience of more than 3 to the

Table II: Gender-Wise Distribution Based on the Dental Caries Experience

Gender	Group A No dental caries	Group B Dental caries experience of 1 - 3	Group C Dental caries experience of >3	Total
Male	16	40	41	**97**
Female	13	37	36	**86**
Total	**29**	**77**	**77**	**183**
Not Statistically significant				

Table III: Dermatoglyphic Patterns and the Dental Caries Experience

GROUPS	LOOPS	ARCHES	WHORLS	Total
Group A (No dental caries)	149 (51.4%)	29 (10%)	112 (38.6%)	**290**
Group B (Dental caries experience of 1 – 3)	465 (60.4%)	35 (4.5%)	270 (35.1%)	**770**
Group C (Dental caries experience >3)	470 (61%)	41 (5.3%)	259 (33.7%)	**770**
Total	**1084**	**105**	**641**	**1830**
Not Statistically significant				

Table IV: Finger-wise Distribution of Dermatoglyphic Patterns and Dental Caries Experience in the Permanent Dentition

	Finger	Group A (No dental caries)	Group B (Dental caries experience of 1 – 3)	Group C (Dental caries experience of >3)
Right Hand	1	Loop	Loop	Loop
	2	Whorl	Whorl	Whorl
	3	Loop	Loop	Loop
	4	Whorl	Loop	Whorl
	5	Loop	Loop	Loop
Left hand	1	Loop	Loop	Loop
	2	Loop*	Whorl	Whorl
	3	Loop	Loop	Loop
	4	Whorl	Loop	Loop
	5	Loop	Loop	Loop
* Statistically significant at p < 0.05				

Table V: Finger-wise Distribution of Dermatoglyphic Patterns and Dental Caries Experience in the Deciduous Dentition

	Finger	Group A (No dental caries)	Group B (Dental caries experience of 1 – 3)	Group C (Dental caries experience of >3)
Right Hand	1	Loop	Loop	Loop
	2	Loop	Loop	Whorl*
	3	Loop	Loop	Loop
	4	Loop	Loop	Loop
	5	Loop	Loop	Loop
Left hand	1	Loop	Loop	Loop
	2	Loop	Loop	Whorl*
	3	Loop	Loop	Loop
	4	Whorl	Loop	Loop
	5	Loop	Loop	Loop
* Statistically significant at p < 0.05				

Table VI: Mean Total Ridge Count (TRC) Values among Groups

Groups	N (Total fingers)	Min	Max	Mean (SD)
Group A (No dental caries)	290	8	28	17.10* (3.27)
Group B (Dental caries experience of 1 – 3)	770	8	29	14.43*(2.92)
Group C (Dental caries experience >3)	770	7	25	14.12*(3.02)
*One way Anova between groups significant at 0.05 level				

group C (Table II).

When the 10 fingers of the183 children were analysed, we got a total of 1830 dermatoglyphic patterns, out of which, 1084 were loops, 641 were whorls and 105 were arches (Table III).When the patterns were compared between the three groups, we found that the frequency of loops was higher in the high caries group (Group C) whereas the frequency of arches and whorls were higher in the no caries group (Group A). However, this finding was not statistically significant

Table VII: Within Groups Analysis Using Post Hoc Tukey's Test		
Between	**Standard error**	**P value**
Group A & Group B	0.208	0.000*
Group A & Group C	0.208	0.000*
Group B & Group C	0.154	0.108*
***Significant at 0.001 level**		

(Table III).

Gender-wise analysis using the Chi-square test showed no statistically significant association between dermatoglyphic patterns and dental caries experience.

When the finger wise distribution of dermatoglyphic patterns were compared with the dental caries experience in the permanent dentition, we found that the presence of a loop in the second finger (ring finger) of the left hand was associated with no caries whereas whorls were more commonly associated with dental caries and this was found to be statistically significant (Table IV).

Table V shows the finger wise distribution of dermatoglyphic patterns when compared with the dental caries experience in the deciduous dentition. Here we found that the presence of whorls in the second finger (ring finger) of both the right as well as the left hand was associated with high dental caries experience and this was found to be statistically significant.

Table VI shows the mean Total Ridge Count (TRC) values of the population. The mean TRC values were higher (17.1) in the no caries group (Group A) when compared to the TRC values of 14.43 and 14.12 in Group B and Group C respectively. Analysis using the one way ANOVA found a statistically significant relation. The TRC value was found to decrease with an increase in the caries experience among the study participants (Table VI).

Within group analysis done using Post Hoc Tukey's test showed that there was a statistically significant difference in TRC values between Group A and B, Group A and C but not between Group B and C. These values indicate that high TRC values were associated with low caries experience and low TRC values with high caries experience (Table VII).

Discussion

Dermatoglyphics has been a useful guide and a powerful tool in understanding basic questions in biology, medicine, genetics and evolution, apart from being the best method for personal identification. In the same context, dermatoglyphics might be used as a valuable tool in determining the population at risk for dental caries. Host factors like the structure of dental enamel, immunologic response to cariogenic bacteria, or the composition of saliva are the factors that affect the development of dental caries in an individual. Genetic variations in the host may contribute to increased risks for dental caries.[9]

A total of 183 children aged 12 years participated in this study. The age group of 12 year olds was selected for this study as it is generally the age at which children leave primary school and the last age at which reliable sample may be obtained easily through the school system. This age group is also the global monitoring age for dental caries for international comparisons and monitoring of disease trends.[20]

The prevalence of dental caries was found to be 84% which was found to be very high compared to the study by Suprabha *et al*.[16] The children were divided into three groups based on their dental caries experience.[19] The number of children with highest DMFT/dmft scores in the three categories was 29, 77 and 77 respectively.

When the 1830 dermatoglyphic patterns of 183 children were analysed, we found an increased frequency of loops among this study

population. However, on individual finger analysis it was seen that whorls were seen with increased frequency in children with high dental caries experience and it was found to be statistically significant. Similar findings were reported by other studies.[1,5,28] Atasu [28]in his study stated that students with dental caries had more whorls on their fingertips whereas Madan *et al*[1] reported that although the maximum occurrence of whorls were seen in the dental caries group, the prevalence was found to be higher on the 3rd digit (ring finger) of the left hand in females and in the 3rd digit (ring finger) on the right hand in males. Abhilash *et al*[5] reported that dental caries susceptibility of an individual increases with an increase in the incidence of whorl pattern.Bhat *et al* [29] in their study also found the frequency of whorls to be more in the caries group and the frequency of loops to be more in the caries free group. The increased frequency of occurrence of whorl pattern on 2nd finger (ring finger) of children with high caries experience in our study was inaccordance with the results of the previous studies by Atasu[28], Madan *et al.*[1] and Abhilash *et al*.[5] This association was true for both primary and permanent dentition in our study. When the Total Ridge Count (TRC) was analysed, an inverse relation was observed between the Total Ridge Count (TRC) and dental caries experience. One way ANOVA was significant between mean TRC values and high caries experience in both primary and permanent dentition. Hence, the present study demonstrates that TRC values decreased significantly with an increase in caries experience. This finding was corroborated in other studies where it was shown that Total Ridge Count (TRC) values are inversely related to dental caries experience.[1,5,28]

Conclusions

Dental caries if not controlled in the early phase may lead to harmful consequences. In children it can be a major reason for the loss of school hours. The disability associated with advanced dental carious lesions is also severe. Establishing a basis for the genetic contribution to dental caries will improve our understanding of the complexity of dental caries pathogenesis and provide an opportunity to link patterns of inheritance with susceptibility to dental caries.

Further studies in this area, on well-characterized populations with clearly defined dental caries prevalence, taking into consideration all the confounding variables, will be required to analyse the relationship between dermatoglyphics and dental caries in depth.If the science of dermatoglyphics could be used for predicting dental caries risk, this would then provide a vital component in the search for an acceptable, accurate and cost-effective tool for predicting and preventing dental caries and for promoting oral health.

Key Message

The science of dermatoglyphics may be used to determine the population at risk for the development of dental caries.

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Indian Journal of Anthropology	2	8000	500
Indian Journal of Applied Physics	2	3500	400
Indian Journal of Biology	2	1500	170
Indian Journal of Cancer Education and Research	2	4500	500
Indian Journal of Communicable Diseases	2	1000	58
Indian Journal of Dental Education	4	3200	288
Indian Journal of Forensic Medicine and Pathology	4	12500	576
Indian Journal of Forensic Odontology	4	3200	288
Indian Journal of Genetics and Molecular Research	2	5000	262
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Original Article

Study of Concealed Evidence in Homicidal Deaths

Bibhuti Bhusana Panda* Amarendra Nayak, Manoj Kumar Jena*****

Abstract

The present study was carried in the Department of Forensic Medicine & Toxicology, SCB Medical College, Cuttack, Odisha during the year 2010 to 2012 with aim and objective to determine the various method and motive to conceal the evidence of Homicidal cases by the assailants after committing the crime. Total 111 cases of homicidal deaths were subjected to autopsy and various relevant data were taken from history, inquest report and dead body challan. Garment study and post mortem findings are also taken into consideration. Out of it there were 22 cases (19.81%) showed some evidence of concealment and comprises various methods and motives. The assailants tried to hide the identification of victim, manner and place of occurrence to be out of suspicion to escape from the crime and also to maintain reputation. So with careful, systemized and meticulous examination of homicidal cases can lead to a definite conclusion and help the crime investigation agency away from misguide by the assailants and help to uncover the mask on concealment.

Keywords: Concealment; Homicide;Meticulous examination.

Introduction

Homicide is killing of a human being by another human being.[1] It is a heinous crime against society and is as old as our civilization.[2] In present day society with the help of advanced knowledge which may be acquired from the media like TV, cinema, internet etc. the criminals are adopting various scientific means to execute the crime and wiping out evidences to escape from conviction. Various common methods adopted by the assailants are use of hard and blunt weapon, stabbing, cut throat, chopping, strangulation, firearm etc.[2] After committing the crime they may try to conceal the facts just to go scot free and to live a life of a respectable person. The role of forensic pathologist is to give all the possible facts to the police.[3] But more difficulties arise when the evidences are destroyed or the body of offence concealed.[4] Assailants are very keen to conceal crime by different methods, so there may be wrong interpretation by inexperienced autopsy surgeon and hence it may lead to miscarriage of justice.[5]

Aims and Objectives

1. To study the methods used by the assailants to conceal the crime.
2. To study the motives of assailants for concealment.

Materials and Methods

The present study was carried out on homicidal victims consisting of 111 cases brought for medico-legal post-mortem

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examination to the mortuary of S.C.B. Medical College, Cuttack, Odisha, India during September 2010 to August 2012.

Cases of homicide were selected by history, police inquest, dead body challan, garment examination and autopsy findings. Histological study was done in doubtful cases to know the ante-mortem or postmortem wound. Cases were excluded from the study where there was only allegation of homicide without any circumstantial evidence or corroborative autopsy finding.

The data collected in a preformed Proforma and at the end of the study various observations and results were noted and it further discussed with similar studies and case reports.

Observation and Results

Out of 111 homicidal cases in this study 22 cases (19.81%) show some clue to conceal the evidences of homicide by the assailants. The various methods and motives of the assailants found in this study are as follows:

1. In one case out of the total study there was a postmortem railway run over with presence of ante-mortem stab wound on chest. The assailant here tried to conceal the identification, manner and place of occurrence.
2. In three numbers of cases there was presence of postmortem burn to conceal the identification and manner after committing homicide. The methods of homicide used in these cases were cut throat involving C3 vertebral body; firearm injury over head with bullet found inside the skull; and a case of ligature strangulation with ligature material present over the neck.
3. In one case there were injuries over the face (contusion, laceration and cut) to disfigure it with presence of other fatal injuries over the body. The motive of assailant is to conceal the identification of victim.
4. There was postmortem suspension of a dead body with a ligature with presence of ante mortem depressed fracture of skull over vertex and brain injury. The assailant

Table 1: Incidence of Homicidal Cases Where Concealment of Evidence Found

Total cases of Homicide	Concealment cases	Percentage
111	22	19.81

Table 2: Methods Used for Concealment

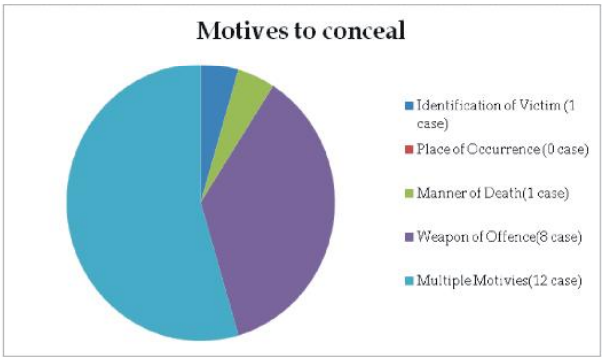
Methods	No. of Cases	Percentage
Hiding the weapon of offence	08	36.36
Keeping the body away form place of occurrence	08	36.36
Postmortem Burning	03	13.63
Disfiguration	02	9.09
Postmortem Suspension	01	4.54

Table 3: Motives of Assailant

Motives to Conceal	Number of cases*	Percentage
Identity of victims	13	59.09
Place of occurrence	10	45.45
Manner of death	14	63.63
The weapon of offence	08	36.36

*A single case may have more than one motives of concealment

Figure 1: Motive of Assailant



tried to conceal the manner in this case.

5. In one instance a decapitated head was found miles away from its trunk with an intention to conceal the identification of victim and place of occurrence.
6. There was an incident of postmortem submersion of dead body with ectopic disposal having an ante-mortem cut throat injury to conceal manner and place of occurrence.
7. In six different cases the dead bodies were found away from the scene of crime. This may be done to conceal the identity and place of occurrence by the assailant.
8. The weapon of offence which reveals one of the important tools for homicide investigation are usually found absent at the place of crime either by the secret disposal or voluntary destruction by the assailant. In 8 cases (7.2%) in the present series the weapon of offence recovered later by police were concealed by the assailant after committing the crime. The assailants hid the weapon to conceal the manner and trace evidences present over it.

Common methods used by the assailants to conceal the crime in the order are hiding the weapon of offence, keeping the body away from place of occurrence, postmortem burning and disfiguring. The main motives of assailants in the order are to conceal the manner of death, identity of victim and place of occurrence. In most of the cases there are multiple motives to conceal the crime.

Discussion

Similar studies and cases were found by the following authors.

1. Basappa S. Hugar found in 15.75% cases the dead bodies were moved from the scene of crime and attempts were made by the assailants to obliterate the identity as well as evidence of crime.[2]
2. Upadhyay P. found in 23.2% cases the assailants attempted to conceal the crime.[6]
3. Mohanty M. K. *et al* found in 14.7% cases the dead bodies were located away from scene of crime.[7]
4. Meshram A. H. *et al* found a case of postmortem burn with ante-mortem strangulation in his case report.[3]
5. Tumar A. R. *et al* studied the postmortem burning of the corpses following homicide.[8]
6. Jambure M. P. *et al* studied case report of electrocution as a method to conceal homicide.[5]
7. Thind A. S. *et al* found a case report on strangulation followed by postmortem electrocution to conceal the manner.[9]
8. Sheikh M.I. studied investigation of concealed homicide and establishment of positive identification.[4]
9. Sadler D. W. presented two cases where the homicidal strangulation first discovered at necropsy without any visible sign of injury. The assailants' motive was to conceal the manner.[10]

Conclusion

Assailants try to hide the identification of victim, place of occurrence and manner after committing the crime to escape punishment and to save their reputation by using various methods. So with careful, systemized and meticulous examination of the homicide cases with the knowledge of common methods of concealment of crime can lead to a definite conclusion and help the crime investigation for administration of justice.

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Case Report

Cranio-Cerebral Injury due to Ocular Impalement: An Unusual Case Report

Prateek Rastogi*, Jenash Acharya, Raghavendra Babu Y.P.***

Abstract

Injury to skull and its contents due to direct or indirect trauma is a common occurrence as well as cause of death in majority of accidents. We present a case wherein an industrial worker suffered penetrating ocular injury resulting in cranial trauma and death. The heated iron rod penetrated the eye, travelled below upwards from front to back, fractured the roof of orbit, causing penetrating injury to the brain.This case recommends use of protective eye gear for all workers in hazardous jobs.

Keywords: Occular trauma; Brain injury; Industrial accident.

Introduction

Penetrating ocular injuries and their complications are routinely dealt by surgeons around the world. Ocular injuries pertaining to trauma to lens, conjunctiva, cornea, orbit and about treatment and surgical modalities for it can time and again be sited in literature. However, it goes beyond the hands of any human being if not a treating doctor when the force and direction of the penetrating object is such that it perforates the eyeball and causes injury to posterior structures as deep as brain resulting in immediate death of any individual. We present such a case where an industrial worker in iron manufacturing company sustained perforating injury to the eyeball resulting in immediate death.

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Case History

As per the history given by the investigating officer, the deceased was a laborer in a steel and iron welding mill. One day when he was on duty a heated iron rod penetrated into his left eye while working on it. It was also mentioned that they had no doubt of foul play involved and it was a clear case of industrial accident. The 21 years adult was then rushed to nearby hospital where he succumbed to death prior to seeking any medical attention. The cause of death as furnished by the investigating officers was death due to penetration of iron rod into face.

At autopsy, a burn injury, measuring 10x5cm over the left eye involving left ala of

Fig 1: Occular Injury

Fig 2: Injury to the Brain

nose and left side of face and zygoma was noted overlying which was a penetrating laceration (Fig 1). Left cornea was opaque in appearance. Another superficial burn injury measuring 7x2cms was horizontally present at back of left forearm, 4 cm below the left elbow joint.Internal examination revealed sub-scalpal contusion over left supra-orbital region & Sub-dural and sub arachnoid hemorrhage over right cerebral hemisphere (Fig 2). On

Fig 3: Fracture of Anterior Cranial Fossa

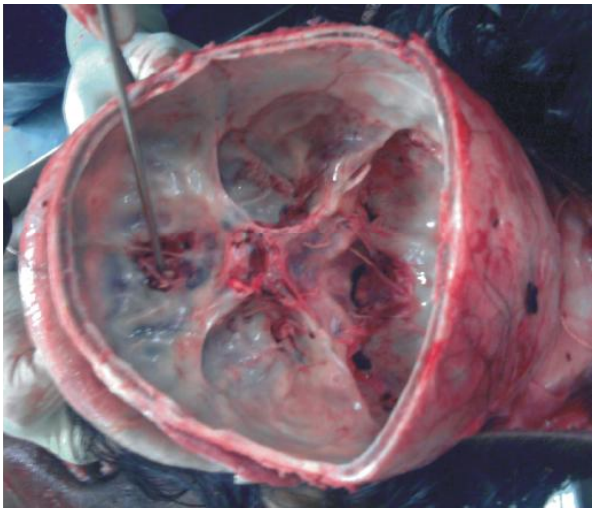

Fig 4: Trauma to Undersurface of Brain

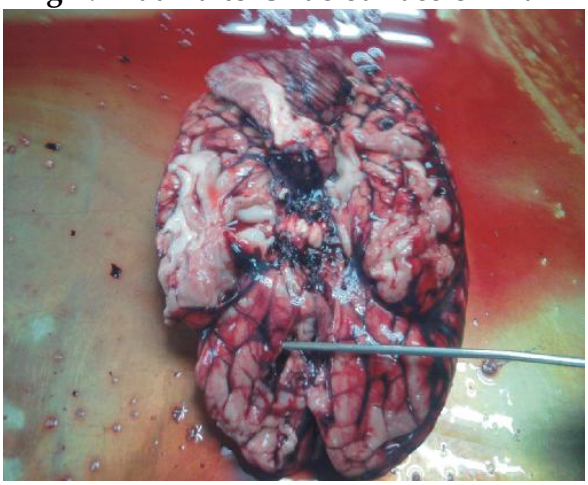

Fig 5: Damage to the Basal ganglia

reflecting the frontal lobes of the brain, roof of left orbit (anterior cranial fossa) showed a perforating fracture at base of the skull (Fig 3) overlying which was a penetrating injury on the undersurface of softened frontal lobe (Fig 4). On further dissection, it was revealed that right basal ganglia were contused along with evident right intra-ventricular hemorrhage and pontine hemorrhage (Fig 5).

No other specific findings were noted in other internal organs except for congestion. Inner wall of left ventricle showed sub-endocardial hemorrhage and stomach contained greenish coloured mucoid fluid without any abnormal odour. The cause of death was given as cranio-cerebral injury sustained as a result of penetrating trauma to the left eye.

Discussion

Anatomical classification of ocular trauma can be done based on injury confined to anterior segment, posterior segment, adnexa and orbit. It can again be classified into penetrating or perforating based on structure involved. If only one surface of an ocular structure is damaged it is a penetrating injury whereas involvement of two structures creating entry and an exit is defined as perforating injury or in common words "double penetrating" injuries.[1] The classification to ocular trauma ends here, but what we had found in our case was injury that was deeper to ocular injury. Ocular injuries in adults are usually an intentional insult in which males are more affected than females (4:1).[2,3,4] In pediatric group, which amount to 8-14% of all eye injuries; it's usually accidental and involves only one side.[5,6]

The heated iron rod had penetrated taking such an unusual route and direction that on perforating the eyeball it had further travelled from below to upwards and front to back, fracturing the roof of orbital plate and further beyond causing penetrating injury to base of the brain. This unusual case in which brain sustained penetrating injury by a heated iron metallic rod with no evident fracture on the exterior of skull vault is what makes this case worth reporting. It is also recommended that employers in hardware industries are to look into providing proper safety eye gears which would not only save the employee's eyesight but their vision in life too.

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Case Report

Death by Lightning Strike

R. Ravi Kumar*, Chetan Kumar**

Abstract

Lightning is a massive electrostatic discharge between the electrically charged regions within clouds or between a cloud and the surface of a planet. The charged regions within the atmosphere temporarily equalize themselves through a lightning flash, commonly referred to as a *strike* if it hits an object on the ground. Humans or animals struck by lightning may suffer severe injuries or even death due to internal organ and nervous system damage. A lightning strike can cause death or various injuries to one or several persons. The mechanism of injury is unique, and the manifestations differ from those of other electrical injuries. The case described in this report illustrate diverse injuries and circumstances in which death is attributable to lightning can occur and how to proceed during autopsy examination in cases of suspected death by lightning.

Keywords:Lightning;Electrostatic discharge;Planet.

Introduction

Lightning is common in tropical and subtropical countries and even in higher altitude, occasional tragedies occur where number of people are killed or injured in single episode.[1] Lightning can strike or injure humans in four different ways: Direct strike: In a *direct hit*, the electrical charge strikes the person first. *Splash* hits occur when lightning jumps to a person (lower resistance path) from a nearby object that has more resistance, striking the person on its way to the ground. In *ground* strikes, the bolt lands near the person and is conducted by a connection to the ground (usually the feet), due to the voltage gradient in the earth. This can still cause substantial injury.

Injuries caused by lightning is from three factors: a) electrical damage b) intense heat and c) the mechanical energy which these generate.

Electricity

Counter intuitively, lightning current flowing through the victim's body resistance may develop a high voltage sufficient to *flash* around the skin or clothing to the ground in a *direct strike*, resulting in a surprisingly benign outcome.

The lightning often leaves skin burns in characteristic Lichtenberg figures, sometimes called *lightning flowers*; they may persist for hours or days, and are a useful indicator for medical examiners when trying to determine the cause of death. They are thought to be caused by the rupture of small capillaries under the skin, either from the lightning current or from the mechanical shock wave. The intense electrical current can cause a loss of consciousness; it is also speculated that the EMP created by a nearby lightning strike can cause cardiac arrest.

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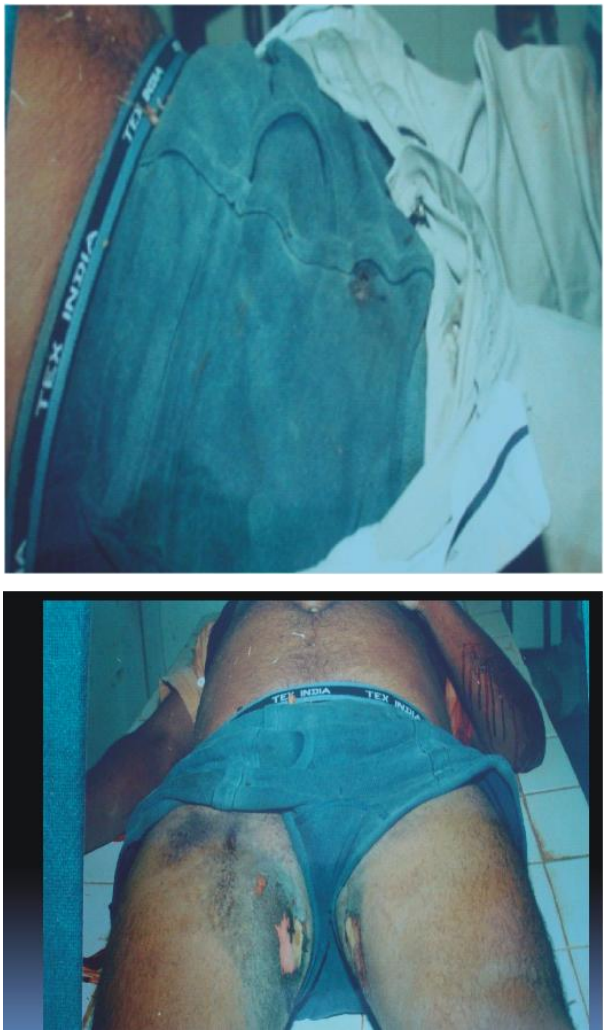
Figure I: Picture Showing Trouser and Underwear were Burnt Including the Inner Aspect of Thighs and Buttocks



Heat

A bolt of lightning can reach temperatures approaching 28,000° Celsius (50,000° Fahrenheit) in a split second. This is about five times hotter than the surface of the sun.[4] Spectacular and unconventional lightning damage can be caused by thermal effects of lightning. *Hot lightning* (high-current lightning) which lasts for more than a second can deposit immense energy, melting or carbonizing large objects. The intense heat generated by a lightning strike can burn tissue, and cause lung damage, and the chest can be damaged by the mechanical force of rapidly expanding heated air.

Concussive Injury

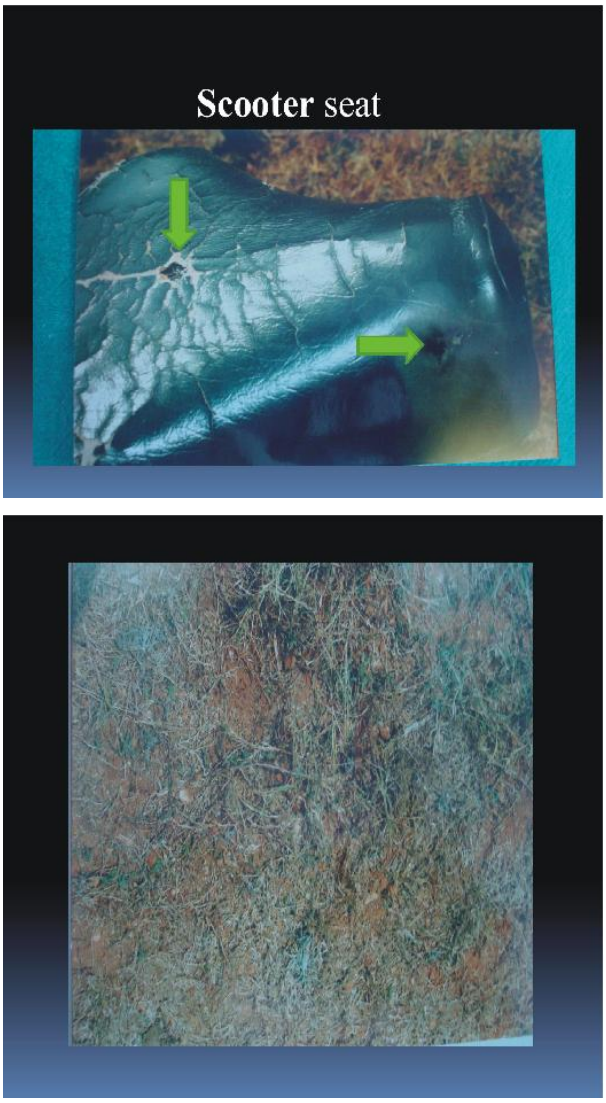
Just as heat can cause expanding air in the lungs, the explosive shock wave created by lightning (the cause of "thunder") can cause concussive and auditory injury at extremely close range. Other physical injury can be caused by objects damaged or thrown by the lightning strike. For example, lightning striking a nearby tree may vaporize sap, and the steam explosion often causes bark and wood fragments to be explosively ejected.

Case Report

According to the police, a 35 yr old male, while returning home on his scooter on a stormy night was found dead on the road with multiple injuries on the body, at the outskirts of city Suspected to be a case of RTA booked under section 279, 304(A) IPC. The

Figure II: Picture Showing the Abrasions and Singeing of the Hairs over Chest and Abdomen

Figure III: Picture Showing the Burnt Scooter Seat and Scene of Crime



body was brought to mortuary to conduct the autopsy.

Post Mortem Examination

Cloth examination showed the trouser and underwear were burnt over the inner aspect of thighs and buttocks. Dead body was that of a male measuring 174cms, moderately built and nourished. Rigor mortis present all over the body. Post mortem staining present over the back of the body and is fixed. Multiple Abrasions of varying sizes were present all over the body. The abrasions are bright red in color.

Superficial flash burns were noted over the inner aspect of both thighs corresponding to the burnt clothing. Body hairs over front of chest, abdomen and pubic hairs are partially burnt and shows singeing. Internal findings on opening the body showed all viscera intact and congested. Blood was sent to FSL for chemical analysis and the skin sample from the burn site was sent for histo-pathological examination. Chemical analysis proved positive for the presence of alcohol in blood. quantum of ethyl alcohol 39.23 mg/dl of blood. Histo-pathological study showed typical features of elongated nuclei, pallisading pattern of cells and dermis showed few congested blood vessels. Cause of Death: Shock due to lightning strike was proved by autopsy study. Early suspicion of RTA and assault was disproved.

The importance of collecting history and visiting scene of incidence is once again highlighted in this case.

Discussion

Injuries and death occurring due to lightning strike are reported frequently.[2] The physical damage in fatal cases can vary from virtually nil to gross burning, fractures and tissue destruction. In lightning injury, cardiac damage or arrest may be caused by either electrical shock or induced vascular spasm. [3,4] Deep burns occur in fewer than 5% of lightning injuries.[5,6] Patients may exhibit one or more of four types of superficial burns or skin changes that do not reflect actual burn injury: linear, punctate, feathering, or thermal burns.[5,6]

Linear burns tend to occur in areas where sweat or water accumulate, such as under the arms or down the chest. These are superficial burns that appear to be caused by steam production from the flashover phenomenon. Punctate burns appear as multiple, small cigarette-like burns, often with a heavier central concentration in a rosette-like pattern. [7] They range from a few millimeters to a

centimeter in diameter. Feathering burns are not true burns because there is no damage to the skin itself. They seem to be caused by electron showers induced by the lightning that make a fern pattern on the skin.[8] These transient lesions are pathognomonic for lightning injury and require no therapy. Thermal burns occur if the clothing is ignited or may be caused by metal that the person is wearing or carrying during the flashover.[9] Pulmonary contusion and haemorrhage are reported with lightning injury.[10] Blunt abdominal injuries and often with head injury caused either by the lightning strike itself or by falling to the ground.

Early recognition of lightning injury of cases and management of complications will have better outcomes.[11] It is important to understand risk factors for lightning development, consequences and medical treatment if struck, and most importantly, how not to be a victim. Lightning strike results in death in 20%-30% of the injuries and the most common cause of death is Cardio pulmonary arrest.[12]

The most critical injuries are to the circulatory system, the lungs, and the central nervous system but injuries also occur to other body systems. Some victims suffer immediate cardiac arrest and will not survive without prompt emergency care.[13] It is safe to administer care immediately, because the victim will not retain any electrical charge after the lightning has struck. Other victims may suffer myocardial infarction and various cardiac arrhythmias most of which can be rapidly fatal as well.

Conclusion

Lightning injuries affect 800 to 1000 persons per year. Cardiac arrest is the main cause of death, burns tend to be superficial. From time and again individuals die as a result of injuries being struck by lightning and the possibility of such a death is overlooked unless certain practical factors like A) Examination of clothes is done. B) Histo-pathological specimens to be collected. C) Visiting/photographs of scene of incidence. D) History of thunderstorm and evidence of effects of lightening should be considered. To prevent from the injuries and death from lightning safety precautions should be taken. When there is thunderstorm, avoid being in an open field, outdoors and under a tree. Electric equipments should be avoided or turned off. Improved warning systems, increased public education about safety regarding lightning, and improved medical care will reduce the incidences of injury and death caused by lightening.

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Case Report

Psychological Autopsy: An Important Tool for Postmortem Diagnosis of Death

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Abstract

Autopsy surgeons not only deal with unnatural deaths, but also deal with a wide range of deaths from natural causes, which are of sudden, unexpected or clinically undiagnosed cases. It is pertinent for an autopsy surgeon to be aware of the causes of sudden natural death. Here is a case of sudden death due to cerebrovascular accident with suspicion of foul play is reported. The suspicion of foul play was negated by an autopsy of the dead body aided with psychological autopsy of the family of the deceased.

Keywords: Sudden death; Cerebrovascular accident; Autopsy; Psychological autopsy.

Introduction

Sudden death is now currently described as natural unexpected death occurring within 1h of new symptoms.[1] Cardiac causes are the leading causes of sudden death, followed by causes of respiratory system and central nervous system. Central nervous system causes account for 10-18% of all sudden deaths.[2] Subarachnoid hemorrhage and cerebral hemorrhage are the most frequent causes of sudden death due to Cerebra vascular accidents (CVA).[3] Here, we present a case of sudden death due to cerebrovascular accident due to a spontaneous bleed which had aroused the suspicion of foul play.

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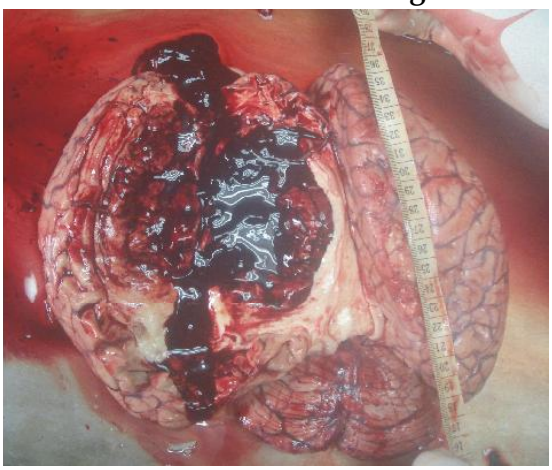
Case Report

An adult male aged 45 years, waiting for a bus at a bus stop, fainted suddenly and was brought to the hospital. He was declared brought dead by the doctors. The family of the deceased however expressed their reservations as to the above history and they suspected some one would have pushed the old man leading to the death. An autopsy was requisitioned by the Investigating Officer.

At autopsy, deceased was an adult male poorly built and nourished. No external injuries were found over the body. Internal examination revealed, diffuse subarachnoid haemorrhage with oedema of the brain. Cut

Fig 1: Cut Section of Brain showing Cerebral Haemorrhage



section of the brain revealed haemorrhage in the basal ganglia in the left cerebral hemisphere (Fig 1). Other internal organs were unremarkable. Chemical analysis of routine viscera did not reveal evidence of any toxin. Histopathology of the cerebral hemisphere showed infiltration of the internal carotid artery by lymphocytes and neutrophils.

Further probing of the family of the deceased revealed a history of chronic hypertension and diabetes. It was also revealed that the deceased was non-compliant to the prescribed treatment by the doctor. The family members were then made aware of the complications of the chronic hypertension and non adherence to the prescribed treatment. The combination of autopsy findings and counseling allayed the fears of the family of foul play in the death of their near one.

The cause of death was opined as complications of unilateral spontaneous intracerebral haemorrhage.

Discussion

Autopsy surgeons deal with not only a wide range of unnatural cases viz., criminal, accidental and suicidal deaths, but also with a wide range of natural deaths. These sudden deaths especially, if they had occurred suddenly in apparently healthy individuals pose a great challenge to the autopsy surgeon. Many of these deaths are sudden, unexpected, clinically unexplained or obscure.[4,5] Sudden deaths due to neurological causes are not rare and frequently encountered during medicolegal work. But sometimes physical evidence found on the body may not be sufficient to conclude on the manner of death. In such cases where the manner of death is unexplained and is not clear, a psychological autopsy may assist the autopsy surgeon and the Investigating Officer in solving the deadlock.[6] It refers to assessment of the mental state of deceased person before death. It involves evaluation of the sort of persons, their personality and thought processes, which will be required to assist the investigation.[7]

Cerebrovascular accidents (CVA) account for 10 to 20% of all sudden deaths.[8] CVA's occur predominantly in the middle and late years of life. The incidence of CVA's increases with age, thus the disability affects many people in their "golden years".[9] Subarachnoid hemorrhage and cerebral hemorrhage are the most frequent causes of sudden death due to stroke. Brainstem hemorrhage, which is the cause of respiratory and vasomotor centers dysfunction, is frequently the direct cause of sudden death caused by stroke. Cerebral edema, secondary lethal arrhythmia, myocardial infarction, pulmonary embolism, or asphyxiation by dysphagia may be indirect causes of death associated with stroke.[3]

In the present case, the victim was an old man who suddenly fainted and collapsed and was brought dead to the hospital. Even though eyewitness suggested a death due to natural diseases, the family contested against it and suspected foul play. But a medico-legal and psychological autopsy revealed the cause of death as CVA.

CVA's resulting in sudden death is a known entity, but suspicions do arise in circumstances where a person is found unconscious and un-witnessed by the family members when suspect foul play. So it is pertinent to keep in mind that psychological autopsy do has a role in routine medico-legal autopsies.

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