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Aims & Scope

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Blunt Force Trauma in a Suspected Case of Drug Overdose Death: a Dilemma for Forensic Pathologists

1A. Haricharan, 2Soibam Neha, 3Konda K. Kumar, 4Faisal M. Sofi , 5Th. Meera Devi

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ABSTRACT

Deaths resulting from blunt force injury are some of the most common cases encountered by a practisingforensic pathologist. At the same time, deaths due to drug abuse, especially synthetic opioids, are also a commonphenomenon all over the world. In this paper, an interesting case is reported wherein a dead body brought asa case of drug overdose had tell-tale signs of blunt trauma on the body. The injuries were present on the nonaccessible parts of the deceased's body pointing towards homicide. This case has been reported considering theinteresting nature of the case as well as to emphasize the importance of meticulous postmortem examination sothat the opinion may not be influenced by the history given by the investigating agencies.

Keywords: History, drug overdose, blunt force trauma, death

INTRODUCTION

Opioid abuse has been a global menace for centuries. The state of Manipur is a borderstate with neighbouring Myanmar, which is apart of the 'Golden Triangle', and considereda major transit point for drug trafficking andhas many drug-dependent people, especiallybetween the ages of 16 and 45.1
It is known that synthetic opioids are refractive to reversal by antagonists and haveoften proven lethal.2 On the other hand, onemillion people die annually worldwide due tohomicides.3 However, homicidal blunt forcetrauma in a case of suspected accidental drugoverdose death is a challenge to investigateand requires a thorough examination of allaspects of the case.

CASE REPORT

A24-year-old male was broughtto a peripheral hospital in Imphal, Manipur (India), late atnight for treatment as a suspected case of drugoverdose; however, he was declared dead by the doctor. The history given by thepolice was that he was a drug addict, and heattended a party along with his friends theprevious evening. He had injected himselfwith some drug after which he fell asleep. Atmidnight, when his friends tried to wake himup, he was not responding, and white frothwas seen coming out of his mouth and nostrils.

AUTOPSY FINDINGS

Rigor mortis was fully developed and postmortem staining was present at the back and fixed. The face was congested; lips, fingertips and toes were cyanosed. White froth was seen around the mouth and nose (Fig 1). An injectionmark was seen over the right cubital fossa, redin colour (Fig 2). Multiple abraded

contusions were seen over the back, across the midline,over an area (20cm x 16cm), with sizes rangingfrom (2cm x 1cm) to (9cm x 1.3cm), 108cm abovethe heel, red in colour (Fig 3). Multiple abradedcontusions were seen over the anterior aspect ofthe right leg, over an area (18cm x 10cm), with sizes ranging from (1cm x 0.8cm) to (4cm x 1cm),25cm above the heel, red in colour (Fig 4). Scalphaematoma, (5cm x 6cm), was present over theright occipital region, 1cm from the midline; and(6cm x 3cm), over the left occipital region, 3cmfrom the midline; red in colour (Fig 5). Subduralhaemorrhage with corresponding subarachnoidhaemorrhage was seen over bilateral occipitallobes and the cerebellum (Fig 6). The stomachcontained brownish-coloured fluid with semi digested rice particles @ 100 ml with no peculiar

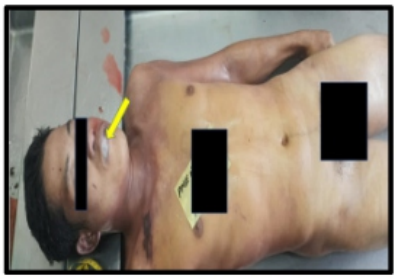

Fig. 1: White froth around the mouth and nose

Fig. 2: Injection mark over the right cubital fossa

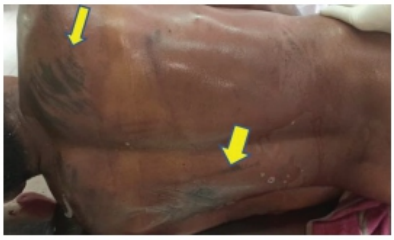

Fig. 3: Multiple abraded contusions over the back

Fig. 4: Multiple contusions over the anterior aspect of the right leg

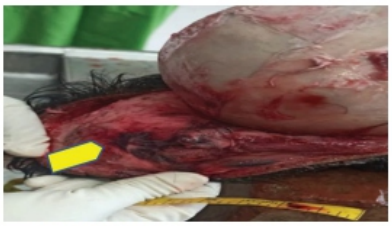

Fig. 5: Scalp haematoma over the right occipital region

Fig. 6: Subdural haemorrhage with subarachnoid haemorrhage over bilateral occipital lobes and the cerebellum

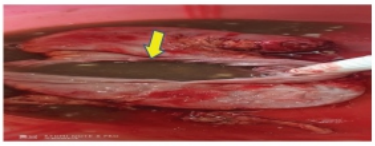

Fig. 7: The stomach contained brownish-coloured fluid with semi-digested rice particles

smell (Fig 7). Brain & lungs were congested and oedematous. All the other organs were alsocongested. Histopathology Examinations howed features of interstitial oedema & congestion inthe lungs, heart tissues showed congestion andthe kidneys showed acute tubular necrosis.High-Performance Liquid Chromatography(HPLC) detected morphine in the blood. Thefinal opinion as to the cause of death was givenas “Asphyxia with intracranial haemorrhageresulting from blunt head trauma”.

DISCUSSION

A death is labelled as suspicious if it is unexpected, and its circumstances or causeare unexplained in the early investigation.4The body was brought by the police as acase of a suspected drug overdose. It iscommon for substance-abusing individualsto accidentally injure themselves because ofinebriation or intoxication, which impairsjudgment or motor control or coordination.5 At the same time, inflicting injury to thehead is one of the most efficient methodsof homicide as assailants often select a partof the body, where the maximum damagecan be done with minimum effort.6 Further,an overdose of opioids can suppress therespiratory system, resulting in hypoxiawhich can result in variable levels of braindamage, ranging from transient cognitiveimpairment to death.7 However, the presenceof multiple blunt trauma on the body withassociated head injury baffled the autopsysurgeons regarding the cause and nature ofdeath in the present case. It appeared that thedrug overdose led to considerable harm torespiratory control in presence of blunt headtrauma. Hence, asphyxia and homicidal blunt head trauma could have contributed to the sudden death of the person. Interestingly, theautopsy findings in the present case helped inturning the investigation towards homicide.

CONCLUSION

The present case was a challenge for the autopsy surgeon since there were manyfactors which contributed to the cause ofdeath. Both head injury and drug overdosecan individually cause death in ordinarycircumstances. In the present case, autopsyhelped in establishing the cause and mannerof death, and helped in the investigation ofthe crime in the right direction.

Ethical clearance: Taken from Research EthicsBoard Committee, RIMS, Imphal.
Source of funding: Nil
Conflict of Interest:- Nil

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Sociodemographic Profile of Cases of Deaths Due to Poisoning -1 Year Study

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ABSTRACT

Poisoning is a major public health problem globally, with thousands of deaths occurring every year, & those who survived the same, live with a life long suffering. In a developing country like India where more thanhalf of the population is still engaged in occupational activity of agriculture, accessibility to toxic substancesis not much hard. That is the reason, organophosphorus compounds are the most commonly used poisonoussubstance creating a burden of poison related morbidity & mortality.

Objective: 1) To determine sociodemographic profile of poisoning cases brought for autopsy. 2) To assess theirpattern.

Methodology: A cross sectional study was conducted for a period of 1 year (January 2021 – December 2021),in cases of poisoning brought for autopsy at Tertiary care teaching hospital, Thoothukudi. All the data wereregarding age, gender, residence, type of poison, manner, duration of hospitalisation & outcome was collectedbased pre structured proforma & further chemical analysis report. Data was analysed using standard statisticalmethod.

Results: Of the total, 140 cases, poisoning studied, 77% cases were males, 23% females. Maximum case was noted in age group of 31-40 years (22.9%), majority belong to lower socioeconomic class (88%), Organophosphoruscompounds contribute 60% of cases, & majority of it is suicidal poisoning – 89%. , the maximum duration oftreatment taken was between 1-7 days(51.4%).Conclusion:- Males contribute majority of poisoning cases. It is themiddle age group, with suicidal poisoning tendency more contributing to total cases. Early& proper treatmentcare in acute poisoning cases, with increasing mental health awareness among the common public can help inreducing the mortality due to poisoning.

Keywords: Organo-phosphorus, suicidal poisoning,

INTRODUCTION

Poisoning is a major public health problem globally, with thousands of deaths occurringevery year, & those who survived live a life long suffering. In the last few decades,with the improvement in knowledge ofscience &technology a revolution has been created, whereby man has found new ways to lead a healthy life as well as to earlyend his life. In the scenario of developedworld, it is the household chemical agentsand prescribed drugs commonly used aspoisoning agents, whereas in the developingcountries, agricultural - chemicals, in spite of their invaluable contribution increasing the food production and pest control, are themost common offenders. There are more than9 million natural and synthetic chemicalsworldwide and the list keeps on growinginexorably. Pesticides are the commonestcause of poisoning and according to WHOestimates approximately 3 million pesticidespoisoning so occur annually worldwidecausing more than 220000 deaths(1). Indiaaccounts for one third of pesticide poisoningcases in the third world and the worst affected are the farm workers who contribute nearly

three quarters of the labour force. In generalaccidental poisoning is more common in children whereas suicidal poisoning is more common young adults. Most of thefatality rate is of intentional poisoning by OP(Organo-phosphorous) compounds, whichhas been reported in southern and centralIndia.As per National Crime Records Bureau (ncrb) studies, the rate of suicides is 12% in2021 which was 9.9% in 2017. Among thestates with higher percentage of share ofsuicide during 2019-2021 was Maharashtra(13.6%) , followed by Tamil Nadu (9.7%).The most common method adopted by victims was hanging (57%) followed bypoison (25.1%) as per 2020-2021 studies().Hence It is very important to know nature and severity of poisoning in order totake appropriate preventive measures. Theaim of present study is to determine the socio-demographic profile and assessing the pattern of commonly used poisons inthe cases being brought for medico legal examination.

MATERIALS AND METHODS

The present cross- sectional study was conducted for a period of one year fromJanuary 2021- December 2021, in the casesof death due to poisoning, subjected toautopsy at Government Thoothukudi medical college. Cases of Snake bite, food poisoningand alcohol intoxication were excludedin the study. Data regarding age, gender,residence, time elapsed after intake, type ofpoison, manner of poisoning, duration hospitalization and outcome was collected ina pre-structured proforma based on inquestreport, post mortem examination & reportof chemical analysis of viscera from forensic science laboratory . The data was analyzed using standard statistical methods.

RESULTS

Out of total -895 cases brought for medicolegal autopsy in 1 year study period,140 (15.64%)poisoning cases werepresent.In this,males(n=108, 77%) , contributed the majorityof cases compared to females (n=32, 23%).The incidence of poisoning death was notedto be higher in age group of 31-40 years (n=32,22.9%) & lowest was recorded in 71-80 yearsage group(n=4, 0.03%)- (table 1)
The incidence of poisoning was foundto be more among married (n=102, 72.86%), while among singles (n= 38, 27.14%).inour case, majority of the deceased belong tolower socioeconomic status (n=124, 88.57%),while minimal no. in upper class(n=1,0.07%).The majority of case was found to haveoccurred in time period from July- September

Table 1: Age Distribution

Age Group	Male(N)	%	Female(N)	%	Total
10-20 YRS	6	50%	6	50%	12
21-30 YRS	14	73.68	5	26.31	19
31-40 YRS	28	87.5	4	1.25	32
41-50 YRS	20	83.33	4	1.66	24
51-60 YRS	20	80	5	20	25
61-70 YRS	16	66.66	8	33.33	24
71-80 YRS	4	100	0	0	4
TOTAL	108	77.14	32	22.857	140

Table 2

Commonly used poison	No.of cases (n)	%
organophosphorous	84	0.6
Herbicide	9	6.4
Rat paste	9	6.4
Tablet overdose	8	5.7
Hairdye	5	3.57
Others	25	17.85
TOTAL	140	

n=52, 37.14%), while least in january –march time period (n=25, 17.87%).The mostcommon manner of death was found to be suicidal(n=125, 89%), while the least commonwas homicidal (n=1, 0.007%).

Most commonly used poison was organophosphorous (n= 84, 60%), while least common wash airdye(n=5,3.57%),weincludedin other poisons (carbamates/kerosene/plant poison/acid poison/cow dung poison) which contributed n=25,17.857%(TABLE1.2) .Of all the samples from poisoning casessent to viscera analysis -positive report wasless (n=47,33%), while negative report wasobtained more (n=93, 67%).

Majority of cases occurred at home (n=96,68.57%) while those occur outside homewas comparatively less (n-44, 31.4%) .Thetime duration of survival after poisoning tilldeath, maximum deaths occurred in 1-7 days(n=72,51.4%), while those who survived morethan 7 days was only (n=12)8.57%.

DISCUSSION

There has been an ongoing trend in increase in no. of deaths due to poisoning. The socio demographic profile plays major rolein it. The regional variations & accessibilityto different sorts of poison can vary fromplace to place at times. In our present studyof the total- 865 cases, 140 cases account forpoisoning which is15.62%. Almost similarpattern was observed In incidence ofpoisoning case study conducted in variousparts ranging between 10-20%, as in studies by Kumar TN etal -11.7%, Kanchan Tetal – 17.9%,Raut PK etal -14.54, Rangu Sridhara chary etal-15.7%, while exceptions were noted instudies of Harish D, Shetty AK etal, Singh SPetal ,Haloi m etal with incidences of – 24%,25%, 5.25%, 3.7% respectively(3,4,5,6,8,11). Ruralbackground as the common backgroundcorrelates with almost every study. The mostcommon manner being suicide was notedin our study (89.28%), similar to findingsby Siddhapur KR etal (93.1%), Haloi .M.etal(92.7%), Kumar D Retal(91.53%)(10,12).Thisimplies that poisoning is most commonly used method for suicide, as it is easily available inany house, & mere enragement or stress factoror even under effect of addiction, compel theperson to take it as soon as possible. Majoritydeaths was seen in males (77.14%) similarto other studies. This shows though women are said to be mentally weak, when it comesto handling social, economic stress, many atimes men fall prey to thought of losing their lives.

As per our study , majority of deceased belong to age group-31-40 yrs (22.85), whichis a bit different from other studies, wheremore predominant age group was 21-30 years, as per studies of Raut P K etal (45.71%),Shetty AK etal (43%), Singh S P etal (41.82%).(4,7,12)This variation might be possibly due to variation in living conditions of people over here compared to other regions. The workingclass bear

more stress , are more addicted tosubstance abuse which often leads to family problems, emotional breakdown ultimatelyending up in deaths. As similar to other studies , in our study also the incidence ofpoisoning among married people was more(72.857%) , other studies also supporting thesame as per Haloi. M et al. (66.6%), SinghSP et al(60%), Raut Pk et al(60%). (4,7,10)Theunsatisfactory married life, unemployment, substance abuse, extra marital affairs allcontribute to the increasing incidence a5mongmarried groups. The most common poisonused is organophosphorous ((n=84,60%),which is almost same in every region ofindia with exceptions seen in studies ofsinghSP et al (aluminium phosphide = 50.9%),Harish Detal (aluminiumphosphide=50.2%), GargiJetal (aluminiumphosphide–43.6%).(4,8,9) In general insecticides with organophosphoruscompound contribute maximum as it is easilyavailable for agricultural purpose . But as perour study viscera analysis came positive forless cases (n= 47, 33.57%), while negativefor majority of cases (n=93 , 66.42%) whichis contradictory to studies of Rangu SridharaChary et al(88.97% positive), Gargi j HR Chanana A.(2,9)The variation may be dueto presence of very trace amounts of poisonsinsamples available, can be due to effectiveinitial treatment of eliminating poison, or maybe due to the false history alleged the poison consumed or may even be due tothe laboratory analysis difference. In majorityof cases the incidence of poisoning occurredwhile they were at home (n=96, 68.57%),indicating no matter whatever the cause is,majority of them prefer their last times athome itself.

CONCLUSION

Organophosphorous contribute the major cause of poisons contributing to death.In a developing country like India wheremajority of its earnings come from agricultureactivities, the use of insecticides/ pesticidescannot be fully avoided. The same is withthe industries involved in producing theseschemicals. Rather than banning these items, putting a control over their accessibilityis what can be done at the maximum.The increased health awareness amongcommon public including the mental healthcare programmes to tackle the serious lifesituations can very much reduce the suddenprovocative thought of committing suicides.The various government schemes & financialsupports to support the rural class can help in their upbringing socially & economicallythereby reducing the burden. The increasedsetting up of poison information & controlcentres with sophisticated technologies canhelp in effective diagnosis & management ofcases thereby reducing the mortality.

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CONFLICT OF INTEREST: NIL

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Retrospective Study of Pattern of Skull Fractures in Different Medicolegal Autopsies

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A B S T R A C T

Skull fractures occurred in RTAs, Assaults and other cases are the most common cause for hospitalization, disability, financial loss and death of the individual. Skull fractures are of various types i.e., linear, comminuted,depressed, hinge etc. Some of the skull fractures may cause rupture of dura mater and injury to brain matterthereby, causing permanent neurological damage and death. In this present study, we focused on the pattern ofskull bone fractures involved in various manners like Accidental, Homicidal, Suicidal, also pattern of distributionamong male and female, age wise distribution, time of death in a day, and also discussed about any otherassociated injuries that contributes to cause of death. 165(92%) skull fractures are observed in accidents, 141(78%)cases involve linear fracture. region wise distribution most commonly involved is base of skull region alone in63(35%) cases commonly seen in fall from height cases, parieto-temporal and base of skull together 36(20%) casesseen in road traffic accidents, temporal and base of skull region 14(7.8%). In other associated injuries commonlyinvolved intracranial haemorrhages and scalp contusions.

Keywords: skull fractures pattern, manner of death, age wise distribution, region of fracture

INTRODUCTION

Skull fractures occurred due to RTAs, Assaults and other cases are the most common cause for hospitalization, disability, financial lossand death of the individual. Skull fracturesare of various types i.e., linear, fissured,comminute and depressed. Some of the skullfractures may cause rupture of the dura materand brain matter thereby causing damage tothe brain and leads to permanent neurologicaldamage and leads to death. In this study wescientifically want to study the pattern of skullbone fractures involved in various manners like Accidental, Homicidal, Suicidal and also pattern of distribution among male andfemale, age wise distribution, time of deathin a day, and also discuss about any otherassociated injuries that contributes to cause of death.

MATERIALS AND METHODS

In this study total 180 cases post-mortem conducted in mortuary of GGH Mortuary,Guntur Medical, Guntur. These cases arepresented with skull fractures for post-mortemexamination in which manner such as accidental,homicidal, suicidal to be assessed during the period of April 2022 to September 2022. Allthe necessary information is collected fromthe inquest papers, investigating officer andrelatives of the deceased. All the findings aredescribed in detail in the prescribed proformaand the collected data

analysed with suitablestatistical tools to find out the significance of the results.Autopsy dissection techniques are used with references from Otto saphir2

RESULTS AND DISCUSSION

Head injury is a morbid state, which is produced by mechanical force which indicatesthe severity of force applied to the skull region to cause fractures and effect on brain such as transient concussions up to some extent.mostly due to blunt force impact and causinggross and subtle structural changes in thescalp, skull, and contents of the skull. There are two types of forces that leads to causinghead injury 1. Direct Force like compressionof skull under the heavy objects like vehiclewheels commonly seen in road accidents. 2.Indirect force from heavy objects like bricksand metal sticks hitting the head in motion which is seen in assault cases, in other way head is in motion and it is hitting the stableobjects observed in fell on hard surfaces.

Outer table of skull bone is comparatively thicker than inner table, approximately twotimes1. The thickness of skull bone varies fromregion to region such as thicker in temporal,sphenoid greater wing, sagittal ridgesand protuberance of occipital and thinner,vulnerable at parietotemporal lateral partsof frontal bone and lateral parts of occipitalbone. It is rare that the skull fracture itself isdangerous to life, but the concomitant effectof transmitted force upon the cranial contents.

In present study total 180 cases of deathswith skull fractures were included of which153 cases are male, 27 are female. Among theselected population, male predominance isseen (85%) when compared to Female (15%)it indicates that male persons are mostly accompanied with outdoor chores and it issimilar to study conducted by Dr. R. Ravi Kumar7 mentioned in his study, male victims are 87.75%.

All the cases are divided according to the age group as shown in Table1, In age groupwise distribution more in age groups 41-50years i.e., 30%, 20% in 21-30 years, and it isalmost equal to age group 31-40 years (18%),51-60 years (17%) indicate that skull fracturesare more common in younger and middle age groups. Inference from above, highest numberof cases belongs to the age group between 41-50 years and least number in the age groupbetween 0-10 years (Table 1).

Distribution of cases among manner ofdeath 165(92%) cases are due to accidental,9 (5%) cases are due to homicidal,6(3%)cases are due to suicidal in manner of death(Table 2). Manner of death in skull fracturesseen are mostly accidental (92%), followed byhomicidal (5%), suicidal (3%) which indicatesthat reason for skull fractures commonly areroad traffic and other accidents, least commonin assault, and suicidal falls.

In present study total 180 cases of deathswith skull fractures were included of which66(37%) died at 6AM to 11.59PM,48(27%)

Table 1: Age group wise distribution of cases

Age groups	Number cases of deaths with skull fractures	Percentage (%)
0-10	3	2%
11-20	6	3%
21-30	36	20%
31-40	33	18%
41-50	54	30%
51-60	30	17%
61-70	12	7%
71-80	6	3%
Total	180	100%

Table 2 : Distribution among manner of death

Manner of Death	Number of Autopsies	Percentage
Homicidal	9	5%
Suicidal	6	3%
Accidental	165	92%
Total	180	100%

died at 12NOON to 5.59PM,33(18%) cases died at 6PM to 11.59PM,33(18%) died at12AM to 5.59AM. Time of death in a 24 hours framework as shown in table 3, commonlyoccurs in road traffic accidents morninghours 6 AM -11.59 AM i.e. (37%), followed by12 PM- 5.59 PM (27%), indicate that most ofthe incidents causing head injuries occurs inbetween 6 AM – 11.59 AM, it is almost equalto total cases happened during night hours 6 PM -5.59 AM (Table 3).

In present study total 180 cases of deaths with skull fractures were included of which the following region wise distribution ,63(35%)is present in base of skull region ,36(20%)is present in parieto-temporal and base ofskull ,14(7.8%) is present in temporal andbase of skull region fracture and remainingall regions wise distribution in below 4). Skull fractures region wise distributionmost commonly involved is base of skullregion alone in 63(35%)cases commonlyseen in fall from height cases ring fracturesare commonly seen3, parieto-temporal and base of skull together 36(20%)cases seen inroad traffic accidents, temporal and base ofskull region 14(7.8%)cases ,when comparedto study done by Anh, Nguyen Tuan4 et.al,where the temporal bone and base of skull aremost common and when compared to studydone by Sunil Kumar soni5 et al, where mostcommon site of fracture is frontal (40.35%)followed by temporal (28.94%) (Table 4).

In present study, deaths with skull fractures (table 5) were included of which141(78%) are Linear type of fractures,24(13%) is comminuted type of fractures, 6(3%)are Hinge type of fracture and depressed,

Table 3: Distribution among time of death in a day

Time of death	Number of Autopsies	Percentage
12AM to 5.59AM	33	18%
6AM to 11.59AM	66	37%
12NOON to 5.59PM	48	27%
6PM to 11.59 PM	33	18%
Total	180	100%

depressed+ hinge, comminuted + hinge each share 3(2%) of distribution. Type of fracturesdistribution in our study most commontype is linear or fissure (78%) followed bycomminuted fracture (13). It is similar to thestudy conducted by the Sunil Kumar Soni5et.al where the 56.14% are linear fractures and comminuted fracture are 10.52%andalsointhestudy conducted by Anh, Nguyen Tuan4 et.al,the most common type is linear (46%) and asper Author David dolinak8 most encountered skull fractures in post-mortem examinationare linear and curvilinear fractures (Table 5).

In present study total 180 cases of deaths with skull fractures were included of which75(42%) cases are associated with intracranial haemorrhages, 35(20%) cases are associatedwith contusion of scalp,19(10%) each areassociated with black eye and blunt injury toneck,16(9%) each are associated with lacerationof scalp and blunt injury tochest (fracture of rib).Other injuries associated with skull

fractures are

Table 4 : Distribution among skull region wise injury

Area of fracture	Number of persons affected	Percentage (%)
Frontal	3	1.7
Temporal	3	1.7
Parietal	8	4.4
Occipital	3	1.7
F+P+T	3	1.7
P+T	9	5
F-P-MCF	3	1.7
Orbital+F-P	3	1.7
O+BOS	11	6.1
P-T+Base of skull	36	20
P+O	3	1.7
T+O+F+BOS	3	1.7
F+BOS	3	1.7
F-P+BOS	3	1.7
T+BOS	14	7.8
BOS	63	35
F-T+BOS	3	1.7
P-O+BOS	6	3.3
Total	180	100

Table 5: Distribution among type of fracture

Types of fracture	Number cases of deaths with skull fractures	Percentage *%)
Linear	141	78
Comminuted	24	13
Depressed	3	2
Hinge	6	3
Depressed +Hinge	3	2
Comminuted fracture+ Hinge	3	2
Total	180	100

Table 6: Distribution of other associated injuries along with skull fractures

Associated injuries	Number of affected	Percentage
Intracranial haemorrhage	75	42%
Black eye	19	10%
Laceration of scalp	16	9%
Contusion of scalp	35	20%
Blunt injury to neck	19	10%
Blunt injury to chest (rib fracture)	16	9%
Total	180	100%

as shown in Table 6, intracranial haemorrhages (42%) are more common6 and least with bluntinjury to the neck causing spinal cord fracture(10%) (Table 6).

CONCLUSION

Skull fractures are more common in accidents and causing more deaths in male population belongs to middle age which are mostlypreventable in nature by providing earlymedical assistance to the victims can decreasethe death rate and effective implementationof preventive measures and strengthen themedical policies. Most common region of skull involved in road traffic accidents areparietotemporal and base of skull, regioninvolved in fall from height is base of skulland in assault cases parietal region.

Conflict of interest statement: None.
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Ethical consideration: This study is approvedby Institutional Ethics Committee of Guntur Medical College, Guntur, vide reference no.GMC/IEC/015/2022, Dated 29-09-2022.

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Forensic Epidemiological Study of Drowning Deaths in a Cosmopolitan City of Karnataka

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ABSTRACT

Drowning is one of the leading causes of unintentional injury death worldwide, amounting to about 7% of all injury-related deaths. The estimated world-wide annual deaths due to drowning is said to be around 2,36,000.Children, males and individuals with increased access to water are most at risk of drowning. In India there existsproximity of people with the water bodies like rivers, canals, wells or ponds. All these water bodies are easilyaccessible and there are hardly any preventive or safety measures. This major public health problem related todrowning can be prevented by frequently studying data from the medicolegal registers, which is primarily theaim of this study.

Keywords: Drowning, Asphyxia, Autopsy, submersion, epidemiology, prevention.

INTRODUCTION

Drowning is a form of asphyxia caused by aspiration of fluid into air-passages, causedby complete or partial submersion in wateror other fluid medium. In the year 2002 theWorld Congress on Drowning (WCOD) whichwas held in Amsterdam gave new definitionof drowning as “the process of experiencingrespiratory impairment from submersion or immersion in a liquid.

Magnitude of the Problem

In many countries, a major contributor to premature mortality and an important cause of deaths due to unintentional injury is drowning.2 According to the current estimates of World Health Organization,every year almost 0.26 million people die dueto drowning out of which more than 90% ofthe victims are from low- and middle-incomenations.3 As per NCRBI data in the year 2021,drowning was the third major contributorwhich accounted for 7.5% of all unnaturalcauses of accidental deaths.4 In India, majorsources of water supply are wells, rivers,canals and dams. Due to ease of accessand lack of safety measures drowning is acommon cause of unnatural deaths. Also dueto easy and unsecured access to water bodies in India it becomes an easy way for disposingon bodies after homicide.5 And determining the manner of death especially in drowning deaths has always posed a great challengeto the forensic pathologist. The encountersare even more plausible in coastal areas.Mangalore is a cosmopolitan coastal citylocated in the Southwest part of India withmore than nine lakh inhabitants surroundedby the Arabian Sea and Nethravathi river.Mangalore is a tropical region with peak summers

and well known forits heavy rainfall during the rainy seasons with overflowing of Nethravathi river and in-turn occurs floodingof the low-lying areas in the sub-urban areas.6Data and knowledge about factors affecting drowning can help in better understandingof this menace and in turn lead to moreeffective measures to prevent the problem,albeit challenging. This paper aims to studythe epidemiology of drowning deaths in Mangalore, over the last six years roughly(5.5 years) so that preventive measures can be undertaken.

MATERIALS & METHODS

The study material consisted of 306 medicolegal autopsies conducted in the department of forensic medicine and toxicology, KanachurInstitute of Medical Sciences, Mangalore,Karnataka between January 2016 to June 2022 making it a period of five and halfyears. Of these, 19 cases (6.2%) were deathsdue to Drowning. These Drowning deathswere studied retrospectively (retrospective observational study design) after obtaining clearance from the institutional ethical clearance committee.

Forensic epidemiological study parameters to be studied such as age, sex, season, watersource, manner of death, and occupation wererecorded on a structured proforma. Caseswhich are still pending toxicological chemicalanalysis were excluded. Hospital case records,police inquestreports, detailed interview withrelatives, post mortem examination reportsand chemical analysis reports were the sourcefor material.
The information thus collected, wastabulated using Statistical Package for Social Sciences (SPSS) software, IBM manufacturer,Chicago, USA, version 21.0 and results werethereby drawn.

RESULTS

During this study period, a total of 306 cases were brought for postmortem examinationout of which 19 (6.2%) deaths were due toDrowning. The highest number of victims11 (57.9%) belonged to age group of 41-50years [Table 1]. Males dominated femalesin number of deaths. 14 victims were males(73.68%) and 5 victims were females (26.31%)[Table 2]. Majority of deaths happened duringrainy season amounting to 12 deaths (63.15%)[Table 3]. The most common manner ofdeath was accidental drowning amountingto 16 deaths, (84.21%) [Table 4]. Maximumnumber of persons fell victim by falling intooverflowing canals (gutters) amounting to13 deaths (68.42%) [Table 5]. Majority of thevictims 16 (84.21%) were self-employed streeturchins [Table 6].

Table 1: Age Distribution of Decedents

Age group (Years)	Number of Deaths	Percentage (%)
0-10	-	-
11-20	1	5.26
21-30	1	5.26
31-40	4	21.05
41-50	11	57.9
51-60	2	10.52
TOTAL	19	100

Table 2: Sex Distribution

Sex	Number of Deaths	Percentage (%)
Male	14	73.68
Female	5	26.32
TOTAL	19	100

Table 3: Season of Death

Season	Number of Deaths	Percentage (%)
Summer	6	31.57
Rainy	12	63.15
Winter	1	5.26
TOTAL	19	100

Table 4: Manner of Drowning

Manner	Number of Deaths	Percentage (%)
Accidental	16	84.21
Suicidal	3	15.79
Homicidal	Nil	-
	19	100

Table 5: Drowning Water Source

Water Source	Number of Deaths	Percentage (%)
Canal (Gutter)	13	68.42
Well	5	26.32
Sea	1	5.26
TOTAL	19	100

Table 6: Occupation of Decedents

Occupation	Number of Deaths	Percentage (%)
Unemployed Student	1	5.26
Self-employed Street Urchin	16	84.21
Employed	2	10.52
TOTAL	19	100

DISCUSSION

In this section the authors attempt to compare our study findings with observations madeby other researchers on forensic epidemiologyof drowning hitherto falling during the sameobservational study period as ours or such coastalregions to. It would be pertinent to the readers atthis stage firstly to know that there are 6 tertiarycare medical college and hospitals within a16-kilometre radius in the city of Mangalore. Thedata collected from KIMS hospital Mangalore isbut a smallfraction of cases falling under the same jurisdiction of police stations which prefer the government hospital in majority of cases. Thus,when our study values do not correlate with otherresearchers, this factor has to be kept in mind.And when they do, they cannot be equated withcities bigger than Mangalore. However, the studygets its advantage over other regions because ofthe city being located in a coastal region.
Majority of the decedents in our study belonged to 41-50 years age group which correlated with findings made by Lin YC et al.,7and closely to Niraj Kumar et al.,8 but it did not correlate with Shetty & Shetty 6 , Radha krishnaet al.,9. Males predominated females in ourstudy which correlated with findings made byall authors credited above.6-9 Further, majority of the decedents fell victim during rainy season.This observation correlated with study madeby Radha krishna et al., but it did not correlatewith observation made by other researcherscredited above. 6,7,8 This could be due toregional/locality/topographical differencesbetween the suburbs versus downtown. Themost common manner of death was accidentalin our study which correlated with all otherauthors credited above. 6-9 While consideringthe water source to which the decedents fellvictim to- most of our studied cases submerged into overflowing canals (gutters) whichcorrelated with all authors credited above 6,8,9except by Lin YC et al. This small differencein non-correlation could be explained by thefact that their study primarily focussed ondrowning in the elderly in bathtubs. Lastly,we observed that majority of the decedents inour study were self-employed street urchinswho being more prone to drowning whichmay be well put as an occupational risk. This observation correlated closely correlated with Niraj Kumar et al but it did not correlate withother authors credited above. This could beonce again due to the difference in the localityas stated earlier the scenario of the suburbs ofMangalore versus downtown.

CONCLUSION

The authors conclude that drowning is undoubtedly a high-priority public healthproblem. The Municipal corporation andsuch bodies have taken adequate measuresin every area such as barricading entry ofpeople into the beaches during the nights,appointing night watchmen around thebeaches, prompt closure of open drains etc.However, the topography of the suburbs issuch that the mud easily gets leeched leading to overflowing of gutters and canals whichwe feel must be looked upon to so that theseaccidental deaths being predominant willreduce. While the municipal bodies haveno role in curbing suicidal and homicidal drowning deaths, it purely rests in the mentality of every individual to live and letlive in accordance with the law as legallyabiding citizens of India.

Conflict of Interest: None
Ethical Committee Clearance: Obtained
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A Study of Postmortem Findings of Asphxial Deaths Due to Hanging in a Semi Urban Region of Karnataka

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ABSTRACT

Hanging, a method of deliberate & intentional self-harm amounts for a major proportion of autopsies which medicolegal experts encounter in their clinical tenure at various hospitals pan India. A retrospective study wasconducted in the Department of Forensic Medicine and Toxicology, Kanachur Institute of Medical Sciences,Mangalore from Jan 2016 to June 2022, with an objective to study the post mortem findings in autopsy casesof hanging. Out of 306 autopsies, 14.38 % cases were that of hanging with a female to male ratio being 3:1.Most cases were atypical (81.81%,36) and partial hanging (72.72%, 32) with the ligature mark situated abovethe thyroid cartilage. 86.36 % of cases (38) had dried salivary stain at the angle of mouth and one case showedinvoluntary discharge. The incidence of fracture of hyoid bone and thyroid cartilage not observed in any cases.

Keywords: Violent asphyxia, Hanging, Autopsy, salivary stains, thyroid cartilage, hyoid bone.

INTRODUCTION

Hanging is a type of violent asphyxial death in which the neck is constricted with aligature and the body is suspended whereinthe weight of the body acts as the constrictingforce. According to the literature, there aretwo types of hanging that are documentedi.e., hanging with complete suspension of thebody without the feet touching the ground(complete hanging); and hanging withincomplete suspension, with parts of the bodyor feet touching the ground (incomplete orpartial hanging). Based on the position of the knot, hanging is described under 2 headings –Typical hanging where the knot is present atthe occiput and atypical hanging where theknot is at any other position.

At autopsy, the classical signs of asphyxia observed are cyanosis, congestion, petechialhaemorrhage, pulmonary edema andpostmortem fluidity of the blood.[1,8]

A detailed assessment of various postmortem findings is always deemed mandatory especially in a few cases where the ligaturemark produced due to the variable amount ofpressure on the neck may create ambiguity.

In the current study it is attempted to get an insight into the post mortem features of deaths due to hanging in Mangalore region.

MATERIALS AND METHODS

The study consisted of 44 hanging victims out of 306 medico-legal autopsies performedin the Department of Forensic Medicine,Kanachur Institute of Medical Sciences,Mangalore, Karnataka during the period of5.5 years (from January 2016 to June 2022).

Necessary information for the study wasgathered from inquest report by the Policeand treatment records of hospital. Discussionwith relatives, friends, and neighbours ofthe victims were also obtained separately foradditional data. In certain cases, crime scenevisits and review of the photographs wereutilized for supplementary information.

A detailed proforma was used to recordthe details of observation made in the cases ofhanging in the present study. The informationthus collected, was tabulated using StatisticalPackage for Social Sciences (SPSS) software,IBM manufacturer, Chicago, USA, version21.0 and results were thereby drawn.

RESULTS

During this study period, 306 cases werebrought for post-mortem examination outof which 44 (14.38 %) deaths were due tohanging. 3/4th of the victims were females.
Out of 306 cases, typical hanging was found only in 8 cases (18.19 %) whereas mostof the cases 36 (81.81%) were atypical hanging.Knot was on the left side of neck in 23 cases(52.27%) (Table 1).

In the present study partial hanging was seen in almost 3/4th of the deaths. Completehanging was accounted for 12(27.28%) deaths(Table2).

In our study, the level of ligature mark was above the thyroid cartilage in 38 cases,overriding the thyroid cartilage in 4 cases and below the thyroid cartilage in 2 cases (Table 3).86.36 % of cases (38) had dried salivarystain at the angle of mouth and 2.27 % of total case showed involuntary discharge.
No incidence of hyoid bone and thyroidcartilage fracture were observed in any of the cases.
Postmortem lividity was seen over the back of the body in 41 (93.18%) cases.

In present study, Peri ligature injuries like rope burns (93.18% of cases) followed by Cyanosis of fingertips and nail beds of both hands (88.63 % cases) were one of the commonest findings. Petechial haemorrhage on face were observed in all partial hanging case. Pale, white, hard and glistening sub cutaneous tissue underneath the ligature marks were noticed at autopsy in all cases. Pulmonary edema was observed in 42 cases

Table 1: Typical and Atypical hanging

	Position of knot			
Typical / Atypical	Back	Left	Right	Total (n=44)
Typical	8	-	-	8(18.19%)
Atypical	-	23	13	36(81.81%)
	8(18.19%)	23(52.27%)	13(29.54%)	44

Table 2: Type of Hanging (Complete / Partial)

Type of Hanging	Number	Percentage
Complete	12	27.28
Partial	32	72.72
Total	44	100.0

Table 3: According to the Level of the Ligature Mark

Level of ligature mark	Cases	Percentage
Above the thyroid cartilage	38	86.36
Below the thyroid cartilage	2	4.55
Overriding the thyroid cartilage	4	9.09
Total	44	100

and congestion of lungs were noticed in all the cases. Other classic signs of asphyxia were absent in majority of complete suspension of victims' bodies.

DISCUSSION

During this study period, 306 cases were brought for post-mortem examination out ofwhich44 (14.38 %)deaths were due to hanging.75% of the victims were females. Domestic and work-related issues, bereavement, failurein love along with easy accessibility of ligaturematerial in a private setting may be the cause for the female predominance.

In our study, atypical hanging (81.81%) was commonly noticed over typical hanging (18.19 %). In over half of the victims' cases, Knot was on the left side of neck. Similar findings were observed in the studies conducted by other authors. 1, 2,11 The form of knot and completeness of hanging are important in determining the ligature mark over the neck.

In the present study, partial hanging was more commonly observed in comparisonto complete hanging which was reported inapproximately 1/4th of the deaths. This is inconcurrence with studies by some authors1,2 but not in agreement with a few others. 3,4,12,15 This could be due to regional influence,multiple medical colleges being under thesame jurisdiction of the police stations,dynamics of hanging with regards to the residence.

In our study, the level of ligature mark was above the thyroid cartilage in majority of the cases followed by those overriding the thyroid cartilage and the least below the thyroid cartilage. This was also observed in few other studies. 1,4,13This observation is suggestive of a greater force acting of in the elastic soft tissue over a small area of the neck between bony margin of the jaw and the thyroid cartilage.

Majority of cases (38) had dried salivary stain at the angle of mouth and a single casepresented with involuntary discharge atautopsy. The findings are consistent with afew north Indian studies 5,12 who observed 32.31% cases with dribbling of saliva. Absence of hyoid bone and thyroid cartilage fracture inany of the cases was inconsistent with a few studies.2,6,7,8,9,10,12

Postmortem lividity was seen over the back of the body in majority of the victims'points to the fact that the body was removedfrom suspension within a few hours andplaced in a prone position.

These internal findings at autopsy with regards to signs of asphyxia was found to beconsistent with a few literature studies. 13,14

CONCLUSION

Precise understanding and interpreting of autopsy findings in hanging cases is of utmostimportance in making an assertive diagnosisof death owing to hanging. Our current studyshowed that the findings in different types ofhanging could differ, from time to time withexceptions to the largely accepted. Awarenessof these combinations of findings are ofvital importance in coming to an inferencein a suspected case of hanging to avoid any inaccurate opinion.

Conflict of Interest: Nil
Ethical Clearance: Obtained
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2. Survey paper (giving an original, detailed and critical view of a research problem or an area to which the author has made a contribution visible through his self-citation);

3. Short or preliminary communication (original management paper of full format but of a smaller extent or of a preliminary character);

4. Scientific critique or forum (discussion on a particular scientific topic, based exclusively on management argumentation) and commentaries. Exceptionally, in particular areas, a scientific paper in the Journal can be in a form of a monograph or a critical edition of scientific data (historical, archival, lexicographic, bibliographic, data survey, etc.) which were unknown or hardly accessible for scientific research.

Professional articles:

1. Professional paper (contribution offering experience useful for improvement of professional practice but not necessarily based on scientific methods);
2. Informative contribution (editorial, commentary, etc.);
3. Review (of a book, software, case study, scientific event, etc.)

Language

The article should be in English. The grammar and style of the article should be of good quality. The systematized text should be without abbreviations (except standard ones). All measurements must be in SI units. The sequence of formulae is denoted in Arabic numerals in parentheses on the right-hand side.

Abstract and Summary

An abstract is a concise informative presentation of the article content for fast and accurate Evaluation of its relevance. It is both in the Editorial Office's and the author's best interest for an abstract to contain terms often used for indexing and article search. The abstract describes the purpose of the study and the methods, outlines the findings and state the conclusions. A 100- to 250-Word abstract should be placed between the title and the keywords with the body text to follow. Besides an abstract are advised to have a summary in English, at the end of the article, after the Reference list. The summary should be structured and long up to 1/10 of the article length (it is more extensive than the abstract).

Keywords

Keywords are terms or phrases showing adequately the article content for indexing and search purposes. They should be allocated heaving in mind widely accepted international sources (index, dictionary or thesaurus), such as the Web of Science keyword list for science in general. The higher their usage frequency is the better. Up to 10 keywords immediately follow the abstract and the summary, in respective languages.

Acknowledgements

The name and the number of the project or programmed within which the article was realized is given in a separate note at the bottom of the first page together with the name of the institution which financially supported the project or programmed.

Tables and Illustrations

All the captions should be in the original language as well as in English, together with the texts in illustrations if possible. Tables are typed in the same style as the text and are denoted by numerals at the top. Photographs and drawings, placed appropriately in the text, should be clear, precise and suitable for reproduction. Drawings should be created in Word or Corel.

Citation in the Text

Citation in the text must be uniform. When citing references in the text, use the reference number set in square brackets from the Reference list at the end of the article.

Footnotes

Footnotes are given at the bottom of the page with the text they refer to. They can contain less relevant details, additional explanations or used sources (e.g. scientific material, manuals). They cannot replace the cited literature.
The article should be accompanied with a cover letter with the information about the author(s): surname, middle initial, first name, and citizen personal number, rank, title, e-mail address, and affiliation address, home address including municipality, phone number in the office and at home (or a mobile phone number). The cover letter should state the type of the article and tell which illustrations are original and which are not.

Note