

Profile of Drowning Deaths: A Cross Sectional Study from Loni, Maharashtra

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ABSTRACT

A descriptive cross-sectional study was conducted on all cases of deaths due to drowning autopsied at the mortuary of Pravara Rural Hospital attached to Rural Medical College, Loni, a rural region in Western Maharashtra, India. The study was conducted over a period of 4 years, two years retrospective (record based) from September 2012 to August 2014 and two years prospective from September 2014 to August 2016. Data was being collected from medico-legal autopsy records of drowning victims. The cases were studied to know the socio-demographic profile of victims, manner of death and place of drowning. The cases represented approximately 3.42% of all autopsy cases. The manner of the death in most cases (68.89%) was accidental in nature. Majority of the victims were male (57.78%) belonging to the age group of 11-20 years (31.11%). Most of the victims (31.11%) were students followed by housewives (28.89%). Most of the drowning cases (51.11%) occurred in well, followed by river (20.0%). Deaths due to drowning can be prevented by proper education and awareness programmes. Preventive measures include teaching swimming to children as well as adults, installing barriers controlling access to water and training bystanders in safe rescue and resuscitation measures.

KEYWORDS: Drowning; Asphyxia; Rural.

INTRODUCTION

Asphyxia is derived from Greek word and literally means "pulselessness".¹ However

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in Forensic Medicine the term asphyxia is a condition in which the process of respiration *i.e.* exchange of air between the atmosphere and the lung beds is prevented by some violent mechanical means. Violent asphyxial deaths can be caused by different methods such as hanging, strangulation, drowning and suffocation.²

Investigation of bodies found in various types of water is an important and sometimes difficult part of medico-legal examination. The World Health Organization (WHO) defines drowning as a "process of experiencing respiratory impairment from submersion/immersion in liquid." WHO estimate indicates around 236000 people died from drowning in 2019, making drowning a major public health problem worldwide. In 2019, injuries accounted for almost 8% of total global mortality. Drowning is the third leading cause of



unintentional injury death, accounting for 7% of all injury-related deaths.³ Bodies retrieved from water medium pose several recognized challenges to the autopsy surgeon. Sometimes the assailants dispose off the dead bodies of victims in the rivers, seas and wells to simulate death due to drowning. In essence, the diagnosis of drowning is one of exclusion.

We have undertaken this study to evaluate the socio-demographic profile of victims, manner of death, place of drowning and postmortem features of drowning victims in Loni, a rural region of Western Maharashtra.

MATERIAL AND METHODS

The current study was a descriptive cross-sectional study carried out at Department of Forensic Medicine, Rural Medical College of Pravara Institute of Medical Sciences. The study was conducted over a period of 4 years, two years retrospective (record based) from September 2012 to August 2014 and two years prospective from September 2014 to August 2016.

Detailed analysis of the cases was based on medicolegal records and evaluation of postmortem reports of drowning victims. Information regarding the deceased, circumstances of death were collected from the investigating officer and relatives. In some of the instances, this information was supplemented by either a visit to the scene of crime or from the photographs of crime scene, supplied by police. Putrefied bodies were excluded from this study. Approval for study was obtained from Institutional Ethics Committee of Pravara Institute of Medical Sciences.

RESULTS

Overall, 1315 medico legal autopsies were carried out during the study period, out of which 45 cases were deaths due to drowning which constitutes around 3.42% of total cases. In our study, most of the drowning deaths (68.89%) were accidental in nature, 12 cases (26.67%) were suicidal while 2 cases were homicidal in nature. Majority of the victims (57.78%) were male as compared to female (42.22%) and the male/female ratio was 1.37:1. The age range of victims in the study period was 8 days to 73 years and the commonest age group involved was 11-20 years (31.11%), followed by 21-30 years (20%). The incidence of drowning was more common in married persons (53.33%) as compared to unmarried ones (46.67%). In present study, most of the deaths were seen in students (31.11%), followed by housewives (28.89%). Most of the drowning cases (51.11%) occurred

in well, followed by river (20.0%). Among the 45 drowning deaths in present study, froth at mouth and nostrils was found in 35 cases (77.78%), cutis anserina in 25 cases (55.55%) and washerwoman's hand/feet in 23 cases (51.11%). No any case of cadaveric spasm was seen. Mud/water in trachea was present in 40 cases (88.88%), water (>100 ml) in pleural cavities in 35 cases (77.78%) while mud/water in stomach was seen in 29 cases (64.44%). Paultauff's hemorrhage was observed in 31.11% of the victims.

Table 1: Distribution in relation to marital status and occupation of victims

	n	%
Total number of autopsies	1315	100
Total deaths due to drowning	45	3.42
Manner of death		
Accidental	31	68.89
Suicidal	12	26.67
Homicidal	2	4.44

Table 2: Distribution in relation to age and gender of victims

	n	%
Sex		
Male	26	57.78
Female	19	42.22
Age		
00 - 10	5	11.11
11 - 20	14	31.11
21 - 30	9	20
31 - 40	6	13.33
41 - 50	6	13.33
51 - 60	3	6.67
61 - 70	1	2.22
>70	1	2.22

Table 3: Distribution in relation to marital status and occupation of victims

	n	%
Marital Status		
Married	24	53.33
Unmarried	21	46.67
Occupation		
Student	14	31.11

table cont....

Housewife	13	28.89
Laborer	5	11.11
Farmer	4	8.89
Service	3	6.67
Business	1	2.22
Unemployed	1	2.22
Not Applicable (Kids)	4	8.89

Table 4: Distribution in relation to place of drowning

	n	%
Well	23	51.11
River	9	20
Canal	6	13.33
Pond	4	8.89
Swimming Pool	1	2.22
Bathtub	1	2.22
Water-drum	1	2.22

Table 5: Postmortem Features of Drowning

	n	%
External Features		
Froth at mouth and nostrils	35	77.78
Cutis anserina	25	55.55
Washerwoman's hand/feet	23	13.33
Cadaveric spasm	0	0
Internal Features		
Mud/water in trachea	40	88.88
Water in pleural cavities (>100ml)	35	77.78
Mud/water in stomach	29	64.44
Paultauff's hemorrhage	14	31.11

DISCUSSION

Drowning is a serious public health problem worldwide. Most of the drowning deaths (68.89%) in our study were accidental in nature. This was in accordance with the study of other researchers.^{4,7} In the study of Stemberga *et al* at Croatia, suicide by drowning accounted for 10% of all suicides and 31% of all cases of drowning.⁸ Racz *et al* showed that accidental drowning was commonly related to alcohol consumption in South-west Hungary.⁹

Majority of the victims in our study were male. A male predominance was also seen in most of the studies by other researchers.^{4,7,9-11} Exposure to water and aquatic environments is usually more in males as compared to females. Lack of proper swimming training, working near water-bodies under influence of alcohol and absence of precautionary measures are important risk factors for accidental drowning in males.

The most common age group affected in our study was 11-20 years which is consistent with the studies of other researchers.¹²⁻¹⁴ In the study of Kiakalayeh *et al* in Northern Iran around one-third of the drowning fatalities were under the age of 20 years.¹⁵ Other studies have highlighted an increasing trend of drowning deaths in the age group of 21-30 years which is also the second most common age group affected in our study.^{4,7,10,11} Teenagers and young adults have a tendency to overestimate their skills and underestimate dangers associated with water. They engage in adventurous water activities without proper safety measures, often under influence of alcohol and drugs which leads to accidental drowning.

In our study drowning deaths were more commonly observed in married persons. Married victims also contributed to majority of cases in the studies of other researchers.^{10,11,14} This might be due to the fact that married persons are exposed more to aquatic environment for their work or means of transportation. Increased familial responsibilities, maladjustment in married life and limited source of income are important causes of suicidal drowning in married persons.

In present study, most of the deaths were seen in students (31.11%). Students also contributed to majority of the victims in the studies of other researchers.^{10,11,14} This is mostly due to the carelessness and adventurous attitude of the youngsters while swimming and involving in watersports and recreational activities in water.

Most of the drowning cases (51.11%) in our study occurred in well, followed by river (20.0%). It is known that access to water and type of water settings available will have an impact on the drowning deaths of that particular region. Well is present in many houses as well in farms in Loni where the rural people work all day long. Also there is the Pravara River which flows by the neighbouring Pravaranagar region as well as the Pravara Canal which provides water for irrigation purposes. Well was also seen to be the common place of drowning in the studies of Chaudhary *et al* and Shetty *et al*.^{4,5} Swimming pools contributed to majority of drowning deaths in the study of Morris *et al* in Pretoria, South Africa.¹⁶ Some researchers have also reported natural waterbodies to be responsible for majority of drowning deaths. In the study of Anary *et al* at Mazandaran Province, Iran, most of

the deaths were seen in the unprotected beaches of Caspian Sea while, Racz et al reported majority of the deaths occurred in River Danube (26.32%) followed by Lake Balaton (19.30%) in Southwest Hungary.^{8,9}

In our study, the most common external autopsy finding was froth at mouth and nostrils seen in 77.78% cases. This is consistent with the study of Patel et al in Baroda, India.¹⁷ However, in the study of Morris et al in Pretoria, South Africa, froth was seen in only 31% cases.¹⁶ The most common internal autopsy finding in our study was mud/water in trachea found in 88.88% cases. In the study of Patel et al mud/water in trachea was present in all cases of drowning victims.¹⁷

CONCLUSION

Though drowning is a major public health concern,

there is ample scope for its prevention and reduce the number of fatalities through proper education and awareness programmes. Preventive measures include teaching swimming to children as well as adults, installing barriers controlling access to water, training bystanders in safe rescue and resuscitation measures and improving flood risk management. Use of alcohol and drugs should be avoided while swimming or engaging in recreational activities in water. To reduce the rate of suicides by drowning, awareness has to be created by appropriate education and by influencing the media in their portrayal of suicidal news.

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