

A Study on the Patterns of Drowning Cases Brought for Medico-legal Autopsy

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Abstract

Drowning is a form of death in which the atmospheric air is prevented from entering the lungs due to the submersion of the body in water or any other fluid medium^{1,2}. Drowning can be classified as wet drowning (fresh or salt water), dry drowning, secondary drowning and the immersion syndrome or hydrocution (cold water drowning).^{2,3,4,5} Drowning is an important public health issue with major impacts on human resource which is a preventable phenomenon. According to National Crime Records Bureau, Ministry of Home Affairs in 2014, in India, death due to drowning was 6.6%, making it third largest cause of death in India⁶ India is a vast country having plenty of water bodies and an extensive coastline and under such conducive circumstances, cause of death due to drowning is a frequent event where medico-legal experts are called upon to investigate. With a view to investigate the epidemiological factors, a study was conducted in the Deptt. of Forensic Medicine, Gauhati Medical College for a period of 1 year. In our study we found that most of the victims were males (82%) in the 31- 40 years age group (24.4%). Most of the victims had drowned in fresh water (94.5%) and running type (63.8%). A total of 34 cases constituting 26.77% had external injuries. Most of the cases were accidental in nature (78%). An exhaustive study to unearth these socio-demographical factors of drowning, hence should be conducted, to analyze their impact on population and its prevention.

Keywords: *Drowning, fresh water, accidental, prevention.*

Introduction

India is a vast country blessed with natural resources of water bodies. But often this has led to inevitable loss of human life by the act of drowning. Drowning deaths are often unpredictable and poses variety of questions for a forensic expert. The WHO reports nearly 3,60,000 drowning deaths each year⁶, of which approximately 90% occur in low-income and middle-income countries (LMIC)⁷. India contributes significantly to the global

burden of drowning, with national drowning deaths accounting for 17% of global unintentional drowning mortality¹. With a coastline of over 8000km and extensive inland freshwater systems², a large proportion of India's population is regularly exposed to water. Many waterbodies are located within or nearby community settings, particularly in rural areas. Cataclysmic weather events are common in many parts of the country, particularly in North-Eastern states including Assam and West Bengal. Over 12% of the country is prone to flooding and river erosion³. In India, accidental drowning is mostly common. Many valuable lives are lost during the period of floods. Sometimes accidental drowning can also occur in swimming pools due to jumping off from the high diving board causing to injury over the head after striking over solid surface, with resultant loss of consciousness and inhalation of water. In marine, air or rarely road transport accidents, the victim may be injured

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or killed before entering the water. Person falling from docks, bridges may get his body strike on any heavy and hard objects, such as rocks or some solid obstruction. After immersion, the body may strike the rocks, coral or marine structures thereby producing injuries and as the body floats along the bottom, injuries may occur over the head, face, backs of the hands, knees and the toes. Accidental drowning in shallow water can occur in intoxicated, insane or epileptic individuals⁴. Despite a number of drowning risk factors being common in India, little empirical data are available on the burden or context of drowning- related morbidity or mortality within the country. A better understanding of the context and trends of fatal and non-fatal drowning is required to inform appropriate prevention strategies.

Aims and Objectives:

1. To evaluate the present trends of drowning by appropriate statistical analysis
2. To analyze the effect of various socio-demographic factors upon drowning
3. To study the injuries associated with drowning.

Materials and Method

The present study has been carried out in the Department of Forensic Medicine, Gauhati Medical College upon the 127 drowning cases out of total 3,367 cases brought for autopsy by police from within the district administrative area of Kamrup, Assam and few referral cases from the neighbouring districts. 24 cases excluded via exclusion criteria. The study period

extended for 1 year from 1st July, 2017 to the 30th June, 2018. The data was collected in pre designed proforma from autopsies, interviews of accompanying attendants and police, which were subsequently analysed and represented in the form of tables, graphs and charts.

Inclusion Criteria: All the cases brought for medico-legal autopsy to the mortuary in the department of Forensic Medicine, Gauhati Medical College & Hospital within the study period, where the cause of death was drowning.

Exclusion criteria: Decomposed cases and cases where the actual death was not due to drowning.

Results and Observation

During the period from 1st July 2017 to 30th June 2018, a total of 151 cases of drowning were registered for autopsy out of which 127 were selected based on exclusion criteria. We found that most of the victims were males (82%), in the 31-40 years age group (31 cases). **(Fig-1)** and belonged to rural locality (63.77%). Most of the victims had drowned in fresh water (94.5%) **(Table-1)** and running type (63.77%), which comprises rivers, streams etc. There were 2 cases in which drowning occurred in a swimming pool. **(Table-2)**. Majority of the incidents occurred near place of residence or work (54%). The months of July registered the highest number of cases with 18 cases. **(Fig-2)**. A total of 34 cases constituting 26.77% had external injuries. **(Fig-3)**. Most of the cases were accidental in nature (78%) and the rest were suicidal.

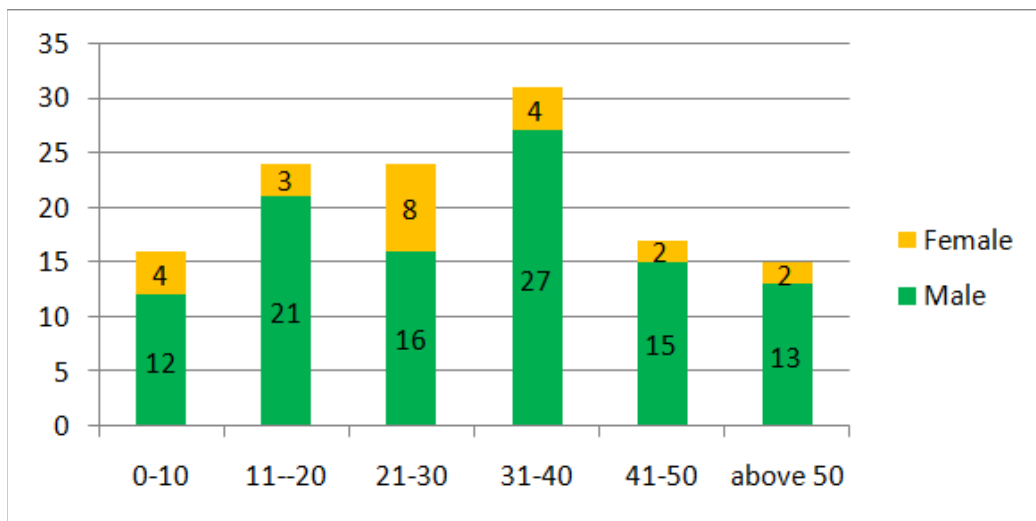


Fig. 1: Sex ratio and Age groups

Table 1: Type of Drowning

Type of drowning	No. of cases	%
Fresh water	120	94.5
Shallow water	4	3.14
Secondary	3	2.36
Place of drowning	No. of cases	%
Running water	81	63.77
Stagnant water	41	32.3
Swimming pool	2	1.57
Others	3	2.36

Table 2: Place of Drowning

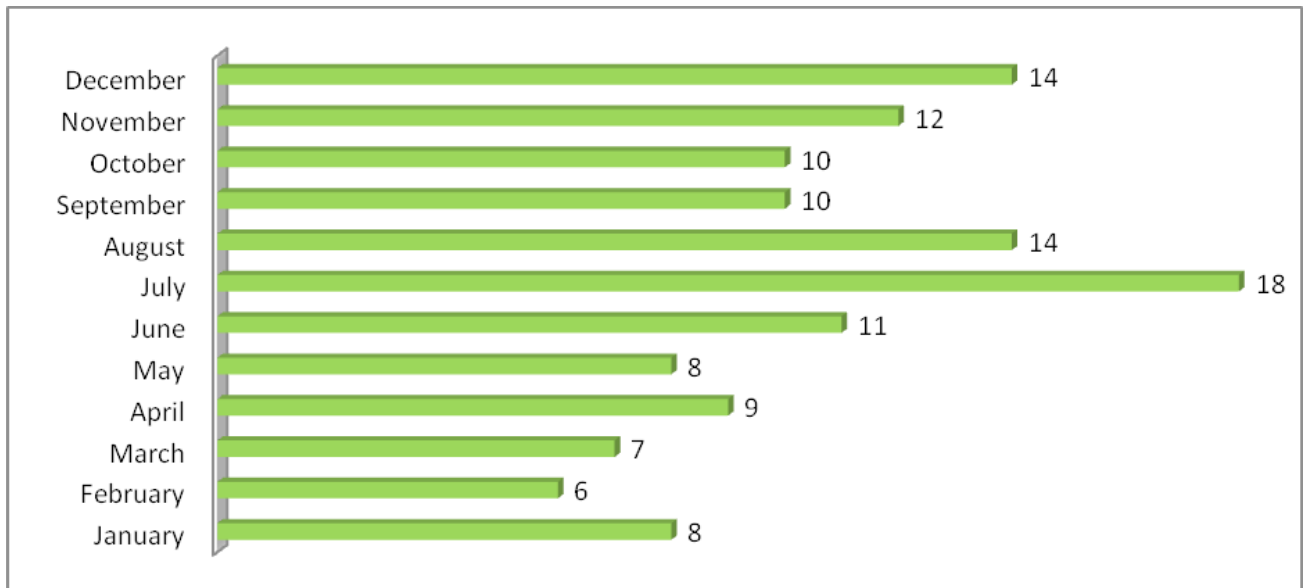


Fig. 2: Month distribution

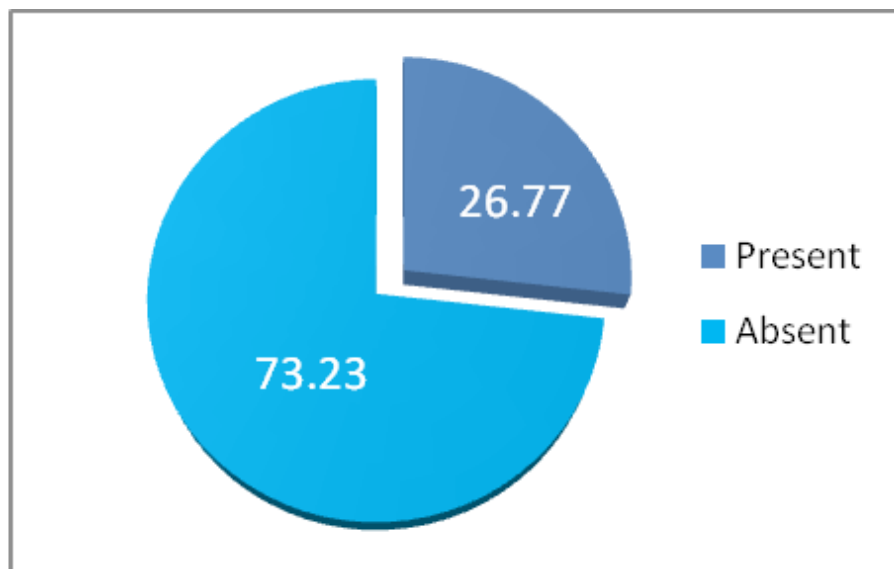


Fig. 3: Injuries detected

Discussion

The present study has been compared with similar studies conducted by various authors in different parts of the world. The comparison has been carried out in order to bring out similarity and variation of findings of the observation. During study, a total of 3,367 medico-legal autopsies were performed, out of which, 127 cases were considered based on inclusion and exclusion criteria. The study found that drowning cases mostly involved males with 82% cases similar to the works carried out by **Donson H⁸** and **Tokbi S⁹**. The male preponderance may be attributed to the fact that males population outnumber females in our state and are more exposed to water sources such as irrigation and fishing. The age group 31-40 was the most commonly affected with 31 (24.4%) cases similar to the study of **Chakraborty P et al¹⁰** but differs with **Turgut A¹¹** and **Tokbi S⁹** who reported that for persons aged between 10–19 years, the death rate was the highest. The cause has been attributed to being the most productive population to earn livelihood. Most of the victims were from the rural background with 63.77% cases similar to **Hossain M et al¹²** and **Tokbi S⁹** but varying with the study of **Auer A¹³** where urban dwellers (58.8%) was reported to be more. The findings are in expected lines owing to irrigation and fishing and abundant water bodies in rural areas. Fresh water drowning constituted nearly 94.5% of the cases. **Palimar V¹⁴** and **Tokbi S⁹** also noted similar findings. It is due to Assam having vast fresh water bodies with no coastline. Majority of the victims drowned in running water similar to findings of **Tokbi S⁹** but varying with **Chakraborty P et al¹⁰** who found stagnant water bodies to be the most involved. Most of the victims drowned at a site near to their homes (54%). 51 cases drowned at a place near their work place. **Racz E et al¹⁵** reported similar findings. Heavy rainfall in our state and floods and poor roads and demarcation attribute to these causes. The months of July registered highest 18 (14.17%) cases. **Pal S K¹⁶** and **Tokbi S⁹** reported similar findings to the study which is due to monsoon season and floods here. A few cases had injuries which mostly occurred in the head or face due to impact in the running water with underlying stones or objects similar to the study of **Tokbi S⁹**. Most of the cases were accidental in nature (78%). **Mukherjee A A¹⁷** reported findings similar to the study. However **Kumar A G V¹⁸** reported suicidal cases to be more common. The cause can be attributed to poor infrastructure and general lack of alertness amongst non-swimmers.

Conclusion

The present study was done with the aim of having an overview of the the epidemiology of all the ante-mortem drowning cases. Drowning cannot be stopped *per se* but few steps can be taken to prevent it. Drainage of unnecessary water accumulations, building flood control embankments, implementation and enforcement of mandatory isolation fencing for swimming pools should be done. Promotion of swimming programs for primary school children, increased awareness of drowning survival tactics, and train lifeguards for regular deployment in supervised swimming locations are the need of the hour. Increased education in boat safety regulations and training the general community in timely resuscitation manoeuvres can increase the survival prospects of drowning victims.

Ethical Clearance: Taken from Institutional Ethics Committee, Gauhati Medical College & Hospital, Guwahati-32.

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Conflict of Interest: Nil

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