Original Research Article

Pattern of Drowning among Autopsies Conducted at Baroda Medical College and S.S.G Hospital

Nayan Chavda[1], Jaimini Vasava[2], Ankur Patel[3], Sunil Bhatt[4], Hardik Prajapati[5]

[1]Resident Doctor, Baroda medical college, [2]Resident Doctor, B.J medical college Ahmedabad, [3]Associate Professor, Baroda medical college, [4]Associate Professor, Baroda medical college, [5]Senior Resident doctor, Baroda Medical college.

How to cite this article: Nayan Chavda, Jaimini Vasava, Ankur Patel et. al. Pattern of Drowning among Autopsies Conducted at Baroda Medical College and S.S.G Hospital. Medico Legal Update / Vol. 24 No. 4, October-December 2024.

Abstract

Drowning kills at least 3,72,000 people every year and is the 3rd leading cause of unintentional deaths. In addition to the human tragedy, drowning represents a huge economic problem with direct and indirect costs, including many Disability-Adjusted Life Years. In India, there is limited knowledge about the epidemiology of drowning. The objective of the study was to study the incidence, manner and epidemiology of deaths due to drowning in and around Vadodara region. The present study was conducted from May 2022 to April 2023 in Government Medical College, Baroda on 82 cases to study the various epidemiological parameters of drowning. In this study period, 1989 cases of post-mortem examination were done out of which 82 cases were of drowning deaths. A maximum number of cases were seen in the age group of 21–30 years with 43% cases of males, dominating the study population. 62% of deaths were accidental in nature and occurred during the rainy season. The most common place of occurrence of drowning was river (38%) followed by water canal (31%). Soddening of hands and feet was the most common external feature of drowning followed by the presence of froth at mouth and nostril. Drowning is a most ignored public hazard worldwide with serious implications for the society. Public awareness regarding safety measures and drowning prevention strategies suitable to the needs of geographical region should be adapted.

Keywords: Drowning, Manner of death, Site of drowning.

Introduction

One of the most neglected public health issues concerning the world today is drowning. Drowning kills at least 3,72,000 people worldwide every year and is the 3rd leading cause of accidental drowning deaths.[1] Conceptually, "drowning" is a complex and multifaceted phenomenon, characterized as a chain of events.[2] Drowning is "The process of experiencing respiratory impairment from immersion or submersion in liquid".[3]

Diagnosing drowning remains one of the most challenging tasks in forensic medicine, as highlighted

Corresponding Author: Jaimini Vasava, Resident Doctor, B.J medical college Ahmedabad.

E-mail:

Submission date: Jul 9, 2024 **Revision date:** Jul 19, 2024 **Published date: October 28, 2024**

in the literature. External examinations and autopsy findings often lack specificity in many cases, while laboratory investigations can be inconclusive.

Drowning as the cause of death is determined on the basis of external signs, internal signs, biochemical tests for drowning and analysis of diatomaceous material (Diatom test) by the autopsy surgeon. External signs of drowning can vary depending on several factors, and it is important to remember that none of them are considered pathognomonic for drowning.

In a vast country like India, characterized by numerous water bodies and a lengthy coastline, drowning deaths are a persistent concern. The frequent occurrence of floods across different regions and heavy monsoon rains significantly contribute to these fatalities.

Methods

The present study was a prospective study, conducted for 1 year during May 2022 to April 2023. During the study period, a total of 1938 medico-legal autopsies were performed at the Mortuary of the Department of Forensic Medicine, Baroda Medical College. Of these, 82 were deaths caused by drowning which include in our study. All the dead bodies recovered from different sources of submersion were included in this study.

Detailed history related to place of occurrence, incident, type of water body, and other relevant findings were obtained from police and relatives while receiving inquest papers. Details like age, sex, month, time of occurrence, occupation, education, religion, marital status, cause of death, manner of death etc were collected and filled in a proforma. It was then interpreted statistically with tables and bar diagrams.

During postmortem examination condition of clothing, skin changes, examination of natural orifices, injuries on body, and cadaveric spasm were observed, and all the cavities were examined.

In all cases, diatoms were examined with standard protocol in tissues and samples of water collected from place of death. In this study, the term drowning refers to immediate and delayed immersion deaths.

Results

Incidence of drowning is seen in all age groups; majority of cases were in 21–30-years age group (43%) followed by 31–40 years age group (23%). In the present study, 63.41% victims were males and 36.58% victims were females (Table 1). Of the 82 drowning deaths during the study period, 51cases (62%) were accidental, and 31 cases (38%) were suicidal deaths (table.5). Among external features of drowning, soddening (98%) was the most prominent feature, followed by froth at mouth and nostril (84%) and bluish fingernails and lips (77%) (Table 2). The presence of water in stomach (98%) was the predominant internal finding followed by heavy, voluminous, oedematous, and congested lungs (96%) and froth in trachea (53%) (Table 3). Most of the victims were retrieved from rivers (38%) followed by water canal (31%) (Table.6). Month of August accounting for 23 deaths (29%) was the time of majority of drowning deaths followed by July with17 deaths (23%) and lastly June with 12 deaths (17%) (Table 4). Majority of the victims were labourers with 52 cases (63%) followed by student with18cases (31%) and lastly housewife with 8cases (10%) (Table 7).

Table 1: Case distribution by age wise

Age (years)	Male (%)	Female (%)	Total (%)
0-10	1(1.21)	1(1.21)	2(2.42)
11-20	5(6.09)	3(3.06)	8(9.15)
21-30	22(26.82)	13(15.85)	35(42.68)
31-40	12(14.63)	7(8.53)	19(23.17)
41-50	5(6.09)	3(3.06)	8(9.75)
51-60	3(3.06)	1(1.21)	4(4.87)
61-70	2(2.40)	1(1.21)	3(3.61)
>70	2(2.40)	1(1.21)	3(3.61)
Total	52(63.41)	30(36.58)	82(100)

Table 2: Distribution of external features of drowning

Feature	Case	Percentage
Cutis anserine	14	17
Froth at mouth and nostril	69	84
Soddening	80	98
Degloving	60	73
Congested conjunctiva	56	68
Bluish fingernails and lips	63	77
Animal bites and decomposition	13	16

Table 3: Distribution of internal features of drowning

Feature	Case	Percentage
Froth in trachea	52	63
Mud in trachea	49	60
Froth in larynx	43	52
Presence of voluminous, oedematous, and congested lungs with c/s showing copious frothy fluid	79	96
Emphysema aquosum	32	39
Rib marking on lungs	56	68
Paltauf'shemorrhages	68	83
Presence of water in stomach	80	98

Table 4: distribution of case by month wise.

Month	Cases	Percentage
May	7	6
June	12	15
July	17	22
August	23	29
September	7	9
November	5	6
December	4	5
January	3	4
February	2	2
March	1	1
April	1	1
Total	82	100

Table 5: Distribution of case by manner of death.

Manner of death	Cases	Percentage
Accidental	51	62
Suicidal	31	38
Total	82	100

Table 6: Distribution of cases according to place of drowning

Place of drowning	Case	Percentage
Well	17	21
River	31	38
Water canal	26	31
Pond	8	10
Total	82	100

Table 7: Distribution of case according to occupation

Occupation	Case	Percentage
Labourer	52	63
Student	18	31
House wife	8	10
Self employed	2	2
Farmer	1	1
Not known	1	1
Total	82	100

Discussion

The findings in autopsy among drowning cases are usually characteristic, supportive, and is not diagnostic in multiple cases. The mechanism of death in drowning is quite complicated with the involvement of asphyxia and filling of the airways with fluid along with effects at hydrostatic and osmotic level. Males dominated the study with 52 cases when compared with 30 cases of females. Similar results were found in studies by Kanchan et al[4], Chaudhary et al[5], Shetty and Shetty.[6] Male predominance is probably multifactorial as men have exposure to activities where submersion is possible. Maximum cases of drowning were seen in the age group of 21–30 years (63%,) followed by 31–40 years age group. Similar results were seen in studies by Shetty and Shetty[6], Sheikhazadi and Ghadyani.[7]Probable reason for this preponderance of 21–30-year age group is due to carelessness, adventurous nature, and intoxication, whereas swimming or during recreational activities in or around water source. Drowning in 31–40 years age group may be due to familial and financial problems and not finding any solutions to them. Contrasting results were found in the study conducted by Selvaraj and Rama.[8] Maximum cases of death were accidental 51 cases (62%) followed by suicidal 31cases (38%). Similar results were seen in studies by Uppu et al[9], Kumar et al[10] and Venkatesulu et al.[14] The majority of drowning victims were retrieved from rivers 31 cases (38%), followed water canals 26 (31%). This can be attributed to the presence of river in the vicinity of the city and people entering river for recreation and during religious festivals. Similar findings were noted in the study by Selvaraj and Rama[8] and contrasting findings were noted in studies by Fralick et al[11]and Rao et al.[12] Soddening of hands and feet was the major external finding in our

study in 80cases (98%), followed by froth at mouth and nostril in69 cases (84%). The presence of water in stomach was the prominent finding in 80 cases (98%), followed by the presence of heavy and voluminous lungs in79 cases (96%) and froth in trachea in 52 cases (63%). Similar findings were noted in the study of Kumar et al.[10] Maximum cases of drowning deaths occurred in the month of August with23 cases (29%), followed July with 17cases (22%). The findings are almost similar to the studies conducted by Phad and Dhawane[13] and Venkatesulu et al.[14] Most of the deaths occurred in rainy season. Most of the victims were labourers[52 cases(63%)] followed by student[18 (31%)]. This is in contrast to the study conducted by Phad and Dhawane[13] and Venkatesulu et al.[14]Where most common victims of drowning deaths were the students, but in our study, labourers had higher preponderance. This could be attributed to the fact that most of them were daily wage labourers and lack of day-to-day work leads to financial stress on them.

Conclusion

The present study demonstrates the magnitude of drowning deaths and the threat it poses to the public health systems. Young adults are more prone to drowning deaths. This highlights the need for accurately assessing local data to effectively target at-risk populations. Drowning prevention is of paramount importance and is the ultimate motivation for understanding drowning .Greater emphasis on the training of the general populace in measures to be taken in such a situation is required as lifesaving measures like Cardio-Pulmonary Resuscitation can determine whether the victim survives to reach medical treatment or succumbs prior to itIt is preventable but neglected relative to its impact on families, communities and livelihoods. Most of them died by accidents or by committing suicide which denotes the lack of safety measures in the canals/ water bodies. This can be rectified if people are employed in the canals/surrounding water bodies with watchers and improve safety by committing rescue teams after identifying the places with high activity and save those victims.

Reference

1. World Health Organization. Drowning Fact Sheet 2017. Geneva: World Health Organization; c2017. Available from: http://www.who.int/ mediacentre/ factsheets/fs347/en [Last accessed on 2017 Dec 01].
2. Bierens JJ, editor. Handbook on Drowning: Prevention, Rescue, Treatment. Berlin: Springer-Verlag; 2006.
3. Van Beek EF, Branche CM, Szpilman D, Modell JH, Bierens JJ. A new definition of drowning: Toward documentation and prevention of a global health. problem. Bull World Health Organ 2005; 83:853-6.
4. Kanchan T, Rastogi P, Mohanty MK. Profile of near drowning victims in coastal region of Karnataka. J Indian Acad Forensic Med 2007; 29:52-4.
5. Chaudhary BL, Deepak S, Veena M, Tirpude BH, Study of drowning cases in Kasturba Hospital Sevagram, Wardha. J Forensic Med Toxicology2005; 22:29-30.
6. Shetty BS, Shetty M. Epidemiology of drowning in Mangalore, a coastal Taluk of South India. J Forensic Leg Med 2007; 14:4105.
7. Sheikhazadi A, Ghadyani MH. Epidemiology of drowning in Isfahan province, centre of Iran. J Res Med Sci 2009; 13:79-87.
8. Selvaraj T, Rama V. Epidemiological study of drowning deaths in Madurai Region. Indian J Forensic Med Toxicology2020; 14:576-9.
9. Uppu RS, Asnanda Rao BV, Rajesh B. An autopsy study of drowning deaths in and around Visakhapatnam. Indian J Forensic Med Toxicology2020; 14:23-7.
10. Kumar A, Sharma L, Kumar B. Profile of medico-legal deaths due to drowning-a retrospective study. Int J Sci Res 2019; 8:62-3.
11. Fralick M, Denny C, Redelmeir D. Drowning and the influence of hot weather. PLoS One 2013;8: e71689. cross sectional study. Egypt J Forensic Sci 2018; 8:26.
12. Rao R, et al. Sch J App Med Sci 2014;2:1397-401.
13. Phad LG, Dhawane SG. Epidemiological profile of drowning deaths-a crosssectional study. Egypt J Forensic Sci 2018; 8:26.
14. venkatesulu profile of drowning deaths study, Asian J Pharm Clin Res, Vol 16, Issue 8, 2023, 30-32.