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Original Research Article

Demographic Profile of Deaths Due to Drowning in and Around Bhopal, Madhya Pradesh

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Abstract:

Drowning remains a global public health problem, claiming many lives each year, especially among young children and youth. This summary presents a comprehensive demographic study of drowning incidents, analysing the complex interplay of various factors that contribute to this global public health problem. By examining the demographics of drowning victims, this study aims to identify vulnerable populations and inform targeted prevention strategies to reduce drowning deaths. This study uses extensive data from different geographic regions and reveals important patterns of drowning. It shows that young children and young people make up a disproportionate number of victims, as men are more prone to drowning than women. Additionally, socioeconomic inequality is a determining factor, with poor communities experiencing higher drowning rates due to limited water safety resources and education. The study examines the contextual factors that influence drowning incidents and highlights the prevalence of drowning in natural bodies of water, including rivers, lakes and oceans, compared to man-made environments such as swimming pools. It also examines the role of alcohol consumption, inadequate supervision and lack of swimming skills as important risk factors for drowning deaths. In addition, the study assesses the effectiveness of existing drone prevention initiatives and identifies gaps in their coverage. Analysing successful interventions such as water safety education programs and lifesaving equipment distribution, the study recommends evidence-based strategies to reduce the risk of drowning in vulnerable populations. In conclusion, this demographic study on drowning highlights the urgent need for targeted interventions tailored to specific vulnerable populations. By understanding the factors that influence drowning incidents, policy makers, public health agencies and conservation organizations can proactively plan and implement preventive measures and ultimately work to curb the number of drowning tragedies worldwide.

Keyword: Drowning, Demography, Data, Autopsy.

Introduction

Drowning is considered the leading cause of death in water and the third leading cause of accidental death worldwide. Drowning rates are highest in developing countries [1,2]. The World Health Organization (WHO) defines it as: "The process of experiencing respiratory distress as a result of immersion/immersion in a liquid" [3].

Drowning is one of the 10 leading causes of death among people under the age of 25 and is most common in low- and middle-income countries. Drowning is an important but often neglected public health problem. Drowning affects all age groups, but certain groups are particularly vulnerable. Most drowning deaths (almost 97%) occur in developing countries like ours [4].

Drowning is one of the easiest ways to commit suicide. Unlike other forms of drowning death, drowning is very difficult to diagnose, and many drowning cases show seasonal and festival trends. As a city of lakes, Bhopal increases human access to water and human factors such as inexperience, accidental entry into deep water, lack of swimming skills, immaturity, drunkenness and physical weakness increase the risk of drowning. Environmental factors such as bad weather conditions, hostile water environment are also

factors that can cause people problems in the water. Therefore, this subject was selected for review to find out recent demographic trends in drowning deaths.

Suicide by drowning is quite common, but in the absence of suicide note or an eyewitness, it can be difficult to draw a clear conclusion. Very often circumstantial evidence can be decisive and factors such as previous suicidal attempts, suicidal ideation and psychiatric illness should be taken into account. In suicidal drowning, the person is usually more or less fully clothed, the person may have chosen to jump from a height, and sometimes they may apply weight or take poisons before jumping into the water.

In a study of suicide mortality rates in the Northeast, they found that 13% of all suicide attempts were fatal (23% in men, 5% in women, 7% in those aged 15-24 and 34 % in those aged ≥65), drug intoxication accounted for 74% of crimes but only 14 % of deaths, guns and hangings accounted for only 10% of crimes but 67% of deaths, by following by drowning accounted froe <1% of actions with a fatality rate of 84 % and accounted for 2% of all suicides in the Northeast [5].

According to the WHO, more than 90 per cent of drowning deaths happen in low and middle-income countries, with children under five being at maximum risk. These deaths are usually linked to routine activities, like collecting water for domestic use, bathing, travelling over water on boats or ferries, and fishing. The effect of seasonal or extreme weather events like the monsoons is also one of the major causes of drowning.

According to the UN, an estimated 236,000 people drown annually, which makes drowning a major public health problem all around the world. Drowning is one of the major causes of death for children and young people aged between 1 to 24 years around the globe. Drowning is the third leading reason for unintentional injury death and accounts for seven per cent of all injury-related deaths [6].

Materials and Methods

The study has been carried out in the year 2021-22 after approval from ethical committee of Gandhi medical college, Bhopal. 62 cases were taken to study on epidemiological profile of the drowning deaths, excluding bodies in advanced state of decomposition. The study was carried out over the period of January 2021 to August 2022, with the aim of studying various epidemiological parameters. The factors taken to enumerate the study are age, sex, marital status, region, socioeconomic status and comorbidity conditions. Consent was taken as per the proforma and protocol approved by the ethical clearance committee.

Observations and Results

A total number of 4590 autopsies were carried out at Gandhi Medical College Bhopal, over a period of 20 months and of which there were 83 cases of deaths due to drowning out of which 62 cases are included and rest excluded due to decomposition and head injuries, constituting 1.35% of all the unnatural deaths at the Department of Gandhi Medical College Bhopal.

The cases taken were 62 and the study includes, only the non-decomposed, unmutilated dead bodies which were retrieved from water sources and having history of drowning, brought for post mortem examination. As per law of the land, consent of relatives is not required for carrying out the medicolegal post-mortem examination on the corpse of the deceased; hence it was not necessary to obtain consent from relatives or any other authority in this particular study.

Demographic information regarding the deceased including age, gender, occupation, literacy, per capita income, time of incident, place of incidence, cause for submersion and the circumstances of death was collected from the police and relatives. Data collection is done by MS Excel and appropriate statistical methods are applied.

Of the 62 cases, 74% were males and 26% were females with a male to female ratio of 2.9: 1, and the same is shown Table 1.

Table 1: The Sex-Wise Distribution of Drowning Deaths

Sex	Number	Percent
Males	46	74
Females	16	26
Total	**62**	**100**

Table 2 shows the age and sex wise distribution of drowning deaths and the highest rate was seen in the age group of 11-20 years (30.65%) followed by 21-30 years (27.42%), 31-40 years (19.35%), constituting more than half of the cases (fig. 8).

Table 2:

Age Group	Male	Percent	Female	Percent	Total	Percent
0 - 10 years	6	13.04	2	12.50	8	12.90
11 - 20 years	15	32.61	4	25	19	30.65
21 -30 years	15	32.61	2	12.5	17	27.42
31 - 40 years	8	17.39	4	25	12	19.35
41 - 50 years	2	0.04	2	12.5	4	0.06
>50 years	0	0	2	12.5	2	0.032
Total	46	100	16	100	62	100

Table 3 represents the marital status of drowning groups and as usual the highest rate is observed in unmarried amounting to 61.30%.

Table 3: Marital Status of the Drowning Victims

Marital status	Male	Percent	Female	Percent	Total	Percent
Unmarried	32	69.57	6	37.5	38	61.30
Married	10	21.74	8	50	18	29.03
Widowed	0	0	1	6.25	1	1.61
Divorced	1	2.17	0	0	1	1.61
Not known	3	6.52	1	6.25	4	6.45
Total	**46**	**100**	**16**	**100**	**62**	**100**

In the study 45 (72.58%) were literates, 13 (20.97%) were illiterates and the education status of 4 (6.45%) of the peoples were not known, as can be seen in fig.1.

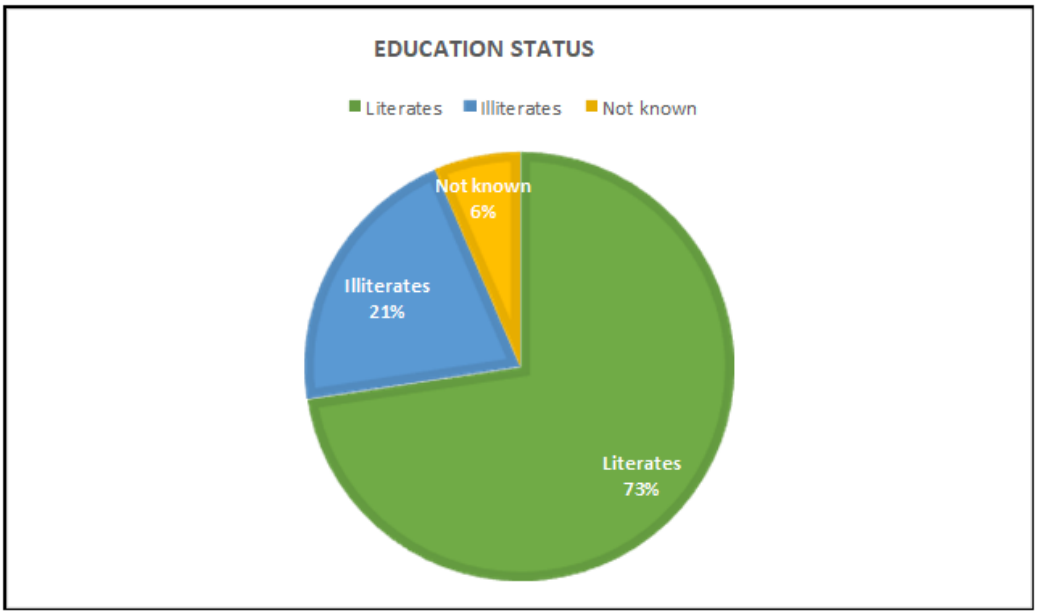

Figure 1:

Most of the submerged victims belonged to Class 4 (Upper Lower 48.39%) and Class 3 of socio-economic status (Lower middle 27.42%) followed by Class 5, Class 2 & Class1 as depicted in Table.4

Table: 4 The Socio-Economic State of Drowning Victims.

Socio-Economic Status	Number	Percent
Class 1 (Upper)	1	1.61
Class 2 (Upper-middle)	4	6.45
Class 3 (lower-middle)	17	27.42
Class 4 (Upper-lower)	30	48.39
Class 5 (Lower-lower)	7	11.29
Not known	3	4.84
Total	**62**	**100**

Table. 5 depict the season wise distribution of submersion deaths for the year 2021-2022: The majority of the deaths occurred in monsoon (32.26%) and winter (25.81%) and lowest cases constituting in autumn (3.23%)

Table 5: the Season-Wise Distribution of Drowning Victims

Season	Number	Percent
Winter	16	25.81
Spring	11	17.74
Summer	13	20.97
Monsoon	20	32.26
Autumn	2	3.23
Total	**62**	**100**

60.4% of people drowned at the places near to their residence (< 1 KM from their residence) and another 39.60% drowned in the places away from their residence, and for rest not known residence. Table 6 represent the place wise distribution of drowning and the commonest site was pond (33.87%), followed by Lake (22.58%), and rarest site was drainage.

Table 6: the Place-Wise Distribution of Drowning Deaths

Place of Drowning	Male	Female	Total	Percent
Stagnant	8	2	10	16.13
Running	0	0	0	0
Lake	11	3	14	22.58
Pond	16	5	21	33.87
Drainage	4	0	4	6.45
Rain	0	0	0	0
Canal	0	0	0	0
River	6	1	7	11.29
Well	1	5	6	9.68
Grand Total	**46**	**16**	**62**	**100**

When the reasons for submersion were seen, it was found that in more than ¼th of the cases the reasons were not known, and when known, most drowned while playing, swimming, attending nature's call, under the influence of alcohol/drugs or bathing as presented in table.7.

Table 7: the Manner of Drowning

Cause for immersion	Male	Percent	Female	Percent	Number	Percent
Accidental	27	58.70	7	43.75	34	54.84
Suicidal	6	13.04	6	37.5	12	19.35
Undetermined	13	28.26	3	18.75	16	25.81
Total	**46**	**100**	**16**	**100**	**62**	**100**

In our study majority of the victims were non-swimmers (77.42%) with a male: female ratio of 26: 1 and a smaller number of victims' swimming ability (8.06%) and in another 14.52% of cases their ability to swim was not known. (Table.8).

Table 8: The Swimming Abilities of the Drowning Victims

Swimming	Male	Percent	Female	Percent	Total	Percent
Swimmer	5	10.87	0	0	5	8.06
Non-swimmer	35	76.09	13	81.25	48	77.42
Not known	6	13.04	3	18.75	9	14.52
Total	**46**	**100**	**16**	**100**	**62**	**100**

Discussions

Male had a clear predominance of 74%, female 26%. These values are similar to the other studies, where Dery Azmak [7] reported 90% of men and Suresh Kumar [8] reported 78% of men; Gino R Somers [9] reported 71%, Li yang [10] 61% and Jan M. Gorniak [11] 63%. High exposure to water, riskier behaviour and alcohol consumption may be the likely reasons for the higher number of males as compared to females. The age group of cases included in the study varied from 0-10 years to over 50 years.

Most deaths occurred in the age group of 11-20 years (30.65%), followed by 21-30 years (27.42%), 31-40 years (19.35%), constituting more than half of the cases (fig. 8). And this rate is respectively B. Suresh Kumar Shetty who also reported a maximum between 21 and 30 years (25.8%), M Kohn [12] reported it between 25 and 35 years and Jan M. Gorniak [13] reported it between 19 to 30 years. 29. Years (21%), followed by 0-5 years (15%) and Jonathan, on the other hand, reported 1-1 years. This high proportion of young adults may be due to immaturity, greater exposure, learning and exploration of ideas.

The highest number of drownings occurred in the Class 4 (Upper Lower 48.39%) and Class 3 of socio-economic status (Lower middle 27.42%) followed by Class 5, Class 2 & Class1 as depicted in Table.4. and many countries reported this to the WHO.

This may be due to lack of supervision of children, greater exposure to unprotected water sources and less opportunity to learn to swim. This is also reflected in our study, where 77.42% of deaths occurred among non-swimmers, and a similarly high mortality (93.2%) was reported by Li Yang; few drowned while defecating and bathing in water, and even more cases occurred in the morning hours, indicating a lack of proper facilities and strict taboos inside and outside the houses.

The most common dive site was a pond (33.87%), followed by Lake (22.58%), and rarest site was drainage and most dive sites were in the monsoon (32.26%) and winter (25.81%) and lowest cases constituting in autumn (3.23%) and the results are consistent with the Jan. M. Gorniak, where he reported that the most common place is Lake Erie and most deaths in June, July and August 3.85% and; This is against the study of Suresh Kumar Shetty who reported it in well (44%) and in spring 52.38% followed by summer 2.86% and Gino R Somers also reported spring and summer (87%).

This seasonal increase in summer and spring may be due to the monsoon rains that hit India in late summer and spring, causing rising water levels and dangerous sewer overflows, and in addition to residential lake and watershed intrusions causing sewer overflows; in our study, there was a significant number (6.45%) of victims who drowned in sewers and not all were under the influence of alcohol/drugs, suggesting the need for proper sewer maintenance.

Conclusion

Majority of the cases were males (74%) as compared to females. Maximum cases were observed in monsoon followed by winter. A significant number of deaths occurred in approachable ponds, lakes and rivers. Dead bodies were found in water bodies in floating position, immersion position and on meeting area between water and land- 32.26%, 66.13% and 1.61% respectively and wore clothing were wet. Accidental drowning was the most common followed by undetermined drowning, and accidental drowning was more common in males and suicide in females, and more than 48% of the victims were non-swimmers. Proper awareness, education, exact engineering, fencing and netting with caution alerts and supervision of the water bodies can reduce the rate of drowning.

Ethical Clearance: The study has been carried out in the year 2021-22 after proper approval from ethical committee of Gandhi medical college, Bhopal.

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