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High Mortality Rate Due to Inflated Prevalence of Drowning Cases; An Observational Study Reflecting Regional Trends and Factors Affecting Asphyxial Deaths Due to Drowning in District Muzaffargarh

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ABSTRACT

Asphyxia deaths due to drowning, especially accidental deaths are soaring daily in many areas of Pakistan. This fact led us to conduct this study on prime areas of Muzaffargarh on the bank of River Chenab. **Objectives:** To determine the frequency of drowning cases and factors affecting their high prevalence. **Methods:** A retrospective study comprising 5 years (2019-2023), including both genders and age groups, asphyxia deaths particularly due to drowning but excluding unidentified bodies and other modes of asphyxia deaths. All variables are analyzed through SPSS-27. **Results:** Out of 412 drowning cases, 309 cases belong to accidental drowning (75%) with a predominance of the male population, almost 68.68%. The most prevalent age group involved is 11-20 years (31.31%). The majority of cases happen in the monsoon and summer seasons, 28.88% and 26.45% respectively. **Conclusions:** It was concluded that asphyxia deaths due to drowning are rising day by day, especially the cases involving accidental deaths. This showed the lack of proper preventive strategies in areas of Chenab River in District Muzaffargarh.

INTRODUCTION

The Drowning Debacle, creeping engulfing innocent lives daily, making it the third leading cause of unintentional deaths globally. According to WHO, low and middle-income countries account for 90% of unintentional drowning deaths [1]. WHO estimated that nearly 263000 drowning deaths occur globally annually [2] and the most affected population belongs to low and middle-income countries like Pakistan, amounting to almost 82000 fatalities including the precious lives of children aged 1 to 14 years [3]. Loss of many precious lives is underestimated in terms of data gathering by authorities which snubs the actual need for help [4]. According to a study conducted in Tanzania, children aged less than 14 and older people are the most vulnerable population group [5]. In another study, homicidal deaths due to drowning also escalated daily, especially when we talked about child homicide [6]. In

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consonance with research done in Australia, suicidal deaths due to drowning are soaring day by day and the most endangered people are women and older [7]. According to another significant study, the majority of cases of drowning deaths are accidental and involve young men, going on excursion trips and there they meet their unfortunate fate [8]. Another noticeable reason is drug and alcohol intoxication which leads to increasing cases of drowning deaths in coastal areas [9]. A greater number of children are affected daily, which highlights the need for assessing the risk and developing its managing strategies on the local level [10]. The rate of hospitalization due to drowning cases is inflated as compared to previous years [11]. All over the world, especially in high-income countries, prioritizing the need for proper infrastructure for the collection of legit data and also constructing a proper management system for drowning death cases, is being initialized already [12]. Among other countries, Pakistan is another underdeveloped country, that faces an enormous number of accidental deaths due to drowning. Changing climate, excessive flooding and lack of protected excursion spots near lakes and rivers, make it very easy to be engulfed by unintentional drowning death. Another important factor is the lack of a proper management system for dealing with drowning deaths, which also correlates directly to the lack of people awareness, lack of people education and lack of preventive measures. Muzaffargarh district lies on the bank of the Chenab River, a major agricultural land with many industrial zones, contributing greatly to the economy of Pakistan, yet highly underprivileged and ignored in terms of basic life facilities, education and health opportunities. Being on the bank of the Chenab River, a huge number of accidental cases appear in the locality, which marks the highest rate of mortality due to drowning in this district. Development of water safety measures, preventive strategies, training of the local population awareness programs and a proper management system is the actual need of the hour so that the mortality rate could be minimalized in this underestimated and ignored area.

Drowning represents the third leading cause of unintentional death globally, disproportionately affecting low- and middle-income countries that account for 90% of such fatalities, with Pakistan bearing a substantial share of this burden due to its extensive network of rivers, canals, and flood-prone regions that lack adequate water safety infrastructure and public awareness programs. District Muzaffargarh, situated along the banks of the Chenab River in Southern Punjab, represents a particularly high-risk locality where agricultural and occupational dependence on riverside activities, combined with limited education, inadequate preventive measures, and the absence of a formal drowning management system, creates conditions for persistently elevated drowning mortality. Despite the magnitude of this public health crisis, locally contextualized forensic epidemiological data documenting the frequency, demographic patterns, seasonal trends, and circumstantial factors contributing to drowning deaths in this specific district are virtually absent from the published literature, leaving policymakers without the evidence needed to design targeted interventions. This study therefore aimed to determine the frequency of asphyxial drowning deaths in District Muzaffargarh over a five-year period, identify key contributing factors including demographic characteristics, manner of death, seasonal variation, and activity-related circumstances, and highlight the urgent need for preventive strategies along the Chenab River corridor.

METHODS

A 5-year retrospective study was conducted at Central Station of District Emergency Service, Rescuee1122. This study duration was January 2019 to December 2023 and comprised 412 cases of deaths due to drowning during this period. After receiving approval from concerned authorities (ref no: 9/19/DEO/MGH/ (PES)), a random sampling Technique was used. Dead bodies of asphyxia deaths due to drowning were included in this study. Dead bodies of other modes of asphyxia deaths like strangulation and hanging and unidentified dead bodies were excluded. Data records were taken. All the variables were collected and analyzed through SPSS version 27.0. The statistical analysis of data was carried out using tables, graphs and percentages.

RESULTS

According to this study, out of 412 drowning cases, 309 include accidental cases (75%), 71 suicidal cases (17.23%) and 32 homicidal cases (7.76%). The majority of cases belong to the male gender (68.68%) and the most prevalent age group is 11-20 (31.31%). Age less than 10 years and from 21-30 years also show a significant number of cases, 23.78% and 18.93% respectively. Almost 28.88% of cases took place during monsoon season, 26.45% in summer and the most happening time of occurrence is morning (48.05%) and afternoon (24.75%). A few eminent reasons for accidental cases were excursion (31.71%), swimming (25.24%) and professional animal caretakers (23.30%) (Table 1).

Table 1: Frequency and Percentages of Different Variables

Variables	Frequency (%)
Gender	
Male	283 (68.68%)
Female	129 (31.31%)
Age (Years)	
<10	98 (23.78%)

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11-20	129 (31.31%)
21-30	78 (18.93%)
31-40	56 (13.59%)
41-50	32 (7.76%)
>50	19 (4.61%)
Manner of Death	
Suicide	71 (17.23%)
Homicide	32 (7.76%)
Accident	309 (75%)
Time of Drowning	
Morning	198 (48.05%)
Afternoon	102 (24.75%)
Evening	61 (14.80%)
Night	33 (8.00%)
Season of Drowning	
Spring	78 (18.93)
Summer	109 (26.45)
Monsoon	119 (28.88)
Autumn	62 (15.04)
Winter	44 (10.67)

Results show a correlation between factors affecting accidental drowning. The prominent reason in cases of accidental drowning is excursion (31.71%), as for season, monsoon accounts for the highest frequency, almost 29.77% and the most happening time is morning, 39.15% (Table).

Table 2: Inferential Data Regarding Accidental Cases

Accidental Cases (309/75%)		Frequency (%)
Reasons	Excursion	98 (31.71%)
	Bathing/Washing	61 (19.74%)
	Swimming	78 (25.24%)
	Occupational (Animal Caretakers)	72 (23.30%)
Time	Morning	121 (39.15%)
	Afternoon	93 (30.09%)
	Evening	64 (20.71%)
	Night	31 (10.03%)
Seasons	Spring	56 (18.12%)
	Summer	89 (28.80%)
	Monsoon	92 (29.77%)
	Autumn	44 (14.23%)
	Winter	28 (9.06%)

This finding manifests a gradual inflation of accidental cases of drowning, with the escalation of cases in 2023 (Figure 1).

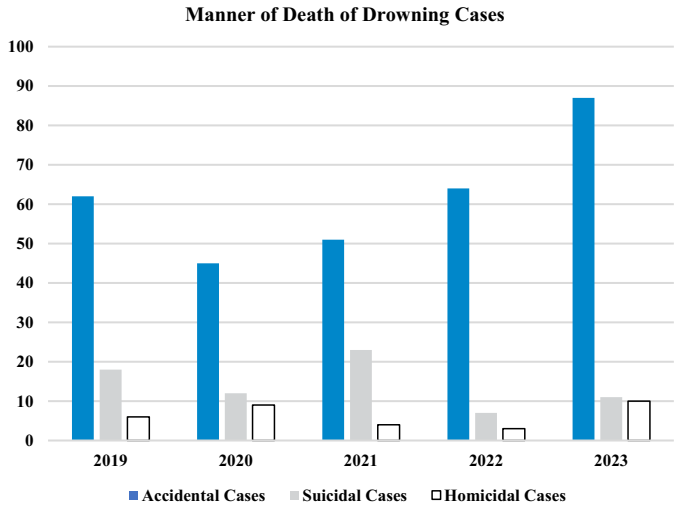


Figure 1: Year Wise Distribution of Drowning Cases According to Manner of Death

DISCUSSION

In this five-year study, a total of 412 cases are encountered, of which 309 cases belong to accidental deaths alone. The majority of cases belong to the male population (68.68%) with the most happening age group of 11-20 years (31.31%). A study conducted in Karachi manifests that there is a high prevalence of the male population, with almost 83.01% involved in drowning cases [13]. Another study done in Hyderabad demonstrates that there is a high prevalence of the male population involved in asphyxia deaths especially cases of drowning [14]. The same fact is interpreted in this current study which shows that males are more prone to face accidental deaths in drowning, as they are the sole bread earners and the majority are involved in professions like animal caretakers, who use canals and river sides to provide water to their animals, also many people wash their clothes and bathe along the riverside. Another astonishing fact is that many people who come for excursions along canal or river sides face a high ratio of accidental deaths due to drowning. A high number of cases belong to people who live in nearby areas of canals and rivers, and they are indulged in swimming, especially in summer. Complementing these facts described in this study, another research elaborated that swimming as an excursion activity leads to a high ratio of accidental deaths due to asphyxia drowning [15]. Another study done in Arkanabad Karachi shows that drowning deaths are becoming as common as natural deaths, highlighting the fact that such cases of deaths due to drowning are spreading day by day [16]. Some risky behavioural factors like intoxication, lack of swimming skills, swimming alone without any protective measures, bathing and playing without considering water levels and some other irresponsible activities lead to the soaring number of accidental drowning cases in broad daylight [17]. The

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majority of the cases occur in the monsoon season and also in summer, especially the people of flood-prone areas highly affected by seasonal changes, this environmental fact is being elaborated by another study [18]. A frequent number of accidental cases appear mostly in the morning and afternoon as the majority of professional animal caretakers perform their daily activities at that particular time. The same goes for people coming for excursion and enjoyment in broad daylight. In all these scenarios males are mostly involved in accidental deaths due to drowning [19]. The current study reveals that homicidal and suicidal cases are less common, 7.76% and 17.23% respectively. One study elaborated that, homicidal deaths due to drowning are sometimes hard to justify as many other asphyxia factors are involved in the majority of cases [20]. Similarly, suicidal deaths are less prevalent than homicidal deaths in comparison to accidental drowning cases. According to the current study, cases of drowning deaths have not declined over the period, but they are gradually inclining over the years. Hence this study highlights the necessity of implementing prevention strategies, policy-making and advocacy to reduce such traumatic mishaps shortly [21].

This study was constrained by its retrospective design based solely on records from the District Emergency Service Rescue 1122, which may have excluded drowning deaths not reported to this agency, particularly those from remote rural areas or cases where bodies were never recovered, leading to potential underestimation of the true mortality burden. The exclusion of unidentified bodies and non-drowning asphyxia deaths, while methodologically appropriate, may have further limited the completeness of the dataset, and the absence of socioeconomic, educational, or swimming proficiency data restricted a more nuanced analysis of underlying risk factors. Future research should employ prospective, multi-source surveillance systems integrating data from hospitals, police records, and community-level reporting to capture a more complete picture of drowning mortality across Muzaffargarh and neighboring riparian districts. Qualitative investigations exploring community perceptions of water safety, behavioral risk factors, and barriers to preventive action, alongside evaluation of the impact of targeted water safety education programs and infrastructure improvements such as warning signage and designated safe bathing areas, would provide the comprehensive evidence base needed to inform effective policy and save lives in this chronically underserved region.

CONCLUSIONS

It was concluded that deaths due to drowning, especially accidental deaths, are on the rise in district Muzaffargarh, as the majority of cases occur in the Chenab River. Therefore, proper management systems dealing with prevention programs, techniques and legislation are mandatory to overcome flaws and cons which prevail in those areas and are the main reasons behind such disastrous drowning deaths. There is a dire need for strict policymaking for the prevention of such disastrous accidents shortly.

Authors' Contribution

Conceptualization: SGS
Methodology: SHZ, SJ
Formal analysis: TM, IA
Writing and Drafting: SGS, RA, TM, IA
Review and Editing: SGS, RA, SHZ, SJ, TM, IA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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