

■ ORIGINAL ARTICLE

# Profile of Deaths due to Drowning in a Tertiary Care Centre Located along Sea Shore and River Bank

Shashikantha Naik CR<sup>1</sup>, Yogesh C<sup>2</sup>, Lohith Kumar R<sup>3</sup>, Abishek Yadav<sup>4</sup>

## ABSTRACT

**CONTEXT:** Profiling of drowning is essential for understanding its full burden which is vital to resourcing and directing prevention efforts as drowning is still one of the leading causes of morbidity and mortality.

**AIM:** The aim of this study is to analyse the factors associated with drowning cases recorded in a tertiary care centre located along sea shore and river bank in one year.

**SETTINGS AND DESIGN:** A retrospective content based analysis of drowning cases recorded in one year from January 1<sup>st</sup> 2019 to 31<sup>st</sup> December 2019 in a tertiary care centre located along sea shore and river bank and the results were tabulated.

**RESULTS:** Of the 36 cases, 26 cases were males and 10 were females accounting for 76.3% and 27.7% respectively with 88.88% (32 cases) accidental drowning and 36.11% (13 cases) in the age group of 30-45 years.

**CONCLUSIONS:** Our study concludes that the middle-aged rural males form the majority of drowning in large water bodies highlighting the absence of safety measures and awareness of swimming skills contributing to the causal factors of drowning.

**KEYWORDS** | drowning, accidental deaths, swimming deaths, drowning prevention, drowning safety measures

## INTRODUCTION

**D**ROWNING IS THE PROCESS OF experiencing respiratory impairment due to submersion /immersion in liquid; outcomes are classified as death, morbidity and no morbidity.<sup>1</sup> Drowning is a global public health issue, with the WHO estimating that 372,000 people die from drowning annually.<sup>1</sup> Drowning is the second leading cause of death from unintentional injury, after road traffic injuries. About 97% of all

deaths from drowning occur in low- and middle-income countries due to conditions such as poor infrastructure, poor regulation of water bodies and low awareness of water risks and swimming skills.<sup>2,3</sup> As per the National Crime Records Bureau-Accidental Deaths and Suicides (2012), every day, eighty persons die of drowning in India, which accounts for 7.4% of all unnatural deaths. In 2013, there were 29,456 deaths by

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drowning.<sup>4</sup> Identifying risk factors leading to drowning is essential for developing targeted, efficient prevention strategies. Proposed contributory factors for drowning in rivers include a lack of barriers controlling access to water, an absence of adult supervision for young children, poor swimming skills, minimal awareness of the dangers, the consumption of alcohol, transportation on water, a lack of safe water supply, and disasters related to flooding.<sup>1</sup> The circumstances leading to drowning are complex. In high income countries people interact with water primarily for recreation.<sup>5</sup> By contrast, drowning in low and middle income countries often occurs as a result of interactions with water due to daily life or occupational endeavours.<sup>6</sup>

The real number of deaths by drowning is likely to be higher due to under-reporting, as victims are not hospitalised or cases are not recorded because of a lack of death collection tools in many low and middle income countries (LMICs).<sup>7</sup> Official data categorization methods for drowning exclude intentional drowning deaths (suicide or homicide) and drowning deaths caused by flood disasters and water transport incidents. Non-fatal drowning statistics in many countries are not readily available or are unreliable. Hence this study would give insight into medicolegal and epidemiological factors of drowning cases reported in a tertiary care hospital in South India.

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#### METHODS AND MATERIALS

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A total of 36 drowning cases were studied that was recorded in one year from January 1st 2019 to 31st December 2019 in a tertiary care centre located along sea shore and river bank. It was a retrospective analytical study with secondary data obtained from the Medical Records Department in the hospital. It was a based on content analysis where a proforma was formed related to the nature and details of the drowning cases that was used to obtain the data. All age group registered as drowning cases and treated in the hospital were included in the

study. Unregistered cases and cases that were sent for further referral from the hospital were excluded from the study. The data was analysed and results were tabulated using simple tables and pie charts. Percentage calculations were made for better statistical reporting.

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#### METHODS AND MATERIALS

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On environmental factors related to the events of drowning, presence of wave was observed in 26 (72.22%) cases, absent in 9 (25%) cases and one not known. Winter season saw maximum drowning with 18(50%) cases, 5(13.88%) cases in summer, 9(25%) cases in monsoon and 4 (11.11%) cases in post monsoon season. All the drowning cases were wet drowning. 27 (75%) cases were recorded in the day and 7 (19.44%) cases were recorded in the night with 2 (5.55%) cases remain unknown.

Life jacket was not used in all the cases. Only 4 cases (11.11%) knew swimming and 30 (83.33%) cases were not aware of swimming. 32 (88.88%) cases have been previously involved in drowning events. Safety measures were present during the drowning of 15 (41.66%) cases and absent in 21 (58.33%) cases. Of the 36 cases, 19 (52.77%) cases were not under supervision and 16 (44.44%) cases were under supervision with one case remaining unknown. All the events were fatal. Asphyxia was the cause of death in 35 (97.22%) cases and not opined in one case. Of the 36 cases, 32 (88.88%) were accidental, 1(2.77%) case was a suicide and intention were not known in 3 (8.33%)cases. Post mortem changes were normal in 34 (94.44%) cases and 2 (5.55%) cases were decomposed. Figure 1 and 2 represent the waterbody distribution and seasonal distribution of drowning cases, respectively.

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#### DISCUSSION

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Understanding the epidemiology of drowning injuries is fundamental in directing preventative efforts. The major purpose of collecting epidemiological data is to create and follow the

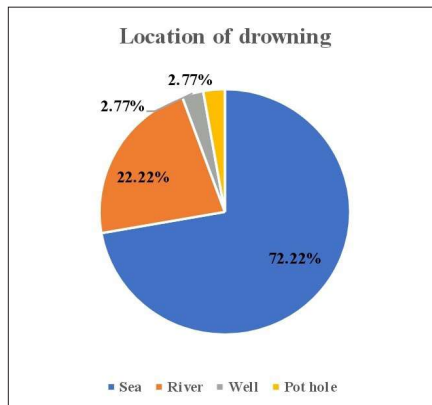


Figure 1: Testing Water body distribution of drowning.

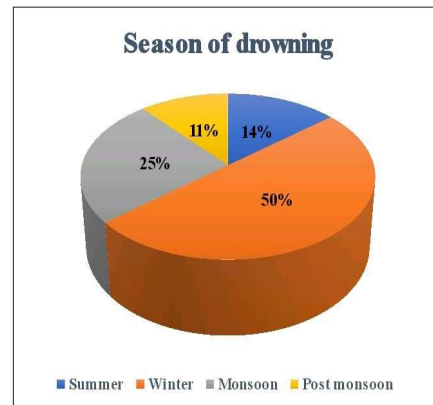


Figure 2: distribution of drowning by Seasons

| AGE         | CASES (%)   |
|-------------|-------------|
| <15 years   | 4 (11.11%)  |
| 15-30 years | 9 (25%)     |
| 30-45 years | 13 (36.11%) |
| 45-60 years | 8 (22.22%)  |
| >60 years   | 2 (5.55%)   |

Table 1: Age distribution of drowning cases

effectiveness of preventive strategies, which include education, engineering, legislation and enforcement. There are various locations and risk factors for drowning that reporting will never be simple. Improving drowning data in countries has been identified as a key strategy by the World Health Organization (WHO) to better understand the full extent and circumstances of drowning, to target interventions and evaluate their effectiveness.<sup>8</sup>

Analysing the human factors, males form the majority of the drowning cases (76.3%) similar to a study done in Singapore.<sup>9</sup> Possible explanations for this gender difference include riskier behaviour than their female counterparts and therefore expose themselves to more dangerous situations when around bodies of water.<sup>10</sup> Sociocultural reasons may also play a role, in that in some cultures, male toddlers are allowed more time for exploration than their female counterparts, including in water where males typically swim and are involved in water recreation more often than females.<sup>11</sup>

With regards to age distribution, middle aged

group from 30-45 years have been most affected in our study (36.11%), 25% affected in 15-30 years and only 11.11% of under 15 age group population were affected. This is comparable to a study done in Western Cape, South Africa where 54.84% cases were reported among 15-45 years.<sup>12</sup> Winter season saw 50% of drowning cases in our study similar to a study by Morris *et al.*,<sup>13</sup> where the months of December to February recorded the maximum cases equating to the winter months in India. Rural population were more affected in drowning recording 52.77% cases similar to a study done by Turgut<sup>14</sup> showing rural areas in LMICs pose a significantly greater risk than urban areas to potential drowning victims.

75% of the cases were recorded in the day from 6am to 6pm compared to the study done in Seychelles<sup>15</sup> where maximum events occurred from 12 noon to 2pm. Boating remains the commonest activity prior to drowning (41.6%) similar to a study done in Canada<sup>16</sup> with fishing and swimming forming the next categories. Untrained drivers, old age of boats, overcrowding and presence of wave (present in 72.22% cases in our study) may be the contributing factors for drowning while traveling in a boat.<sup>17</sup> Adults were more likely than children to drown in large, open bodies of water and adult men in particular were more likely to drown in the ocean and lagoons when compared with adult women<sup>12</sup> echoing our study where 72.22% cases were drowned in sea and closed water bodies like pools and wells contribute lesser in rural population and low

income countries.<sup>18</sup>

Usage of alcohol and recreational drugs contribute a significant amount to the drowning mortality but in sharp contrast, only 5.55% of the cases were reported to be under the influence of alcohol. However, one paper shows around 74% of drowning is related to alcohol.<sup>19</sup> About 83.3% cases were not aware of swimming skills and 52.77% cases were not under supervision, both variables similar to a study done in Kerala.<sup>4</sup> Therefore, though children may be accompanied by family members while playing in water bodies, the need of “close supervision” or “touch supervision” has to be emphasized.<sup>20,21</sup> In our study, life jackets were worn by none of the cases and safety measures were absent in 58.33% of the cases. Safety equipments and Flotation devices such as lifejackets are indispensable on all water transportation vessels, whether for public or private use as absence of them can cause major drowning incidents as that occurred in the European Seas.<sup>22</sup>

The use of International Classification of Diseases (ICD) codes to explore drowning is a common approach but provides a limited understanding of causal factors, impacting the development and reporting on the effectiveness of prevention strategies.<sup>23</sup> Much of the evidence to support the proposed risk factors for drowning is based on population-based studies or case series. Other prevention strategies include focusing on pool safety such as restricting access to private pools for young children, education and training at schools on life skills, increasing public awareness through media campaigns, and the implementation of water safety legislation, community awareness, improved supervision of children around water bodies, building lifesaving facilities and enforcement of boat construction and maintenance regulations.<sup>24</sup>

However, there are certain limitations in our study which includes a small sample size, lack of certain information where many of the causal factors have “not known” categories

in them which remains as a hindrance to the accumulation of proper evidence-based drowning data. Besides these, the unregistered drowning cases may contribute significantly to the underreporting of drowning statistics in India. Good epidemiological studies are needed to identify the risk factors and evaluate the proposed prevention strategies for drowning in India. Furthermore, future research should focus on the intent for drowning which would help to inform policies and prevention interventions.

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#### CONCLUSION

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Our study concludes that the middle-aged rural males form a majority of drowning in large water bodies highlighting the absence of safety measures and lack of swimming skills contributing to drowning. Understanding drowning risk factors aids in implementation of effective preventative strategies. The comparison of drowning data between countries allows for identification of similarities in drowning risk and therefore effective prevention, as well as informing potential improvements in data collection and coding. Nationwide population-based studies are essential to identify the risk factors in accordance with the social, cultural and religious practices that enables to develop preventive strategies according to the needs of the country. **IJFMP**

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