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EPIDEMIOLOGICAL STUDY ON THE PATTERN AND DISTRIBUTION OF DROWNING INCIDENTS IN THE UDAIPUR REGION

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ABSTRACT **Objective:** To analyze the pattern and distribution of drowning incidents in the Udaipur region to inform prevention strategies. **Methods:** A cross-sectional study was conducted at RNT Medical College & Hospitals, analyzing 50 cases of drowning categorized by age, gender, and circumstances, over 1.5 years. **Results:** The study found a high incidence of drowning among males (80%) and adults aged 21-40 years (44%). Accidental drownings accounted for the majority (78%), with lakes (36%) and wells (26%) being common retrieval sites. **Conclusion:** The findings highlight the need for targeted drowning prevention strategies, particularly for adult males and at high-risk water sites. Enhanced public safety education and improved surveillance measures are recommended.

KEYWORDS : Drowning; Epidemiology; Udaipur; Public Health; Prevention Strategy; Water Safety

INTRODUCTION

Drowning remains a significant public health concern globally, accounting for an estimated 236,000 deaths annually according to the World Health Organization. Despite substantial efforts to reduce these preventable deaths, drowning rates continue to pose a challenge, particularly in regions with extensive inland water bodies and varying levels of public health infrastructure. The Udaipur region, renowned for its lakes and scenic water bodies, presents a unique setting to explore the epidemiological patterns of drowning incidents. This study aims to provide a comprehensive analysis of drowning cases in Udaipur, contributing to the sparse literature on this critical issue in the Indian context and offering insights that could inform regional safety protocols and prevention strategies.[1,2,3]

The geographical and cultural characteristics of Udaipur influence recreational activities and occupational exposures to water bodies, which may affect drowning risk factors differently compared to other regions. Prior research has predominantly focused on coastal drowning patterns or has been limited to small-scale observational studies that do not capture the broader epidemiological trends necessary for effective policy formulation. This research addresses this gap by systematically assessing the distribution and determinants of drowning in the Udaipur region, including demographic variables such as age, gender, religion, marital status, profession, education level, and socioeconomic status.[4,5,6]

Additionally, this study examines the circumstances of drowning incidents, including the type of water bodies involved, manner of death, and associated factors such as alcohol use and environmental conditions. By analyzing postmortem findings and categorizing the incidents by accidental, suicidal, and homicidal drownings, we aim to provide a detailed understanding of the risk factors and preventive measures that could be applied to reduce drowning incidences in similar settings globally and locally.[7,8]

Our study is structured to first outline the methods used for data collection and analysis, followed by a detailed presentation of the results across multiple variables. The discussion will interpret these findings in the context of existing research, and the conclusion will offer targeted recommendations for drowning prevention tailored to the Udaipur region's specific needs and challenges.[9] Through this epidemiological study, we aim to enhance the understanding of drowning patterns and support the development of more effective safety interventions and public health policies.

MATERIALS AND METHODS

This study was conducted in the Department of Forensic Medicine & Toxicology at RNT Medical College & Hospitals, employing a cross-sectional design over a period of 1.5 years.

Study Setting

The study took place within the Department of Forensic Medicine at RNT Medical College.

Sample Size Determination

The calculation yielded a sample size of 41, which was rounded up to 50 to enhance the robustness of the study findings.

Source of Cases

Drowning cases reported to this institution during the years 2023-2024 were included. Cases were documented using a specially designed proforma. Included were deceased individuals brought by police to the mortuary of the Department of Forensic Medicine or transferred from the casualty department, including those who died despite treatment.

Inclusion Criteria

The study included:

- All deceased drowning cases, irrespective of age, gender, religion, and marital status.
- Bodies retrieved from water bodies, identified or unidentified.
- Cases with any history of water submersion, regardless of the duration or the body's condition (fresh or decomposed).

Exclusion Criteria

- Bodies brought to the mortuary for reasons other than drowning were excluded from the study.

Data Analysis

Data entry and initial cleaning were performed using Microsoft Excel to ensure data quality. Statistical analyses were conducted to compute rates, ratios, and proportions for qualitative data. The chi-square test was applied for statistical inference, with a significance level set at $p<0.05p$. All findings and conclusions were derived from the analyzed data.

RESULTS

The study analyzed drowning cases in the Udaipur region, with findings categorized by age, gender, manner of death, and location of body retrieval. The age distribution of drowning victims (Table 1) showed a higher incidence in younger age groups, with 44% of the cases aged between 21-40 years, followed by 28% under the age of 20. The age groups of 41-60 and those above 60 years had a lower frequency of cases, representing 24% and 4% respectively.

Gender distribution (Table 2) revealed a significant male predominance in drowning incidents, with males accounting for 80% of the cases compared to 20% for females. This aligns with the global trends where drowning incidents are typically higher among males.

In terms of the manner of death (Table 3), the majority of drowning cases were accidental (78%), while suicidal and homicidal drownings were less frequent, constituting 18% and 4% of the cases respectively. These findings suggest that most drownings are unintended and might be preventable with appropriate safety measures and public awareness campaigns.

The analysis of the location where the bodies were retrieved (Table 4) indicated that lakes were the most common sites, with 36% of the

bodies found there. Wells were also a significant retrieval site, accounting for 26% of the cases. Other locations such as ponds and rivers each accounted for 12% of the drownings, while drains, culverts, pits, swimming pools, and water tanks had minimal cases, each contributing less than 6% to the total.

These results highlight critical areas where safety interventions and educational campaigns could be targeted to reduce drowning incidents, particularly in natural water bodies like lakes and wells that pose the highest risks in the region.

Table 1: Distribution of Drowning Cases According to Age

S.No.	Age (years)	Frequency	Percentage
1	0-20	14	28
2	21-40	22	44
3	41-60	12	24
4	60 above	2	4

Table 2: Distribution of Drowning Cases According to Gender

S.No.	Gender	Frequency	Percentage
1	Male	40	80
2	Female	10	20

Table 3: Distribution of Drowning Cases According to Manner of Death

S.No.	Manner of Drowning	Frequency	Percentage
1	Accidental	39	78
2	Suicidal	9	18
3	Homicidal	2	4

Table 4: Distribution of Drowning Cases According to Place of Retrieval of Body

S.No.	Place of Retrieval of Body	Frequency	Percentage
1	Culvert	1	2
2	Drain	3	6
3	Lake	18	36
4	Pit	1	2
5	Pond	6	12
6	River	6	12
7	Swimming pool	1	2
8	Water tank	1	2
9	Well	13	26

DISCUSSION

This study elucidates several critical aspects of the epidemiology of drowning in the Udaipur region, reflecting both global trends and unique regional characteristics. The significant predominance of males in drowning incidents (80%) aligns with global observations that suggest men are at higher risk, possibly due to increased exposure to water bodies through recreational and occupational activities or risk-taking behaviors. This gender disparity underscores the need for targeted interventions that address specific high-risk behaviors among men in the region.[10,11]

Age-wise, the highest incidence of drowning was noted among individuals aged 21-40 years (44%), which is a deviation from some global patterns where the highest rates are often seen in children. This finding suggests that adults in this age range may be engaging in water-related activities without adequate safety measures. The lower incidence in older adults and children may reflect reduced exposure or more supervised water interactions, respectively.[12]

The predominance of accidental drownings (78%) over suicidal and homicidal underscores potential preventive measures, such as improved safety signage, community education on water safety, and enhanced surveillance of popular water bodies. This indicates that most drownings could potentially be prevented through such systemic and community-level interventions.[13]

Furthermore, the places of body retrieval highlight specific risk locations, with lakes and wells being the most common sites for drowning. This suggests a geographical and possibly socio-cultural pattern that could inform localized drowning prevention strategies, emphasizing the need for safety measures around these bodies of water.[14]

The findings also provide a basis for refining public health policies, advocating for targeted drowning prevention programs, and reinforcing the importance of emergency response capabilities in the region. Given the varying circumstances and characteristics associated with drowning events, multifaceted strategies that include education, engineering, and enforcement interventions tailored to specific demographic and geographic profiles in Udaipur are recommended.

CONCLUSION

The study presents an in-depth analysis of drowning patterns in the Udaipur region, highlighting significant risk factors associated with gender, age, and specific locations. The findings advocate for the implementation of strategic preventive measures and public health interventions aimed at reducing drowning incidents. Continued research and data-driven approaches are essential to develop a comprehensive understanding that will further guide effective safety regulations and promote drowning prevention in similar regions.

Conflict of Interest

There were no conflicts of interest reported.

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