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Forensic Epidemiological Study of Drowning Deaths in a Cosmopolitan City of Karnataka

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ABSTRACT

Drowning is one of the leading causes of unintentional injury death worldwide, amounting to about 7% of all injury-related deaths. The estimated world-wide annual deaths due to drowning is said to be around 2,36,000. Children, males and individuals with increased access to water are most at risk of drowning. In India there exists proximity of people with the water bodies like rivers, canals, wells or ponds. All these water bodies are easily accessible and there are hardly any preventive or safety measures. This major public health problem related to drowning can be prevented by frequently studying data from the medicolegal registers, which is primarily the aim of this study.

Keywords: Drowning, Asphyxia, Autopsy, submersion, epidemiology, prevention.

INTRODUCTION

Drowning is a form of asphyxia caused by aspiration of fluid into air-passages, caused by complete or partial submersion in water or other fluid medium. In the year 2002 the World Congress on Drowning (WCOD) which was held in Amsterdam gave new definition of drowning as "the process of experiencing respiratory impairment from submersion or immersion in a liquid.[1]

Magnitude of the Problem

In many countries, a major contributor to premature mortality and an important cause of deaths due to unintentional injury is drowning.[2] According to the current estimates of World Health Organization, every year almost 0.26 million people die due to drowning out of which more than 90% of the victims are from low- and middle-income nations.[3] As per NCRBI data in the year 2021, drowning was the third major contributor which accounted for 7.5% of all unnatural causes of accidental deaths.[4] In India, major sources of water supply are wells, rivers, canals and dams. Due to ease of access and lack of safety measures drowning is a common cause of unnatural deaths. Also due to easy and unsecured access to water bodies in India it becomes an easy way for disposing on bodies after homicide.[5] And determining

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the manner of death especially in drowning deaths has always posed a great challenge to the forensic pathologist. The encounters are even more plausible in coastal areas. Mangalore is a cosmopolitan coastal city located in the Southwest part of India with more than nine lakh inhabitants surrounded by the Arabian Sea and Nethravathi river. Mangalore is a tropical region with peak summers and well known for its heavy rainfall during the rainy seasons with overflowing of Nethravathi river and in-turn occurs flooding of the low-lying areas in the sub-urban areas.[6] Data and knowledge about factors affecting drowning can help in better understanding of this menace and in turn lead to more effective measures to prevent the problem, albeit challenging. This paper aims to study the epidemiology of drowning deaths in Mangalore, over the last six years roughly (5.5 years) so that preventive measures can be undertaken.

MATERIALS & METHODS

The study material consisted of 306 medicolegal autopsies conducted in the department of forensic medicine and toxicology, Kanachur Institute of Medical Sciences, Mangalore, Karnataka between January 2016 to June 2022 making it a period of five and half years. Of these, 19 cases (6.2%) were deaths due to Drowning. These Drowning deaths were studied retrospectively (retrospective observational study design) after obtaining clearance from the institutional ethical clearance committee.

Forensic epidemiological study parameters to be studied such as age, sex, season, water source, manner of death, and occupation were recorded on a structured proforma. Cases which are still pending toxicological chemical analysis were excluded. Hospital case records, police inquest reports, detailed interview with relatives, post mortem examination reports and chemical analysis reports were the source for material.

The information thus collected, was tabulated using Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 21.0 and results were thereby drawn.

RESULTS

During this study period, a total of 306 cases were brought for postmortem examination out of which 19 (6.2%) deaths were due to Drowning. The highest number of victims 11 (57.9%) belonged to age group of 41-50 years [Table 1]. Males dominated females in number of deaths. 14 victims were males (73.68%) and 5 victims were females (26.31%) [Table 2]. Majority of deaths happened during rainy season amounting to 12 deaths (63.15%) [Table 3]. The most common manner of death was accidental drowning amounting to 16 deaths, (84.21%) [Table 4]. Maximum number of persons fell victim by falling into overflowing canals (gutters) amounting to 13 deaths (68.42%) [Table 5]. Majority of the victims 16 (84.21%) were self-employed street urchins [Table 6].

Table 1: Age Distribution of Decedents

Age group (Years)	Number of Deaths	Percentage (%)
0-10	-	-
11-20	1	5.26
21-30	1	5.26
31-40	4	21.05
41-50	11	57.9
51-60	2	10.52
TOTAL	19	100

Table 2: Sex Distribution

Sex	Number of Deaths	Percentage (%)
Male	14	73.68
Female	5	26.32
TOTAL	19	100

Table 3: Season of Death

Season	Number of Deaths	Percentage (%)
Summer	6	31.57
Rainy	12	63.15
Winter	1	5.26
TOTAL	19	100

Table 4: Manner of Drowning

Manner	Number of Deaths	Percentage (%)
Accidental	16	84.21
Suicidal	3	15.79
Homicidal	Nil	-
	19	100

Table 5: Drowning Water Source

Water Source	Number of Deaths	Percentage (%)
Canal (Gutter)	13	68.42
Well	5	26.32
Sea	1	5.26
TOTAL	19	100

Table 6: Occupation of Decedents

Occupation	Number of Deaths	Percentage (%)
Unemployed Student	1	5.26
Self-employed Street Urchin	16	84.21
Employed	2	10.52
TOTAL	19	100

DISCUSSION

In this section the authors attempt to compare our study findings with observations made by other researchers on forensic epidemiology of drowning hitherto falling during the same observational study period as ours or such coastal regions to. It would be pertinent to the readers at this stage firstly to know that there are 6 tertiary care medical college and hospitals within a 16-kilometre radius in the city of Mangalore. The data collected from KIMS hospital Mangalore is but a small fraction of cases falling under the same jurisdiction of police stations which prefer the government hospital in majority of cases. Thus, when our study values do not correlate with other researchers, this factor has to be kept in mind. And when they do, they cannot be equated with cities bigger than Mangalore. However, the study gets its advantage over other regions because of the city being located in a coastal region.

Majority of the decedents in our study belonged to 41-50 years age group which correlated with findings made by Lin YC et al.,[7] and closely to Niraj Kumar et al.,[8] but it did not correlate with Shetty & Shetty [6], Radhakrishna et al.,[9]. Males predominated females in our study which correlated with findings made by all authors credited above.[6-9] Further, majority of the decedents fell victim during rainy season. This observation correlated with study made by Radhakrishna et al., but it did not correlate with observation made by other researchers credited above. [6,7,8] This could be due to regional/locality/topographical differences between the suburbs versus downtown. The most common manner of death was accidental in our study which correlated with all other authors credited above. [6-9] While considering the water source to which the decedents fell victim to- most of our studied cases submerged into overflowing canals (gutters) which correlated with all authors credited above [6,8,9] except by Lin YC et al. This small difference in non-correlation could be explained by the fact that their study primarily focussed on drowning in the elderly in bathtubs. Lastly, we observed that majority of the decedents in our study were self-employed street urchins who being more prone to drowning which may be well put as an occupational risk. This observation correlated closely correlated with Niraj Kumar et al but it did not correlate with other authors credited above. This could be once again due to the difference in the locality as stated earlier the scenario of the suburbs of Mangalore versus downtown.

CONCLUSION

The authors conclude that drowning is undoubtedly a high-priority public health problem. The Municipal corporation and such bodies have taken adequate measures in every area such as barricading entry of people into the beaches during the nights, appointing night watchmen around the beaches, prompt closure of open drains etc. However, the topography of the suburbs is such that the mud easily gets leeched leading to overflowing of gutters and canals which we feel must be looked upon to so that these accidental deaths being predominant will reduce. While the municipal bodies have no role in curbing suicidal and homicidal

drowning deaths, it purely rests in the mentality of every individual to live and let live in accordance with the law as legally abiding citizens of India.

Conflict of Interest: None

Ethical Committee Clearance: Obtained

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