Profile of near drowning victims in a coastal region of Karnataka

*Dr. Tanuj Kanchan, †Dr. Prateek Rastogi, **Dr. Manoj Kumar Mohanty
*Assistant Professor, Forensic Medicine, Kasturba Medical College, Mangalore
**Associate Professor, Forensic Medicine, PSI7MS, Chinoutpalli, Andhra Pradesh

Corresponding Author:
Dr. Tanuj Kanchan
Assistant Professor,
Department of Forensic Medicine,
Kasturba Medical College, Mangalore — 575001,
Karnataka, India.
Tel:    +91 824 2422271, Extn – 5565 (Office)
       +91 9448252394 (Mobile)
Fax :    +91 824 2428183
E-mail: tanujkanchan@yahoo.co.in
        tanujkanchan@gmail.com

TOTAL NUMBER OF TABLES= 1 [ONE]
FIGURES= 2 [TWO]

Abstract
BACKGROUND: Drowning and near drowning are serious public health problems and an important cause of morbidity and mortality worldwide. Present study is done to understand the pattern of near drowning cases in this coastal region of Karnataka. METHODS: This hospital based retrospective research was conducted at Kasturba Hospital, Manipal in Southern India from January 1993 to December 2003. A detailed victimologic profile was made. RESULTS: Study included a total of 58 cases of near drowning. Males were predominantly affected (84.5%). Majority of the victims were aged below 10 years (39.7%). Manner was accidental in maximum (82.3%) reported cases. Incidence of fresh water drowning was more than sea water drowning. Fatal outcome was reported in 12.1% cases with maximum fatalities occurring within one to three days of hospitalization. Most of the victims witnessed respiratory complications (55.2%). CONCLUSION: Males in the first decade are at increased risk of accidental drowning. Swimming under adult supervision, immediate resuscitative measures and early medical aid is proposed.

Keywords: Drowning; Near Drowning; Accident; Mortality.

Introduction:
Drowning is a process resulting from submersion in water or any other liquid in which there is loss of consciousness and threat to life [1]. When the victim shows an apparent initial recovery from drowning but then dies hours or days after the incident owing to complications it is termed as secondary drowning [2]. Near drowning refers to submersion cases when the victim survives for at least 24 hours after the event [3]. People have reportedly drowned in as little as 30mm of water lying face down. Children have drowned in baths, buckets and toilets; those under the influence of alcohol or drugs have died in puddles. The rate of drowning in populations around the world varies widely according to their access to water, the climate and the national swimming culture. The United Kingdom suffers 450 drowning per annum or 1 per 150,000 of population whereas; the United States suffers 6,500 drowning or around 1 per 50,000 of population. The rate of near drowning incidents is however, unknown.

Manipal is a rural township in Udupi district of coastal Karnataka situated in Southern India, and Kasturba Hospital is the apex teaching hospital of Kasturba Medical College, Manipal. This retrospective hospital based research is done with an aim to determine pattern of near drowning, circumstances and location of drowning, and complications that developed during the hospital stay to understand the problem status of near drowning in this coastal part of the country and suggest preventive measures.

Material and Methods:
This eleven year retrospective review was carried out at Kasturba Hospital, Manipal. Hospital records of all the drowning cases admitted in our hospital between January 1993 and December 2003 were studied and a detailed victimologic profile was made.
The data was registered in a database and in addition to age and sex, was analysed for circumstances, location of drowning, and complications that developed during the hospital stay. Victims who survived for less than 24 hours following drowning were excluded from the study.

**Results:**
A total of 58 cases of near drowning were admitted in Kasturba Hospital, Manipal during January 1993 and December 2003. Majority of the victims (n= 49, 84.5%) were males, male-female ratio being 5.4:1. Peak incidence is observed during 1st decade of life, after which a gradual decline was evident. 1st and 2nd decades together accounted for 58.6% (n=34) of the total near drowning cases (Figure 1). Manner of near drowning was accidental in 82.3% (n=48) and suicidal in 10.3% (n=6) cases. Exact manner of death remained unknown in four cases. No homicidal near drowning was reported during the study period. Place of incident and media of submersion was known in 94.8% (n=55) cases, of which maximum (n=38, 69.1%) were cases of fresh water drowning (Figure 2). Duration of hospital stay is shown in table 1. Respiratory complications were encountered in maximum number of cases (n=32) followed by neurological complications (n=12). In nine victims (15.5%) no complications were reported while seven victims (12.1%) died in the hospital. Period of survival in fatal cases varied from 2 -18 days.

**Discussion:**
According to the Global Burden of Disease (GBD) 2000, an estimated 449,000 people drowned worldwide and a further 1.3 million Disability Adjusted Life Years were lost as a result of premature death or disability from drowning. Low and Middle- income countries have the highest rate of drowning [4]. Near drowning is the survival of a drowning event involving unconsciousness or water inhalation and can lead to serious secondary complications, including death, after the event. Our study of near drowning cases shows that males are more likely to drown than females, especially during the first decade of life, similar to other studies [5]. Paden et al. have reported a higher drowning mortality rate in males than females for all ages in all regions and a higher mortality rate when compared to any other cause of injury worldwide in children under the age of 15 years [4]. 1st and 2nd decade together accounted for more than half of the total near drowning cases. Young children are at greatest risk of near drowning owing to their energy and curiosity that can easily lead them to fall into water source from which they cannot escape. In teenagers and adults however, near drowning has been associated with drugs and intoxication, seizures, and physical impairment because of a medical condition [6]. Unintentional drowning was reported in maximum cases similar to studies worldwide. Victims of accidental drowning are usually children, fisherman, and dock workers, intoxicated or epileptic subjects. Suicidal episodes are fairly common amongst women or disabled persons, while homicides are rare except in cases of infants, children & disabled persons [7]. In our study no homicidal case of near drowning was reported. In the US causes of drowning are related to swimming, boating, and scuba diving. Suicidal drowning was seen in about 10% of the drowning cases. Drowning remains a relatively popular method of suicide in this region [8]. Fresh water drowning was more commonly encountered with drowning in pond and wells predominating similar to a study in neighbouring coastal region [9]. In a similar study in coastal region of Florida fatal accidental drowning in salt water was most common [10]. World wide most drowning incidents occur in water, 90% in freshwater (rivers and lakes) and 10% in sea water, drowning in other fluids are rare and usually be accidental. Near drowning is characterized by severe oxygen deprivation caused by submersion in water when the person survives. Water enters the lungs when a person is submerged under water. Thus, the lungs cannot efficiently transfer oxygen to the blood. The decrease in the level of oxygen in the blood that results may lead to brain damage and death. Water contaminated by bacteria, algae, sand, dirt, chemicals, or a person’s vomit, can cause lung injury in addition. People who are rescued are reported to have symptoms ranging from anxiety to near death. The original concept of drowning deaths was that they were asphyxial in nature with water occluding the airways. Experiments by Swann & coworkers suggested that death was due to electrolyte disturbance and / or cardiac arrhythmias, produced by large volume of water entering the circulation through lungs. Model suggested that about 10 % of drowning victims do not aspirate water but die of asphyxia due to laryngospasm. In our study respiratory complications were encountered in maximum number of cases followed by neurological complications. Electrolyte imbalance in these cases of near drowning is a topic of future research.

In nine victims, no complications were reported while seven victims died in the hospital. Period of survival in fatal cases varied from 2 -18 days. The chances of survival depend on the duration of submersion, the water temperature, the person's age, and how soon resuscitation begins. People who have consumed alcoholic beverages before submersion are more prone to develop brain or lung damage.
Survival is possible after submersion for as long as 40 minutes. Almost all people who are alert and conscious upon their arrival at the hospital recover fully.

**Conclusion and recommendations:**
Accidental drowning is largely preventable and males below 10 years of age form the high risk group. The quality of information available needs to be improved especially with regard to disease status and alcohol intoxication among the victims.

The reduction of drowning through education should become a significant element of school curricula. Swimming pools should be adequately fenced. Constant supervision of children in or near any source of water, including pools and bathtubs is recommended. A person should not engage in swimming or boating when under the influence of alcohol or sedatives. People who have seizures should be cautious near water source. To decrease the risk of drowning, a person should avoid swimming alone.

Immediate on-site resuscitation is the key in increasing the chances of survival without brain damage and thus recommended. Attempts should be made to revive the person even when the time under water is prolonged. Artificial respiration and CPR should be provided and immediate transfer to hospital is sought.

<table>
<thead>
<tr>
<th>Hospitalisation (days)</th>
<th>No. of cases (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1-2</td>
<td>15</td>
<td>25.9</td>
</tr>
<tr>
<td>&gt; 2-3</td>
<td>10</td>
<td>17.2</td>
</tr>
<tr>
<td>&gt; 3-4</td>
<td>07</td>
<td>12.1</td>
</tr>
<tr>
<td>&gt; 4-5</td>
<td>08</td>
<td>13.8</td>
</tr>
<tr>
<td>&gt; 5-7</td>
<td>06</td>
<td>10.3</td>
</tr>
<tr>
<td>&gt; 7-30</td>
<td>11</td>
<td>18.9</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>01</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>100</td>
</tr>
</tbody>
</table>