

# Socio-demographic Characteristics of Drowning in Children Admitted in A Medical College Hospital

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## ABSTRACT

**Background:** Drowning is an important cause of mortality among children in rural Bangladesh. This study was done to find out the sociodemographic characteristics of drowning affected children.

**Materials and methods :** It is a descriptive study among the victim of drowning admitted in the Department of Pediatrics, Chittagong Medical College Hospital, Chattogram during the period of January 2014 to December 2014. One hundred victims were selected for the study. History and face to face interview were taken, the socio-demographic characteristics were analyzed statistically.

**Results:** Of 100 patients in this study, age ranged from 6 month to 12 years, largest number (76%) of victims belonged to 1-4 years age group. Most of the drowning events occurred in rural area (82%). Almost all (87%) of rural drowning occurred in pond, 8% drowning occurred in bucket, all of which were urban.

April to October (88%) were found to be high risk months for drowning. Almost all (96%) of the victims were found unable to swim and in 100% cases, there is no fencing present around pond. Most (82%) of the victim survived without morbidity, 6% died, 4% survived with morbidity.

**Conclusion:** Children of 1-4 years old, rural children, children of poor socioeconomic background are vulnerable to drowning. Drowning mostly occurs during daylight, lack of supervision of child is strongly associated with drowning. Drowning has specific seasonal pattern. Busy mother with a large family, illiterate mother, lack of pond fencing or door fencing, and lack of swimming ability are also associated with drowning.

**Key words:** Drowning, Health problem; Sociodemographic characteristics.

## Introduction

Drowning is a major but often neglected public health problem. It is an important cause of mortality among children in rural Bangladesh.<sup>1</sup> Effective therapeutic and preventive measures against different infectious disease have remarkably reduced child mortality.<sup>1</sup> But Unintentional injuries including drowning has become one of the leading causes of childhood mortality among children.

Results of studies in different countries showed that drowning is one of the leading cause of mortality among children.<sup>2-4</sup> Available data showed that there are substantial differences in drowning fatality rates across the world. For some countries, mostly high-income ones,

the pattern of fatal drowning is well documented.<sup>4,5</sup> However death from drowning have not been adequately studied and addressed insome low-income countries like Bangladesh.<sup>6,7</sup> Hardly a day goes by in Bangladesh in which the media do not report a child's death by drowning. But according to experts, this is just the tip of an iceberg, with the actual number of the case fatalities several times greater than the reality.<sup>7</sup>

Water to most children means fun and adventure in ponds, ditches, lakes or simply in the road following a rainstorm, also in a bucket or tub water, though it can be a dangerous medium. A small child can be drowned in a few centimeters of water at the bottom of a bucket, in the bath, or in a rice field. Drowning is an injury that displays epidemiological patterns that change according to age group, body of water and activity.<sup>8</sup> In most of the countries around the world, drowning ranks among the top three cause of death from unintentional injury, with the rates highest among children under five years of age.<sup>9</sup> Drowning has been previously defined as death secondary to asphyxia while immersed in a liquid usually water within 24 hours of submersion. At the 2002 world congress of drowning, held in Amsterdam, a group of experts suggested a new consensus definition for drowning to decrease the confusion. The new definition states that "Drowning is a process resulting in primary respiratory impairment from submersion in a liquid medium, outcome may include delayed morbidity."<sup>10,11</sup>

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Fatal drowning ranked 13th as the overall cause of death among children under 15 years old, with the 1-4 years age group appearing at the greatest risk.<sup>9</sup> The overall global rate for drowning among children is 7.2 deaths per 100,000 population, with significant regional variations.<sup>9</sup> The drowning rate in low income and middle income countries is six times higher than in high income countries (With rates of 7.8 per 100,000 and 1.2 per 100,000 respectively).<sup>9</sup> Key risk factors for drowning are male sex, age less than 4 years, alcohol use, low income, poor education, rural residency, aquatic exposure, risky behavior and lack of supervision.<sup>11-14</sup> For people of epilepsy, the risk of drowning is 15 to 19 times as high as the risk for those who do not have epilepsy.<sup>15</sup> Exposure-adjusted, person-time estimates for drowning are 200 times as high as such estimates for deaths from traffic accident.<sup>16</sup>

The Bangladesh study found that drowning is the fifth leading cause of death among children 1-17 year(s) of age.<sup>17</sup> The incidence of drowning fatalities among children aged 1-4 year(s) was 86.3 per 100,000 children.<sup>17</sup> Twenty six percent of all death in children between the ages of 1-4 year (s) is due to drowning.<sup>8</sup> The annual near drowning rates in children aged 1-4 year(s) are 136.9 per 100,000 in rural areas and 18.9 per 100,000 in urban areas.<sup>17</sup>

A report of safety week stated that more than 30,000 children died from injury each year in Bangladesh.<sup>17</sup> A massive 17,000 of these lives are due to near drowning, that is 46 children a day.<sup>17</sup> This proportion seems to be very high and deserve attention from researcher and policy maker. Despite this overwhelming figure, drowning is still not given the focus to combat this national tragedy.

Death from drowning of children can be expected to be a major problem in Bangladesh because of the geographical feature of the country.<sup>8</sup> Villages are usually surrounded and intersected by canals and rivers and there are numerous ponds near houses. Most of the villages are inundated for several months in the monsoon. Some research reveals a clear seasonal pattern of drowning.<sup>8</sup> The peak of the drowning death usually takes place in the monsoon months that is April to September.<sup>8</sup> Majority of near drowning among children occurs in rural areas typically in rivers, ponds, ditches, buckets in bathrooms and in urban area drowning occur in buckets, toilets, sinks and other common household objects containing water. Young children fall head first into this water container and may not be able to extricate themselves. The mortality rate is high because of cleaning fluids and other caustic substances that bucket may contain.<sup>19</sup>

The place of drowning is also related to the age. Most of the death happened very close to home. Brief lapses (<5min) in supervision are associated with most of drowning events.<sup>19</sup> Some young children are supervised by older children, and both drown at a time, this incidence is not very uncommon. Concomitant medical condition like epilepsy, cerebral palsy etc. also increases the likelihood of drowning.<sup>19</sup>

Death due to drowning is principally avoidable and can be decreased by raising awareness about the dangers of drowning. This highlights the need for well-designed research to study the clinical and sociodemographic characteristics which can identify the causes and the origins of drowning injuries and to evaluate the preventive measures. Current study was done to find out such sociodemographic characteristics which may help the policy maker to identify the problem and to take appropriate measures for saving valuable lives of children from drowning in Bangladesh.

Drowning is a major cause of childhood mortality in Bangladesh. Death is more by drowning than from any other type of injury or non-injury related killers such as pneumonia, malnutrition or diarrhea. Yet, to date, these deaths have gone unnoticed. As a result, drowning prevention and management remain almost nonexistent in our country. The knowledge about the seasonal pattern, age group variation, location and time of drowning and other drowning related factors might help us to take appropriate preventive measure and can save valuable lives of children from drowning. So, this study was performed to find out sociodemographic characteristics of drowning in children. To find out the sociodemographic characteristics of drowning in children.

#### Materials and methods

The variables of victims are age, sex, locality, socioeconomic status, activity of the victim prior drowning, swimming ability and underlying medical disease of the victim.

The variables related to parents of victim are maternal age, maternal education, maternal profession of the victim, number of surviving children of mother, activity and presence of mother during drowning and presence of accompanying person with the victim.

The variables related to drowning are location, time of drowning, site of drowning, distance of drowning site from home, presence of fencing (Door or pond fencing) outcome of drowning cases.

This study is a hospital based descriptive type of cross-sectional study, was done in Pediatric Ward of Chittagong Medical College Hospital (CMCH) Chattogram. The time period was one year from 1st January to 31st December 2014.

Sample size was determined 384 but during this one year period 114 cases of drowning victims were admitted in the Pediatric Ward of CMCH. Among 114 cases, 14 cases were brought dead and not gave the consent to include in this study. All the convenient cases who fulfilled the inclusion criteria and whose attendant gave the informed consent were taken. This study included children, aged 6 month - 12 year(s) who attended the Inpatient Department of Chittagong Medical College Hospital due to unintentional or accidental drowning. After the patient admitted to Pediatric Ward, all emergency and necessary measures were taken. Once the child was settled, parents were informed about the study and requested for written consent to be included in the study, those who convinced were asked about detailed history and examination as per "case record form". All drowning cases were subdivided into three groups: 6 month – 1 year, 1 - 4 year(s) and 4 - 12 year(s). Children less than 6 month were excluded because they are not at high risk as they are usually not capable or moving by themselves, and children more than 12 year(s) were excluded as in Inpatient Department of CMCH up to 12 years old patient were admitted. All data collected in individual pre-determined case record form containing different code number. Then all data were compiled and analyzed statistically. The collected data were compiled and re-examined to exclude inappropriate entry as well as to exclude errors in data collection procedure. The compiled data were then analyzed with the help of SPSS program, version 11.5. Written approval for the study was taken from the Director of Chittagong Medical College Hospital and ethical clearance were taken from ethical review committee of CMCH. The aim and objectives of the study along with its procedure and benefits of this study explained to the parents of the children in detail in easily understandable language. Informed verbal consent from the attendant was taken duly.

## Results

### Age of the victim

Among 100 victims around 76 (76%) drowning occurred among 1-4 years age group, 18 (18%) in more than 4 years age group and 6 (6%) among infant.

### Gender of the victims

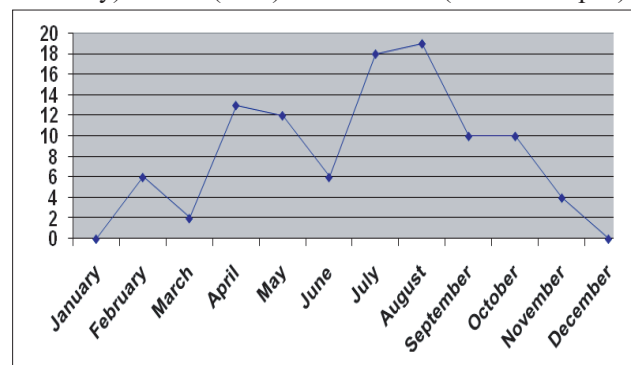
The rate of drowning was higher for boys (67%) than girls(33%).

### Location of drowning

Drowning is predominantly a rural problem, 82 (82%) patient comes from rural area and 18 (18%) patient comes from the urban area.

### Seasonal variation of drowning

Regarding seasonal variation, drowning rate among children shows that 57 (57%) occurred in the monsoon (July to October) and 10 (10%) in winter (November to February) and 27 (27%) in hot season (March to April).



**Figure 1** Distribution of victims of near drowning by season

### Site of drowning

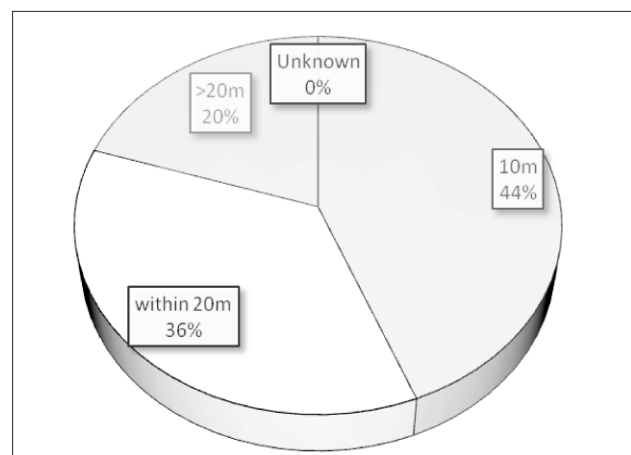
Pond (87%) were identified the most common site for drowning followed by bucket (8%), ditches (2%), others (3%) including canals, wells etc.

### Time of drowning

Majority (66%) of drowning occurred before noontime when mothers and other relatives were busy with their household chores and 24(24%) drowning occurred at evening.

### Distance of site of drowning from home

Out of 100 victims, Almost half of the cases (44%), drowning site were very close to home (Within 10m).



**Figure 2** Distribution of victim by distance of site of drowning from home

### Activity of victim prior to drowning

Most of the victims (82%) were found, playing before drowning, 14 (14%) victims were bathing and in 4 (4%) cases activity of victim was unknown prior drowning.

**Socioeconomic status**

Most (82%) of the victim belongs to lower and lower middle socioeconomic group.

**Ability of victims to swim**

Among 100 cases most (96%) of the victims were unable to swim.

**Maternal age distribution**

Among 100 mothers, 78 (78%) mothers age were between 20 yrs - 30 yrs.

**Maternal education**

Among 100 mothers almost half (46%) of the mother had primary education, one third (32%) had secondary education, 14 (14%) mother had no formal education.

**Maternal profession**

Among 100 victim, 98 (98%) mothers of victim were housewife.

**Number of surviving children**

35 (35%) of 100 mothers of victim had 1 child, 42 (42%) has 2 children, 20 (20%) had 3 children, 5 (5%) had > 4 children.

**Presence of parent at home during drowning**

Among 100 parents, at least one parent was at home 90 (90%) cases, parents were outside the home at 10 (10%) cases.

**Activity of mother during drowning**

Among 100 mothers, most of the mothers of victim (74%) were busy with their household work, 12 (12%) mothers were sleeping or gossiping and in 14% cases, mothers were not remembered what they were doing during drowning of their children.

**Presence of accompanying person with victim during the incidence**

In 67 (67%) cases, there was no accompanying person with the victim.

**Medical condition associated with near drowning**

Among 100 cases, 2 (2%) victims had seizure disorder, 2 (2%) victims had psychiatric illness which was probably the cause of drowning in that case, 96 (96%) victims had no underlying medical disease.

**Presence of fencing**

In all the cases, no fencing was present around the pond, home or door.

**Discussion**

Drowning is an important cause of mortality among children in rural Bangladesh. In this study an attempt was made to study the Sociodemographic characteristics of drowning. Drowning rate is known to vary greatly with age. In this study the highest (76%) rate of drowning was in children of 1-4 years of age. The rate of drowning was found to be decreased with

increasing age. The finding is very close to observations in other countries and also Matlab study (80% drowning occurred children of 1-4 years age group).<sup>1-3,20-30</sup> Accidental drowning occurred most in children in the age group of 1-4 yrs and this might be due to behavioral patterns of children of this age group. This group is more curious, can move independently and usually have a natural affinity for water. The rates of drowning was higher among the boys (67%) than girls (33%). This finding is also very close to the Matlab study by Anwarul Iqbal et al. and also consistent with the study of BHIS (The Bangladesh Health and injury Survey).<sup>17</sup> The Matlab study showed that risk of drowning is 20% higher among boys.<sup>1</sup>

This study found that drowning rate is much higher in rural areas (82%) than those who drowned in the towns and cities (18%) where they face fewer water hazards. This finding is consistent with the study of BHIS.<sup>17</sup>

April to October (88%) are found to be high risk month for drowning and these months cover the first rainfall and the entire monsoon season of Bangladesh when water levels are very high and collections of water are closest to house premises. This result also very close to the study, done in Matlab.<sup>1</sup> This pattern of seasonality is in accordance with another study conducted in Matlab which also found a strong association between near drowning in children 1-4 years and monsoon season.<sup>31</sup>

Results of most the studies in developed countries showed that drowning among children aged 1-4 years occur in swimming pool, which is not the scenario in rural Bangladesh.<sup>8,28-30</sup> In this study it has been found that in rural area, drowning mostly occurs in the pond (87%) and urban drowning occur in bucket (8%) kept in bathroom or kitchen as a temporary water reservoir. This finding is consistent with study done in Matlab by Anwarul Iqbal et al. in which pond (45.1%) was identified most common site for drowning.<sup>1</sup>

The time of drowning is another important point of consideration for preventive measure. In this study it has been observed that almost all (80%) of the drowning occurred in daylight hours and 46% drowning occurred before noon when mother and other care taker remain busy with their household work. This suggests that children are not properly supervised during this time. This finding is consistent with the study done in BHIS (97%) and also with the study done by M Kapil Ahmed (61%) in Matlab.<sup>8,17</sup>

In rural Bangladesh pond, ditches and sometimes river are located very close to house which is routinely used for household work throughout the year. Living near water body was found to be a cause of drowning. In this study it is found that 44% drowning site is within 10 m and 36% drowning site is within 20m that is (44+36)

80% cases drowning site is very close to house (Within 20 m). This study is found very close to the study done by BHIS (The Bangladesh Health and injury survey) in Dhaka.<sup>17</sup>

This study also showed that 82% victim were playing before the incidence, 14% drowning occurred during bathing. This finding also supports the finding of study of BHIS.<sup>17</sup>

In this study 56% of drowning victims come from lower and lower middle-class family as their parents spent most of their time to earn money and get less time to look after their child.

This study showed that most of the (96%) victims were unable to swim. This finding is consistent with finding of BHIS study.<sup>17</sup> The BHIS showed a direct link between the likelihood of drowning and lack of swimming skills.

This study showed that 78% mothers were in between 20 -30 years, 46% mothers had only primary education and 14 % mothers had no formal education, and 98% mothers were house wife. This finding is consistent with study done by M Kapil Ahmed in Matlab which showed that maternal age, parity, education has significant impact on drowning.<sup>8</sup> The study done by Anwarul Iqbal et al. showed that 67% mother had no formal education.<sup>1</sup> The BHIS also showed that having an illiterate mother significantly increase the chance of drowning.

This study found that 42% mothers of the victim had 2 children and 5% mothers had more than 4 children, but study done by Anwarul Iqbal et al. at Matlab showed that 50% mothers of the victim had more than three siblings.<sup>1</sup>

This study found that in 90% cases at least one parent was present at home and 74% cases mothers were busy with their household work during the incidence. This result also like the result of the study of BHIS.<sup>17</sup>

This study also showed that 67% children were unaccompanied during the incidence and of the remainder, almost most of them were accompanied by children too young to rescue them. This finding is similar to the finding of the study of BHIS.<sup>17</sup> The BHIS study showed that in two third cases, child was accompanied but half were with children who were 10 years or below. The BHIS study also showed that a lack of adequate supervision, busy mother with a large family and many children to care for are often unable to watch over the little ones.<sup>17</sup>

This study showed that in 4% cases near drowning victims are associated with some medical condition like epilepsy, psychiatric illness which might be the cause of drowning. This study also showed that in 100% cases there in no fencing present around the pond or door.

Drowning remains an important and preventable cause of childhood mortality, which requires adequate preventive strategies. In developed countries, different preventive strategies have been proposed.<sup>8,23,31</sup> Baseline observational studies were carried out in Bangladesh regarding community perceptions about drowning. These studies recommended the attachment of bell to the child's waist and the fencing of ponds or other open water bodies or establishment of toddler-proof barriers.<sup>32,2</sup> Caretakers need to identify a specific person to look after the toddlers. Children should never be left alone in any condition.

Targeting drowning as a public health priority will require shifts in routine strategies and evaluation of novel or traditional approaches. Traditional approaches which may need to be reevaluated and promoted. Initial explorations in the community suggest that development and introduction of interventions includes to increase awareness. Training in resuscitation techniques should also be evaluated as a strategy to reduce death by drowning. One hurdle is to assure that parents and communities, health worker, programme manager, health professional and policy makers recognize drowning as a public health problem. The GOB programme, part of the national MCH-FP programme, can help to reduce deaths from drowning by raising awareness of parents and relatives about the danger and prevention of drowning. In formulating these policies, one should not lose sight of the role of parents who have, of course, the final responsibility for the safety of their children.

#### Limitations

It is a hospital based study and sample size was small.

#### Conclusions

From the present study, it can be concluded that children less than 4 years, rural children, poor socioeconomic background are vulnerable to drowning. Drowning mostly occurs during daylight hours, lack of supervision or supervision by guardians is strongly associated with drowning. Drowning has specific seasonal pattern. It happens mostly in rainy seasons when water bodies are abundant. No pond fencing or door fencing and lack of swimming ability may be associated with near drowning.

#### Recommendations

Intervention aimed at reducing mortality and morbidity from childhood drowning need to be focused on both prevention and management. For prevention, the characteristics revealed from this study should be kept in mind and the recommendations are as follows :-

a) Removing hazards: Drain unnecessary accumulation of water (Pond, bucket, ditch).

b) Create barrier: Ensure mandatory isolation-fencing for pond and water bodies when possible. Fencing around the rural fishpond, ditches, which are filled with rain water and other bodies around the houses and the locality.

- Encourage fencing home in close proximity to water.
- Encourage the use of grill over the water well.
- Use tight fitted cover over the water container or bucket.
- Pay attention to those who are at risk.
- Increase awareness among parents and other caregiver.

#### Disclosure

All the authors declared no competing interest.

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