Definition and classification of drowning

Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid. This definition was adopted by the World Congress of Drowning in 2002.

To facilitate appropriate drowning prevention, the International Classification of Diseases 10th Revision (ICD 10), Chapter 20 – External causes of morbidity and mortality, has classified it as follows:

- **Accidental drowning and submersion** (W65–W74) includes all unintentional drowning and submersion, except those due to transport accidents (V01–V99), water transport accidents (V90–V92) and cataclysm (X34–X39).

- **Drowning and submersion by intention** is categorized as intentional self-harm by drowning and submersion (X71), assault by drowning and submersion (X92).

- **Drowning and submersion** is classified as drowning and submersion, undetermined intent (Y21) when information is insufficient to make a distinction between unintentional or intentional submersion.

Global burden from drowning

Drowning is the third leading cause of unintentional injury deaths among all populations worldwide following road traffic injuries and falls. It accounts for 7% of all injury-related deaths. In 2011, an estimated 360,000 people died from drowning globally. Low- and middle-income countries account for 95% of unintentional drowning deaths.

Worldwide, for children aged <15 years, drowning accounted for the highest mortality rate among all causes of injury. Globally, about 23% of all unintentional injury deaths among children are due to drowning and 1.3% of all disability-adjusted life years (DALY) lost for children below 15 years of age in low-income and middle-income countries is from drowning. An estimate suggests that 2–3 million children aged 0–14 years survived a drowning incident in 2004 globally. However, about 5% of child drowning survivors were admitted to hospital with neurological damage.
Drowning can be a serious impediment to achieving Millennium Development Goal.

**Magnitude of drowning in the South-East Asia Region**

Drowning is one of the major causes of mortality in the South-East Asia Region. India, as a whole, has an average drowning death rate of 6.6 per 100,000 population per year. One person drowns every 8 minutes in India which has particularly high drowning mortality rates. It also contributes 43% of the world’s drowning deaths and 41% of the total global DALY lost related to drowning together with China.

A hospital-based study by the Nepal Health Research Council during 2008–2009 documented 37,973 injuries, showing that drowning constituted 0.07% of all injury deaths.

Myanmar’s Health Management Information System has reported that drowning is the leading cause of injury deaths accounting for 1257–1511 deaths/year since 2005. This number increased remarkably in 2008 to 7625 deaths (15.97 deaths/100,000 population per year).

In Maldives, 1.9% of the total deaths were due to drowning. The age-adjusted death rate in 2011 was 7.33 per 100,000 of population.

**Child fatality from drowning in the South-East Asia Region**

According to Global Health Estimates by the World Health Organization, child fatality from drowning in the South-East Asia Region is 8.6/100,000 children. This rate is second only to the African Region (Figure 1).

A five-country community survey in Bangladesh, China, Philippines, Thailand and Viet Nam in 2008 revealed an average rate of drowning deaths at 30 per 100,000 children under the age of 18 years. Among these countries Bangladesh has the highest number of such cases every year (16,570 cases). In Thailand 2,645 children die due to drowning each year.

Drowning is the leading cause of death in children aged 1–17 years in Bangladesh, (28.6 per 100,000 children ≤17 years) in 2003.

In India, death registration data 2001–2003 show that unintentional injuries were reported to be the sixth leading cause of death among children of ≤5 years. Most of the childhood drowning deaths were in rural areas.

The Thai death registry report of 1999–2012, revealed drowning as the leading cause of death among children (≤15 years) with an age-specific rate of 7.7–11.5 per 100,000 children. Drowning accounted for 33.9–46.5% of all Thai child injury deaths.
Risk of drowning in the South-East Asia Region

Age

In most of the countries, drowning rates are often the highest in the 1–4 years age group and then rapidly decline as age increases. The median age of drowning is over 10 years. In general, children under five have the highest drowning mortality rates worldwide.

In Bangladesh, the highest rates of drowning and near drowning have been observed among children of the 1–4 years age group. In Thailand, the drowning rate is the highest among the 1–4 years age group, but near-drowning events occurred mostly in the 5–9 years age group.

In Bangladesh, based on the rate reported in the Bangladesh Health and Injury Survey (BHIS, 2005) almost 17 000 children drowned, or about 46 deaths per day. The number of near-drowning cases was about four times of this (over 68 000). 26% of all deaths in children of 1–4 years were due to drowning.

In Thailand, it was found that most drowning deaths occur in toddlers who die at a rate of 40 deaths per 100 000 children annually. The highest incidence (86.3/100 000 children ≤15 year old) was in children aged 1–4 years and comprised more than one quarter (26%) of all deaths.

Sex

The drowning rate of males is higher than those of females in all age groups. Nearly 80% of deaths from drowning occur in males. This might be due to increased exposure to water and riskier behaviour such as swimming alone, drinking alcohol before swimming alone and boating.

In Thailand, boys have about twice the fatal drowning rate than girls in both 0–4 years and 5–9 years age groups (Figure 2).

Inadequate supervision

Almost all drowning occurred during daylight hours (97%) and most infant and young children drowned when the supervisor or mother were distracted. Young children who escaped the supervision of their caretakers drowned in unprotected water sources. Their caretakers were often unaware of the drowning for an hour or longer.
Increased access to water is another risk factor for drowning. In low-income countries, those involved in commercial fishing or fishing for subsistence, using small boats are more prone to drowning. Children who live near open water sources, such as ditches, ponds, irrigation channels, or pools, are especially at risk. Evidence shows that about 70% of drowning deaths occurred in ditches and ponds; mostly (85%) infants and very young children drowned in water bodies within 20 metres of their homes. A study from the United States of America showed that between 1996 and 1999, children under five died from complications of products related to drowning in and around the home. The products most frequently involved in drowning deaths included bathtubs, five-gallon buckets, spas, hot tubs, and toilets. The South-East Asia Region may have the same problem which needs to be investigated.

The Thailand National Sentinel Injury Surveillance (IS) 1998–2007 reported that children below 15 years of age drowned mostly by playing in natural water sources (39.9%), followed by drowning after falling into natural water sources (8.3%), swimming pools (5%), and bath tubs (2.5%).

Large numbers of drowning deaths are related to natural disasters and water transport. Unsafe or overcrowded water transportation, and vessels lacking flotation devices for passengers increase the risk of drowning. In southern India, 12 people drowned and 20 others remained missing after a crowded boat carrying pilgrims capsized in a river on 30 January 2010. Majority of the victims were women (27 including three pregnant women) and children (7), which may also be the case for similar incidents in the Region.

Residents of areas prone to floods and other cataclysmic events like flash floods and tsunamis are at higher risk. Children accounted for about one third of those who died during the Indian Ocean tsunami in 2004. Living near the sea, rivers or other water bodies increases the risk of drowning.

**Time of occurrence**

January, April, September, and December were the four months with the most deaths in Bangladesh and almost all (97%) drowning occurred in daylight between 06:00 and 18:00. Thailand IS showed that child drowning deaths peaked in April, followed by May and March (period of annual long school holiday from March to mid-May) and October (mid-year school holiday). The highest incidence of serious drowning injuries occurred during weekends; the number for weekends alone accounted for 38.8% of all drowning fatalities. The time of the day with the highest occurrence of drowning was between 15:00 and 17:59, followed by 12:00 and 14:59, and together constituted 64% of all fatal drowning.

**Figure 2: Fatal drowning rates per 100,000 children aged 0–14 years in Thailand by sex, 1999–2012**

Other factors

In many countries, lower socioeconomic status and rural residence are associated with drowning risk.\(^1\)

Illiteracy of mothers and low family income were identified as risk factors for childhood drowning in many countries like Bangladesh\(^{28}\). In Bangladesh, children whose mothers had only primary education were at a significantly greater risk of drowning compared to children whose mothers had secondary or higher education\(^{29}\).

Child drowning risk increased as maternal age and family size increased.

Tourists unfamiliar with local water risks and features, people with medical conditions such as epilepsy \(^{30}\), and those using alcohol near or in the water\(^{22}\) faced higher risk of drowning.

Drowning prevention in some South-East Asia countries

Drowning prevention in Bangladesh

The Centre for Injury Prevention and Research, Bangladesh (CIPRB) conducted a large quasi-experimental community research in four sub districts (about 174,000 households with an average population of 813,000 per sub district). The programme used local resources, relying on local community participation to create a culture of water safety. An International Drowning Research Centre was also developed under the umbrella of CIPRB. Age-specific drowning prevention interventions of CIPRB are:

For children under five years of age

- **Home safety counselling:** A community volunteer counsels the household occupants, especially mothers, for removal of drowning hazards in, at and near the home on a monthly basis.

- **Establishment of crèches:** Community crèches have been established to accommodate around 25 children under the direct supervision of a trained volunteer supervisor while parents are busy with their normal daily work.

For children 5–10 years of age

- CIPRB in collaboration with The Alliance for Safe Children (TASC) and Royal Life Saving Society Australia (RLSSA) developed the SwimSafe programme to teach survival swimming.

- Some natural ponds are designated as community ponds based on suitability and availability. Trained community swimming instructors (CSIs) (certified by the Bangladesh Swimming Federation) provide swimming and water safety training at community ponds. Training involves knowledge and practical skills in the delivery of the ‘Swim for Life’ programme, pond management and promotion of drowning prevention across the community.
For all children

- After any fatal drowning occurs in the village, courtyard meetings and social autopsy meetings are conducted with people to identify the cause.
- Street theatre and video-shows on water safety themes are organized. Booklets and posters are distributed at school.
- Collaboration is undertaken with relevant agencies to implement survival swimming curriculum and prevention programmes.

Along with these programmes, CIPRB has established a community-based active surveillance system in the project areas to report all injury mortality including drowning.

After implementation of the programme in Bangladesh, the mortality rate of child drowning (per 100,000 children) in three piloted sub-districts decreased from 11.1 in 2006 to 9.8 and 9.3 in 2007 and 2008, respectively.

Thailand National Drowning Prevention Programme

The injury management unit of the Ministry of Public Health (MOPH) Thailand has embarked on a data and policy-driven project “Childhood drowning prevention” since 2006. Mass media campaigns were conducted to raise awareness on childhood drowning problems through provision of scientific evidence and practical preventive measures and advocate for substantial national policy. Subsequently, the health minister declared childhood drowning prevention as an important policy of the MOPH and the National Multisectoral Child Drowning Prevention Committee was formed.

Implementation of national drowning prevention programme

- A public policy forum was organized to determine measures for child drowning prevention.
- Child survival swimming policy was established and the recommendation “children should be able to swim from six years of age” added in the mother and child health record book.
- The Day of Child Drowning Prevention was commemorated for raising awareness.
- Parents were educated on child drowning prevention at all public health centres.
- Information on drowning prevention was disseminated through mass media with support from the private sector.
- A pilot project for model development of childhood drowning prevention was set up in four provinces which has expanded to 30 (out of total 77).
- Capacity-building of health personnel and networks in preventing childhood drowning, and expediting adjustment of the related legislation were undertaken.
Childhood drowning surveillance and investigation was conducted.

After implementation of the drowning prevention programme, the mortality rate of childhood drowning (<15 years) decreased from 11.1/100 000 children per year to 8.4 in 2012.

Drowning prevention initiatives in other countries of the Region

- **Project: Swim International** is operating in India (Swim India) and Nepal (Swim Nepal) in educating mainly schoolchildren in drowning prevention (swimming lessons and resuscitation skills)\(^3\). The Rashtriya Life Saving Society (RLSS) is operating a Swim and Survive programme in India in four States. The curriculum of the programme has been designed to teach children the skills of basic swimming, treading water and rolling over onto one’s back as part of the first level. The programme is supported officially in Kerala at the state level for schoolchildren.
- The Ministry of Health and Sri Lanka Red Cross Society are the main organizations to take initiatives in Sri Lanka. Several meetings of stakeholders have been conducted and compilation of a national report on drowning through the *Drowning Prevention Association of Sri Lanka* is in the pipeline. Training curriculum on basic water safety skills and information, education and communication (IEC) materials are under review for national-level endorsement.

Limitations and challenges of drowning prevention programmes in the South-East Asia Region

**Low priority issue**

Most countries in the South-East Asia Region have no national policy/strategy on drowning prevention.

**Population characteristics**

- Most of the population of the Region resides in rural areas where water hazards are abundant in or around the home and throughout the community.
- There is a lack of or low education and awareness.

**Non-availability of data**

- Population-based data are appropriate in identifying and prioritizing the burden of drowning, but are not usually available. Drowning is underreported in hospital-based data. Distinctions between unintentional and intentional injuries may be unclear, and intentional drowning deaths (such as suicide, assaults) are mostly not reported or misclassified\(^3\).
Diverse nature of prevention

- Comprehensive prevention strategies are required according to the population and exposure. Different prevention strategies are needed to address different exposures.\(^{33}\)

Strategies and measures for prevention

Primary prevention

1. Data and generating evidence
   - The burden of drowning must be defined.
   - Many interventions still require rigorous evaluation.

2. Engineering methods to eliminate exposure
   - Unnecessary accumulation of water should be drained.
   - Wells or open cisterns should be covered.
   - Safe drainage systems, piped water systems, and flood control embankments should be established in flood-prone areas.\(^{34}\)
   - Four-sided pool fences or barriers should be built\(^{35}\) to create and maintain safe water zones for recreation.

3. Enforcement and legislation
   - Mandatory four-sided fences should be installed around pools with adequate enforcement and verification system for closure.
   - Water safety laws should be developed, upgraded and enforced for water transport including adequate personal floating devices for all passengers, regular safety checks, prohibiting alcohol use while boating or swimming and during leisure on the beach.
   - Legislation and enforcement is strongly needed to ensure availability of sufficient number of properly-fitted and appropriate personal flotation devices in commercial passenger boats/ship.

4. Educating individuals and communities
   - Education on drowning awareness, risks associated with drowning and training on water survival skills appear to be promising strategies to prevent drowning.

5. Adapting interventions
   To maximize their effectiveness, prevention strategies and measures against drowning should be adapted to the child’s developmental stage and sociocultural norms. Affordability and availability are important factors. Fencing works well for swimming pools, but it may not be the solution in regions where canals and irrigation ditches and large water reservoirs i.e. ponds are abundant. Risk-spot location is important with special surveillance, warning signs and installation of rescue equipment at sites where fencing is not possible.
Secondary prevention

Rescuing a drowning person

- Get a long stick or pole and reach it towards the drowning person, or throw the drowning person a rope. Tell him to grab it and pull him to safety. If no rope is available, at least throw any floating device.

- Never get in the water to swim to rescue the drowning person if not specially trained as a lifeguard. There have been too many cases of rescuers drowning.

Pre-hospital management of drowning patients

The most important and detrimental consequence of submersion is hypoxia. Therefore, oxygenation, ventilation, and perfusion should be restored as rapidly as possible following activation of the emergency medical services (EMS) system.\(^{36}\)

Basic steps of pre-hospital management of drowning are:

- get help or call for help

- check for breathing and pulse

- start CPR (cardiopulmonary resuscitation), if there is no pulse

repeat if the person is still not breathing.

Chest compression is not the best way to resuscitate near-drowning/drowning victims because the person’s primary problem is lack of oxygen. It is advised to use the ABC (airway, breathing, chest compressions) method and start mouth-to-mouth breathing first before chest compression for heartbeat. Detailed CPR instructions are available from: http://www.mayoclinic.com/health/first-aid-cpr/FA00061

- If the victim vomits, turn the victim’s mouth to the side and remove the vomitus using a finger, a cloth, or suction to void airway obstruction. Consider also other associated injuries, i.e. head injury or spinal cord injury.

References


Drowning prevention in the South-East Asia Region—2014


Evidence for key strategies to prevent drowning among children

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<th>Promising</th>
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<td>Wearing personal flotation devices</td>
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<td>Promoting drowning prevention through doctors</td>
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<td>Restricting access to areas unsafe for swimming</td>
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<td>Promoting solar pool covers*</td>
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<td>Using baby bath seats*</td>
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* These are not primarily designed as drowning prevention interventions.


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http://www.searo.who.int/entity/disabilities_injury_rehabilitation/topics/disabilityfactsheet2013/en/