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EDITORIAL

DROWNING-THE SILENT KILLER

The general assembly of United Nations, in September 2010 evaluated the outcome document of Millenium Development Goal and expressed deep concern about the shortfall of the progress. Among the 67 countries with high under-five childhood mortality (>40 deaths/1000 live birth), only 10 are on the track of meeting the target - reduction of mortality by two third between 1990 to 2015. The summit identified the lack of focus on childhood injury as the main area for failure.¹

Recent (2010) world conference on injury prevention and safety promotion in London also highlighted the insufficient global interest in this sector. Children are highly susceptible to injuries, which are preventable cause of death or disability. But the low and middle income countries have scanty data on injuries and lack national policies on the prevention of such injuries. Childhood injuries are not simple accidents, many of them can be prevented or their severity can be reduced. High income countries have reduced deaths by 35-50% over past 10 years by implementing multisectoral approach.¹ Childhood drowning comprises the most important unintentional injuries in developing countries. World congress on drowning in conjunction with World Health Organization redefined drowning as a process of experiencing respiratory impairment from submersion or immersion in liquid.²

Epidemiology: About 8,30,000 children under 18 years die each year as a result of unintentional injuries, including road traffic accidents, drowning, poisoning, snake bite and burns. Injury is responsible for 40% of childhood death in high income countries, whereas it contributes to 95% death in low and middle income countries. More than 450 children drown each day world wide, and thousands have serious lifelong disabilities including brain damage as a result of nonfatal drowning events. In Bangladesh, 20-29% of under four deaths are caused by drowning.¹

Worldwide half a million people die each year (one person/minute) from drowning with more than 97% death occurring in low and middle income countries. For each death there are 1-4 drowning incidents serious enough to warrant hospitalization.³ In the 0-4 year group, drowning is the 11th leading cause of mortality and 3rd cause for mortality in age 5-15 years. Drowning is almost exclusively a problem of rural areas, a reason for gaining less attention by media and experts.⁴ In Bangladesh, Recent (2005) national data suggests that drowning accounts for 19-26% mortality among children of 1-4 years age. Thus it is the third important health hazards after pneumonia and diarrhea. Deaths were most common among children of 12 to 24 months, occurring before noon time when the mother remains busiest with housework.⁴

Sites and risk factors: The sites of drowning are varied depending on geography, status, accessibility and age group. However majority of incidents occur in fresh water including bath tubs, swimming pools, lakes, canals and rivers. In USA (1995), Brenner found that 55% infant death from drowning were in bath tubs, 56% under four children were in artificial pools and among older children 63% died in natural fresh water. Certain medical conditions, notably epilepsy, physical handicap, autistic syndrome and Long QT syndrome have been associated with increased risk of drowning. Alcohol is estimated to be involved with 30-50% of teen age and adult drowning because it stimulates heroism, clouds judgment and blunts co-ordination.³

Pathophysiology: The sequence of events occurring after submersion has been extensively studied in animal model yet the exact mechanism of drowning in humans remains unclear.

Fresh water drowning thought to cause hypervolemia, hemodilution and hyponatremia and sea water drowning was supposed to produce hypovolemia, haemoconcentration and hypernatremia. Common clinical feature of aspiration of fresh water are hypoxemia, hypercarbia and metabolic acidosis. The initial hypoxemia due to laryngospasm is followed by fluid aspiration which causes acute lung injury as a result of surfactant disruption with alveolar collapse, atelectasis and intrapulmonary shunting. The severe lung dysfunction results in profound hypoxia which can be sufficient to cause cardiac arrest and cerebral oedema.³

Hypothermia commonly accompanies drowning particularly in children due to their large surface area in comparison to their body mass ratio. Body tries to compensate by shivering, but below 30°C shivering stops, heart rate and blood pressure falls and patient are at risk of ventricular fibrillation. Paradoxically, cold water drowning may be associated with a better prognosis. Indeed there have been remarkable case histories of children who have survived being submerged in cold water upto 150 minutes. The critical factor here is the cerebral protection by hypothermia must precede hypoxic damage to brain which necessitates rapid fall in core body temperature.³

Treatment: The primary aims of out-hospital treatment are relief of hypoxia, restoration of cardiovascular stability, prevention of further heat loss and speedy evacuation to hospital. Even in a developed country like United Kingdom, 20% victims were not resuscitated at site and another 20% received incomplete resuscitation. Therefore bystander could be the most helpful person for a victim provided he has basic training for life support. Drowning victims should be placed in right lateral position with the head lower than the trunk to limit aspiration of vomitus. 60% patient vomit during resuscitation and gentle pressure over cricoids can prevent aspiration. Rewarming should be commenced quickly after drying the body. In case of drowning from fall or diving, cervical injury could be a crucial factor and needs special care during transport.

Once in hospital, warming both internal and external, should be continued along with oxygen support and intravenous fluid. Aggressive pulmonary support might be necessary with intubation and positive pressure ventilation. The primary hypoxic ischemic injury to brain is irreversible. The main aim of cerebral resuscitation is prevention of secondary neuronal damage. Hypertherapy, proposed by Conn et al, some 30 years ago is helpful but inconsistent. The strategies were - fluid restriction, controlled ventilation, hypothermia, barbiturate coma and cerebral decompression. Matlab study in Bangladesh revealed a panic stricken situation. Parental involvement there in emergency is refrained on the belief that if they touch the child, the child will die since drowning is not an accident rather it is due to evil spirits. The age old hazardous practice developed in rural area is spinning the child, and applying pressure over the child's belly should be discouraged.⁴

Prognosis: Predicting outcome in drowning victims is difficult and no one factor can reliably predict good

versus poor outcome. Researchers have developed several scoring system but none is without limitation. The combination of Orlowski and Lavelles marker for poor prognosis gives close to 90% accuracy. These are: at scene - age < 3 years, submersion > 5 minute, resuscitation time >10 minutes and at emergency room- Glasgow coma score <5, unreactive pupil and arterial pH < 7.1.³ Nearly quarter of the victim in pediatric intensive care succumbs and another quarter sustains with persistent vegetative state.

Prevention: The old adage, "an ounce of prevention is worth a pound of cure" is best applicable for drowning. In an analysis, 86% death were found to be preventable only with adequate supervision, fencing swimming pools, providing floatation devices and ensuring immediate resuscitation. These interventions are cost effective giving high returns to investments.' Various indigenous practices have evolved over time to prevent drowning including pleasing the supernatural power, physical measures to constrain the movements of the child, employing scaring tactics, and securing a bell around child's waist. Strategies for preventing accidental drowning can be grouped under two headings. Site factors are - safe nonslippery bath tub with hand rails, fencing pools, pool alarms, floatation devices and trained life guards. Human factors are alertness for potential danger, parental supervision, swimming lesson, CPR training and refraining from alcohol.³

While drowning constitutes serious threat in this region, the public health community is quite slow to respond with sound preventive measures. Mass awareness through print and electronic media is immediately necessary to reduce the incidence and take appropriate measures after drowning. An intervention program in health policy is also essential to ensure the environmental and human factors for preventing drowning and death.⁴ Pediatric society should take pivotal role in motivating the public representatives for taking legislative measures.

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