DROWNING: THE SILENT KILLER OF THAI CHILDREN

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Abstract

To explore the magnitude of child drowning and to examine the factors associated with drowning and near drowning among children in Thailand, the national survey which covered 32 provinces in the 5 regions of Thailand was set. The sample was a representative group that included urban and rural components. The total sample size was 100,000 households, or 389,000 individuals. A preliminary analysis shows that drowning was a leading cause of death of children, the mortality rate of children age 1-4 and 5-9 were 45.53 per 100,000 and 42.82 per 100,000 respectively. Most fatal drownings occurs in natural bodies of water. About half of all drowning deaths occur within 100 meters of the child's home. Rivers are the leading location of drowning in the 5-9 age groups (66%) and in children generally (1 to 17, 51%). There are many factors associated with drowning including environmental factors, ability to swim, natural bodies of water, and distance of water source from the home. Reducing child drowning, particularly for the under-five requires developing ways to increase close adult supervisions as well as reducing access to drowning hazards close to home. This could be by using play pens or door barriers for very young children, and fences or other barriers around water bodies for older, more adventurous children. These measures need to be conjunction with close supervision and swimming lessons.

Keywords: drowning, children, environmental factor

Introduction

Drowning is defined as death following asphyxia as a consequence of submersion or immersion in liquid. Near drowning has been used to describe the survival of a patient for longer than 24 hours following submersion, however, most authorities recommend that the term no longer be used because some of these patients eventually die[1]. Drowning is a major cause of death, and it has been estimated that, in 2002, 385 million people drowned worldwide, with 97% of drowning occurring in low-and middle-income countries[2], although the majority of available data was related to developed countries. The mortality rate of drowning indicates that it is the third leading cause of death due to injury in children aged 1-5, with the mortality rates in boys being almost twice as high as those in girls. Not all drownings are related to recreational water use, and the percentage that is attributable to swimming pools and similar environments is likely to vary from country to country.[3]

In 1995, a Provincial Injury Surveillance system was established in order to compile an injury database to assess the quality of acute care and referral services provided to the injured at the provincial level, and to facilitate injury prevention and

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control at local and national levels in Thailand. In 2004, the injury surveillance system reported that the leading cause of death among children under 15 was transport injury (38.2%), followed by drowning (27.2%), and falls (2.9%).[4] However, data from death certificates obtained in 2003-2005 showed that among children under 15 years, drowning mortality rates were 10.5, 10.7 and 10.7 respectively and drowning was in fact the leading cause of death, accounting for twice as many deaths as road traffic accidents.[5] The discrepancy in mortality rates between sources might be because the majority of nearly-drowning victims die before they can be referred to the health care system.

In order to prevent child drowning, we need to understand the causes and identify the role of health sectors in government and other sectors that are concern with this problem. This article will highlight the magnitude of the drowning problem as a leading cause of death by estimating the mortality due to drowning, and examining factors associated with drowning among Thai children. The results of this survey might used to mobilize policy makers to address injury as a critical issue in the health care system in Thailand.

The study was part of the survey which aims to determine the causes of mortality and morbidity due to injury among the Thai population. It was a joint project of the Institute of Health Research; Chulalongkorn University, the Alliance for Safe Children (TASC) and UNICEF, Thailand.

Materials and Methods

Multi-stage sampling was used to determine the study areas, this was performed by the National Statistics Office. A household survey was conducted from September 2003 to April 2004 in municipal and non municipal areas in Thailand. Interviewers were trained to test their performance before gathering the injury data. They were also supervised during the recruitment period. A key informant per household was interviewed, usually the housewife or caretaker or an informant who could provide injury information. Injury cases were defined as all intentional or unintentional injuries that had occurred in the last 3, 6 and 12 months preceding the surveys, and affecting any member of the household. The data were daily cleaned and checked before sending to be entered in the injury database at the head office.

Five standard questionnaires were developed in order to identify the magnitude of injury and explore the consequences of the injury. Firstly, a screening form, containing socio demographic information, included causes of sickness in the past 12 months and causes of death in past 3 years of all members in the household. The second questionnaire was used to determine the cause of death. The third one was used to investigate the cause of illness. The last two questionnaires were used to examine the mechanisms of injury death, location, nature of injury, treatment and outcome.

Regarding ethical issues, respondents were ask for permission before interviews were conducted and all subjects gave verbal consent acknowledging that they retained the right not to participate or answer some questions. All information obtained was used strictly for research purposes, and the privacy of participants was fully respected.

The total sample was 100,179 households, and covered 389,531 individuals within these households, including 98,904 children between the ages of 0 and 17. In our study, there were no deaths from drowning below the age of one year.

Results

Our data showed that about half of the children were adolescents (10-17 years of age). Table 1 shows the baseline characteristics of the sample. In total, 98,904 individual were between the age of 0 and 17, the majority were 10-14 years old (32.58%). Almost all of the children (82.07%) were less than 15 years old and only 3.35% were under 1. The boy: girl ratio was 1.01:1.

Table 1 Number and percentage of children by gender

Age	Male		Female		Total	
	n	%	n	%	n	%
< 1	1,671	3.35	1,638	3.34	3,309	3.35
1-4	9,065	18.1	8,526	17.40	17,591	17.7
5-9	14,416	28.8	13,631	27.82	28,047	28.3
10-14	16,243	32.5	15,977	32.60	32,220	32.5
15-17	8,506	17.0	9,231	18.84	17,737	17.9
0-17	49,901	100	49,003	100	98,904	100

Magnitude of drowning and near drowning

Most drowning deaths occur between the ages of 1 and 9 (Table 2). Children in this group are increasingly mobile and independent of their mothers or caretakers, therefore there is an increase in their exposure to water hazards such as open wells, rivers, and ponds. The peak drowning rate is 144.5 per 100,000 and is experienced by 4 year old males; for females, the peak drowning rate occurs in 2 year olds and is 68.8 per 100,000.

Table 2 Drowning rates by age group

Age group	Mortality rate per 100,000	Morbidity rate per 100,000
1-4	45.53	17.07
5-9	42.82	32.11
10-14	21.75	15.53
15-17	0	5.64
1-17	27.33	18.22

Factors associated with drowning

The following tables show the various environmental factors connected to drowning deaths. None of the drowned children between 5-9 years knew how to swim. Almost all (89.47%) of children between the ages of 5 and 14 did not know how to swim (Table 3). Children over four are old enough to have potentially learned to swim and these deaths might have been prevented had they been able to swim and knew water safety.

Table 3 Percentage of swimming skills of drowned children over 4 years

Age group	Swimming skill	
	Yes	No
5-9	0	100
10-14	28.57	71.43
Total	10.53	89.47

About a half of the drownings took place in bodies of water less than 100 meters from the house. Over one-third of toddlers drowned within 20 meters of the home (Table 4).

Table 4 Percentage of distance to water body where drowning took place

Distance	Age Group (Year)			
	1-4	5-9	10-14	1-17
1-5 m	12.50	0.00	14.29	7.41
6-10 m	12.50	0.00	14.29	7.41
11-20 m	12.50	0.00	0.00	3.70
21-50 m	0	8.33	14.29	7.41
51-100 m	12.50	25.00	0.00	14.81
100 m+	37.50	58.33	42.86	48.15
Unknown	12.50	8.33	14.29	11.11

No children drowned indoors. As can be seen in table 5, most fatal drownings occur in natural bodies of water. These water sources include rivers, ponds, ditches, wells, dams, and others. Rivers are the leading location of drowning for most age groups. This drowning hazard should be addressed, as natural water sources can be easily fenced in order to prevent drowning.

Figure 1 shows that there is not a temporal pattern to drowning. Drowning deaths fluctuate widely throughout the year without a relationship to rain. Most drownings occur (22.22%) in the summer period. April, October and December are the three months with the most deaths.

Table 6 shows the activities in which children were engaged prior to the drowning event. Over half (55.55%) were playing in water, while some were playing near the water. Some activities were noted as unknown.

Table 5 Percentage of place of drowning of children

Place	Age group (year)			
	1-4	5-9	10-14	1-17
Pond	25.00	25.00	42.86	29.63
Ditch	25.00	0	0	7.41
Well	0	8.33	0	3.70
River	37.50	66.67	42.86	51.85
Dam	0	0	14.29	3.70
Other	12.50	0	0	3.70

Table 6 Activity of children prior to drowning

Activity	Percent
Playing in water	55.55
Bath/Swim	3.70
Play near water	22.22
Unknown	18.52

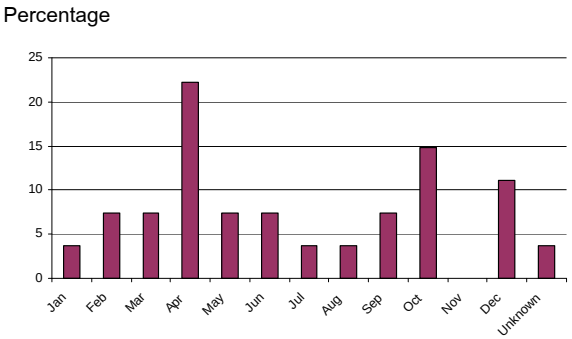


Figure 1 Childhood drowning by months

Discussion and conclusions

Drowning is the leading cause of death in children between the ages of 1 and 4 years in Thailand. Based on the injury surveillance system in 2004, drowning was accounted for 45% of deaths in children under age 10. Within this group, natural water sources were the leading location of child drowning.[4] This survey reveals a number of findings which are important to consider. First, drowning is predominantly an issue in toddlers and young children. The mortality rate decreases as age increases. The onset of drowning in late infancy is likely the result of mothers or care takers being unaware that children can walk, and thus leaving children unsupervised, assuming they can only crawl.

Second, children need to acquire swimming skills. As we have seen, most of the drowned children between 5-9 years of age could not swim. It is clear that for children over five years of age, swimming is a necessary life skill for survival in a country such as Thailand. The reciprocal relationship between swimming ability and drowning is clearly evident and is convincing evidence that development of swimming skills is the public health “cure” for the epidemic of drowning in children after age four.

Drowning in developed countries such as Denmark showed that a third of all cases occurred in open sea and 20% in harbours, and incidents in the age range of 0-2 years occurred in private pools.[6] However, the location of drowning for toddlers in our study was within 100 meters of the house, in a river, pond or ditch. Furthermore, there were no drownings indoor, therefore, it is evident that mothers or caretakers must pay close attention to children of this age group when outdoors. Fourth, more than half of drownings occur during water play. It should

be noted children who are playing in or near water are prone to drowning. Robyn Norton, et al. suggested a promising drowning intervention by limiting exposure to bodies of water close to the dwelling through actions such as fencing, by providing a learn-to-swim program, by providing education about risks for drowning, by increasing supervision and providing lifeguards at recreational facilities, etc.[7] These should be noted by policy makers and all stakeholders.

The findings of our study suggest that it is desirable to set targets and formulate policies with respect to drowning since it is an important component of high mortality in Thai children. Death due to drowning is, in principle, avoidable and can be decreased by raising awareness about the dangers of drowning through use of mass media and public announcements. School teachers and parents can help to reduce death from drowning by raising awareness within the community about the dangers of drowning and its prevention. It is our hope that this study will guide policy makers in the government and in non government organizations to prepare prevention plans or programs. In formulating these policies, one should not lose sight of the role of parents who have the final responsibility for the safety of their children.

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การจมน้ำ: ภัยเงียบของเด็กไทย

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บทคัดย่อ

การสำรวจปัจจัยที่เกี่ยวข้องกับการจมน้ำและการเสียชีวิตจากการจมน้ำเด็กไทยครั้งนี้ เป็นการสำรวจระดับชาติครอบคลุม 32 จังหวัดในพื้นที่ 5 ภาคของประเทศไทย กลุ่มตัวอย่างเป็นตัวแทนที่อาศัยในและนอกเขตเทศบาล จำนวนทั้งสิ้น 389,000 คน จาก 100,000 ครัวเรือน ผลการสำรวจพบว่า การจมน้ำเป็นสาเหตุหลักของการเสียชีวิตของเด็ก โดยมีอัตราการตายเท่ากับ 45.53 ต่อ 100,000 ในเด็กอายุ 1-4 ปี และอัตรา 42.82 ต่อ 100,000 ในเด็กอายุ 5-9 ปี การจมน้ำทั้งหมดเกิดขึ้นในแหล่งน้ำธรรมชาติ ประมาณครึ่งของการเสียชีวิตจากการจมน้ำเกิดขึ้นในระยะ 100 เมตรห่างจากบ้าน เด็กวัย 5-9 ปี เสียชีวิตที่แม่น้ำมากที่สุด และเป็นสถานที่ๆเด็กส่วนใหญ่เสียชีวิต การจมน้ำเสียชีวิตของเด็กมีหลายปัจจัยเข้ามาเกี่ยวข้อง เช่น ปัจจัยแวดล้อม ความสามารถในการว่ายน้ำ แหล่งน้ำธรรมชาติและระยะทางจากบ้านถึงแหล่งน้ำ เพื่อลดการจมน้ำในเด็ก โดยเฉพาะเด็กอายุต่ำกว่า 5 ปี ต้องดูแลอย่างใกล้ชิด เพื่อไม่ให้เด็กเข้าใกล้แหล่งน้ำ ทั้งนี้ทำได้โดยการใช้ที่กั้นหรือประตูกั้นในเด็กเล็ก และใช้รั้วหรือกำแพงกั้นบริเวณรอบแหล่งน้ำสำหรับเด็กโต การป้องกันเหล่านี้จำเป็นต้องทำไปพร้อมกับการดูแลอย่างใกล้ชิดพร้อมกับการสอนว่ายน้ำ

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