



## Maternal Beliefs and Socioeconomic Correlated Factors on Child Mortality from Drowning in Caspian Sea Coastline

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### ABSTRACT

**Objective:** To investigate maternal beliefs, practices about causes and determinant factors on drowning and maternal socioeconomic correlated factors on child mortality from drowning.

**Methods:** From March 2005 to March 2009, in a register-based cohort study and household survey, individual records utilizing drowning registry data of northern Iran were enrolled. Mothers (n=276) who responded to multiple questions in a household survey were included. The patterns, interrelationships and effects of socioeconomic correlated factors on child mortality were analyzed.

**Results:** A significant difference in relation to mother's educational level and age and family income distribution was noticed. Participants in household survey also reported that establishment of a multi-sectorial collaboration, integration of public health messages into local television, additional rescue stations and lifeguard, hazard environment fencing, increasing adult supervision, more support on increasing swimming ability among the children were all effective on reducing of drowning death.

**Conclusion:** Due to the high rate of drowning in children and lack of attention among elders, a greater emphasis should be placed on educating mothers to assist a better supervision on their children.

**Keywords:** Drowning; Maternal; Child; Socioeconomic; Iran.

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### Introduction

Drowning is a serious public health problem, yet little is known on its characteristics [1]. The recent Global Burden Disease study data revealed a 7% global mortality from all injuries related deaths from drowning [2]. The rate and patterns of drowning in different populations around the world varies widely by geographic area, depending on the local, physical (their

access to water), social and environmental (national swimming culture) factors [3-5]. In Iran, a recent population-based prospective study showed a fatal drowning rate of 4.26 per 100 000 populations among the residents of Northern Iran during 2005-2006 [6]. The rate of drowning is much higher than the official figures, ranging from 5.26 to 8.25 per 100,000 population when compared to national figures of 4.5 per 100,000 [7,8]. However, drowning also takes a tremendous financial

toll on affected families and society as a whole [9]. A previous study showed that in low and middle income countries, the rate of drowning was more frequent in lower socioeconomic families and in areas with lower educational level [10]. It was shown that mothers' age and literacy and family income were the risk factors for drowning [11]. Many studies in high income countries have shown that people with lower socioeconomic level were more likely to sustain injuries [12,13].

In Iran, socioeconomic differences and its relation to drowning attracted less attention [13]. As most families are usually dependent on one person's income, therefore exploring the socioeconomic impact of drowning on at risk group as children seem necessary. The aim of this study was to identify the effects of different socioeconomic factors correlated to child mortality from drowning and also determined possible implications for a preventive drowning program.

## Materials and Methods

This study was conducted on resident population of the Caspian Sea Coastline in Northern Iran during 2005-2009. In Iran, data on drowning mortality rate can be found from a number of different sources, including the Forensic Medicine System, Death Registry System and Red Crescent Society. Unintentional drowning cases were identified through report codes based on the International Classification of Disease, 10th Revisions (ICD-10). This study included deaths classified with ICD codes V90-V94, W16, W67-W74 [14].

We analyzed death registry data on child drowning mortality and were linked to forensic medicine and Red Crescent Society data. During that period, 276 cases were collected from data sources. To observe the effects of socioeconomic variables, household surveys of mothers of unintentional drowning victims were performed. However, when a drowning case involving a local resident child was identified, a questionnaire was used to collect information related to the death, including the activities of the children prior to drowning and the activities of their mothers at the time of drowning.

The first part of the questionnaire focused on the mother's beliefs and practices regarding drowning. This section included questions about *who is victim*, *where victims drown*, *why do children drown*,

*and how can we prevent drowning?* The second part of the questionnaire included questions about socio-economic, socio-cultural and demographic characteristics. The socio-economic and socio-cultural variables included family's income and impact of drowning on victims' families (In rural areas of Iran, primary adult caretakers of young children are almost mothers). The demographic variables included mother's age and educational status. The mother's age was divided into three age groups of ten years interval (less than 20, 20-30 and above 30 years old). Educational level was divided into four groups [(with no education, primary education (from class one to five), high school (class six to eleven), diploma (class twelve) and higher]. Trained data collectors provided the information by face-to-face interviews with adult members of the deceased victims' families. Regarding to ethical consideration, interviewee was informed about purpose and design of the studies and that their participation was confidential, anonymous, and voluntary. Information explaining the aim of the study was provided orally and written.

All statistical analyses were performed by using SPSS software (Version19, Chicago, IL, USA). The significance level was set to  $p=0.05$ . Chi-Square test was conducted to analyze group differences. In this study correlation of child mortality with socio-demographic and socioeconomic factors were calculated using the non-parametric Spearman correlation coefficient.

## Results

Overall, 276 drowning cases of children were identified during the study period while 130 cases were less than ten years old. The incident rate fell from 2.75 per 100,000 among children aged younger than ten years at the baseline to 2.08 per 100,000 at the end line among the same age group. Older children between 10-19 years old had an annual rate ranging from 6.12 to 2.1 per 100,000 populations (Table 1).

### Participants' Views about Drowning

All groups were aware that drowning is common in Caspian Sea Coastline but it's neglected by policy makers. They expressed that drowning was more horrible than normal death.

**Table 1.** Case related to drowning in resident population near the Caspian Sea Coastline (2005-2009).

Study period	2005/6	2006/7	2007/8	2008/9
<b>Independent variables</b>				
<b>Drowning cases(total)</b>	191	154	204	160
<b>Mortality ratio per 100000</b>	4.24	3.07	4.04	3.16
<b>Young children (aged 0-9)</b>	27 (14.1%)	21 (13.6%)	20 (9.8%)	17 (10.7%)
<b>Rate per 100,000 population</b>	2.75	2.61	2.47	2.08
<b>Oldest children (aged 10-19)</b>	61 (31.9%)	52 (33.8%)	57 (28%)	21 (13.1%)
<b>Rate per 100,000 population</b>	6.12	5.4	5.4	2.1

### Who Is Victim?

All of them mentioned that the risk of drowning in males was higher than females.

### Where the Victims Drown?

Participants claimed that unprotected areas on the beach of Caspian Sea and rivers were the common sites of drowning. Due to restriction of budget, lifeguard service cannot provide adequate protection, therefore supervision by lifeguard service covered only during the summer season on the beach of Caspian Sea. Participants had also identified that rivers, dams and lakes were hazardous water reservoirs for rural setting, and the main reason for the glaring difference was that use of bathtubs and swimming pools were much less common in Iran.

### Why Do Children Drown?

Most of groups mentioned that due to lack of supervision by parents, most of drowning children happened during daylight hours.

### What Can We do to Prevent Drowning?

a) Basic swimming skills should be trained to children. b) Additional rescue stations and lifeguarding are needed along the Caspian Sea Coastline (one lifeguard for every 500 meters).

c) Integration of public health messages into local television such as the Darya program is necessary. d) Lake and water canal fencing may help to prevent drowning events in rural settings. The majority of the participants expected that some measures, especially the fencing of rivers and canal water way should be done by governmental organizations.

### Socio-Cultural Destination

With regard to socio-cultural status for explaining impact of drowning among victim's family, even most of them have experienced strong feeling such as fear, sadness, guilt and anger after that event in their daily

life and it was possibly to remember the emotional memorable but they helped in understanding how and why this happened. This research found that most of them recovered on their own and got back to their normal lives with the support of family and friends, and without professional assistance. However, in some cases who do not recover on their own may need more professional help.

### Socioeconomic of Destination

Data regarding age of child at death including the "youngest" and "oldest" groups of children, that is, children between the ages of 1 and 9 years, and children between the ages of 10 and 19, respectively, were compared, to analyze mother's educational level, mother's age and family income distribution in both groups. The results revealed that illiterate women had lower child mortality (37.8%) among oldest groups of children. On the other hand, In cases respondent' mother' age, a higher level of child mortality was observed among oldest groups of children. Respondent's lower monthly income was associated with a higher mortality among youngest groups of children. The age of children at death and its association with socio-economic characteristics showed a significant correlation with mother's educational level, mother's age and family income distribution (Table 2).

The result of non-parametric Spearman correlation coefficient analysis showed that children drowning mortality among youngest and oldest groups was positively and significantly correlated with family income mother's educational level and age (Table 3).

### Discussion

The result of this study provided important information and insights into the community's knowledge and perceptions about drowning and interrelationship between youngest and oldest children drowning mortality with socioeconomic

**Table 2.** Distributions of Child Drowning Mortality by Socioeconomic status, (2005-2009).

Attributers	Youngest children (Less than 10 years)	Oldest children (above 10 years)	Contingency analysis
Independent variables			
<b>Maternal education (total)</b>	85	191	X <sup>2</sup> =46.25
<b>Illiterate</b>	23 (62.2%)	14 (37.8%)	p<0.001
<b>Primary</b>	40 (45.5%)	48 (54.5%)	df=3
<b>High school</b>	15 (19.2%)	63 (80.8%)	
<b>Diploma and higher</b>	7 (9.6%)	66 (90.4%)	
<b>Mother's age(total)</b>	85	191	X <sup>2</sup> =8.95
<b>Less than 20 years</b>	6 (22.2%)	21 (77.8%)	p=0.011
<b>20-30 years</b>	31 (23.8%)	99 (67.2%)	df=2
<b>Older than 30 years</b>	48 (40.3%)	71 (59.7%)	
<b>Family's income (total)</b>	85	191	X <sup>2</sup> =23.36
<b>Less than 200 \$</b>	15 (17.2%)	72 (82.8%)	p<0.001
<b>200-700 \$</b>	50 (47.6%)	55 (52.4%)	df=2
<b>More than 700\$</b>	20 (23.8%)	64 (76.2%)	

**Table 3.** Correlation between age of child at death and socio-economic variables.

		Education	Age	Income	Age of child at death
<b>Education</b>	Pearson Correlation	1	0.265 <sup>a</sup>	0.731 <sup>a</sup>	0.480 <sup>a</sup>
	Sig. (2-tailed)		<0.001	<0.001	<0.001
	N		276	276	276
<b>Age</b>	Pearson Correlation		1	0.185 <sup>a</sup>	0.453 <sup>a</sup>
	Sig. (2-tailed)			0.002	<0.001
	N			276	276
<b>Income</b>	Pearson Correlation			1	0.838 <sup>a</sup>
	Sig. (2-tailed)				<0.001
	N				276
<b>Age of child at death</b>	Pearson Correlation				1
	Sig. (2-tailed)				
	N				276

<sup>a</sup>Correlation is significant at the 0.01 level (2-tailed).

and demographic characteristics. The participants perceived that the occurrence of drowning was high in male gender. These findings are consistent with drowning data gathered since 1970s from most areas of the world [10,15].

The gender difference depends on that males are less likely to use protective devices in water-related activities and have a higher exposure, e.g., boating and fishing. Shallow water diving have a higher incidence rate near the Caspian Sea Coast followed by rivers and lake.

The risk of death from drowning was found to be higher in the existence unprotected area in the beaches of Caspian Sea where emergency services were not readily available. This pattern of drowning is in accordance with other studies [16,17], and indicates that more life guarding services are needed. In addition to the lifeguard's availability, a rescue or resuscitation is necessary. As mentioned above, lifeguard monitoring based on three components includes; budget, the adequate number of lifeguards to swimmer and quality of the lifeguards' services. First component is due to restrictions of budget while lifeguard services cannot provide adequate protection. Like this research, supervision by lifeguard services was covered only during the summer season. Second component is the ratio of lifeguards to swimmers which depends on the number of swimmers that may increase or decrease due to unexpected tourism. In many countries like Greece and Brazil, the number of lifeguard to swimmer was predicted by law (In Greece, one lifeguard per 600 m of beach and two lifeguard per 500 m of beach in Brazil) [18,19], but in Iran; no such law passed. The gap between the knowledge and behavior may be due to the prevailing culture and practice to accept these events as natural and inevitable results in absence of any effort taken at individual or at community level. The majority of the participants expected that some measures, especially fencing of rivers and water channels should be done by governmental organizations. In the developed world, pool fencing along with some legislation has

proved to be an effective means of drowning prevention [20]. In rural setting of Caspian Sea Coastline; there are numerous unprotected water bodies surrounding households, which are used for washing, transportation, and fishing purposes. These areas are also popular recreational sites, especially for children. The majority of the participants expected that some measures, especially the fencing of rivers and water ways should be done by governmental organizations. Most of participants state that the majority of drowning deaths took place during the rainy season, when water levels in the ponds, lakes, rivers and wells are high; while in the summer season; the majority of deaths took place during the warmer months of the year when recreational swimming is popular.

Finally, using findings from interview and household survey applicable measures for drowning prevention package were formulated. These measures included establishment of multisectoral collaboration, integration of public health messages into local television, additional rescue stations and lifeguard, hazard environment fencing, increase in adult supervision, and more support on increasing swimming ability among the children.

#### *Why Is a Lower Maternal Socioeconomic Status Associated with More Drowning Mortality Rate?*

Given our survey process, the variation in child mortality from drowning by maternal socioeconomic status was evaluated. It was noted that child mortality from drowning was positively and strongly related to maternal age, education and family income. This steep gradient by those socioeconomic factors are consistent with data from most areas of the world [21,22].

The risk of death from drowning was found to be higher among children with older than younger mothers. The main reason for this is probably that the older mothers usually have more children and pay less attention to the safety of the children than in households with fewer children. However, most drowning cases among children occurred during daylight hours. Many of mothers indicated that

they were busy with other activities and may not have known that their children were playing near water. This study also showed that, the children of families with less educated mothers and lower economic status were more vulnerable to drowning, because those mothers were less experienced in close supervision of the children. It is consistent with previous studies [23].

Parental income is also another factor associated with drowning death, and there is a positive relationship between deprivation levels and risk of drowning. These findings are consistent with drowning data from Bangladesh and South Korea [24-26].

Regarding to impact of drowning on victim's mothers, unfortunately, many of them have experienced a high level of anxiety, together with difficulties with relationships, work and daily life. On the other hand, the amount of behavioral control within the family unit and the amount of social

support given tended to reduce the burden felt by caregivers [27-29].

Prevention of drowning is multifaceted and involves government and non-governmental stakeholders and groups. However, in low- and middle-income countries like Iran, the role of government supporting is vital for successful strategically management of drowning prevention program in the area. Due to the high rate of drowning in male children and lack of attention among older and less educated mothers, a greater emphasis should be placed on educating mothers to better assist them in supervising their children.

To have a truly effective drowning prevention strategy, at-risk populations, male children, should particularly be trained in basic swimming and rescue skills, and many more rescue stations are needed in areas where swimming occurs.

**Conflict of Interest:** None declared.

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