

## Investigating causes of infant mortality in hospital of children during 2010-2011 in Bandar Abbas

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### ABSTRACT

**Introduction:** Infant mortality index is an important health indicator. This index has a direct impact on infant mortality and mortality of children less than five years. The present study aimed to investigate causes of infant deaths during 2010-2011 in Bandar Abbas hospital of children.

**Methods:** In this cross-sectional retrospective study profiles of all dead newborns who aged from 0 to 28 days in Children's Hospital of Bandar Abbas zero to 28 days during the past two years were considered as the sample of this study. The necessary information were collected through answering to a predesigned checklist, telephone interviews, if necessary, the data were gathered from visiting people in person. Then the data were analyzed by using SPSS software version 16.

**Results:** In the present study, prematurity was the most common cause of infant death (25 percent). 62 percent of newborns aged less than 7 days so two-thirds of the deaths occurred in the first week of their life, variables such as the infant's age, the RAM or pre-term, birth weight, type of birth, father's education, and mother's education all showed a statistically significant relationship with infant mortality.

**Conclusion:** In this regard paying particular attention to low birth weight infants, increasing the health awareness of mothers and families, providing the standard care before and during pregnancy can be effective in reducing infant mortality.

**Keywords:** Infants, Mortality, prematurity

### Introduction

Maintaining and promoting the health of children as a vulnerable group has a special place in health and medical services (1). Neonatal mortality index is an important health indicator which directly impacts on indices of infant mortality and mortality of children who are under-five (2). And this reflects the educational, social, health, nutritional, and medical status of a community (3). Of the total annual births in the world, more than 14 million people die in the first year of life. About 7 million of these deaths occur in infants, in other words, almost 60% of all deaths were infant mortality (4). Approximately 2.3% of all deaths in the first year of children's life in the United States of America were within the neonatal period (5). Of the 130 million babies who are born every year, 40 million of them will die within the first 28 days of their birth, and the overall rate of infant

mortality in the world is 30 cases per 1,000 live births. Three quarters of neonatal deaths occur in the first week of their birth, and more than a quarter occurs in the first 24 hours after birth (6). According to the reports of World Health Organization in 2008 infant mortality rate in the world were 28 cases per 1,000 live births which in developed countries, the average estimate was 4, in the less developed countries was 31, and in the least developed countries was 41 cases per every 1,000 live births.(10)

According to the same report, Liberia, Cote d'Ivoire, Iraq and Afghanistan, with more than 60 neonatal deaths per 1,000 live births had the highest infant mortality rates. In this report Infant mortality statistics in Iran have been reported as 19 cases (7). Infant mortality is declining worldwide. Part of relates to neonatal periods and almost two-thirds of them are neonatal deaths

which is reducing (8). Since infant mortality reflects social and health development of community, of course, the first step in reducing infant mortality is to identify and resolve the causes of this phenomenon. So the present study aimed to determine the factors associated with infant mortality in the city of Bandar Abbas.

## **Material and Method**

The present study is an analytical cross-sectional. The study sample were all 0 to 28-day-old infants who died at the very beginning of their infancy in Children's Hospital of Bandar Abbas during 2010-2011. This pediatric hospital is one of the hospitals in Bandar Abbas which was equipped with Baby specialist therefore most people who had sick children referred to this hospital. So we chose this hospital to get to the most number of samples. According to the rates of deaths which occurred in Bandar Abbas (311 cases) as well as the statistics of deaths which occurred in the age group under 28 days, 93% sure we can say that, the selected sample (deaths occurred Children's Hospital) represents the main community (deaths under 28 days, in Bandar Abbas). The instrument which used in this study in data collection procedure was a predesigned questionnaire and phone interview with the infants' families. This questionnaire was designed based on relevant texts and opinions of those who were expert in this regard. The validity of this questionnaire was confirmed by 5 experts. There were both limited and open-ended questions in this questionnaire. It has three parts. Part I has questions regarding the socioeconomic status of the infant's family such as: mother's education, father's education, mother's occupation, monthly income, place of residence, maternal smoking history, the second part of the questionnaire was about the mother and her way of giving birth to the child it includes things like: type of pregnancy (wanted, unwanted), history of abortion, stillbirth history, type of delivery, maternal age at delivery, birth rank, consanguinity, time between the previous delivery and this one, receiving prenatal care during pregnancy, maternal illness, child survival status of the previous pregnancy, and risky pregnancies, the third part of the questionnaire includes information related to the infants. Which include the type of infant feeding, maternal factors, infant gender, birth weight, congenital anomalies of the child, the child's age at death, and type of birth (single, twins)?

Those parts of the data that were not available in the infant's profile were collected either through

phone interview or talking to the infants' mothers in person. After talking or interviewing with mother, the checklists were completed and if they were not completed from either of these ways they were excluded from the study. Inclusion criteria were: age less than 28 days, gestational age equal to or greater than 23 weeks, birth during 2010 and 2011, being native born of Bandar Abbas. Exclusion criteria were: gestational age less than 23 weeks, weighing less than 400 grams, incomplete profiles and lack of communication with family of the infant. The procedure was in this way that the researcher by having the permission of the Vice Chancellor of the university went to the Informatics Department and collected the list of all dead neonates during the specified time scale, then after getting permission from the authorities of hospital, the researcher extracted all the medical records of those who were in the list. About 297 medical records of dead infants were extracted from archival records within these two years of which 150 cases were related to 2011 and 147 cases were from 2010 and 5 records were excluded from the study because they had incomplete checklists. The checklists were completed by a trained person who studied all the medical records carefully within two weeks.

In the present study birth weight was categorized into five classes: less than 1000 g, between 1000 to 1499 g, between 1500 to 1999g, between 2000 to 2499 g, and more than 2500 g. The death age were classified into three categories: infants who died before 24 hours old, infants who died between 2-7 days of their age, infants who died before 28-day-old. Then data were analyzed by using SPSS software at level of significance  $p$ -value  $< 0.05$ .

## **Results**

In the current study of 292 cases of neonatal deaths which occurred in the Children's Hospital of Bandar Abbas were studied and based on the results of this study, 42.8% of the infants were female. Mean age of dead infants was  $7.67 \pm 6.92$  whose age varied from one to twenty-eight days. Mean weight of dead infants was  $1890.47 \pm 1164.81$ g. Frequency distribution of common causes of neonatal mortality is shown in Table 1. Prematurity was considered as a major cause of death and respiratory problems, heart problems, septicemia and jaundice, were respectively the following were the main causes of neonatal mortality.

According to Table 2, what can be inferred is that 181 or (62%) of newborns were less than 7-day-old and accordingly about two-thirds of deaths occurred in the first week of their life. 271 cases (92.8%) had gestational age less than 37 weeks, 226 infants (77.3%) weighed less than 2,500 grams (in other words they were premature). The following table shows that 20.2 percent of infants had low birth weight and 22.6% had normal weight. Also according to the characteristics of mothers 246 mothers (84.2%) were 18 to 35 years old, 266 cases (91.1%) had Diploma or below high school degrees. 119 mothers (40.8) were for the first time pregnant and 166 mothers (56.8) had between twice to 4 times pregnancy. Other factors included in our study were only one or at most two of the leading causes of death, so all the other causes were brought in a group called "other factors" which includes 32 cases (11%).

Based on the results of this study some characteristics of newborns such as infant's age ( $p = 0.007$ ), gestational age of infants ( $p < 0.001$ ), birth weight ( $p < 0.001$ ), Type of birth ( $p = 0.044$ ) were significantly associated with cause of infant mortality. But no significant relationship was found between gender and cause of infant's death. As well the cause of infant mortality in term and preterm is different, and this difference can be seen in the groups with different weights (Table 3). Delivery time was considered as an influential variable affecting the infant mortality which based on the results of this study, death of infants in the women who had their first delivery was 40.8%, in women who had their second to fourth deliveries this rate was 56.8%, and in mothers who had more than five deliveries the infant mortality rate was only 2.4%.

Table 4 shows that father's education ( $p = 0.007$ ) and mother's education ( $p = 0.014$ ) were significantly associated with the causes of infant mortality. But other maternal variables did not affect cause of infant mortality.

## Discussion and Conclusion

Perhaps one of the most risky individual's life period, is one's neonatal period several factors such as mother's age, mother's living condition, pregnancy complications, infant's birth weight, and number of mother's delivery are involved in this regard. In addition babies by entering the new world are under the impact of pathogens which affect their immune system and so their health demands a robust system to combat these factors.

Given that 65 percent of deaths under one year old were mortality during infancy (9), this study aimed to investigate cause of infant mortality in Hospital in Bandar Abbas so that small actions are taken in making the authorities aware of the causes of infant mortality so that some measures are implemented by them to reduce infant mortality.

In developed countries, infant mortality was firstly due to congenital abnormalities, but in Iran the most common cause of infants' death was neonatal infections (septicemia) and prematurity. What can be seen from the results of the study is that the most frequent cause of neonatal mortality was prematurity. A significant relationship was seen between infant's age and cause of infant's mortality. So that in 7-day-old infants the most leading cause of mortality was their prematurity while in babies who were more than 7 days old the leading cause of death was heart problems. As well infant's birth weight was significantly associated with infant mortality so that birth weight, mother's number of deliveries, dietary intake, socioeconomic status, place of residence, mother's education, maternal health and access to health services are associated. And according to results of this study (Table 3) in infants who were severely underweight mortality was because of prematurity mortality and as the infants weight more the less frequent were cause of mortality because of prematurity and in this study this fact is quite evident.

Results of this study are consistent with those of Hamedi et al in Kerman (5), Bijari in Kerman (10), Ismaeil Nasab in Kermanshah (11), Taghavi in Azarbaijan and Khorasan (12), Soheil Agha in Pakistan (13). Several certain factors gave birth to a premature baby, such as maternal age less than 20 years and more than 40 years, smoking in pregnancy, tiring trips in pregnancy, maternal poor nutrition, maternal infection, and socio-economic factors. By regarding the importance of this fact that prematurity has been considered as the most important factor in infant mortality in recent studies actions should be taken to reduce causes of the infant mortality. Prematurity could affect some other neonatal factors, including weight at birth which in our study the effect of this factor was clear-cut so that 226 dead infants (4/77) were less weight than normal (2500 g). Generally prematurity itself was considered as a major cause of infant mortality because it indirectly causes respiratory problems and low birth weight of infants. So raising the quality of

maternal pregnancy conditions, especially maternal food habits, prevention of preterm delivery, changes in socio-economic conditions of family, implementing training programs for groups who are at risk especially pregnant women with low literacy, pregnant women who had their first delivery, mothers who aged less than 19 years and over 35 years can be effective in preventing premature and reducing infant mortality.

Second leading cause of infant mortality was respiratory problems in which several factors, such as pulmonary hemorrhage, respiratory abnormalities, diaphragmatic hernia; and remaining of fetal blood flow can be involved in. These factors may arise due to multiple, caesarean section, low birth weight and prematurity. The results of this study showed that in infants that died due to respiratory problems several variables were evident such as: age less than 7 days, pre-term delivery, and they weighed less than 2,500.

Another common cause of infant mortality was sepsis, the results of this study were consistent with those of Nayeri et al (2) and Amani et al (14). In preterm and premature infants septicemia is common. Factors involved in septicemia includes: the low birth weight, gestational age, fetal gender, pregnancy and prenatal care. In the current study it was also found that the death of infants due to septicemia in the newborns was more frequently seen in male infants, infants who weigh less than 7 days, preterm, and newborns weighing less than 2500 grams. Thus regarding the high incidence of this factor in infant mortality we should look for its causative factors which can be prematurity, low Apgar score, maternal age, the number of maternal pregnancy, and maternal infection ( 15 ). And necessary actions should be taken to reduce these factors and consequently reduce infant mortality rate. Since Asphyxi was not regarded as the most causes of mortality in the current study and just one of the death causes was because of it so we didn't mention it at all.

According to the results of the present study ages of newborn were significantly associated with infant mortality, so that in infants who were less than 7 days old the leading cause of death was prematurity while heart failure was considered as the leading factor in infants with a mean neonatal age more than 7 days.

A significant relationship was also found between the infant's birth weight and infant mortality so that infant's birth weight, the number of mother's pregnancy, dietary intake, socioeconomic status, place of residence, maternal education, maternal

health and access to health services are associated with each other. And according to our results (Table3) in infants who were severely underweight mortality was due to prematurity, and as the infant's weight increases the frequency of deaths due to prematurity reduced so effect of underweight on mortality due to prematurity is quite evident in this study. There was also a significant relationship between parental educations and causes of infant's mortality. Results of the present study showed that educational level of parents is inversely associated with neonatal mortality, so that the frequency of mortality of infants with college-educated parents were less than babies whose parents had lower degrees such as secondary school or diploma. Also the highest mortality in infants of mothers with lower educational degrees was due to the immaturity. So lack of enough education can affect parental awareness of the importance and necessity of the information involved parental care during pregnancy periods and this will lead to some problems such as preterm and premature birth etc.

At the end it should be noted that about 62 percent of deaths in the neonatal period were during the first 7 days of the infant's life. Therefore it is necessary to pay attention to neonatal period and by identifying women who are at risk and applying prenatal care and then identifying risk factors contributing to preterm delivery, premature and low weight babies, the essential actions are taken to reduce infant mortality in this period.

### **Limitations**

This study has some limitations including: being retrospective, unavailability of those samples who during hospitalization period in order to increase the richness of information, lack of access to death records of other infants in the other cities of Hormozgan and this limits the generalization of the result to the whole province. Therefore it is recommended that larger studies may be conducted in the whole province in order to achieve more comprehensive results about cause of neonatal mortality in Hormozgan.

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**Table 1:** Frequency distribution of causes of infant death

Cause	frequency	Percent
Immaturity	75	25
Difficulty breathing	67	22.9
Heart problem	63	21.6
Septicemia	46	15.8
Jaundice	11	3.8
Other	32	11
Sum	292	100

**Table 2:** Frequency distribution of demographic data of the dead infants and their mothers

Characteristics of infant			
variable	Groups	frequency	Percent
gender	Girl	125	42.8
	Son	167	57.2
Infant Age (days)	Less than 7 days	181	62
	More than 7 days	111	38
Gestational age	Less than 37 w	271	92.8
	More than 37 w	21	7.2
Birth weight (g)	999-500	59	20.2
	1499-1000	62	21.2
	1999-1500	47	16.1
	2499-2000	58	19.9
	2500<	66	22.6
Characteristics of the mother			
Age of mother	18>	15	5.1
	18-35	246	84.2
	35<	31	10.6
Education of mother	Diploma or less	266	91.1
	Collegiate	26	8.9
Delivery Rank	The first order	119	40.8
	4-2	166	56.8
	5+	7	2.4

**Table 3:** Relationship between causes of death and infant characteristics

variable	groups	Immaturity		Difficulty breathing		Heart problem		Septicemia		Jaundice		Other		Amountp
		frequency	Percent	frequency	Percent	frequency	Percent	frequency	Percent	frequency	Percent	frequency	Percent	
gender	Girl	39	31.2	31	24.8	23	18.4	15	12	5	4	12	9.6	.216
	Son	34	20.4	36	21.6	40	24	31	18.6	6	3.6	20	12	
Infant Age (days)	Less than 7 days	51	28.2	47	26	39	21.5	27	14.9	2	1.1	15	8.3	.007
	More than 7 days	22	19.8	20	18	24	21.6	19	17.1	9	8.1	17	15.3	
Gestational age	Less than 37 w	5	5.2	17	17.7	32	33.3	14	14.6	9	9.4	19	19.8	<.0001
	More than 37 w	68	34.7	50	25.5	31	15.8	32	16.3	2	1	13	6.6	
Birth weight (g)	999-500	24	40.7	20	33.9	5	8.5	8	13.6	0	0	2	3.4	<.0001
	1499-1000	22	35.5	13	21	16	25.8	6	9.7	2	3.2	3	4.8	
	1999-1500	15	31.9	12	25.5	4	8.5	14	29.8	0	0	2	4.3	
	2499-2000	7	12.1	8	13.8	16	27.6	7	12.1	5	8.6	15	25.9	
	2500<	5	7.6	14	21.2	22	33.3	11	16.7	4	6.1	10	15.2	
Type of Birth	A twin	56	22.8	52	21.1	58	23.6	41	16.7	11	4.5	28	11.4	.044
	Twain	17	37	15	32.6	5	10.9	5	10.9	0	0	4	8.7	

**Table 4:** Relationship between causes of death and Characteristics of the mother

variable	groups	Immaturity		Difficulty breathing		Heart problem		Septicemia		Jaundice		Other		Amount p
		frequency	Percent	frequency	Percent	frequency	Percent	frequency	Percent	frequency	Percent	frequency	Percent	
Age of mother	18>	3	20	5	33.3	5	33.3	2	13.3	0	0	0	0	0.355
	35-18	62	25.2	58	23.6	48	19.5	37	15	11	4.5	30	12.2	
	35<	8	25.8	4	12.9	10	32.3	7	22.6	0	0	2	6.5	
Education of mother	Diploma or less	62	23.3	60	22.6	61	22.9	43	16.2	8	3	32	12	0.014
	Collegiate	11	42.3	7	26.9	2	7.7	3	11.5	3	11.5	0	0	
Delivery Rank	Delivery Rank	39	32.8	20	16.8	24	20.2	17	14.3	4	3.4	15	12.6	0.085
	4.2	33	19.9	43	25.9	39	23.5	28	16.9	6	3.6	17	10.2	
	5+	1	14.3	4	57.1	0	0	1	14.3	1	14.3	0	0	
Education of father	Diploma or less	61	23.4	60	23	61	23.4	44	16.9	7	2.7	28	10.7	0.007
	Collegiate	12	38.7	7	22.6	2	6.5	2	6.5	4	12.9	4	12.9	
Smoking	yes	2	12.5	4	25	3	18.8	4	25	2	12.5	1	6.3	0.322
	no	71	25.7	63	22.8	60	21.7	42	15.2	9	3.3	31	11.2	