

## A Study on the Health Factors of Infant and Child Mortality in Rajshahi, Bangladesh

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**Abstract:** The aim of this study is to identify the important health factors that influenced infant and child mortality in Rajshahi district, Bangladesh. Data have been collected through a structured questionnaire under a project of UNFPA, using purposive sampling technique. Well known statistical tools chi-square ( $\chi^2$ ) test, and logistic regression are used to analyze the data. The study results reveal that health related variables such as immunization practices, treatment facilities, delivery systems, and regular checkup of mothers and babies health condition among a set of selected variables which affect infant and child mortality. The  $\chi^2$ -test result implies that immunization practices and mother's and children's health checkup, place of maternal delivery and place of treatment are significantly associated with infant and child mortality. Multivariate analysis results are also confirmed the same result as seen in  $\chi^2$  test evaluation. It is evident from the study that the child had 62.50% lower risk of death who were immunized than that of who were never immunized, and also the risk of infant mortality was 95.10% lower among those who had to take their treatment from a specialist doctor. Therefore, we should give attention to the expansion of public health system in order to reduce the risk of infant and child mortality in Bangladesh.

**Key words:** Neonatal mortality, infant and child mortality, post-neonatal mortality and logistic regression model

### INTRODUCTION

Bangladesh is a densely populated country of 147,570 square kilometers land area (BBS, 2003) with limited natural resources. Her GDP per capita is 2,053 (PPP US\$) and the life expectancy at birth for male and female is 63 and 65 years respectively (ESCAP, 2008). Her vast people (161 million) with infant and under five mortality rate is 52 and 68 per thousand live birth (ESCAP, 2008) constitutes a potential resource of labor force for development. Children in Bangladesh continue to lack basic amenities and opportunities of life. One third of the babies are born with low birth weight. About 70% of all children under-five years of age are malnourished and 11% are severely malnourished. One in every 7 children born in Bangladesh dies before their fifth birthday. Although, sanitation coverage has increased significantly, only 40% of the children have access to sanitary latrines (GOB, 2002). Studies on infant and child mortality have been identified, depending upon the cultural content of the population and the mode of analysis, that birth intervals, birth order, age at delivery, educational status, birth weight, antenatal care, socioeconomic conditions of the mother, immunization of the child, and breastfeeding are the most important factors that affect the survival chance of the infant and child. The

antenatal care is also an important factor in explaining the differentials in the infant and child mortality.

Maternal care is a key behavioral context to influence morbidity control among children and knowledge of how such important indicators as mother's education and reproductive patterns are associated with the risk of morbidity in children. Zacharia *et al.* (1984) identified that medical attention at the time of delivery and antenatal care are significant factors in the survival chance of the new born. In 1985, with the beginning of the third five-year plan, the Government of Bangladesh (GOB) initiated institutionalization of maternal, and childcare and family planning activities through a phased program on maternal and child health and family planning (MCH-FP) services. The overall goal of the MCH program is to improve the health condition of mother's and children. Education modifies women's beliefs about disease causation and care and thus influences both domestic child care practices and the use of modern care services. Caldwell *et al.* (1983) pointed up that schooling enhances the woman's knowledge of modern health care facilities and improves her ability to communicate with modern health care.

However, despite all these efforts, health care facilities in Bangladesh remain limited and inadequate; besides a lack of health personnel, medicines and other

facilities are not uniformly available. Mortality differentials clearly emerge which may be attributed to the differential accessibility and availability of health services. Therefore, the main objectives are to investigate infant and child mortality differentials by different health related characteristics of the population, and to identify the health related factors which are associated with infant and child mortality.

## MATERIALS AND METHODS

The analysis in this study is based on the ever-married women of reproductive age (15-49 years) who had at least one live birth at the time of interview. Data of this study have been collected under the project of UNFPA entitled "Strengthening the Department of Population Science and Human Resource Development". A total of 3750 respondents are taken as the sample for this study of whom 319 and 202 respondents had at least one child loss experienced. All these information were taken by purposive sampling method. The data were analyzed by using Statistical Package for Social Sciences (SPSS), version 10.0. A contingency analysis was used to test for association between the different phenomena on the basis of classification of variables or attributes by applying the Chi-square ( $\chi^2$ ) test, in which

$$\chi^2 = \sum \frac{O_{ij} - E_{ij}}{E_{ij}}$$

follows a  $\chi^2$  distribution with  $(r-1) \times (c-1)$  degrees of freedom. A logistic regression analysis was performed in order to observe the effects of the independent variables (X) on the dependent variable (Y). The logistic function can be written as:

$$E\left(\frac{Y}{Z} = z\right) = \frac{e^z}{1 + e^z}$$

where,  $z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$  are regression parameters, and  $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  and  $\beta_6$  are unknown constants to be determined from the data. For the predicted variables:

$$\text{For Model 1: } Y = \begin{cases} 1, & \text{if Infant death occur,} \\ 0, & \text{otherwise.} \end{cases}$$

$$\text{For Model 2: } Y = \begin{cases} 1, & \text{if Child death occur,} \\ 0, & \text{otherwise.} \end{cases}$$

The explanatory variables are: ever breastfed, immunization practices, treatment place, place of delivery, visit of health worker, and children's health check up.

## RESULTS AND DISCUSSION

**Health behaviors of mothers' and children:** Women in developing countries as well as Bangladesh face a number of special health risks, associated with sexuality and childbearing. According to World Bank (WB) (1993), about one third of the total disease burden that women face is linked to pregnancy, childbirth, abortion and various reproductive tract disorders. One of the important reasons for high rates of infant and child mortality is the limited use of health care services by mothers (Kabir and Amin, 1993). Poor quality health care services, inadequate and low use of oral rehydration therapy, as well as breastfeeding patterns and immunization factors related to infant and child mortality. Proper medical attention and hygienic conditions during delivery can reduce the risk of infections and facilitate management of complications that can cause death or various illnesses for the mother or the newborn child (Mitra *et al.*, 1997). The immunization of children is an important factor that contributes to the child's chances of survival. Bangladesh Demographic and Health Survey (BDHS), 1996-97 information suggests that about two thirds of the children under-five years of age had received vitamin A capsules and less than half of the children are fully immunized. Immunization practice is directly related with health status of children. It saves children from dangerous diseases. Table 1 indicates that only 14.9% children immunized fully, 24.4% partially and a greater portion i.e.; 60.7% children have not been immunized at all.

Treatment place of children may affect infant and child mortality in a large extent. Table 1 shows that a major portion of infant and children treatment place was pallichikisthshak (village doctor) (58.2%). The remaining 25.3, 11.3, 4.0 and 1.2% of children's treatment place were hospital, clinic, homeopathic and kabiraji (village physician who used trees as medicine) respectively. An important element in reducing health risks for mothers and children is to increase the portion of babies that are delivered under medical supervision in health facilities. Therefore, place of delivery is also an important determinant of child survival. According the results, which were shown in Table 1 that a large portion of children's mother delivered places were at home (94.0%) and only few percent i.e.; 5.8% children's mother delivered places were hospital/clinic and 0.2% were other place of delivery. The percentage of children's mother type of delivery indicates that most of mothers delivery process is normal (i.e.; 98.7%) and 1.3% is caesarian.

Visit of health workers constitute a key component of the Bangladesh family planning service delivery system and a key strategy in the program's educational motivational efforts to popularize family planning and health related practice. About 13.4% of the respondents reported that health worker have visited regularly, 34.7% irregular and 51.8% reported that health worker have not

visited for discussing the family planning and health related issues in their home. Table 1 also implies that 77.5% mothers have no health checkup by professional doctors and only 22.5% said that they checked up their health by doctors and only 28.0% children had checkup their health and 72.0% have never checked up their health at the time of the survey. Health checkup for mothers and children may reduce the risk of dying and can ensure healthy life for the future time. But ignorance, poverty, religious barriers, distance of treatment place etc. always create hindered for health related behaviors.

**Differentials of infant and child mortality related to health characteristics:** In a variety of settings, mortality differences have been attributed to inequitable distribution and use of overall health services facilities. In addition to the lack of primary health care services, family poverty may lead to significant differences in infant and child mortality. The demographic and health survey information on maternal and child health indicated that about 95% of births in Bangladesh are delivered at home and more than half of these births (57%) are attended by untrained traditional birth attendants (dais), followed by relatives/others at 25% (Mitra *et al.*, 2005). However, infant and child mortality levels may reduce through the combined effects of improvements in standard of living, better personal and environmental hygiene, the extension of maternal and child health care and improved obstetric care, as well as prevention and treatment of diseases during infancy.

Recently, many developing countries have emphasized the need for successful implementation of health care initiatives based on the assumption that the infant and child mortality levels can be reduced through the introduction of a number of simple and cross-effective health technologies. One of these is the World Health Organization's (WHO's) (1995) Expanded Program on Immunization. The purpose of this program is to achieve significant reduction in levels of childhood mortality through immunization against six of the major infectious diseases, prevalent among children in developing countries- tetanus, diphtheria, whooping cough, Polio, tuberculosis and measles. The present sections examine the mortality differentials according to immunization, treatment place, place of delivery, types of delivery, visit by health worker, health checkup of mothers and children of suburban and rural areas in Rajshahi district.

Neonatal tetanus, whooping cough, polio and measles all of which contribute significantly to the high childhood mortality and these can be prevented through immunization practice. Thus immunization of the children is an important factor that contributes to the child's chances of survival. Table 2 shows that the immunization status of children is a factor in their survival status. Neonatal, post-neonatal and infant mortality levels among those who are not immunized at all are higher than those

Table 1: Percentage of women aged 15-49 years who had at least one child loss experienced according to selected health related characteristics

Background characteristics	Number of cases	Percentage (%)
<b>Immunization</b>		
Full	78	14.9
Partial	127	24.4
Not at all	316	60.7
<b>Treatment place</b>		
Hospital	132	25.3
Clinic	59	11.3
Homeopathic	21	4.0
Kobiraji	6	1.2
Pallichikithshak	303	58.2
<b>Place of delivery</b>		
Hospital/clinic	30	5.8
Home	490	94.0
Others	1	0.2
<b>Types of delivery</b>		
Normal	514	98.7
Caesarian	7	1.3
<b>Visit of health worker</b>		
Regular	70	13.4
Irregular	181	34.7
No	270	51.8
<b>Mother's health checkup</b>		
No	404	77.5
Yes	117	22.5
<b>Children's health checkup</b>		
No	375	72.0
Yes	146	28.0

Table 2: Distribution of neonatal, post-neonatal, infant and child mortality by selected health related characteristics

Characteristics	Percentage of children death			
	Neonatal	Post-neonatal	Infant	Child
<b>Immunization</b>				
Full	7.9	15.1	10.6	27.8
Partial	11.6	32.9	19.6	38.3
Not at all	80.6	52.0	69.8	33.8
<b>Treatment place</b>				
Hospital	24.8	24.0	24.5	27.8
Clinic	11.6	11.6	11.6	10.5
Homeopathic	4.5	4.1	4.4	3.0
Kabiraji	0.8	1.4	1.0	1.5
Pallichikithshak	58.3	58.9	58.5	57.1
<b>Place of delivery</b>				
Hospital/clinic	7.9	6.2	7.2	1.5
Home	92.1	93.2	92.5	98.5
Others	-	0.7	0.3	-
<b>Types of delivery</b>				
Normal	98.3	98.6	98.5	99.2
Caesarian	1.7	1.4	1.5	0.8
<b>Visit of health worker</b>				
Regular	12.0	13.7	12.6	15.8
Irregular	32.2	34.2	33.0	34.7
No	55.8	52.1	54.4	44.4
<b>Mother's health checkup</b>				
No	74.8	81.5	77.3	78.2
Yes	25.2	18.5	22.7	21.8
<b>Children's health checkup</b>				
No	65.3	76.0	69.3	79.7
Yes	34.7	24.0	30.7	20.3

of children who have been immunized with fully and partially. From the results, it is observed that child

mortality is lowest among who have been fully immunized (27.8%) while who have been partially immunized is the highest child mortality (38.3%) and those children who are not immunized is 33.8% mortality level.

Death due to Pneumonia, fever, asthma, diarrhoeal and respiratory etc. diseases can be greatly reduced by timely treatment of infant and children. Therefore, treatment place is also an important for child survival status. It is seen from Table 2 that infant and child mortality level differences due to their treatment places. The result shows that both infant and child mortality is higher whose treatment places are pallichikithshak than those of treatment places are Hospital/Clinic/Kabiraji/Homeopathic (i.e.; 58.5% infant and 57.1% child mortality versus 24.5% and 27.8, 11.6% and 10.5, 4.4 and 3.0%, 1.0 and 1.5%).

Place of delivery is also an important determinant of child survival. In Bangladesh, many children die owing to the lack of safe delivery facilities. Untrained dais, relatives and neighbors attend most of the deliveries and such a practice lead life threatening risk to both the mother and the newborn baby. It is evident from the result (Table 2) that survival is higher among children born in proper health facilities and attended by professional doctors than those born at home attended by untrained dais. It is clearly shown that both infant and child mortality is higher whose delivery places are at home (92.5% infant and 98.5% child mortality levels at home) than those delivery places are Hospital/Clinic (7.2% and 1.5%). These results may imply that more and better antenatal care services during pregnancy may increase the children's chances of survival.

Table 2 also highlights that neonatal (98.3%) mortality, post-neonatal (98.6%) mortality, infant mortality (98.5%) and child mortality (99.2%) are higher among those children's mothers types of delivery is normal than caesarian delivery (i.e.; 1.7% neonatal; 1.4% post-neonatal; 1.5% infant and 0.8% child). The percentage of neonatal, post-neonatal, infant and child mortality levels are lower with regular visit of health worker than none and irregular visit of health worker. The result implies that the percentage of children death is higher among mothers and children's with no health checkup than those with health checkup.

The contingency analysis investigates the degree of association together the dependency criterion between neonatal, post-neonatal, and child mortality and the selected independent health related variables. Table 3 contains the results of contingency analysis. The first column of the Table 3 presents the attributes of health related factors sequentially for which the association to be tested. For health related factors, neonatal, post-neonatal and child mortality is statistically significantly associated with immunization practice of the children, treatment place of the children, place of delivery and health checkup

the children's but statistically insignificant variables are types of delivery, visit of health worker and health checkup mother's at 1, 5 and 10% level. Among the health related statistically significant variables, immunization practice of the children and health checkup of the children's are highly significant level (i.e. 1% level) and the degree of association of these two variables are much higher than other health related variables of the children.

**Determinants of infant and child mortality related to health characteristics:**

The results of logistic regression model analysis for infant mortality showing the effect of demographic, immunization and health related factors of the infants are presented in Table 4. The results like ever breastfed, immunization practices, place of delivery, visitation by health worker and children's health checkup continue to show significant association with infant mortality at 1%, 5% and 10% level. According to the infant mortality model 1, compared with ever breastfed and never breastfed children; with ever breastfed children have  $(1-0.040) \times 100 = 96\%$  lower risk of dying during infancy than never breastfed children. Immunization practices also have substantial effect on infant mortality. The odds ratio for fully and partially immunization practices is 0.353 and 2.725 respectively. The results reveal that the experience of infant death is less if the children have fully immunized (64.7%) while if the children have not fully immunized, that is, partially immunized then they have 172.5% higher risk of dying during infancy than none immunized children. Treatment place of infants with doctor/nurse have 39.9% less likely to die before reaching one year of age than traditional treatment place of infants. It is surprising to notice that the mortality risk of infants is low (80.5%) if the infant born in government hospital/clinic as compared to the infant born at home. Also the influential factors on infant mortality are visitation by health workers and health checkup for children's that irregular and none visitation of health worker in the study areas have 31.7% and 76.0% higher risk of dying before reaching one year of age than regular visitation by health worker and the never health checkup infants have 105.9% higher risk to die as compared to checkup children's in the study areas of suburban and rural in Rajshahi district.

Model 2 indicates that ever breastfed, immunization practice of the children, treatment place of the children, place of delivery and health checkup for children's appeared to be the most significant factors in determining the likelihood of dying between one to five years of life. Ever breastfed continue to show the significant effect on child mortality level. In this case, the odds ratio for ever breastfed child is 0.049 that means, ever breastfed children have 95.1% lower risk of child death than never breastfed child. The immunization practices, treatment place, place of delivery and health checkup for children's

Table 3: Results of contingency analysis according to health related factors

Health related attributes	Neonatal, post neonatal, and child mortality			
	Values of $\chi^2$	d.f.	Coefficient of contingency	Significance of association at 1%, 5% & 10% level
Immunization practice	101.516	4	0.404	Significant*
Treatment place	15.30	8	0.54	Significant***
Place of delivery	9.017	4	0.130	Significant***
Types of delivery	0.527	2	0.032	Insignificant
Visit of health worker	4.548	4	0.093	Insignificant
Mother's health checkup	2.401	2	0.068	Insignificant
Children's health checkup	10.486	2	0.140	Significant*

where,  $\chi^2_{10} = 7.779$  with 4 d.f.;  $\chi^2_{10} = 13.362$  with 8 d.f.;  $\chi^2_{01} = 13.277$  with 4 d.f.;  $\chi^2_{01} = 11.341$  with 2 d.f.;  $\chi^2_{05} = 9.488$  with 4 d.f.;  $\chi^2_{05} = 5.991$  with 2 d.f.; \*Significant at  $p < 0.01$ ; \*\*Significant at  $p < 0.05$ ; \*\*\*Significant at  $p < 0.10$ .

Table 4: Logistic regression estimates for the effect of health related characteristics with infant and child mortality as the dependent variable for suburban and rural areas in Rajshahi district of Bangladesh

Characteristics	Model 1			Model 2		
	Infant mortality			child mortality		
	Coefficient ( $\beta$ )	Significant ( $\beta$ )	Odds ratio	Coefficient ( $\beta$ )	Significant ( $\beta$ )	Odds ratio
Ever breastfeed						
No	-	-	1.000	-	-	1.000
Yes	-3.210	0.002*	0.040	-3.010	0.003*	0.049
Immunization						
Not at all	-	-	1.000	-	-	1.000
Full	-1.042	0.001*	0.353	-0.981	0.001*	0.375
Partial	1.002	0.000*	2.725	1.002	0.002*	2.725
Treatment taken from						
Traditionally	-	-	1.000	-	-	1.000
Doctor/nurse	-0.510	0.049**	0.601	-0.439	0.094***	0.645
Place of delivery						
Home	-	-	1.000	-	-	1.000
Hospital/clinic	-1.633	0.044**	0.195	-2.338	0.029**	0.096
Visit of health worker						
Regular	0.274	0.466	1.317	0.021	0.954	1.021
Irregular	0.565	0.100***	1.760	0.191	0.465	1.210
No	-	-	1.000	-	-	1.000
Children's health checkup						
Yes	0.722	0.013**	2.059	0.532	0.068***	1.702
No	3.927	0.000	50.736	-1.969	0.004	0.140

\*Significant at  $p < 0.01$ , \*\*Significant at  $p < 0.05$ , \*\*\*Significant at  $p < 0.10$ .

are important factors that contribute to the child's chances of survival. In our study results from Table 4, it is showed that the fully and partially immunization have statistically significant (1%) association with childhood mortality. The odds ratio for full and partial immunization is 0.375 and 2.725 respectively, which explains that fully immunized child have 62.5 % less and partially immunized child have 172.5 % higher risk of childhood mortality than none immunized child. However, it should be pointed out that the logistic regression coefficients for immunization practice are not in the expected direction. This may be attributed to the incomplete (partial) dose of the vaccine received by the children during childhood period, which has failed to capture the vaccine's potential effect. Also the treatment taken from doctor/ nurse have 35.50% less likely to die than treatment taken from traditional; place of delivery at hospital/clinic also have 90.40% lower risk

of childhood mortality than place of delivery at home and never health checkup children's have 70.20% higher risk of childhood death than ever health checkup children's of suburban and rural areas in Rajshahi district.

### CONCLUSION AND RECOMMENDATIONS

Rapid growth of population in Bangladesh is a major problem in overall development agenda. Mother and child health issues are now an emerging in growing globalization because happy world needs healthy live for all. The resources of our country are not available and its fully agro-based developing country. As a result, the major portion of population is becoming poor to poorer day by day. This poverty leads to illiteracy, child labor and sometimes other serious problems. It has been well established from our findings that health related factors

are playing significant role on infant and child mortality level. Therefore, we should have extra care of the mother's safe delivery and available treatment facility during pregnancy and after pregnancy. The following recommendations can also be stated for policy implications:

- Government should take balanced program of family planning incorporating simultaneous practice of breast-feeding,
- Government should ensure and take initiatives for full immunization coverage to all across the country,
- Government as well as NGOs should take proper steps to ensure mother and child health conditions and safe delivery of mothers.

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