

Original article**Determinants of Infant And Child Mortality in Bangladesh: Time Trends and Comparisons across South Asia***Karmaker SC¹, Lahiry S², Roy DC³, Singha B⁴***Abstract:**

In spite of various effective intervention programs, the under-5 child mortality rate (U5MR) is still high in Bangladesh. The present paper focused on the levels, trends and determinants of U5MR in Bangladesh utilizing data from Bangladesh Demographic and Health Survey (BDHS), 2007. Differential pattern in U5MR in Bangladesh was examined using life table technique as a bi-variate analysis and Cox proportional hazard model was used to analyze the determinants of U5MR mortality. Data from BDHS (2007) showed that U5MR during the five years preceding the survey was 65 per 1,000 live births, i.e. one in fifteen children born in Bangladesh died before reaching the fifth birthday. The risk of dying in the first month of life (37 per 1,000) was nearly two and a half times greater than in the subsequent 11 months (15 per 1,000). Deaths in the neonatal period accounted for 57 percent of all under-five deaths. In the Cox proportional hazard model analysis, factors such as the place of residence, parent's education, father's working status, sources of drinking water, type of toilet facility, wealth status, watching of television, mother's age, months of breastfeeding, birth interval had significant influence on infant and child mortality. The most significant predictors of neonatal, post-neonatal, infant and child mortality were residence, parent's education, type of toilet facility, wealth status, watching TV, months of breastfeeding, and birth interval. Despite the improvement of medical technology, child mortality remained alarmingly high, indicating that demographic, socioeconomic, household and environmental conditions must be improved to substantially reduce child mortality in this population.

Keywords: determinants; infant mortality; child mortality; Bangladesh; South Asia

DOI: <http://dx.doi.org/10.3329/bjms.v13i4.20590>

Bangladesh Journal of Medical Science Vol. 13 No. 04 October '14. Page: 431-437

Background:

Infant and child mortality rates reflect a country's level of socioeconomic development and are, therefore, used for monitoring and evaluating population and health programs and policies¹⁻³. The rates are also important for monitoring progress towards the United Nations Millennium Development Goals (MDGs) to reduce child mortality by two-thirds by the year 2015³. The Demographic and Health Survey (DHS 2007) in Bangladesh shows that Bangladesh has made sustained and remarkable

progress in many areas of child health¹. The recent DHS (2011) is the ninth demographic survey taken in Bangladesh since 1975¹. The IMR in Bangladesh has fallen from 125 per thousand live births in 1984-85 to 80 per thousand live births in 1994-95, and further to 56 per thousand live births in 2001-2002^{3,6}. But the decline was slow from 1999 (59 per thousand live births) to 2001 (56 per thousand live births). It was estimated that in order to reduce U5MR by two-thirds, IMR has to be as low as 32 deaths per thousand. But declining trend of IMR

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from 1999 does not suggest achieving the targeted death rate by 2015, rather it demands, infant death rates must be reduced by at least 2 deaths per thousand live births between 2003 to 2015¹.

Conditions accounting for about 70% of all child deaths include acute lower respiratory infections, (19%), diarrhoea (18%), malaria (8%), measles, (4%), HIV/AIDS (3%), and neonatal conditions, mainly pre-term birth, birth asphyxia, and infections (37%)². The factors that had often been examined in relation to child mortality in developing countries include various social, demographic and environmental factors². Mortality analysis in relation to these factors generally shows a complex situation because most of these factors are inter-related³. Scaling up effective health services, political awareness, commitment and leadership are needed to ensure that child health receives the attention and resources needed to accelerate progress towards MDG4². The present study examined the demographic and socioeconomic determinants of infant and childhood mortality in Bangladesh by using data of Bangladesh DHS (2007).

Methods:

Study Design: The present study provides information on U5MR. Specifically, it presents information on levels, trends, and differentials in neonatal, post neonatal, infant, and child mortality. Mortality estimates are disaggregated by socioeconomic characteristics, such as urban-rural residence status, administrative division, mother's education, household wealth, as well as by selected demographic characteristics in order to identify segments of the population requiring special attention.

Study population and data source: The data utilized for this study were extracted from the Bangladesh Demographic and Health Survey (DHS) conducted over a five month period from 24 March to 11 August 2007 under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare, Bangladesh. Enumeration areas (EAs) were created during the Bangladesh population census of 2001, on the basis of a convenient number of dwelling units, for data collection.

The 2007 Bangladesh Demographic and Health Survey (2007 BDHS) is a nationally representative survey of 10,996 women aged 15-49 and 3,771 men aged 15-54 from 10,400 households covering 361 sample units (clusters/PSUs) throughout

Bangladesh, 134 in urban areas and 227 in rural areas. The present study utilized information on 6456 children that were born in the five years prior to the survey, of which 377 did not survive, while 6079 were alive (at least one year of age) at the date of the survey⁴.

Using data from the BDHS 2007 survey, the socioeconomic and demographic differentials in infant mortality levels of the country are analyzed.

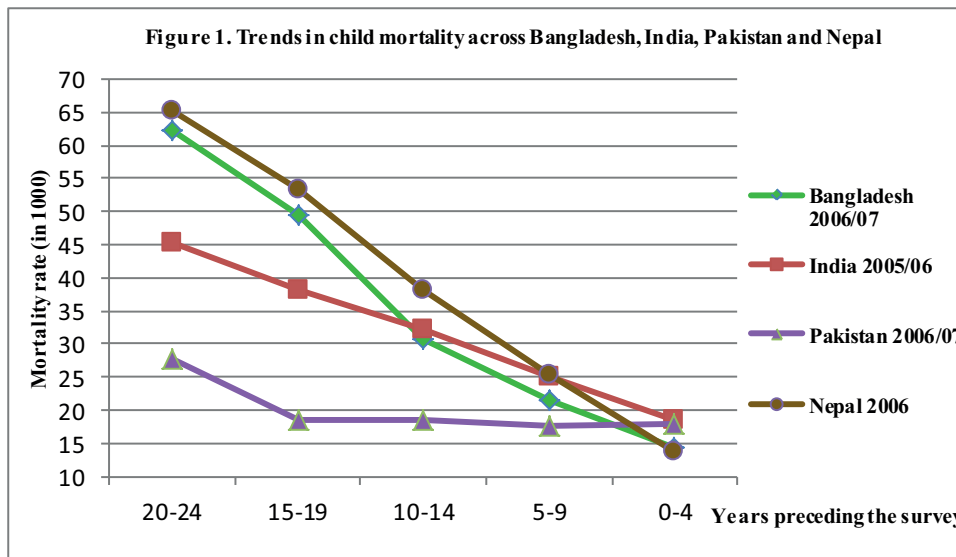
Variables and Techniques of Analysis: The present study considered bivariate and life table analysis of infant mortality for some selected independent variables. The Cox proportional hazard model was used to identify the effect of different demographic and socioeconomic factors on infant and child mortality in Bangladesh.

Commonly used indicators of mortality before age five, based on cohort life-table computations, are basic measures of infant and child mortality. Life table analysis is an important tool to examine mortality differentials with respect to different levels of each of selected independent variables. It gives the more precise and accurate explanation about the trends of infant mortality for different socioeconomic, demographic and sanitation/hygienic/households characteristics. Cohort life tables are computed by following the children in our subsample from birth and computing the probabilities of dying during consecutive age intervals using the traditional actuarial life-table method. The life-table computation used age intervals of 0-59 months. Then we calculated probabilities of survival ($l(x)$ values in conventional life-table notation) at different ages within the age interval 0-59 months in terms of the number of deaths per 1,000 live births. All the analyses were done using SPSS 11.5.

Results and Discussion:

Level and trends in child mortality in Bangladesh, India, Pakistan and Nepal

Figure 1 presents the child mortality for five five-year periods preceding the survey in Bangladesh, India, Pakistan and Nepal. A comparison of mortality rates over the last five years shows that child mortality has declined by 33 percent, 26 percent and 45 percent respectively in Bangladesh, India and Nepal, but increased by about 2 percent in Pakistan. According to these estimates, between the periods 20-24 and 0-4, child mortality in Bangladesh has declined from 62 deaths per 1,000 live births to 14 deaths per 1,000 live births. By comparing the estimates for the same period it is seen that the child



mortality rate has decreased by 27 deaths per 1,000 live births (from 45 to 18) in India, for Pakistan this rate has decreased by 10 deaths per 1,000 live births (from 28 to 18) and for Nepal it has decreased by 51 deaths per 1,000 live births (from 65 to 14). This figure shows that the child mortality has declined consistently in India, Nepal and Bangladesh according to their own trends but not in Pakistan.

Level and trends in under-five mortality in Bangladesh, India, Pakistan and Nepal

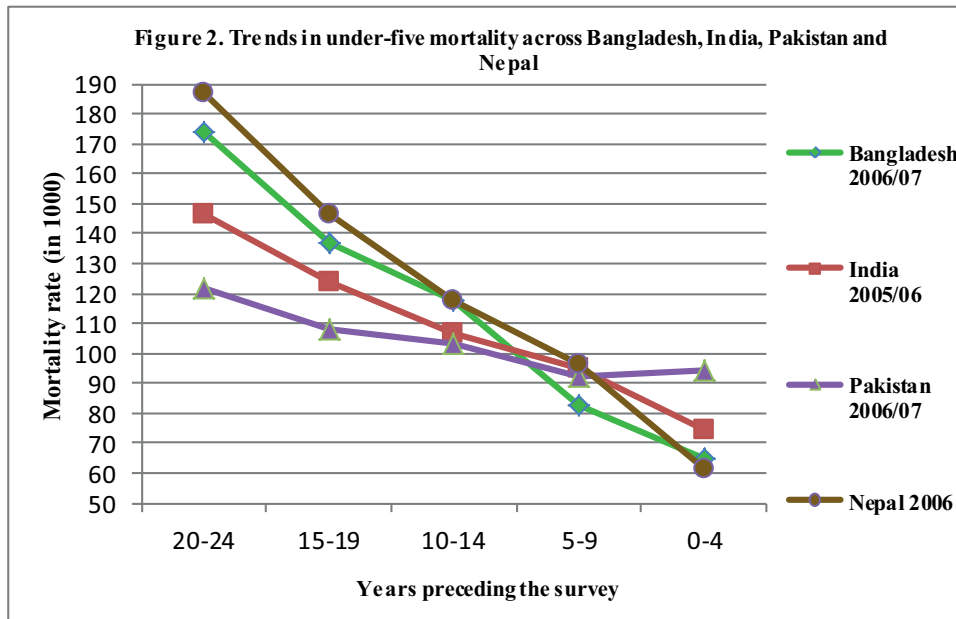


Figure 2 presents the U5MR for five-year periods preceding the survey in Bangladesh, India, Pakistan and Nepal. According to the estimates, over the last five years U5MR shows that the rate is highest in Pakistan (94 deaths per 1,000 live births); lowest in Nepal (61 deaths per 1,000); while comparatively low in Bangladesh (65 deaths per 1,000 live births)

and 67 percent (from 187 to 61) in Nepal.

Our analysis shows higher female neonatal, post neonatal, infant, child and under-five mortality than male mortality rates. In Bangladesh, higher female mortality rates as observed than male were explained by reasons both social and medical in nature. Socially women in Bangladesh enjoy lower status than men. Daughter in this society traditionally cannot inherit an equal share of the father's property. In the present study analysis, it was shown that sex differences were not so high.

Mother's age at first birth showed a positive relation with neonatal, post neonatal and infant mortality rates except in case of child mortality. This is due to lack of knowledge on child bearing activities of younger mother.

The study showed breastfeeding reduce infant and child mortality to some extent as exclusively breastfed children are nutritionally better and they

become naturally immune. Despite efforts of different government agencies and NGOs, exclusive breastfeeding rate had been found to be low in Bangladesh. Traditionally cultural barriers still exist in this arena.

Sources of drinking water have an influential impact in changing the levels of infant and child mortality.

The present study showed that better sources of drinking water reduce the infant and child mortality. Children living in households getting their drinking water from tube well and other sources (pond/ tank/ lake/ rain/ stream etc.) had higher mortality risks than children in families who get their water from piped sources into dwellings.

Better sanitation condition also reduces the infant and child mortality. Infant and child mortality rates were comparatively lower among respondent who had better toilet facilities available to them. Present study showed that respondents who used flush toilet had the lowest infant and child mortality rate while the highest infant mortality was observed among the children of household who have no such facility. The children of household who use pit latrine have comparatively low mortality than those who have no facility.

Radio and Television were found to be one of the most introduced and powerful media. Access to electricity is related to reduction of overall of infant and child mortality. Household with electricity are associated with lower infant and child mortality. The child mortality was slightly longer for respondents without electricity than for those with electricity. These differentials were owing to the fact that a household having electricity may have radio or television and also having better social status. Mass communication raise conscious about diseases, child care and hygienic. As a result infant and child mortality rate is lower for household with electricity.

Cox's proportional hazard model showed that place of residence has significant effect on infant and child mortality. Infant and child mortality is higher in the rural areas than the urban areas. It also implies that all divisions have significant effect both on infant and child mortality. Individually all of the divisions are significant for infant and child mortality. Barisal, Chittagong, Dhaka, Khulna and Rajshahi divisions have significant effect, with reference to Sylhet division. Also mother's education got significant effect both on infant and child mortality. Mother's education shows a distinct influence on infant and child mortality, the rates being lower for mothers with some schooling. This phenomenon may be attributed to children of educated mothers enjoying better diets and better overall care than the children of non educated mothers.

Environment was one of the main factors of infant and child mortality because which diseases are fully related in infant and child mortality is transmitted by infections agents, food, water and air indices strong-

ly related to environmental contamination used to measure the risk of infection care. Sources of water for bathing, cooking, cleaning and storage practice for food, the presence of latrine or toilet and use of soap and water which determine the focal contamination. Most of the developing countries in the world follow western ideas at health and hygienic and greater utilization of facilities, which are main factors for better health and health intervention programs. Provision of health service should eliminate certain diseases in developing countries in according to assumption of the biomedical approach.

Cox's proportional hazard model also showed the importance of the socio-demographic characteristics for infant and child mortality. From the analysis, highly significant determinants were the father's education, father's working status, wealth status, mother's age, months of breastfeeding and birth interval which were found to be strongly correlated with infant and child mortality. Thus he present study had to exert extra attention on these variables to change the level of infant and child mortality. In developing countries, like Bangladesh, reducing mortality is very much essential. It has great impact on fertility. If we can decrease the mortality rate, then fertility will be automatically declined. So, for the development of our country, we have to improve the lacking of these factors and it is possible each people in a family will concern about their child.

Of the South Asian countries Bangladesh is at one extreme in terms of high teenage fertility (with Sri Lanka being at the other extreme)⁷. Early marriage (average age at first marriage is only about 15 years in Bangladesh) combined with low levels of contraceptive has also resulted in children being born early: for example in 1996-97 36% of all teenage women (age 13 - 19 years) were either pregnant or already had a child⁶. Previous researches has suggested that there is a strong relationship between mother's age at birth and child mortality rates^{7,8}. In particular, the literatures predict a u-shaped relationship between the age at the time of childbirth and child mortality⁷. Evidently from the National Family Health Survey 1998-99 data set from neighboring India suggests that mortality rates are lower for children born when their mother was aged 20-29, compared to children that were born to adolescent/teenage mothers or children born when their mother was more than 30 years old⁹. This suggests that there is substantial potential for reducing child

mortality by designing policies aimed at these high-risk women.

An analysis of 1999-2000 DHS data from Bangladesh however does not suggest any evidence of a pronounced u-shaped relationship between mother's age at birth and child mortality.⁸ Instead we find that child mortality rates are higher when the age of the mother at the time of birth is less than 20 but these rates tend to stabilize beyond the age of 20⁸. The present study argued that the high child mortality among adolescent mothers could be related to non-use of available health inputs (e.g. hospital delivery, range of vaccinations). A study in Bangladesh show that condition of facilities and water supply are directly associated with the infant and child mortality¹⁰. Children drinking water from a piped source experience lower mortality than children drinking water from tube-well or other sources¹¹. Studies attracted attention on water supply to reduce child mortality and observed that children whose families reported piped pumped as sources for drinking water had a lower prevalence of disease than children whose families consumed water from other sources¹².

A cross sectional survey data in the multivariate approach by Mangani et al clearly showed the impact of socioeconomic factors on child mortality¹³. A study on user-related factors that influence the utilization of medical care facilities for treating childhood morbidity in sub-Saharan Africa using data from six African countries which participated in the Demographic and Health Surveys (DHS) showed in a logistic regression analyses that factors which account for differentials in health service use include the age of the mother, the mother's education, family resources, rural-urban residence and the number of reported diseases¹⁴. A study in Bangladesh on socioeconomic correlates of under-five mortality and morbidity 1994 and 1995 found mortality differentially on the basis of place of residence, region of residence, level of income, possession of land, level of household education, wall material, roof materials and access to source of drinking water¹⁵. The study also found that mortality of children to be declining with increased educational level of household and better housing condition¹⁴. The study also noticed that mortality was lower if the household income is higher. Another study observed early childhood disease were affect-

ing both moderate and low income families reflecting their surrounding unhygienic and diseases prone environment¹⁶. Another study showed that floor and construction materials, owning of domestic animal, possession of a radio, television, refrigerator, car house or cattle is related to diseases prevalence¹⁷. Lindenbaum et al. (1985) noted that in Bangladesh education yields women's empowerment, ability to pay for the services of maternity clinics, and healthy practices¹⁸.

Using data from the 1989 Bangladesh Fertility Survey (BFS), a study in Bangladesh examined infant and child mortality levels and trends by and using life table analysis to confirm the changes in infant and child mortality. They found that both infant and child mortality declined from the mid 1970s but infant mortality declined more quickly. The level of infant mortality in 1989 was around 100 per 1000 live births while the child mortality was 200 per 1000 live births. The decline in infant mortality is attributed to the introduction of improved public health measures and access to maternal and child health services¹⁹. Another study used data from 1975-76 BFS and showed little evidence regarding breast feeding as the immediate factor through which birth intervals influence child survival in Bangladesh²⁰. Preceding birth interval, subsequent pregnancy and breast feeding duration each have an independence on early mortality risk. within a specific interval the risk of dying decreases with an increase in duration of breast feeding, and also with an increase in duration of breast feeding, and also with an increase in the time between the index birth and the next pregnancy²¹. A hazard analysis in Bangladesh found that the positive effect of mother's education on child survival is different for boys and girls. For boys, a change in mother's education from no schooling to 1-5 years resulted in reducing the predicted risk of death by 45%, while for the girls the reduction was only 7%²².

A study²² observed no age difference on acute respiratory infection (ARI) mortality in Bangladesh while others^{23,24} found higher mortality in infant and child between 1-2 years respectively. Profoundly skewed distribution of burden of ARI mortality in both first and second years of life is reported in WHO Global Burden of Disease although it also revealed a relatively normal distribution for the number of respiratory episodes in both

first 2 years of life²⁵. Some studies found that mothers tend to under report of their children's ailments^{26,27}.

Newborn deaths account for 57% of deaths in children younger than 5 years in Pakistan²⁸. A study in Pakistan revealed that neonatal mortality rate was 43.0 deaths per 1000 livebirths despite community intervention. Another study²⁹ analyzed Pakistan's maternal and child health (MCH) and family planning (FP) policy covering the period 1990–2002, and focused on macroeconomic influences, priority programs and gaps, adequacy of resources, equity and organizational aspects, and the process of policy formulation. Mustafa GZ (2004) in his paper examined the importance of socioeconomic, behavioral and bio-demographic factors in the determination of neonatal, infant and child mortality in Pakistan with special focus on maternal education and health seek-

ing behavior³⁰. The findings indicated that the education of mother had significant effect on the neonatal infant and child survival as mother's education increases, the chances of survival of neonatal, infant and child also increases²⁹. Health care factors such as antenatal care, age at mother at first birth, breastfeeding and immunization also influence neonatal, infant and child survival³⁰.

Conclusions:

The findings of this study may have policy implications and also suggest further investigation using appropriate methodology to estimate the actual effect of independent variables on the mortality and utilization of child health care. Based on the discussion of this study some policy implications, comment and recommendation have been suggested that would help the government to take initiative to promote child health care and child survival.

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