Impacts of Bio-social Factors on Morbidity among Children Aged Under-5 in Bangladesh

Morbidity, clearly, is not a simple problem with a single solution. Multiple and interrelated determinants come into play and therefore a series of approaches and policies have to be evolved to deal with such kind of health hazard.

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Stretching over 147,570 square kilometres of land and with a population exceeding 131 million, Bangladesh is the world's ninth most populous country. It is also one of the most densely populated (834 persons per sq. km.) (BBS, 2001).

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Over-population and poverty are pervasive in Bangladesh and causing hazards such as morbidity. Children aged under five years, whom are naturally innocent, vulnerable and dependent on their parents often suffer from viral and infectious diseases. The future of a nation is linked to the well-being of its children, which depends to a large extent on children's health status. The aim of this study is to examine the prevalence of morbidity among children aged under-5 (0-59 months) in Bangladesh and to determine the factors causing such morbidity.

Morbidity impedes the body's metabolism and retards its immune response. The poor appetite of a malnourished child leads to a fall in dietary intakes and may dictate a morbid condition. Morbidity reveals impairment in the immuno-competence of an organism and may cause death at an early stage of life.

A follow-up study on causes of death among children, implemented within the context of the 1993-1994 BDHS found that 23 per cent of infant deaths and 25 per cent of deaths among children aged 1-4 occurred as a result of ARI (Baqui and others, 1997). Kabir, Shahadat and Akhter (1997) observed morbidity differentials by place of residence, region of residence, level of income, possession of land, level of household education, building materials, and access to safe drinking water in Bangladesh. Their study revealed that morbidity of children declines with the increase in the level of education of parents, and whether children living in houses built in cement had a lower prevalence of morbidity compared with children who lived in mud houses. Islam, Chowdhury and Yusuf (1996) investigated the patterns of morbidity in Bangladesh by children's immunization status, classified as fully immunized (having received all recommended vaccinations[1]) and partially immunized. Their study revealed that the diseases affected a smaller percentage of children having been fully vaccinated. Empirical studies of child morbidity have often found that morbidity was more strongly correlated with age, education of parents, ethnic group etc. Oni, Schumann and Oke (1991) conducted a 12-month diarrhoeal disease surveillance in a sample of 351 children under 3 years of age in a low-income traditional area of Ilorin, Nigeria to determine whether socio-demographic characteristics, including age of the child, sex, parity, mother's education, occupation, mother's age and household kitchen, were associated with the incidence of acute diarrhoea. Bi-variate and multi-variate analyses were used to determine the association. Results indicated that the age of the child had a significant association with diarrhoea. Declerque, Tsui and Mangani (1988) using cross-sectional survey data, collected in Bas Zaire from the mothers of 1,200 urban and 1,670 rural children born in the previous 5 years, found maternal age and birth order as determinants of diarrhoeal and other child morbidities through a multi-variate analysis.

Materials and Methods

This study utilized the data extracted from a nationally representative survey the 1999-2000 Bangladesh Demographic and Health Survey (BDHS). The survey was conducted between 10 November 1999 and 15 March 2000. Information on 6,430 children aged under-5 was available in the BDHS data file collected from 242 rural *Mauzas*[2] and 99 urban *Mahallas*.[3]

Based on the available information, this study examined the influences of the following: (a) demographic factors: sex of child, mother's age at birth of child, number of living children under five years of age, previous birth interval, age of child; (b) socio-economic factors: place of residence, mother's education, mother's occupation, father's education, father's occupation, type of housing, religion, household possessions, mass-media exposure; (c) dietary factor: breastfeeding status; (d) environmental factors: household drinking water source, type of toilet facility; and (e) health-care and immunization factors: antenatal care, vaccination coverage, vitamin A supplementation.

Bi-variate analysis was performed to determine the differentials of morbidity among children aged under-5, according to any prevailing risk factors. Pearson's chi-square test of independence was performed to test the existence of significant association between morbidity and selected risk factors. The significant variables ($p<0.05$) observed in bi-variate analysis were subsequently included in multi-variate analysis. Cox's linear logistic regression model is efficient with acceptable degree of precision for a binary dependent variable. This study considered binary dependent variables and hereby applied Cox's linear logistic regression model (Cox, 1970) for multi-variate analyses. The model used is given by:

$$P_i = \frac{\exp(\beta_0 + \sum_{j=1}^{p} \beta_j X_{ij})}{1 + \exp(\beta_0 + \sum_{j=1}^{p} \beta_j X_{ij})}$$

Where $i = 1, 2, \ldots\ldots, n$; $j = 1, 2, \ldots\ldots\ldots, p$.

Here, P_i is the probability of success of binary dependent variable on i^{th} risk factor. β_0 and β_j's are regression coefficients, which are to be estimated. X_{ij} indicates j^{th} category of i^{th} risk factor.

Three different models had been considered in this study. The fitted model 1 considered prevalence of acute respiratory infection (ARI) as dependent variable and it was coded as '1' if children were classified as ill with ARI during the two weeks preceding the survey, otherwise it was '0'. The fitted model 2 considered prevalence of diarrhoea as a dependent variable and was coded as '1' if children were classified as ill due to diarrhoea two weeks prior to the survey, otherwise it was '0'. The fitted model 3 considered prevalence of fever as dependent variable and was coded as '1' if children were classified as ill due to fever during two weeks preceding the survey, otherwise it was '0'. The study considered 21 independent variables (risk factors) in bi-variate analysis. Significant risk factors depicted from bi-variate analysis were considered for multi-variate modeling to assess the net effect of each factor on morbidity among children aged under five. Significant variables ($p<0.05$) found from bi-variate analyses were included in table 1, 2 and 3. Table 4, 5 and 6 presents the variables found to be significant in the multi-variate analyses. 'SPSS' statistical software was used for data analyses.

Results

Table 1. Differentials of ARI among children aged under-5 by significant biosocial factors

Risk factors	Total number of cases	Prevalence of ARI	p-value*
Age of child (in months)			
< 6	771	23.4	<0 .05
6-11	541	22.7	
12-23	1,316	23.7	
24-35	1,299	17.3	
36-47	1,223	15.0	
48-59	1,280	12.8	
Residence			
Urban	1,059	16.3	< 0.05
Rural	5,371	18.9	
Type of housing			
Made of raw materials	4,246	19.9	< 0.001
Made of tin	1,269	17.2	
Made of brick/cement	915	13.4	
Watched TV/ listen to radio once a week			
No	4,499	19.9	<0 .01
Yes	1,931	15.1	
Duration of breastfeeding			
< 12 months	1,640	22.0	< 0.01
12-23 months	1,867	20.1	
24+ months	2,923	15.7	

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Table 1. *(Continued)*

Risk factors	Total number of cases	Prevalence of ARI	p-value*
Vaccination coverage[1]			
Partially completed	3,174	20.7	<0 .001
Completed	3,206	16.8	
Total	**6,430**	**18.5**	

* Based on ^{2} statistics measuring the significant association between risk factors and ARI.

1 Complete vaccination coverage means for an individual to have received BCG, Measles and all three doses of DPT and POLIO vaccines. Partial vaccination coverage means any dose of the above-cited four vaccines is missing.

Age of child was found to be significantly associated with ARI. The relationship between a child's age and the incidence of ARI as shown in table 1 was curvilinear; 23.4 per cent of children below the age of six months suffered from ARI, while the prevalence rate increased at age interval 6-23 months. After that it subsequently diminished and in 48-59 months interval, it decreased to 12.8 per cent. The prevalence of ARI among children aged under-5 was significantly higher in rural areas (18.9 per cent) than in urban areas (16.3 per cent). Type of housing had a highly significant relationship with the prevalence of ARI. Children living in houses made of raw materials had the highest proportion of ARI, whereas the lowest proportion (13.4 per cent) lived in brick or cement-made houses. Children whose mothers watched television and listened to the radio once a week had lower rate of ARI (15.1 per cent) than those children whose mother did not enjoy any television or radio broadcasting (19.9 per cent). Table 1 shows that the 22 per cent of children who had ARI were breastfed less than 12 months while the percentage to those who were breastfed for 24 or above months was 15.7 per cent. Prevalence of ARI was significantly ($p<0.001$) higher among children (20.7 per cent) who didn't complete the vaccination course than those who completed the entire course (16.8 per cent).

Table 2 shows that the relationship between a child's age and prevalence of diarrhoea was curvilinear and highly significant. The proportion of children suffering from diarrhoea was highest among children aged 6 to 23 months (11.8 per cent) and lowest in age group 48-59 months (2.3 per cent). Incidence of diarrhoea was found to be inversely proportional to the length of breastfeeding. Table 2 shows that 6.5 per cent children who suffered from diarrhoea were breastfed for less than 12 months, while the proportion of children suffering from the same condition and who were breastfed for 24 or above months was only 4 per cent. Prevalence of diarrhoea was significantly ($p<0.01$) higher (7 per cent) among children who did not complete vaccination coverage than among those who completed the entire vaccination course (5.2 per cent).

Table 2. Differentials of diarrhoea among children aged under-5 by significant biosocial factors

Risk factors	Total number of cases	Prevalence of diarrhoea	p-value*
Age of child (in months)			
< 6	771	3.4	< .001
6-11	541	11.8	
12-23	1,316	11.8	
24-35	1,299	5.6	
36-47	1,223	3.8	
48-59	1,280	2.3	
Duration of breast feeding			
< 12 months	1,640	6.5	< .05
12-23 months	1,867	9.2	
24+ months	2,923	4.0	
Vaccination coverage			
Partially completed	3,174	7.0	< .01
Completed	3,206	5.2	
Total	**6,430**	**6.1**	

Based on ^{2} statistics measuring the significant association between risk factors and diarrhoea.

The association between a child's age and the prevalence of fever was highly significant. Prevalence of fever was the highest (37.5 per cent) in the age group 6-12 months and lowest (21.4 per cent) among children aged between 48-59 months old. Mother's education was significantly ($p<0.001$) associated with fever. Table 3 shows that 27.5 per cent of children of illiterate mothers suffered from fever, whereas the proportion was 24.8 per cent for children whose mother had completed secondary or higher level education. 29.9 per cent children with fever had been breastfed for less than 12 months, it's proportion fell to 24.6 per cent for children who were breastfed for 24 months or more. Prevalence of fever was higher (2.5 per cent) among children who did not receive the full vaccination coverage than among those who completed the course.

Table 3. Differentials of fever among children aged under-5 by significant biosocial factors

Risk factors	Total number of cases	Prevalence of fever	p-value*
Age of child (in months)			
< 6	771	26.6	
6-11	541	37.5	
12-23	1,316	34.0	<0 .001
24-35	1,299	27.1	
36-47	1,223	22.5	
48-59	1,280	21.4	
Mother's education			
None	3,007	27.5	
Primary level	1,876	29.1	<0 .001
Secondary or Higher level	1,547	24.8	
Duration of breast feeding status			
< 12 months	1,640	29.9	
12-23 months	1,867	29.8	< 0.05
24+ months	2,923	24.6	
Vaccination coverage			
Partially completed	3,174	28.5	<0 .05
Completed	3,206	26.0	
Total	**6,430**	**27.3**	

Based on ^{2} statistics measuring the significant association between risk factors and fever.

Among the explanatory variables considered in the logistic regression model   age of child, type of housing and exposure to TV/radio   were found significant for the prevalence of ARI. Table 4 shows that children aged 6-11 months, 24-35 months, 33-47 months and 48-59 months were, respectively, 0.90, 0.72, 0.62 and 0.49 less likely to be affected by ARI than children aged below six months. By contrast, children aged between 12-23 months faced 1.32 times greater risk of suffering from ARI. Children living in houses made of raw materials and tin sheets were, respectively, 1.38 and 1.24 times more likely suffer from ARI, compared with children lived in cement/brick houses. Children whose mothers watched television or listen to the radio once a week at least faced 0.79 times less risk of contracting ARI than those children whose mother did not watch or listen to television/radio broadcasts.

Table 4. Logistic regression analysis to identify the risk factors of ARI among children aged under-5

Risk factors	Estimated (β) coefficient	S.E. of estimate	p-value	Odds ratio
Age of child (in months)				
<6 (r)	..	..	<0.001	1.000
6-11	-0.111	0.146		0.895
12-23	0.280	0.223		1.324
24-35	-0.333	0.211		0.716
36-47	-0.486	0.210		0.615
48-59	-0.710	0.211		0.492
Type of housing				
Made of raw materials	0.322	0.128	<0.05	1.380
Made of tin	0.212	0.141		1.236
Made of brick/cement	..	..		1.000
Watched TV/listen radio once a week				
No (r)	..	..	<0.05	1.000
Yes	-0.245	0.094		0.787

Note: 'r' represents reference category.

Table 5. Logistic regression analysis to identify the risk factors of diarrhoea among children aged under-5

Risk factors	Estimated (β) coefficient	S.E. of estimate	p-value	Odds ratio
Age of child (in months)				
<6 (r)	..	..	<0.001	1.000
6-11	1.058	0.127		1.519
12-23	-0.054	0.195		1.491
24-35	-1.059	0.185		0.908
36-47	-1.474	0.185		0.724
48-59	-2.013	0.185		0.677
Vaccination coverage				
Partially completed	0.226	0.116	<0.05	1.253
Complete	..	..		1.000

Note: 'r' represents reference category.

Age of child and vaccination coverage were found significant for the prevalence of childhood diarrhoea among the variables considered in the logistic regression model. Table 5 showsthat children aged 12-23 months, 24-35 months, 36-47 months and 48-59 months faced, respectively, 0.95, 0.35, 0.23 and 0.13 times less risk of diarrhoea compared with children aged 6 months or younger. By contrast, children aged 6-11 months had 2.88 times higher risk of suffering from this condition. Diarrhoea prevalence was highest among children aged 6-23 months, a period during which solid or semi-solid food is introduced. Children who did not receive the complete vaccination course were 1.25 times more likely to suffer from diarrhoea compared with children who had been vaccinated.

Table 6. Logistic regression analysis to identify the risk factors of fever among children aged under-5

Risk factors	Estimated (β) coefficient	S.E. of estimate	p-value	Odds ratio
Age of child (in months)				
<6 (r)	..	..	<0.001	1.000
6-11	0.418	0.127		1.519
12-23	0.399	0.195		1.491
24-35	-0.097	0.185		0.908
36-47	-0.323	0.185		0.724
48-59	-0.389	0.185		0.677
Mothers' education				
None (r)	..	..	<0.05	1.000
Primary level	0.145	0.072		1.156
Secondary or higher level	-0.084	0.091		0.919

Note: 'r' represents reference category.

Logistic regression analysis shows age of child and mother's education to be significant for the prevalence of fever among children aged under-5. Table 6 shows that children aged 24-35 months, 36-47 months and 48-59 months were, respectively, 0.91, 0.72 and 0.68 times less likely to suffer from fever than children 6 months old or younger. But children aged 6-11 months and 12-23 months, respectively, faced 1.52 and 1.49 times higher risk of fever. Children whose mothers attended secondary or higher level education were 0.92 times less likely to have a fever than children whose mother was illiterate.

Discussion

This present study reveals that age of child is a significant factor in the prevalence of ARI, diarrhoea and fever among children aged under-5. Prevalence of morbidity was highest among children aged 6-23 months when they are weaned off breast milk and introduced to solid food. Educated mothers tend to make better use of health services and provide better child-care, including feeding. The analysis shows that children whose mothers attended secondary or higher level of education were less likely to suffer from fever than children whose mother was illiterate. Type of housing appeared as an important risk factor for ARI among children aged under-5. Children living in houses built with raw materials and tin more commonly suffered from ARI compared with children who lived in houses built with cement/brick. Children living in houses built of cement enjoyed better socio-economic status, which in turn ensures better health.

Morbidity, clearly, is not a simple problem with a single solution. Multiple and interrelated determinants come into play; a series of approaches and policies therefore have to be evolved to deal with such kind of health hazard. Emphasis should be placed on parents' education and encourage them to provide better child-care. Vaccination coverage and precautions can protect babies from a substantial risk of morbidity. Integrated health services programmes might be organized for women in the setting of village meetings. Governments may wish to design well thought child care programmes to ensure easy access to health information and health education for parents. Community involvement, NGOs and use of media of mass communication with coverage of necessary health-care information may prove to be useful for improving health status of children under-5 years of age.

Endnotes

1. Completed vaccination coverage means receiving BCG, measles and all three doses of DPT, Polio vaccines

2. *Mauza* is the geographical expression of a unit of landmass for revenue settlement and revenue collection, whereas, within a *mouza* there could be more than one village.

3. *Mahalla* is the smallest administrative unit in urban areas consisting several households.

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