Determinants of Multimorbidity of Infectious Diseases Among Under-five Children of Bangladesh: Role of Community Context

Extended Abstract

1. Background

Over the last few decades, Bangladesh has seen a substantial progress in reducing the burden of infectious diseases especially in children. Such achievement had resulted in further reduction of infant (from 87 deaths per 1000 live births in 1993 to 38 deaths in 2014) and child (from 133 deaths per 1000 live births in 1990 to 30.2 deaths in 2018) mortality in Bangladesh (1). However, despite such remarkable success and knowledge of role of infectious disease in child deaths, early life mortality in Bangladesh is higher than the estimated target of Sustainable Development Goals (1,2). And infectious diseases take a larger part in taking these new born lives. The biggest sorrow lies in the fact that most of these infectious diseases are treatable and preventable.

Diarrhea and respiratory tract infections including fever, cough, and breathing problems are some common diseases that are prevalent across Bangladeshi children (3). Studies have associated this condition with the exposure, environment, and background of children (4). Evidence also shows that the risk of diarrhea and acute respiratory infection was common in younger ages (5,6). Numerous studies from developing countries have also shown a significant effect of improved sanitation and water sources on the incidence of childhood diarrhea (6). A study from Bangladesh had shown that smoking habits among family members, location of the kitchen, and type of cooking fuels play an important role in acute respiratory infection incidence (7). Studies have also shown that urban and male children were lesser likely to experience these diseases due to a preference for better food and health care facilities (8).

So far, knowledge of these determinants had helped Bangladesh to recover from the tag of highest child mortality country across the world. In 1998, government had started vertical programs to focus on the issue of child diarrhea which played a substantial role in reducing deaths and diseases among children (9). However, by time, the face and figure of diseases has changed (in form multimorbidity) because children are no longer battling from one disease. Presence of more than one morbid condition had made the situation worsen. Studies have associated multimorbidity in children with different factors. However, the role of community cannot be denied as the children residing in same community share characteristics too (10,11). Studies from Bangladesh had also pointed towards both individual and community level influence on child mortality (12). This brings the necessity to understand how community can affect the multimorbidity of infectious diseases in children which are resulting into child mortality. From methodological point of view, most of the studies use multinomial regression to show the condition of multimorbidity. However, looking into the count nature of model along with data hierarchical in nature with children nested within households who in turn were nested within communities. We have used mixed-effects random-intercept Poisson regression models to understand the determinants of multimorbidity of infectious diseases in under-five Bangladeshi children considering the community level characteristics.

2. Data, Variables and Methods

2.1 Data source

The current study used the most recent Demographic and Health Survey of Bangladesh conducted during 2017-18 (hereby referred to as BDHS 2017-18). The National Institute for Population Research and Training (NIPORT) has conducted BDHS 2017-18 under the stewardship of the Ministry of Health and Family Welfare (MoHFW) of Bangladesh. The survey provided crucial information on childhood mortality levels, maternal and child health, fertility and fertility preferences, utilization of family planning methods, newborn care, women's empowerment, selected non-communicable diseases (NCDS) and availability and accessibility of health and family planning services at the community level. The survey follows a two-stage stratified sample design. Further details regarding sample design, survey instruments, staff training and fieldwork, data collection and processing, and response rates are available in the BDHS 2017-18 reports (1).

We used the data for 8759 children aged under-five years born to 7562 mothers aged 15-49 years across 672 communities in Bangladesh. However, we dropped the records of 361 children who were not alive during the survey period and had no information regarding their morbidity status. Therefore, the analytical sample for this study is 8398 under-five children across 672 communities.

2.2 Outcome variables

The outcome variable of multimorbidity status comes from the mother's responses regarding the status of their children's morbidity. BDHS 2017-18 collected information regarding whether the children had suffered from fever, cough, acute respiratory infections (ARI) and diarrhoea within two weeks prior to the interview. We combined these four variables into a count variable of morbidity status that contained five categories – children who did not suffer from any of the four morbidities ("no condition"), children who suffered from one ("single condition"), two, three and four conditions respectively. The advantage of this approach is that it allows us to take into account the severity of the children's infirmity in the sense that the greater the number of comorbid conditions the more severe is its effect on the health of children (3).

Table 1: Morbidity profile of children under-five years

Disease characteristics	Total population	
	N	%
Had fever in two weeks		
No	5,634	67.1
Yes	2,764	32.9
Had cough in two weeks		
No	5,357	63.8
Yes	3,041	36.2
Acute Respiratory Infection in two weeks		
No	7,344	87.4
Yes	1,054	12.6
Had diarrhoea in two weeks		
No	7,986	95.1
Yes	412	4.9

Multimorbidity status		
No condition	4,448	53.0
Single condition	1,586	18.9
Two conditions	1,492	17.8
Three conditions	787	9.4
Four conditions	85	1.0
Overall	**8,398**	**100**

Guided by extant research, we identified relevant factors that are associated with the occurrence of morbidity among children (3–5).

2.3 Statistical methods

We performed bivariate and multivariate analysis to realize the study objectives. The bivariate association of multimorbidity status and the child-level, parent-related, household-level and community-level explanatory variables were examined using the chi-square test for association. Equivalently, owing to the count nature of the multimorbidity status variable, multivariable analysis was performed by estimating mixed-effects random-intercept Poisson regression models. The data was hierarchical in nature with children nested within households who in turn were nested within communities. Therefore, we estimated two-level random intercept Poisson models with children at level-1 and communities at level-2.

The multivariate association of morbidity status of children with the explanatory variables was shown using incidence rate ratios (IRR). The IRR gives the risk of having morbidity compared to having no morbidity among those children belonging to a particular category of an explanatory variable given the effect of all the other explanatory variables and the community-level variability remain constant (13). We also calculated Median Incidence Rate Ratios (13,14). Further, we checked for multicollinearity in the regression models and found the mean value of the variance inflation factor (VIF) to be less than 1.5. Therefore, multicollinearity is negligible (15).

3. Expected Findings

Among 8398 Bangladeshi children, acute respiratory infections are more common than diarrhea. The prelim results shows that 12.6% of under-five children experience acute respiratory infection, in contrast to 4.9% of children having diarrhea. 17.8% of under-five children suffers from more than one morbid condition. Strong effect of age on the incidence of these morbidity conditions are expected (3). Because it has been usually found that children at their younger ages can get exposed to contaminated water, soil, and food easily as at these ages they usually crawl and tries to explore the environment. However, older ages children who have already moved towards this exposure are well-known with the environment and sometimes build a strong immunity till that age. Incidence of morbidity condition among under-five children also varies according to household wealth index in both single and multiple morbidity condition. Multiple morbidities were found to be significantly higher among monsoon seasons. Beside these determinants, community level factors are also expected to be an important indicator of multimorbidity of infectious disease in Bangladesh.

Although the government had taken different measures to protect the well-being of children, the COVID-19 pandemic had increased the existing inequities and burdened the country with the risk of childhood disease or death. The unprecedented situation of COVID-19 also draws our attention towards the role of community level characteristics and strengthening the public care facilities. For instance, this pandemic had brought a clear picture how a community can become the reason of both fatality or survival among individuals. The present study is also backed with the recent national-level data of under-five children in Bangladesh which will help us to evaluate the situation just before the pandemic. Our study will also help the policymakers to understand the community level mitigation strategies of childhood multimorbidity.

4. References

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