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Social Gradients of Childhood Morbidity and Malnutrition in Bangladesh: Evidence from the Multiple Indicator Cluster Survey 2019

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Abstract

Childhood morbidity is still a severe concern for Bangladesh despite a substantial reduction in the last few decades. Exploring social gradients in child health allows realizing the relative impact of adverse and favorable influences of different social variables manifested in varying levels along the social spectrum and facilitating better informed and well-targeted health and social policies. Thus present study assessed social gradients in childhood morbidity and malnutrition in Bangladesh. This study used the data from the Bangladesh Multiple Indicator Cluster Survey (MICS) 2019. The sample size for this study was 23,099 and 22,011 for childhood morbidity and malnutrition, respectively. We employed the chi-square tests, concentration index, and multilevel logistic regression analyses. We observed that 6.9, 2.3, and 23.5 percent of children had diarrhea, acute respiratory infection (ARI), and fever in the last two weeks preceding the survey. The mother's education, wealth index, ethnicity, and the household head's education were significant differentials of under-five childhood morbidity. The prevalence of childhood stunted, wasted, underweight, and overweight was 28, 9.8, 22.6, and 2.4 percent, respectively. We observed inequality in under-five malnutrition by place of residence, mother's education, wealth index, ethnicity, and household head's education. The current study found the presence of social gradients in childhood morbidity and malnutrition in Bangladesh. Policymakers should adopt policies targeting to reduce socio-economic disparities for childhood morbidity and malnutrition. Segmented interventions should be designed to reduce child health problems. Public health interventions should focus on the spread of women's education precisely to improve the health status of children.

Keywords: Socio-economic factors, Spatial factors, Child morbidity, Child malnutrition, Child health inequalities, Bangladesh

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Introduction

The world has experienced a rapid decline in global poverty and improved child health status since the 1950s. However, the situation was not the same for all parts of the world and left the scopes of vast inequalities (Costello & White, 2001). The link between the socio-economic condition and ill health has been well reflected in that poorer countries worldwide have low health status, which is even more valid for the more impoverished region within those particular countries (Costello & White, 2001). The major effects of socio-economic differences on health behavior and health outcome have been documented widely (Nettle, 2010). In this regard, exploration of social gradients, which means that each level of socio-economic position enjoys specific health conditions (World Health Organization, 2013), is crucial for realizing the effects of different socio-economic variables on child health outcomes. Different studies were previously conducted based on several indicators like parents' education, household income, wealth index, parents' job status to define social gradients on the child health outcome (Starfield et al., 2002; Devkota & Panda, 2016; Bird et al., 2019; Piotrowska et al., 2019)

Child health has been a burning issue for many decades. Every year, nearly millions of children die primarily from low-income developing countries, and most of these deaths are preventable (Denno & Paul, 2017). It has been estimated from the previous studies that children from the poorest households are three times more likely to die before they reach age five than children from the more affluent households (Li et al., 2017). Globally, respiratory infection, diarrhea, and acute malnutrition were prevalent diseases and causes of death among these vulnerable children (Kassebaum et al., 2019). Exploring the level of effects of social gradients on child health in determining childhood morbidity and malnutrition is necessitated as various socio-demographic aspects significantly predict such health-related outcomes of children around the world (Frenkel, 2018; Adedokun & Yaya, 2020).

With a low health expenditure of 2.3 percent of gross domestic product (GDP) and 5.2 percent of the total budget of the fiscal year 2020-2021 (Hossain & Ahmed, 2020), Bangladesh exposes vulnerable populations such as women and children to health risks and compromises the quality of life-related issues (Rahman, 2018). Child health is still a significant public health concern (Mahumud et al., 2019) in Bangladesh. Acute respiratory infection [ARI], diarrhea, jaundice, and typhoid have been found as the most common diseases among children (Bangladesh Bureau of Statistics [BBS], 2019). With a relatively high value of stunting (31%), wasting (8%), and being underweight (22%) among the

children, malnutrition remains a significant child health issue in Bangladesh (National Institute of Population Research and Training [NIPORT] & ICF, 2020).

The burden of childhood morbidity and nutritional deficiency expedites the necessity of assessing the social gradients of child health as it was found in earlier studies that socio-economic inequalities have mainly been predicting childhood morbidity (Ferdous et al., 2014; Mahumud et al., 2019) and malnutrition (Huda et al., 2018) in Bangladesh. However, improvement of health inequalities is challenged by the insufficient effort of addressing the reality of social gradients in health. Thus, to design public health policies and interventions targeting child health issues, exploring the interrelationship between social gradients and child health is crucial. Exploring such factors may contribute to identifying priority health interventions within policies and the health systems in Bangladesh.

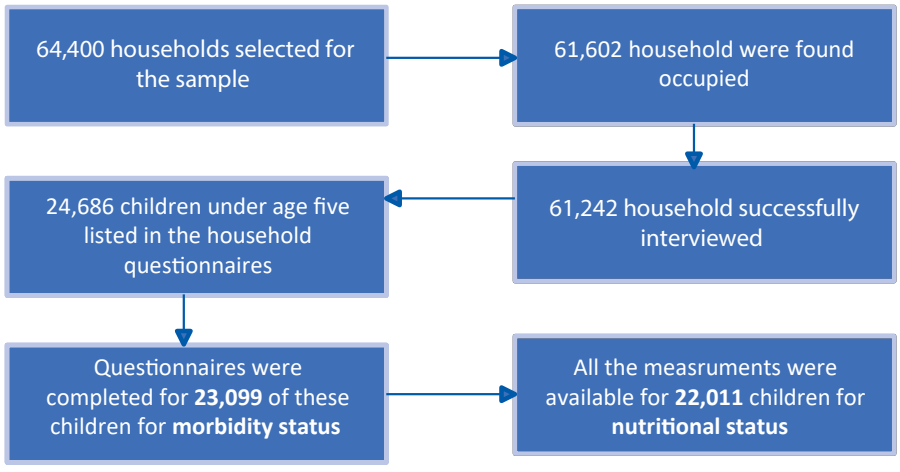
The existing studies in Bangladesh have separately focused on childhood morbidity (Islam, 2013; Kamal et al., 2015) and nutritional status (Rabbi & Karmaker, 2014; Das & Gulshan, 2017; Saha et al., 2019; Sarker et al., 2019) with relatively older datasets which lack applicability in the present context. Most of the studies used demographic and health survey [BDHS] data which is only representative at the divisional level (Islam, 2013; Rabbi & Karmaker, 2014; Kamal et al., 2015; Das & Gulshan, 2017; Saha et al., 2019; Sarker et al., 2019). Hence, considering the importance of exploring the pathways of how social elements are impacting the child health outcome in the current context, the present study utilized Multiple Indicator Cluster Survey [MICS] data which is representative at the district level and aimed to investigate the effects of social gradients in childhood morbidity and malnutrition in Bangladesh.

Materials and methods

Data source and eligibility criteria

This study extracted data from the latest Multiple Indicator Cluster Survey [MICS] 2019 (BBS & UNICEF Bangladesh, 2019). The sample of 64,400 households for the MICS 2019 was selected to estimate national, urban, and rural, eight divisions, and 64 districts (Figure 1). Of the selected households, 61,602 were found occupied, and of these, 61,242 were successfully interviewed, with a response rate of 99.4 percent. All participants (ever-married women or caretakers) were asked to provide detailed information about their children's births. There were 24,686 children under age five listed in the household questionnaires. Questionnaires were completed for 23,099 children with a response rate of 93.6 percent within the interviewed households. All the completed samples were used for childhood morbidity. However, the final sample size for the childhood nutritional status was 22,011.

Figure 1. Process of sample selection for the study



Variables of the study

Dependent variables

The outcome variables of the study were childhood morbidity (fever, diarrhea, ARI) and nutritional status (stunted, wasted, underweight, and overweight). The presence of diarrhea and fever was measured using the following questions: (1) In the last two weeks, has (name) had diarrhea? (2) At any time in the last two weeks, has (name) been ill with a fever? The presence of ARI was calculated as the percentage of children under age five with the symptoms of chest-related short or rapid breathing and/or difficult breathing (Bangladesh Bureau of Statistics (BBS) & UNICEF Bangladesh, 2019; Croft et al., 2018) using the following question: (3) At any time in the last two weeks, has (name) had fast, short, rapid breaths or difficulty breathing? Was the fast or difficult breathing due to a problem in the chest or a blocked or runny nose? Using anthropometric measurement, we estimated stunted (height-for-age), wasted (weight for height), underweight (weight for age), and overweight based on the World Health Organization [WHO] Child Growth Standards (-2 or -3 standard deviation [SD] below the mean for undernutrition and above +2 SD for overnutrition of wasted).

Independent variables

We selected the following independent variables as social gradients based on the existing literature and availability of variables in the dataset (BBS & UNICEF Bangladesh, 2019): mother's education (categorized as no education, primary, secondary, and higher), wealth index, ethnicity, place of residence, and education of household head. The wealth index, which was used to assess the household's socio-economic status, was constructed from data of household possessions using the principal component analysis and divided into five groups (poorest to richest) based on overall asset ownership. To assess the effects of

social gradients on child health, we controlled social, demographic, health, and spatial factors including religion, the age of the mother, age of the child, sex of the child, birth order, previous birth interval, disability status of the child, and administrative division of the country.

Statistical analysis

We performed both bivariate and multivariate analyses to assess the effect of social gradients in childhood morbidity and malnutrition. We used the chi-square test and concentration index [CI] to examine the bivariate level statistics between dependent and independent variables. The CI is often used to measure inequality in one variable, e.g., childhood morbidity over the distribution of others, e.g., wealth index. We estimated CI using 'conindex' command in Stata add-in (O'Donnell et al., 2016). The value of CI ranges between 0 (no inequality) and 1 (perfect inequality). However, significant variables at the bivariate level were used for multivariate analyses and followed a stepwise process. We used Variance Inflator Factor [VIF] to scrutinize multicollinearity among the explanatory variables (mean VIF: 2.07, range 1.0 to 3.49).

Since MICS data are hierarchical, for example, mothers and children are nested within households, and households are nested within clusters, the use of flat models might underestimate standard errors of the estimates, affecting the decision on the null hypothesis. Moreover, mothers within the same cluster might be more similar to each other than the rest of the country, which violates the assumption of flat models: independence of observations and equal variance across the clusters. Therefore, we used multilevel (two-level random effect model) logistic regression models to identify the effect of social gradients on childhood morbidity and malnutrition in Bangladesh by adjusting cluster variance. Two models were analyzed: empty/null model and a model containing variables related to social gradients after controlling the effects of independent variables. The Intra-class correlation [ICC] was estimated using between-cluster variance and within-cluster variance, which helped show the level of between-cluster correlation within a model and compare the successive models by looking at the decline of the ICC. The Proportional Change in Variance [PCV] was also estimated for each model concerning the null model to show how the successive models explained much variability in childhood morbidity and malnutrition odds. All the analyses were carried out considering the complex sampling of the survey.

Results

Background characteristics

Selected background characteristics of the respondents are presented in Table 1. About 79 percent of the respondents were from rural areas. Almost half the mothers of under-five children had secondary, and 16 percent had more than secondary education. Around 21.8 percent of the children were from the poorest

household, where 20.4 percent were from the richest household. Almost 99 percent of the children were Bengali.

Childhood morbidity

Table 1 presents the childhood morbidity prevalence by selected social gradients. We observed that 6.9, 2.3, and 23.5 percent of children had experienced diarrhea, a symptom of ARI, and fever, respectively, in the last two weeks preceding the survey. The children from urban areas had higher diarrhea than rural but a lower ARI and fever. Children of higher educated mothers had a lower prevalence of diarrhea. Nevertheless, we observed a mixed relationship between ARI and fever and women's education. Children from the highest wealth quintile household had a lower prevalence of diarrhea and fever than others. The negative CI value of the wealth index indicated the disproportionate concentration of morbidity among children of the poorest household.

Table 1. Prevalence of childhood morbidity by selected social gradients

Socio-economic characteristics	Sample characteristics, n=23,099 (%)	Diarrhea		ARI		Fever	
		%	CI	%	CI	%	CI
Place of residence			-0.002		0.008	***	0.013
Urban	21.2	7.0		2.2		22.0	
Rural	78.8	6.9		2.3		23.9	
Education of mother		**	-0.040	***	0.015	***	0.002
Pre-primary or none	11.2	7.7		2.1		20.5	
Primary	23.7	7.3		2.3		24.4	
Secondary	49.1	6.9		2.4		24.2	
Higher secondary+	16.0	5.9		2.3		21.9	
Wealth index of household		***	-0.089		-0.033	***	-0.018
Poorest	21.8	8.4		2.4		23.1	
Second/Poorer	19.6	8.2		2.6		24.5	
Middle	18.6	6.1		2.3		25.1	
Fourth/Richer	19.5	6.2		1.9		24.6	
Richest	20.4	5.6		2.3		20.4	
Ethnicity of household		***	0.005		-0.006	**	-0.003
Bengali	98.9	6.9		2.3		23.6	
Other	1.1	9.8		1.2		16.5	
Education of household head		***	-0.039	***	-0.055	***	0.004
Pre-primary or none	30.0	7.1		2.5		22.2	0.013
Primary	29.4	7.7		2.5		24.8	
Secondary	27.9	6.6		2.2		24.6	
Higher secondary+	12.7	5.5		1.7		21.0	
Total	100.0	6.9		2.3		23.5	

*=p≤0.05, **=p ≤0.01, ***=p ≤0.001 of chi -square tests. CI: Concentration Index.

A two-level random effects logistic regression model was used to analyze the effects of social gradients for determining childhood morbidity (Table 2). As the empty model, 7-11 percent of the total variance in the odds of childhood morbidity was accounted for between-cluster variation of characteristics (ICC =0.07 to 0.11). The between-cluster variability declined in the full model (the PCV=10 to 48.6%). We found that wealth index, ethnicity, and education of household heads were the significant determinants of childhood diarrhea.

Children from the poorest (aOR=1.51, p<0.001) and poorer households (aOR=1.61, p<0.001) had higher odds of diarrhea than children from the richest household. The ethnic children (aOR=1.85, p<0.05) had higher odds of diarrhea than Bengali children. In contrast, lower ARI was found among the children from the poorest household. For childhood fever, the mother's education, ethnicity, and education of household head appeared as significant determinants. For instance, compared to the richest, children of the poorer (aOR=1.20, p<0.05), middle (aOR=1.23, p<0.001), and the richer families (aOR=1.22, p<0.001) were more likely to have the fever.

Table 2. The effect of social gradients on childhood morbidity (adjusted odds ratio[aOR])

Socio-economic characteristics	Morbidity		
	Diarrhea	ARI	Fever
Education of mother			
Pre-primary or none			0.97(.09)
Primary			1.13(.09)
Secondary			1.07(.07)
Higher secondary+(R)			
Wealth index			
Poorest	1.51(.16)***	0.62(.11)***	1.14(.09)
Second/Poorer	1.61(.17)***	0.66(.12)*	1.20(.09)*
Middle	1.12(.13)	0.68(.12)*	1.23(.08)***
Fourth/Richer	1.18(.14)	0.65(.11)***	1.22(.08)***
Richest(R)			
Ethnicity			
Bengali(R)			
Other	1.85(.46)*		0.69(.13)*
Education of household head			
Pre-primary or none		1.63(.32)*	0.99(.08)
Primary		1.75(.35)***	1.14(.09)
Secondary		1.37(.27)	1.15(.08)*
Higher secondary+(R)			
Constant	0.02(.001)***	0.004(.001)***	0.12(.01)***
Random intercept	0.45(.08)	0.28(.16)	0.27 (.03)
ICC: Empty model	0.14(.02)	0.14(.03)	0.08 (.01)
ICC: Final model	0.11(.02)	0.08(.04)	0.07 (.01
PCV	21.4%	48.6%	10.1%

R=Reference category; *=p ≤0.05, **=p ≤0.01, ***=p ≤0.001. Standard error in the parenthesis. The adjusted odds ratio was produced using the multilevel logistic regression after controlling religion, the child's age, division, sex of the child and household head, disability status of child and mother.

Childhood nutritional status

The prevalences of childhood stunted, wasted, underweight, and overweight were 28, 9.8, 22.6, and 2.4 percent, respectively. Children from rural areas had significantly higher undernutrition but lower overnutrition than those from urban areas (Table 3). The positive value of CI of wealth index indicated the disproportionate concentration of overnutrition among children from the richest household. A similar concentration of overnutrition was also observed by the education of the mother of children.

Table 3. Prevalence and inequalities of malnutrition among children under age five

Socio-economic characteristics	Stunted		Wasted		Underweight		Overweight	
	%	CI	%	CI	%	CI	%	CI
Place of residence	**	0.013	**	0.024	**	0.035	**	-0.206
Urban	26.3		8.7		18.9		4.8	
Rural	28.4		10.1		23.6		1.8	
Education of women	***	-0.125	***	-0.085	***	-0.131	***	0.157
Pre-primary or none	40.1		12.6		32.5		1.6	
Primary	34.2		11.1		27.4		1.9	
Secondary	25.2		9.5		21.0		2.3	
Higher secondary+	18.7		7.0		13.6		4.2	
Wealth index	***	-0.131	***	-0.087	***	-0.141	***	0.286
Poorest	38.2		11.7		30.0		1.5	
Second/Poorer	31.4		11.6		26.9		1.3	
Middle	25.9		9.3		21.9		1.7	
Fourth/Richer	23.5		8.4		19.5		2.3	
Richest	19.8		8.0		14.2		5.4	
Ethnicity of household		0.001		0.001		-0.002		-0.002
Bengali	27.9		9.8		22.6		2.4	
Other	31.7		10.7		18.9		2.0	
Education of household head	***	-0.094	***	-0.048	***	-0.096	***	0.125
Pre-primary or none	32.8		10.5		26.5		2.0	
Primary	30.5		10.6		24.8		2.0	
Secondary	24.4		9.1		19.8		2.4	
Higher secondary+	18.3		8.0		14.3		4.3	
Total	28.0		9.8		22.6		2.4	

*=p≤0.05, **=p ≤0.01, ***=p ≤0.001 of chi-square tests. CI: concentration index

A two-level random effects logistic regression model was also used to analyze the effects of social gradients for determining childhood malnutrition. As the empty model, 6-23 percent of the total variance in the odds of childhood malnutrition was accounted for between-cluster variation of characteristics (ICC =0.06 to 0.23). The between-cluster variability declined in the full model (the PCD=0.3 to 41.6%). Table 4 shows that place of residence, division, maternal education, wealth index, and education of household head were the significant predictors of childhood stunted. Children of rural areas were 22 percent (p≤0.001) less likely to be stunted than the children of urban areas. Children of pre-primary or no educated (aOR: 1.70, p≤0.001), primary (aOR: 1.44, p≤0.001), and secondary educated (AOR: 1.15, p≤0.05) mother were more like to be stunted than children of a higher educated mother. Similarly, children of poorest (aOR: 2.35, p≤0.001), second (aOR: 1.90, p≤0.001), middle (aOR: 1.52, p≤0.001), and fourth wealth quintile family (aOR: 1.31, p≤0.001) had also higher stunted. However, maternal education and wealth index head were significant factors affecting childhood wasting. Compared to higher education, children of pre-primary or no educated (aOR: 1.63, p≤0.001), primary (aOR: 1.44, p≤0.001), and secondary educated (aOR: 1.28, p≤0.01) mothers were more like to be wasted. Children from the poorest (aOR: 1.35, p≤0.01) and poorer households (aOR: 1.39, p≤0.001) also had a higher wasted than the richest.

Maternal education, wealth index, ethnicity, and education of household head were the significant determinants of childhood underweight (Table 4). Pre-primary or no educated (aOR: 1.90, p≤0.001), primary (aOR: 1.58, p≤0.001), and secondary educated (aOR: 1.31, p≤0.001) mothers were more likely to have underweight children than the higher educated mothers. Similarly, compared to the richest household, the children of poorest (aOR: 2.05, p≤0.001), second (aOR: 1.91, p≤0.001), middle (aOR: 1.53, p≤0.001), and fourth wealth quintile family (aOR: 1.39, p≤0.001) also had higher underweight children. In contrast, non-Bengali children were less likely (aOR: 0.50, p≤0.01) to be underweight than Bengali children. However, residence and wealth index were the significant predictors of childhood overweight. Unlike undernutrition, children of rural areas were 37 percent (p≤0.001) less likely to be overweight than urban. Children of the richest households had higher overweight than others.

Table 4. The effects of social gradients on childhood nutritional problems (aOR)

Socio-economic characteristics	Nutritional problems			
	Stunted	Wasted	Underweight	Overweight
Place of residence				
Urban(R)				
Rural	0.78(.05)***			0.63(.09)***
Education of women				
Pre-primary or none	1.70(.14)***	1.63(.19)***	1.90(.17)***	
Primary	1.44(.11)***	1.44(.16)***	1.58(.12)***	
Secondary	1.15(.07)*	1.28(.12)**	1.31(.09)***	
Higher secondary+(R)				
Wealth index				
Poorest	2.35(.19)***	1.35(.14)**	2.05(.16)***	0.39(.07)***
Second	1.90(.15)***	1.39(.15)***	1.91(.15)***	0.319.06)***
Middle	1.52(.12)***	1.12(.11)	1.53(.12)***	0.42(.08)***
Fourth	1.31(.10)***	1.02(.10)	1.39(.10)***	0.49(.09)***
Richest(R)				
Ethnicity				
Bengali(R)				
Other			0.50(.11)**	
Education of household				
Pre-primary or none	1.24(.10)***		1.15(.09)	
Primary	1.27(.10)***		1.18(.09)*	
Secondary	1.15		1.08(.08)	
Higher secondary+(R)				
Constant	0.23(.03)***	0.08(.06)***	0.20(.02)***	0.01(.003)***
Random intercept	0.20 (.03)	0.23(.06)	0.12(.03)	
ICC: Empty model	0.08 (.01)	0.06 (.01)	0.06 (.01)	0.33 (.04)
ICC: Final model	0.06 (.01)	0.06 (.01)	0.04 (.01)	0.23 (.04)
PCV	31.3%	0.3%	41.6%	40.0%

R=Reference category; *=p≤0.05, **=p≤0.01, ***=p≤0.001. Standard error in the parenthesis. The adjusted odds ratio was produced using the multilevel logistic regression after controlling the child's age, division, sex of the child and household head, disability status of child and mother.

Discussion

Child health has always remained a significant public health issue in a developing country like Bangladesh (Mahumud et al., 2019). Poor health outcomes among children are strongly associated with lower socio-economic status (Mahumud et al., 2019). The present study investigated the effects of social gradients on childhood morbidity and nutritional status in Bangladesh. The study found that 6.9, 2.3, and 23.5 percent of children had experienced diarrhea, a symptom of ARI, and fever, respectively, in the last two weeks preceding the survey. It also explored that childhood stunting, wasting, underweight, and overweight prevalence were 28, 9.8, 22.6, and 2.4 percent, respectively.

Childhood morbidity

In this study, the lower socio-economic status of the household of the children was found to significantly determine childhood diarrhea in Bangladesh, which are supported by the findings of several earlier studies both in the context of Bangladesh and other developing countries (Dessalegn et al., 2011; BBS, 2015; Bitew et al., 2017; Mahumud et al., 2019). Furthermore, the present study also showed a negative association between the children's fever and the mother's educational attainment. Such association between maternal education and child health outcome is in line with the findings of other studies in Bangladesh and some other lower and middle-income countries (Fuchs et al., 2010; Pamuk et al., 2011; Kamal et al., 2015, Andriano & Monden, 2019), where it was shown that educated mothers tend to reduce the risk of disease of their children through their knowledge, awareness, and preventive measures (Kamal et al., 2015).

However, the study also showed that diarrhea and fever were lower among the under-five children in the richest wealth quintile. Several studies in Bangladesh and developing countries support these findings (Nattey et al., 2013; Kamal et al., 2015; Lartey et al., 2016). It could be associated with childcare practice-related knowledge and parental income, which increases the household's affordability towards ensuring better nutrition, a comfortable living environment for children, and quality access to health care services (Semba et al., 2007; Kamal et al., 2015). These opportunities may ultimately reduce children's risk of exposure to diseases.

Childhood nutritional status

In this current study, rural-urban disparities in the nutritional status of children were found, which is also in line with the findings of other studies (Van de Poel et al., 2007; Srinivasan et al., 2013). Furthermore, rural children faced stunting problems more than their urban counterparts at the bivariate level, supported by other studies in Bangladesh and the global context (Van de Poel et al., 2007; Srinivasan et al., 2013). In contrast, the findings of multivariate level showed that children living in urban areas were more stunted, which is in line with the

findings of other studies in the context of Bangladesh (Das & Gulshan, 2017; Saha et al., 2019). In addition, specific urban characteristics such as pollution, an abundance of adulterated food, and an overcrowding environment were found to impact child nutritional status and lead them to nutritional deficiencies in earlier studies (Fay et al., 2005). In this regard, the persistent socio-economic inequality created by the urban-rural disparity was found globally as a significant determinant of overall child health status (Van de Poel et al., 2007), where children were considered to be the lifelong sufferer in terms of health and well-being if they face socio-economic inequity at the very early stage of life (Cabieses et al., 2016).

The overweight problem is less prevalent in rural areas than the urban areas, which is also supported by the findings of previous studies conducted in lower-middle-income countries (Sandjaja et al., 2013; Horiuchi et al., 2019). On the other hand, less physical activity, high consumption of unhealthy foods, and higher preference for consuming foods provided by vendors are common among urban children (Nurwanti et al., 2019). The consumption of caffeinated beverages, soft drinks, sugar-sweetened beverages, which are more accessible in urban areas, was considered responsible for this disparity among urban and rural children (de Lanerolle-Dias et al., 2015; Nurwanti et al., 2019).

The present study also found that malnutrition among children was lower among those whose mothers were comparatively more educated. On the other hand, the mother with no or pre-primary education was more likely to struggle the most with children's malnourishment, such as stunting, wasting, and being underweight, which is supported by another study in the context of Bangladesh (Kabir et al., 2018). This association between maternal education and nutritional status of the children is supported by several other studies conducted in Bangladesh and also in the global context where it was found that educated mothers are well equipped with better knowledge regarding child care, food habits, hygiene practices, and have better access to mass media which increases their level of awareness about child health and nutrition condition (Urke et al., 2011; Rabbi & Karmaker, 2014; Das & Gulshan, 2017).

The study found that the richest households were in a better position regarding every nutritional indicator than the other four wealth quintiles (poorest, second, middle, fourth). This finding is also widely supported by the findings of other studies conducted both globally and in the Bangladesh context (Janevic et al., 2010; Khan & Raza, 2014), where they found that households with comparatively better social strata have greater affordability to get better nutritious food and a hygienic living environment for their children (Kamal et al., 2015).

Strengths and limitations

This study had some compelling strengths that aimed at discerning the social gradients in Bangladesh's childhood morbidity and nutritional status. First, we

analyzed a large nationwide sample (district level representative), which gave enough information and increased its acceptability to another similar setting. Second, we utilized multilevel logistic regression analyses adjusting for cluster variations. Despite such strengths, the study had some limitations, self-reported data is vulnerable to biasness (social desirability and recall). Moreover, the accuracy of reports of date of birth may deteriorate with time and may cause recall bias. Lastly, the use of data from cross-sectional research was less than ideal for determining causality.

Conclusions and implications

This study aimed at assessing the social gradients in childhood morbidity and malnutrition in Bangladesh. Mothers of children with higher educational attainment were found to be having children with better health status. On the other hand, childhood morbidity was higher among the people of the lower wealth quintile. Moreover, nutritional problems were also more prevalent among the children from the lower wealth quintile except overweight issues, which were more prevalent in the upper wealth quintile. These findings implicate the necessity of providing proper health education regarding child health and nutrition, especially to the lower wealth quintile and mothers who have pre-primary or no education through mass media and other appropriate channels. Findings regarding the higher overweight issues of children living in the urban areas implicate the necessity of ensuring the supply of nutritious foods to children, especially in household and early educational institutions where fast-food cultures are being widely practiced. Finally, the study reflects the importance of disease-wise segmented interventions for different regions based on the severity of the morbidity prevalence among the children.

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