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Geospatial, Socioeconomic, Demographic and Health Determinants of Childhood Mortality in Bangladesh

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Abstract: Every year about 13 million under-5 children die across developing countries and most of these deaths are attributed to a range of determinable factors. Over the last 15 years, althoughBangladesh has achieved commendable success in the national development, the prevalence of child mortality continues to be a major public health concerns. This study aims to investigate the impact of some Geospatial socioeconomic, demographic and health factors on mortality in Bangladeshi children aged less than 5 years. A sample of 7,886 children data from the 2014 Bangladesh Demographic and Health Survey was modelled using both the bivariate and multivariate methodologies. Findings demonstratedthat the risk of under-5 child mortality (U5CM) has been influenched by the ten selected factors in this study, among them thesocio-economic factors such as parents' education, occupation and household wealth index appeared to be the most crucial determinants. In the demographic factors, the birth status of child showed that multiple birth child had ran about 8.9 times higher risk of U5CM than single birth child. While the geospatial variable – division of residence revealed statistically significant differentials in U5CM, the health factor – vitamin A also showed that children who missed vitamin A during vaccinations were 2.9 times more likely to be died compared to their counterparts**.** All levels of policy makers including the local NGOs should focus on how to improve these identified socioeconomic, demographic and health characteristics and reduce apparent jurisdictional differentials for eliminating the overall child mortality in the country.

Keywords: Bangladesh, geospatial differentials, parents' education, risk factors, under-5 child mortality, wealth index.

Introduction

In developing countries like Bangladesh studying about under-5 child mortality (U5CM) has got significant attention to researchers due to the prevalence of high rate of U5CM across the globe (Mohammad and Bari, 2017). Child mortality rate is an acceptable and important health indicator of a country. The number of U5CM per 1000 live births is defined as the rate of child mortality which is also a vital indicator of the overall national development (McGuire, 2006). There have been enormous positive achievements in reducing child mortality across the world over the last few decades. In particular, the global number of U5CM had shown gradually decreased from 10.5 million in 1999 (Ahmad, Lopez and Inoue, 2000) to 7.6 million in 2010 (Liu et al., 2012). Despite these gains, the child mortality rate is still high in sub-Saharan Africa and South Asia (Black, Morris and Bryce, 2003). Since, almost 34% of overall under-5 deaths occur only in South Asia; consequently, child mortality is a great concern in this region. Bangladesh has witnessed a large decline in U5CM during the last decade (Mohammad and Bari, 2017). U5CM rate in Bangladesh was 133 per 1000 live birth in 1989-93 (Mitra et al., 1994), while in 2011-2014 it decreased to 38 per 1000 live birth (Mitra et al., 2016).

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Among South Asian countries, Bangladesh has the lowest child mortality rate and already acquired the Millennium Development Goal-4 with 65% decline rate between 1989 to 2014, and the reduction of U5CM has happened relatively more slowly in the recent years (United Nations [UN], 2018). However, until now a large portion of children in Bangladesh every year has been demised due to lack of appropriate conscious and initiatives. Consequently, appropriate actions are still required to enhance the situation so that the survival rate of the children gets increased to achieve the United Nations sustainable development goal three's target of end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births by 2030 (UN, 2018).

Child mortality can be influenced by many factors. As a result of overcrowding, poverty and poor access to adequate food and health services, infectious diseases and malnutrition are very common in Bangladesh (Rahman eat al., 2008) which might cause to child mortality. Poverty is being considered as one of the key variables associated with child mortality across the globe (WHO, 2002; Adedini et al., 2015). Poverty can be signified by the wealth index of household which has found as a significant factor of U5CM in several studies (Wang, 2003; Karmaker et al., 2014; Ezeh et al., 2015). Education is the pre-condition of progress and provides a source of knowledge, and more educated parents can make better use of health services, provide better childcare, have increased knowledge of appropriate child rearing, have more hygienic household practices and personal habits (Rahman and Chowdhury, 2007). There are a number of studies on the childhood mortality in Bangladesh and elsewhere and they found parents' education as the major risk factors of infant and child mortality (Uddin and Hossain, 2008; Mondal, Hossain and Ali, 2009; Gakidou et al., 2010; Akter et al., 2015).

Empirical evidence has demonstrated that there are geospatial differentials in poverty rates and other socioeconomic and health indicators of Bangladesh (Ahmed et al., 2010) and Ethiopia (Ayele, Zewotir and Mwambi, 2015). Also, several research have shown that occupation of father (Hailemariam and Tesfaye, 1997; Mondal et al., 2009; Abir et al., 2015), type of toilet facility (Mondal et al., 2009; Chowdhury, Islam and Hossain, 2010; Khan and Awan, 2017), birth order of child (Hossain, Mani and Islam, 2015; Khan and Awan, 2017), multiple birth (Kembo and Van Ginneken, 2009; Bereka, Habtewold and Nebi, 2017), vitamin A (Humphrey et al., 1996; Rahmathullah et al., 2003) are significant predictors of child mortality. A most recent study in Bangladesh reported that education and occupation of parents as well as birth order of child are responsible for neonatal and child mortality (Maniruzzaman et al., 2018). Studies in Bangladesh have acknowledged about the determinants of child mortality and advised that continuous assessment and special attention are required for dealing with the child mortality issues. This study – therefore – aims to investigate the impact of some Geospatial socioeconomic, demographic and health factors on mortality in Bangladeshi children aged 0-59 months.

The organization of this paper is as follows. The next section provides information about the research methodologies. Then overall analyses are presented and described in the results section. A detailed discussion about the significant findings is provided in the discussion section. The conclusions section highlights some final remarks with policy implications.

Materials and Methods

Data and variables

This research is based on a cross-sectional data from the 2014 Bangladesh Demographic and Health Survey (Mitra et al., 2016). A total sample of 7,886 under-5 years old children information was used to determine the significant risk factors of under-5 child mortality. The analysis was fixed to only the live births till 5 years of age. The study considered ten selected characteristics from Geospatial socioeconomic, demographic and health domains as risk factors.

The outcome variable of this study is the under-5 child mortality (U5CM) i.e. the risk of a child dying between its birth and 59 months of age (Adedini et al., 2015). The children's survival status and the age at death in months (if the child had died) or the last month they were known to be alive (if the child was still living at the time of the survey) were combined to generate the outcome variable for the mortality analysis. Additionally, the exposure variables considered in this study are from the four domains which are:(i) geospatial (i.e. division of residence), (ii) socioeconomic (i.e. mother's and father's education and occupation and wealth index of household, (iii) demographic (i.e. birth order and birth status of child) and (iv) health (i.e. vitamin A and types of toilet facility) characteristics of the study children.

Statistical analysis

Descriptive statistics were applied to find out the frequency, percentage of the child mortality based on the selected characteristics. At the bivariate analysis, the Pearson's chi-square test of independence was implemented to examine the relationship between the outcome variable and the exposure variables. Only the important variables which showed statistically significant results at the bivariate level have been considered for this research and used in the multivariate analysis. Given that the outcome variable has two level (i.e. dead and alive), the binary logistic regression analysis was used to determine the significant risk factors of U5CM at the *p*-value less than 0.05. Odds ratio measures of the selected variables to U5CM from the best fitting model were used to determine the impact of covariates. The statistical software *SPSS version 23.00* was employed to analyze the data.

Results

A total of 7886 children aged 0-59 months were considered for this study. Table 1presents the distribution of the study children according to their background characteristics and the prevalence of U5CM. Results reveal that about 19.2% children resided in Chittagong division followed by 17.5% in Dhaka division, whereas only 10.9% children lived in Khulna division. A total of 4447 (i.e. 56.4%) mothers accomplished secondary or higher level of education among them 3621 (45.9%) mothers had secondary education. A considerable proportion (i.e. 15.6%) of mothers had no formal education. Even in this 21stcentury era, more than a quarter (25.5%) of fathers in Bangladesh did not have any formal education, but about 14.5% had a higher than secondary level of education. Nearly three-fourths of the study children's mothers have been involved in performing only household works. About 24.6% children's fathers have been involved working in the agricultural sector. Almost 41.1% households are classified as poor and about 39.7% were classified as rich. In addition, more than half (53.7%) of the children did not take vitamin A capsules vaccination in two months after their birth. Most of the households

(77.6%) have a pit latrine facility while a small percentage of households (i.e. 2.5%) did not have any toilet facility. About 39.2% children were the first birth and 45.4% were the second or third births, and a very large proportion of the study children (i.e. 98.5%) was in single birth category. According to the sample, nearly 4.0% of the respondents reported that their child had deceased within 0 to 59 months of its age.

Table 1: Geospatial socioeconomic, demographic and health characteristics of studied children aged 0-59 months and their distribution by the under-5 child mortality (U5CM) status in Bangladesh, 2014 (n = 7886)

Characteristic and categories	No. of children[a] (%)	U5CM status *n* (%)		*p*-value[b]
		Dead	Alive	
Geospatial				
Residential division				0.007
Chittagong	1517 (19.2)	64 (4.2)	1453 (95.8)	
Dhaka	1378 (17.5)	43 (3.1)	1335 (96.9)	
Khulna	862 (10.9)	40 (4.6)	822 (95.4)	
Rajshahi	959 (12.2)	36 (3.8)	923 (96.2)	
Rangpur	958 (12.1)	38 (4.0)	920 (96.0)	
Sylhet	1306 (16.6)	74 (5.7)	1232 (94.3)	
Barisal	906 (11.5)	24 (2.6)	882 (97.4)	
Socioeconomic				
Mother's education				0.001
No education	1233 (15.6)	64(5.2)	1169(94.8)	
Primary	2206 (28.0)	99(4.5)	2107(95.5)	
Secondary	3621 (45.9)	141(3.9)	3480(96.1)	
Higher	826 (10.5)	15(1.8)	811(98.2)	
Father's education				<0.001
No education	2008 (25.5)	104(5.3)	1902(94.7)	
Primary	2377 (30.1)	101(4.2)	2276(95.8)	
Secondary	2360 (29.9)	90 (3.8)	2270(96.2)	
Higher	1141 (14.5)	22 (1.9)	1117(98.1)	
Mother's occupation				0.043
Household	5909 (74.9)	225(3.8)	5666(96.2)	
Agricultural sector	951 (12.1)	48(5.0)	903(95.0)	
Service sector	161 (2.0)	12 (7.5)	149 (92.5)	
Professional sector	883 (11.2)	34 (3.9)	849 (96.1)	
Father's occupation				0.005
Unemployed	224 (2.8)	15(6.7)	209(93.3)	
Agricultural sector	1938 (24.6)	93 (4.8)	1860(95.2)	
Non-agri. sector	3453 (43.6)	142 (4.1)	3311(95.9)	
Business/Prof. sector	2271 (28.8)	69(3.0)	2202 (97.0)	
Household wealth index				0.001
Poor	3240 (41.1)	162(5.0)	3078(95.0)	
Middle	1516 (19.2)	56(3.7)	1460(96.3)	
Rich	3130 (39.7)	101(3.2)	3029(96.9)	
Demographic				
Birth order				0.050
1	3094 (39.2)	134(4.3)	2960(95.7)	
2– 3	3578 (45.4)	125(3.5)	3453(96.5)	
4+	1214 (15.4)	60(4.9)	1154(95.1)	
Birth status				<0.001
Multiple birth	118 (1.5)	31 (26.3)	87 (73.7)	
Single birth	7768 (98.5)	288 (3.7)	7480 (96.3)	
Health				

Vitamin A				<0.001
No	2410 (53.7)	95 (3.9)	2315 (96.1)	
Yes	2080 (46.3)	29 (1.4)	2051 (98.6)	
Type of toilet facilities				<0.001
No facilities	194 (2.5)	9 (4.6)	185 (95.4)	
Hanging toilet	267 (3.4)	25 (9.4)	242 (90.6)	
Pit toilet	6123 (77.6)	240 (3.9)	5883 (96.1)	
Flush toilet	1303 (16.5)	45 (3.5)	1257 (96.5)	
Overall	***7886 (100)***	***315 (4.0)***	***7571 (96.0)***	

[a]Total number of children may differ due to missing data.
[b]*p*-value is obtained using the Pearson's Chi-square test.

The percentage distribution of U5CM according to the selected characteristics is also presented in Table 1. Results demonstrate that the overall prevalence of U5CM in Bangladesh was estimated as 4.0% in 2014. The geospatial variable – division of residence had a significant association with U5CM. Sylhet division showed the highest (5.7%) rate of U5CM while Barisal division showed the lowest (2.6%) rate. In the socioeconomic variables, mothers with no formal education caused a significantly highU5CM rate of 5.2% while the corresponding rate had declined with increasing levels of mother's education. Father's education showed almost similar results of maternal education. For instance, about 5.3% children were deceased for the fathers who had no formal education, whereas only 19% children were dead for the fathers who had more than a secondary level education. The U5CM rate was the highest (7.5%) among those children whose mothers were involved in service sectors and the lowest (3.8%) among mothers involved in household works. Father's occupation was significantly associated with U5CM with a $p<0.001$. The rate of U5CM was the highest (6.7%) among unemployed fathers and the lowest (3.0%) among the fathers who were engaged in business or professional sectors. The prevalence of U5CM in poor family was significantly higher (5.0%) compared to rich family (3.2%).

In the demographic characteristics, the percentage of U5CM rate was highest (4.9%) among the child whose birth order was forth and above. The mortality rate among multiple birth child was remarkably much higher (26.3%) than the single birth child (3.7%). Additionally, in the health attributes, U5CM rate was significantly higher among the children who did not receive vitamin A capsules compared to those who had received (3.9% vs. 1.9%). Households with hanging latrine, U5CM rate were highest (9.4%), followed by the households without any toilet facility (4.6%) and then the households had pit latrine (3.9%) and flush latrine (3.5%).

The results of the multivariate logistic regressionanalysis are presented in Table 2. The goodness of fit results of the model i.e. -2 Log likelihoodestimate of 2485 and Chi-square value of 186 on 27 degrees of freedom have demonstrated that the logistic regression model was fitted very well. Findings reveal that U5CM rate was high and significantly associated with geospatial differential factor – residential divisions. Children resided in Sylhet, Khulna and Chittagong divisions had respectively run a 2.2 times, 1.8 times and 1.6 times higher risk of U5CM compared to children resided in Barisal division. Hence, the study seems to show that mortality in under-5 children is one of the best indicators of geospatial inequality. Additionally, in the present study, all of the selected socioeconomic characteristics were significantly associated with U5CM. In particular, poor household wealth index and parental education were found to be generative for U5CM. Children have been living with unemployed, agricultural and non-agricultural sectors working fathers were respectively about 2.3 times, 1.6 times and 1.4 times

more likely to be deceased during the first 59 months of their life than children have been living with business or professional sectors working fathers. Also the service sectors working mothers' children had ran a 2.0 times higher risk of U5CM compare to the professional sectors working mothers' children.

Table 2: Results from binary logistic regression analysis of four groups of selected – Geospatial, socioeconomic, demographic and health characteristics on under-5 child mortality in Bangladesh, 2014 (n = 7886)[a]

Characteristic[s]	Under-5 child mortality		*p*-value
	Coefficient (*B*)	OR [CI]	
Geospatial			
Residential division			
Chittagong	0.482[c]	1.62 [1.00-2.60]	0.048
Dhaka	0.169	1.18 [0.71-1.96]	0.514
Khulna	0.581[c]	1.78 [1.06-2.99]	0.027
Rajshahi	0.360	1.43[0.84-2.42]	0.179
Rangpur	0.417	1.51 [0.90-2.55]	0.115
Sylhet	0.792[d]	2.20 [1.38-3.52]	0.001
Barisal[b]	-	-	-
Socioeconomic			
Mother's Education			
No education	1.085[d]	2.96 [1.67-5.23]	<0.001
Primary	0.932[d]	2.54 [1.46-4.39]	0.001
Secondary	0.784[d]	2.19 [1.27-3.75]	0.004
Higher[b]	-	-	-
Father's Education			
No education	1.040[d]	2.83 [1.22-3.67]	<0.001
Primary	0.812[d]	2.25 [1.04-3.03]	0.002
Secondary	0.700[d]	2.01 [1.00-2.79]	0.006
Higher[b]	-	-	-
Mother's occupation			
Household	-0.008	0.99 [0.68-1.43]	0.964
Agricultural sector	0.283	1.32 [0.84-2.08]	0.217
Services sector	0.699[c]	2.01 [1.01-3.97]	0.044
Professional sector[b]	-	-	-
Fathers occupation			
Unemployed	0.829[d]	2.29 [1.28-4.07]	0.005
agricultural sector	0.475[d]	1.61 [1.17-2.21]	0.003
Non-agri. sector	0.314[c]	1.36 [1.02-1.83]	0.036
Business/Prof. sector[b]	-	-	-
Household wealth index			
Poor	0.456[d]	1.58 [1.22-2.03]	<0.001
Middle	0.140	1.15 [0.82-1.60]	0.409
Rich[b]	-	-	-
Demographic			
Birth order			
1	-0.138	0.87 [0.64-1.18]	0.384
2– 3	-0.362[c]	0.69 [0.51-0.95]	0.024
4+[b]	-	-	-

Birth status			
Multiple birth	2.225[d]	9.25 [6.04-14.17]	<0.001
Single birth[b]	-	-	-
Health			
Vitamin A			
No	1.065[d]	2.90 [1.91-4.41]	<0.001
Yes[b]	-	-	-
Type of toilet facilities			
No facilities	0.307[c]	1.35 [0.65-2.82]	0.042
Hanging toilet	1.060[d]	2.88 [1.36-4.07]	<0.001
Pit toilet	0.131	1.14 [.75-1.46]	0.430
Flush toilet[b]	-	-	-
Model Fitting Information:			
– 2 Log likelihood			2484.81
Chi-square value (df)			186.43 (27)[e]

[a]Reference category of dependent variable is alive children.
[b]Reference category of independent variable in the logistic regression analysis.
[c]*p*-value < 0.05; [d]*p*-value < 0.01; [e]*p*-value < 0.000.

Demographic characteristics have a large impact on U5CM. The results demonstrate that U5CM increased with a multiple birth and decreased with a birth order of 2 – 3. More specifically, children who had a birth order between 2 and 3 were 31% less likely to be dead compared with children who had a birth order 4 or more. The children of multiple birth ran a 9.3 times higher risk of dying than their single birth counterparts. Furthermore, significant effects of selected health factors on U5CM were observed in this analysis. Children who did not receive vitamin A capsules during the vaccinations programme ran a 2.9 times higher risk of dying; whilst children in households having no toilet and hanging toilet facilities were 1.4 times and 2.9 times more likely to be deceased than children in households having flush toilet.

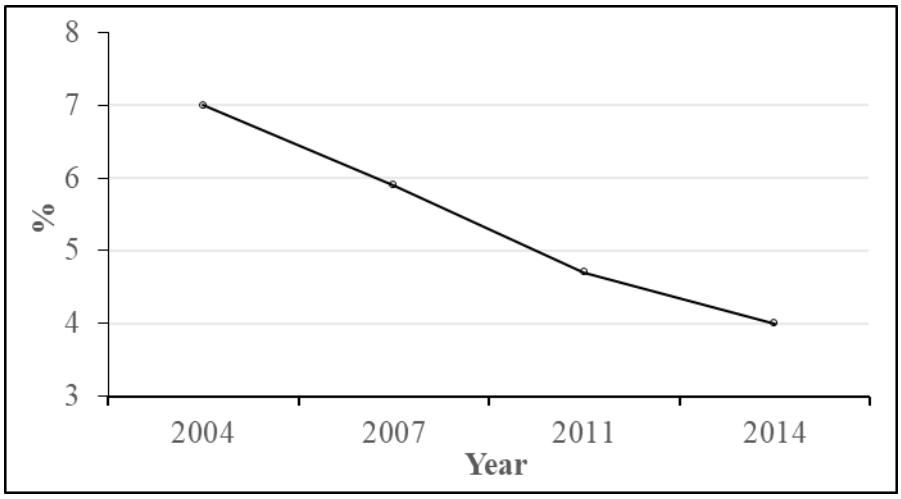
Discussion

This study analyzed the recent BDHS data to examine the impact of some selected Geospatial socioeconomic, demographic and health factors on U5CM in Bangladesh. It could be reported that between the 2004 and 2014 BDHS surveys, the total prevalence of U5CM in Bangladesh decreased by 3.0% – from 7.0% to 4.0% – in children under the age of five (see, Fig. 1). Although the level of U5CM declined moderately by about 2.3%between 2004 and 2011 BDHSs, it decreased slowly by only 0.7% thereafter. Thus the prevalence of U5CM in Bangladesh shows a continuing declining trend, yet the fall in prevalence has not been as rapid as the rise in the population.

Findings reveal that all factors selected in the study had significant effects on U5CM. The risk of U5CM was significantly higher in Sylhet, Chittagong and Khulna divisions compared with the Barisal region. Several studies illustrated that the mortality of children aged up to five years was higher in Sylhet division (Khan and Awan, 2017; Maniruzzaman et al., 2018), and there are regional gaps exist in socioeconomic situations including the poverty rates and to access basic medical facilities which might influence the observed regional differences in the childhood deaths (Abir et al., 2015).TheSylhet, Chittagong and Khulna divisions are also frequently affected by natural disasters such as cyclones, floods, or rainstorms, whereas the other

divisions are at lower risk of natural disasters. It could be reported that relatively a lower percentage of those three division's children who suffered from communicable diseases such as fever, respiratory infection, or diarrhea were taken to a health facility for treatment as compared with the Barisal division children (Bellagio Child Survival Study Group, 2003; Rahman, Chowdhury & Hossain, 2009; Rahman, 2016). Therefore, prevalence of U5CM may vary considerably by geospatial based seasonal illness and with natural disasters because the health facilities may not be accessible during these times.

Figure 1: Trends in prevalence of U5CM in Bangladesh, 2004 – 2014



Education is the pre-condition of socioeconomic progress and provides a source of essential knowledge. More educated parents can make better use of health services, provide better childcare, have increased knowledge of appropriate child rearing, have more hygienic household practices and personal habits and also have higher status in the community (Rahman & Chowdhury, 2007). In the present research, children of uneducated, primary or secondary educated mothers and/or fathers had a higher risk of dying. Lower parental education has also been highlighted as a risk factor for the survival of young children (Maniruzzaman et al., 2018). A few studies had highlighted that U5CM is strongly associated with father's education (Breierova and Duflo, 2004; Mondal et al., 2009; Akter et al., 2015). In Bangladesh, father's education should be more closely related to household income than mother's education. For example, the father's education is a pre-requisite for sufficient access to food in a household and contributes a higher proportion of wealth to children's welfare, and better economic conditions increase the living standards of families, allowing them to take essential care of the children, and provide support to the mother for baby care-giving. All of this depends on the father's education because the main household earner in the country is predominantly male (Rahman et al., 2008; Rahman, 2016).

This study's findings show that children whose mothers were worked at service sectors had a higher risk of U5CM. Typically as the primary carer for children, service sectors mothers can't provide adequate time and caring to their children due to many challenges around their jobs. For an example, mothers in the service sectors need to spend a very longer travel time to and from the workplace. The transportations system in Bangladesh is not well designed and safe

for the female. There is very frequent traffic congestion including heavy concentration of vehicles, absence of adequate public transport, inadequate road infrastructure, faulty signaling equipment and poor enforcement of traffic rules. Also there is no professional childcare centers in the country from where service sectors mothers can get caring supports for their children. Thus careful introduction of adequate social infrastructures (e.g. opportunity of working from home) and policies (e.g. maternal leave option) to support service sectors mothers are vital. Additionally, children of jobless and agricultural sectors fathers had a significantly high risk of childhood death, while business or professional sectors fathers'children had a better likelihood of survival. As previously stated father is the main earner of the family and business or professional sectors fathers have generally a higher income. Children in the lower wealth index, and who did not receive vitamin A capsules during vaccinations had a significantly higher risk of dying. These findings are with the results of other research (Rahmathullah et al., 2003; Chowdhury et al., 2010; Ezeh et al., 2015). Vaccination against diseases such as measles and vitamin A is very important to child's health and survival, and this may depend on household economic conditions as well as awareness. Education certainly improves the wealth in the family and parents' awareness.

Bangladeshi children delivered as multiple birth had about a 9.3 times higher risk of dying than children delivered as a single birth. This finding is consistent with the findings of a study in Zimbabwe and eastern Ethiopia (Kembo and Van Ginneken, 2009; Bereka, Habtewold and Nebi, 2017). Certainly multiple birth children could have a low birth weight which may have influential effects on child mortality. It is also true that most of the mothers in Bangladesh have not sought medical services up to or before the delivery. So they missed the opportunity to gather different knowledge of complications, child nutrition, feeding practices and childcare, which may have negative effects on the child's health and survival.

Moreover, children of second or third order births have a lower risk of childhood mortality than those of higher order births. The primary providers of care for young children in all cultures are predominantly mothers, and therefore care of the child is inextricably linked to the situation of the household and the mother, and all first order births in Bangladesh somehow face inexperienced adolescent mothers due to early marriage. Most of these mothers have a limited awareness of proper childcare and adequate treatment practices. The situation of mothers get better for the two subsequent births though. On the other hands, higher than a third order births are mainly occurred due to no or inappropriate use of contraceptives and frequent child births with minimum births spacing. This condition is even worse for higher order births children and their mothers in terms of better childrearing opportunity and household socioeconomic resources sharing between many under-5 children. Higher order births children may not get adequate attention from parents, proper medical treatments during illness and healthy nutritional supplements, especially who live in a poor household. Also children living in a household with no or Hanging toilet facilities have a significantly higher risk of U5CM than children in households with hygienic flush toilet, and this confirms the findings of other studies (Hailemariam and Tesfaye, 1997; Mondal et al., 2009; Chowdhury et al., 2010; Khan and Awan, 2017).

Conclusions

The study concludes that mortality among under-5 children is one of the major public health problems in Bangladesh. Children residing in a relatively disadvantage spatial jurisdictions such as Chittagong, Khulna and Sylhet divisions and living with households having lower level of mother's and/or father's education, poor infrastructure and policy for mothers worked in service sectors, poor wealth index and unemployment or only farming opportunity of fathers, poor demographic conditions (i.e. higher than 3rd birth order and multiple birth) and also poor immunization and health practices are the most important determents associated with the higher prevalence of U5CM. It is recommended that policymakers should give attention to improving those factors. Therefore, interventions should focus on educating mothers as well as fathers, improve their other socioeconomic conditions including more job opportunities for parents, supporting workplace conditions for working mothers and better economic resources, etc. and to improve parents child care knowledge including adequate healthy feeding, immunization practices, and health facility access for treatment during illness as well as to enhance mothers' health conditions and the birth size of for multiple births children. Further research should explore the diverse impact of maternal health and demographic conditions and protein-energy malnutrition on childhood morbidity and mortality to address the urgency for child-survival programs in the population.

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