A Household Study on Nutritional Status among Mothers and Their School Going Children in Upazila Godagari, Rajshahi District, Bangladesh: A Statistical Analysis

MD. REAZULKARIM, ABU SAYED MD. AL MAMUN†, MD. RIPTERHOSSAIN, MD. NURUL ISLAM, MD. MASUDRANA, MD. ABDUL WADOOD & MD. GOLAMHOSSAIN

Department of Statistics, University of Rajshahi, Rajshahi 6205, Bangladesh
E-mail: mithun_stat@yahoo.com

KEYWORDS: Nutritional status. Mother-child pairs. Upazila Godagari, Rajshahi district. Bangladesh.

ABSTRACT: Malnutrition creates a major public health problem and it increases the morbidity and mortality rate in adult as well as children. The objective of this study was to investigate nutritional status of mother-child pairs in Rajshahi district, Bangladesh. Data was collected from 420 school going children and their mothers using multistage random sampling. It was observed that 65.4% mother-child pairs were of normal weight. Chi-square test demonstrated that there was a significant association between children and their mothers' nutritional status. It was also found that gender of children, children's age, mothers' age, fathers' occupation, children playing outside were the significantly associated with mother-child pairs nutritional status. However, logistic regression model demonstrated that mothers' age was an important predictor of malnutrition among mother-child pairs. These findings can help the health authorities of Bangladesh Government to up-to-date their strategies for improving the household level nutritional status among two vulnerable groups – mothers and their children.

INTRODUCTION

Nutrition is a critical part of health and development. Good nutrition plays a vital role for survival, physical growth, mental development, performance, productivity, health and well-being across the entire life-span. On the other hand, poor nutrition impacts on economic outcomes, education and health; specially, children and pregnant women and mothers suffer from long-term health problems and poor cognitive development due to lack of good nutrition. Malnutrition among children and mothers adversely affect the growth of development in both national and international economic arena as well as health and sustainable developments (NIPORT, 2014). In Bangladesh, more than half of population suffers from malnutrition, 450,000 children suffer from severe acute malnutrition effects, about two million children have moderately acute malnutrition, a quarter of women are underweight and around 15% have short stature, which increases the risk of difficult childbirth and low-birth-weight infants and half of all women suffer from anemia, mostly nutritional in origin (Tahmeed, 2012). These factors affect the nutrition status of mothers and their children pair in Bangladesh.

Malnourished mothers give birth to underweight babies, who grow up more likely to have underweight babies themselves. Overweight and underweight have long been recognized as two different public health

† Corresponding author

problems, as underlying factors have been assumed separately. The paradoxical co-existence of child under-nutrition and maternal overweight in the same household, often described as the 'dual burden of malnutrition', is a relatively new phenomenon that has been described in studies from low- and middle-income countries including Benin, Brazil, China, Haiti, Guatemala, South Africa, Malaysia and Mexico and recently Bangladesh as well (Angeles-Agdeppa and Lana, 2003; Deleuze *et al*., 2005; Raphael *et al*., 2005; Barquera *et al*., 2007). Many Asian and African countries have households with nearly 10% of underweight child or stunted child and overweight or obese mother pair; this figure is higher in many Latin American countries (Garrett and Ruel, 2003).

A recent study reported that low levels of maternal education, working in agriculture, living in urban areas, increased siblings in the household and relative poverty were associated with increased risk of dual burden households (Jehn and Brewis, 2009). So, it is necessary to examine the prevalence of co-existence of malnutrition of mother-child pairs and its associated factors in Bangladeshi population. Therefore, the objectives of this study were to determine the prevalence and associated factors of malnutrition among mother-child pairs in the same households in Rajshahi district, Bangladesh.

Research Hypothesis

1. The prevalence of normal weight mother-child pairs is higher than malnourished mother-child pairs.
2. Socio-economic and demographic factors are significantly associated with malnourished mother-child pairs.

MATERIALS & METHODS

This was a cross sectional study. A total number of 420 mother-child pairs were considered as sample in this study to investigate their nutritional status during the period of September 15 to December 20, 2019. Data were collected from Rajshahi district, Bangladesh. In the present study, data were collected from mothers who had at least one school going child (Nursery–Grade VII) in Rajshahi district, Bangladesh. An appropriate mathematical formula was used for determining sample size for this study. The formula provided that 400 would be the adequate sample size for the present study. However, 420 mother-child pairs (5% extra) were considered for the present study.

Sampling Procedures

Multistage random sampling was utilized for this study. In the first stage, one Upazila (Godagari) was selected randomly from nine Upazilas in Rajshahi district; in the second stage, nine villages were selected from the selected Upazila randomly. In the third and final stage, 50 pairs of mothers and their school going children (Nursery–Grade VII) were selected from each selected village. All necessary information was collected from union parishad/ward commissioner office. A total number of 450 mothers and their children were selected, but 30 mothers were not interested to provide their information. Finally, 420 mothers and their children pairs were considered as sample for the present study. Before collecting data, we discussed our research objectives and procedures with the selected mothers and their husbands/ guardians, and took written consent from each of them. All rules and regulations of the ethnic committee, Institute of Biological Sciences, University of Rajshahi, Bangladesh were followed.

Independent Variables

Some selected socio-economic, demographic and anthropometric factors were considered as independent variables in this study. These were: Gender of children (Boy 0; Girl 1), Age of children (6-8 years 0; 9-11 years 1; 12-13 years 2), Age of mother (< 30 years 0; 31- 35 years 1; 36- 40 years 2; > 40 years 3), Age of father (< 30 years 0; 31- 35 years 1; > 36 years 2), Father's occupation (Labour (Agriculture) 0; Labour (Non-Agriculture) 1; Farmer 2; Business 3; Service 4; Others 5), Mother's occupation (Labour (Agriculture) 0; Service 1; Housewife 2), Father's education (Uneducated 0; Primary 1; Secondary 2; Higher education 3), Mother's education (Uneducated 0; Primary 1; Secondary 2; Higher education 3), Having electricity (Yes 0; No 1), Having drinking water (Yes 0; No 1), Having toilet facility (Yes 0; No 1), Duration of playing (<1 hours 0; 1 to < 3 hours 1; 3 to 4 hours 2; > 4 hours 4); Duration of watching TV (<1 hours 0; 1 to <3 hours 1; 3 to 4 hours 2; >4 hours 3), Father's BMI (Underweight 0; Normal weight 1;

Overweight 2), Mother's BMI (Underweight 0; Normal weight 1; Overweight 2) and Children's BMI (Underweight 0; Normal weight 1; Overweight 2).

Outcome Variable

The outcome variable of this study was nutritional status of mothers and their school going children (Nursery–Grade VII) in Rajshahi district, Bangladesh. The nutritional status of mothers was measured by body mass index (BMI), and classified into three classes according to BMI cut-off points. The cut-off points are as follows:

(i) Under nutrition (BMI<18.5 kg/m^2),

(ii) Normal (18.5≤BMI<25 kg/m^2) and

(iii) Overnutrition (BMI≥25kg/m^2).

The nutritional status of children was measured by BMI percentile (BMIP), and it was classified into three classes on the basis of BMI percentile and the cut-off points given below:

(i) Under nutrition (BMIP≤5th percentile),

(ii) Normal (5th<BMIP≤85th percentile) and

(iii) Over nutrition (BMIP>85th percentile).

Finally, we estimated the household level nutritional status among mothers and their children pairs. The mother-child pairs' nutritional status was classified into nine classes; (i) both under nourished, (ii) both normal weight (healthy), (iii) both over nourished, (iv) undernourished mother and over nourished child, (v) undernourished child and over nourished mother, (vi) normal mother and undernourished child, (vii) normal child and undernourished mother, (viii) normal mother and over nourished child, (ix) normal child and over nourished mother. Since a remarkable number of mother-child pairs were suffering from chronic energy deficiency (under nutrition) in Bangladesh, for further statistical analysis, we again classified them into two groups; both normal weight (healthy pairs) (coded 0) and any of them is malnourished (unhealthy pairs) (coded 1) for finding the risk factors of malnourished mother-child pairs in the rural area of Rajshahi district, Bangladesh.

Statistical Analysis

Descriptive statistics was carried out to find the prevalence of malnutrition among mothers and their school going children separately in Rajshahi district, Bangladesh. Chi-square/Fisher's exact test was usedto find the association between malnutrition (unhealthy pairs) of mother-child pairs and their socio-economic, demographic and anthropometric factors and binary multiple logistic regression was applied to investigate the effect of socio-economic, demographic and anthropometric factors on nutritional status of mother-child pairs. A statistical package, SPSS was used to carry out the entire analysis. A value of $p<0.05$was considered as statistically significant in the analysis.

RESULTS & DISCUSSION

In this cross-sectional study, a total number of 420mother-child pairs were considered to investigate their nutritional status and identify different socio-economic-demographic factors associated with nutritional status. Table 1 provides the frequency distribution of socio-economic, demographic and anthropometric factors of school going children. It was observed that the percentage of school going girls (52.6) was greater than the boys (47.4). Our results were supported by the World Bank report in 2020. They found that the ratio of female to male primary enrollment in Bangladesh was 1.0747 % in 2018, while the ratio of female to male secondary enrollment was 1.16% in 2018. The highest (37.4%) age group of children was observed in 12-13 years, followed by 6-8 years and 9-11 years. Similarly, highest (44.5%) age group of mothers was observed in 31-35 years followed by >36 and < 30 years. It was also observed that 51.4% of the father's age group was between 31-40 years, 7.9% of the father's age group was < 30 years and 33.8% of the father's age group was between 41-50 years and 6.9% father's age group was > 50 years. Table 1 also presented thatthe maximum numbers of mothers were house wives followed by labors (13.8%), and service holders (1.9%). Several studies also reported that about 80% of rural women were housewives in Bangladesh (Hossain *et al*., 2011; Rahman *et al*., 2018). Most of the children's fathers were labors (Agriculture and non-agriculture) followed by farmers (10.7%), businessmen (10.5%) and service holders (6.7%). About 75% of rural men were labors in Bangladesh as was found in a nationally representative data (NIPORT, 2014).

The frequency and percentage distribution of

school going children's parent's education level were shown in Table 1. It was found that the maximum numbers of fathers completed primary education (45.7%) followed by secondary education (27.1%), uneducated (15.2%) and higher secondary (11.9%), while most of mothers had secondary level of education (52.1%) followed by primary (36.0%), higher secondary (6.2%), and uneducated (5.7%).It was found that 21.2% of households did not have electricity. As of 2015, 8% of the urban population and 13% of the rural population did not have access to electricity. An average of 22.1% of the population did not have access to electricity in Bangladesh. Bangladesh will need an estimated 34,000 MW of power by 2030 to sustain its economic growth of over 7 percent (PDB, 2018).

In this study, it was found that 7.1% households did not have safe water system. In 2019, BBS and UNICEF reported that only 2.5% of people did not use safe drinking water. Our result was in line with BBS and UNICEF report. It was observed that 42.4% of households did not have hygienic toilet in the rural area of Rajshahi district. It was also observed that the highest number of students (45.0%) played 1 to <2 hours, 39.8% played < 1 one hours, 12.4% of students played 2 to 3 hours and only 2.9% of students played more than 3 hours per day and similarly, highest number of students (45.0%) watched TV1 to <3 hours, 28.6% watched TV3 to 4 hours, 19.3% of students watched TV more than 4 hours and 7.1% students watched TV less than 1 hours per day.

Table 1 also presented the frequency of children's and their parent's nutritional status and it was observed that 62.9% of mothers were of normal weight, 10.5% underweight and 26.7% overweight. Bangladesh Demographic and Health Survey reported that 31% of ever-married women aged 15-49 years were undernourished (NIPORT, 2014). However, women's nutritional status has improved considerably in last 10 years. The percentage of undernourished women has declined from 34% to 19% between 2004 and 2014. On the other hand, overweight or obesity among ever-married women has been increasing over the past decade (from 9% in 2004 to 24% in 2014). Using a lower cut-off point, with BMI e" 23kg/m^2 as a measure of overweight or obesity in women, the proportion has increased from 17% in 2004 to 39% in 2014. These changes have been possible due to increasing the household wealth quintile in Bangladesh during last two decades (NIPORT, 2014).

However, the percentage of normal weight fathers was more (66.7%) than normal weight mothers, while the percentage of underweight fathers and mothers were almost the same but the number of overweight mothers was greater than that of the overweight fathers. In the case of children nutritional status, most of the (81.2%) children were normal weight while 4.5% were underweight and 14.3% were overweight.

TABLE 1

Frequency distribution of socio-economic, demographic and anthropometric factors of school going children

Variables	Groups	N (%)	Variables	Groups	N (%)
Gender of children	Boy	199 (47.4)	*Age of children*	6-8 years	142 (33.8)
	Girl	221 (52.6)		9-11 years	121 (28.8)
Age of mother	< 30 years	90 (21.4)		12-13 years	157 (37.4)
	31- 35 years	187 (44.5)	*Age of father*	< 30 years	33 (7.9)
	>36 years	143 (34.1)		31- 40 years	216 (51.4)
				41- 50 years	142 (33.8)
Father's occupation	Labour (Agriculture)	182 (43.3)		> 50 years	29 (6.9)
	Labour (Non-Agriculture)	102 (24.3)	*Mother's occupation*	Labour (Agriculture)	58 (13.8)
	Farmer	45 (10.7)		Service	8 (1.9)
	Business	44(10.5)		Housewife	354 (84.3)
	Service	28 (6.7)	*Father's education*	Uneducated	64 (15.2)
	Others	19 (4.5)		Primary	192 (45.7)
Mother's education	Uneducated	24 (5.7)		Secondary	114 (27.1)
	Primary	151 (36.0)		Higher education	50 (11.9)
	Secondary	219 (51.1)	*Having electricity*	Yes	89 (21.2)

Values in parenthesis indicate percentages

From Table 2, it was observed that more than half of mother-child pairs (65.4%) were normal weight, 57.19% of children were under weight and their mothers were normal weight, and 50% of mothers were normal weight but their children were overweight. The frequencies of the categories of other pairs were very less. For further statistical analysis, the mother-child pairs were classified into two classes: (i) mother-child pair's normal weight and (ii) mother-child pair's not normal weight.

TABLE 2

Association between mother and child nutritional status

		Mother's nutritional status				
Mother-child Nutritional Status		Underweight	Normal Weight	Overweight	χ^2- value	P-value
Children's nutritional status	Underweight	5 (26.3)	11(57.19)	3 (15.8)	17.5	0.002
	Normal Weight	36 (10.6)	223 (65.4)	82 (24.0)		
	Overweight	3 (5.0)	30 (50.0)	27 (45.0)		

Values in parenthesis indicate percentages

Table 3 shows the association between mother-child pairs' nutritional status and socio-economic, demographic and anthropometric factors. Chi-square test demonstrated that significant association was observed in mother-child pairs' nutritional status due to gender. It was found that the number of normal weight mother-child pairs decreased with increase of children's age. The significant association was found in mother-child pairs' nutritional status due to age group of children. It was noted that the normal weight of mother-child pairs was decreasing with increasing mothers' age. The significant association was found in mother-child pairs' nutritional status due to age group of mothers. However, there was no significant association between mother-child pairs' nutritional status and father's age group. The significant association in mother-child pairs' nutritional status was observed due to father's occupation. The association between father's education level and mother-child pair's nutritional status was not significant.

Similar results were observed in mother's education level and occupation. There was a significant association in nutritional status of mother-child pairs' due to the duration of children's playing time outside home. The number of normal weights of mother-child pairs increased with the increase in children's playing hours at outdoor space. Mother's physical activity was strongly associated with their child's physical activity (Fogelholm and Kukkonen-Harjula, 2000) and physical activities prevent weight gain as well as to maintain weight loss over time (Chaput*et al*., 2011). Many researchers showed that between the ages of 3 to 12 years, child's body experiences its greatest physical growth, as demonstrated by the child's need to run, climb, and jump in outdoor spaces (Noland *et al*.,'90; Kalish,'95; Cooper *et al*.,'99; Janz *et al*., 2000). Such vital movements and play activities can not only enhance muscle growth, but also support the growth of the child's heart and lungs as well as all other vigorous organs essential for normal physical development (Clements,'98; Pica, 2003).

TABLE 3

Association between the nutritional status of mother-child pairs and socio-economic, demographic and anthropometric factors

		Mother-child pairs nutritional status			
Variables	Group N (%)	Mother-child pairs normal N (%)	Mother-child pairs not normal N (%)	χ^2-value	p-value
Gender of children	Boy	106 (53.3)	93 (46.7)	0.52	0.001
	Girl	118 (53.4)	103 (46.6)		
Age of children	6-8 years	85 (59.9)	57 (40.1)	4.86	0.049
	9-11 years	65 (53.7)	56 (46.3)		
	12-13 years	74 (47.1)	83 (52.9)		
Age of father	< 30 years	23 (69.7)	10 (30.3)	0.01	0.529
	31- 40 years	127 (58.8)	89 (41.2)		
	41- 50 years	55 (38.7)	87 (61.3)		
	> 50 years	11 (64.7)	6 (35.3)		
Age of mothers	< 30 years	62 (68.9)	28 (31.1)	19.14	0.0001

	31- 35 years	97 (51.9)	90 (48.1)		
	>36 years	64 (44.8)	79 (55.2)		
Father's occupation	Labour (Agriculture)	96 (48.4)	86 (51.6)	13.34	0.004
	Labour (Non-Agriculture)	58 (51.4)	44 (48.6)		
	Farmer	23 (51.1)	22 (48.9)		
	Business	24 (54.5)	20 (45.5)		
	Service	13 (46.4)	15 (53.6)		
	Others	10 (52.6)	9 (47.4)		
Father's education	Uneducated	35 (54.7)	29 (45.3)	1.19	0.947
	Primary	105 (54.7)	87 (45.3)		
	Secondary	58 (50.9)	56 (49.1)		
	Higher education	26 (52.0)	24 (48.0)		
Mother's occupation	Labour (Agriculture)	35 (60.3)	23 (39.7)	0.50	0.921
	Service	6 (75.0)	2 (25.0)		
	Housewife	183 (51.7)	171 (48.3)		
Mother's education	Uneducated	15 (62.5)	9 (37.5)	3.03	0.216
	Primary	80 (53.0)	71 (47.0)		
	Secondary	117 (53.4)	102 (46.6)		

Values in parenthesis indicate percentages

From logistic regression analysis it was observed that mother's age was an important factor for nutritional status of mother-child pairs in Rajshahi district, Bangladesh. Mother's age of d" 30 years were more likely to belong to normal mother-child pairs group [p <0.01; AOR=2.556; CI:1.430-4.568] than the mother's age of >36 years. Research indicated that older mother (age > 36 years) spend less time with their children than younger mother (age d" 30 years) (Sayer *et al*., 2004). Younger mothers were more careful about their health and their children's health and their parenting was different than older mothers (Barclay and Myrskylä, 2016).

TABLE 4

Effect of socio-economic and demographic factors on mother-child pairs nutritional status

Variable with groups	B	SE	Wald	p-value	AOR	95% CI for AOR	
						Lower	Upper
Gender of children							
Boy vs Girl	0.033	0.203	0.027	0.870	1.034	0.694	1.539
Age group of mother							
Aged 30 years vs Age>36 years	0.939	0.296	10.038	0.002	2.556	1.430	4.568
Age 31-35 years vs Age>36 years	0.264	0.232	1.292	0.256	1.302	0.826	2.051
Age group of student							
6-8 years vs 12-13 years	0.297	0.248	1.436	0.231	1.346	0.828	2.188
9-11 years vs 12-13 years	0.220	0.251	0.767	0.381	1.246	0.761	2.040
Duration of play							
1 hours vs> 4 hours	-0.342	0.637	0.288	0.591	0.710	0.204	2.476
1 to < 3 hours vs> 4 hours	-0.285	0.637	0.201	0.654	0.752	0.216	2.619
3 to 4 Hours vs> 4 hours	0.023	0.682	0.001	0.973	1.023	0.269	3.892
Father's occupation							
Labour (Agriculture) vs Others	0.178	0.504	0.125	0.724	1.195	0.445	3.208
Labour (Non-Agriculture) vs Others	0.225	0.516	0.189	0.663	1.252	0.455	3.442
Farmer vs Others	0.041	0.569	0.005	0.942	1.042	0.342	3.176
Business vs Others	0.077	0.573	0.018	0.893	1.080	0.351	3.322
Service vs Others	-0.207	0.617	0.113	0.737	0.813	0.243	2.722

CONCLUSIONS

In the present study, we investigated the household nutritional status of mothers and their school going children; a total number of 420 mother-child pairs were considered. Some socio-economic-demographic factors of parents were considered to find the risk factors of unhealthy mother-child pairs. In this study, school going girls were more in number than the boys. Most of the mothers were house wives while fathers were predominantly labors (Agriculture and non-agriculture). It was found that most of the fathers completed primary education while the

maximum number of mothers had secondary education. It was also found that more than 75%, 92.9% and 42.4% of households did not have electricity, safe water supply and hygienic toilet respectively. It is observed that most of the parents and their children were of normal weight. There was a significant association between children and mothers' nutritional status. It was also observed that 65.4% of mother-child pairs were of normal weight. Gender of children, children's age, mothers' age, fathers' occupation, children playing outside were significantly associated with mother-child pairs nutritional status. This study found mothers age was an influential factor for normal mother-child pairs.

Recommendations

Based on the findings of this study, health authorities of Bangladesh Government and non-government organizations may take necessary steps for upgrading the health policy with a view to improving household level nutritional status among mothers and children.

Strength and Limitations

Perhaps, this was the first time attempt to investigate the household level nutritional status among mothers and their school going children in Rajshahi district, Bangladesh. Some limitations of the present study were: only the rural area of Rajshahi district was considered as research area, many possible risk factors were not considered in this study such as health expenditure, domestic violence etc.

ACKNOWLEDGEMENTS

We are grateful to the faculty of Science, University of Rajshahi, Rajshahi-6205, Bangladesh for the financial support.

REFERENCES CITED

Angeles-Agdeppa, I., R. D. Lana and C. V. C. Barba 2003. A case study on dual forms of malnutrition among selected households in District 1, Tondo, Manila. *Asia Pacific Journal of Clinical Nutrition*, 12(4): 438-46.

Bangladesh Bureau of Statistics (BBS) and UNICEF Bangladesh. 2019. *ProgotirPathey,*

Bangladesh Multiple Indicator Cluster Survey 2019, Survey Findings Report. Bangladesh Bureau of Statistics (BBS): Dhaka, Bangladesh.

Barclay, K., and M. Myrskylä 2016. Maternal age and offspring health and health behaviours in late adolescence in Sweden. *SSM –Population Health*, 2: 68-76.

Barquera S, K. E. Peterson, A. Must, B. L. Rogers, M. Flores, R. Houser, E. Monterrubio and J. A. Rivera-Dommarco 2007. Coexistence of maternal central adiposity and child stunting in Mexico. *International Journal of Obesity*, 31.4: 601-607.

Chaput, J., L. Klingenberg, M. Rosenkilde, J. Gilbert, A. Tremblay and A. Sjödin 2011. Physical activity plays an important role in body weight regulation. *Journal of Obesity,* doi:10.1155/2011/360257.

Clements, R. 1998. Wanted: Strong children with healthy imaginations. *Playground Post (Long Island: Playground Environments).*

Cooper, K. H., A. Schwarzenegger and W. Proctor 1999. *Fit Kids! The Complete Shape-up Program from Birth Through High School.* Broadman& Holman: Nashville.

Deleuze NtandouBouzitou, G., B. Fayomi and H. Delisle 2005. Child malnutrition and maternal overweight in same households in poor urban areas of Benin. *Santé (Montrouge, France)*, 15(4): 263-270.

Fogelholm, M. and K. Kukkonen-Harjula 2000. Does physical activity prevent weight gain—a systematic review. *Obesity Reviews*, 1(2): 95-111.

Garrett, J. L., and M. T. Ruel 2003. Stunted child-overweight mother pairs: An emerging policy concern? Food Consumption and Nutrition Division Discussion. International Food Policy Research Institute: Washington DC.

Hossain, K., M. N. Mondal and M. N. Md. Akter 2011. Reproductive health rights of women in the rural areas of meherpur district in Bangladesh. *Journal of Reproduction and Infertility,* 12(1):23-32.

Janz, K. F., J. D. Dawson and L. T. Mahoney 2000. Tracking of fitness and activity during puberty: The Muscatine study. *Medicine and Science in Sports and Exercise*, 32;1250-1257.

Jehn, M. and A. Brewis 2009. Paradoxical malnutrition and the phenomenon of over and undernutrition in underdeveloped economies. *Economy Human Biology,* 7:28-35.

Kalish, S. 1995. *Your Child's Fitness: Practical Advice for Parents*. Champaign: Human Kinetics.

NIPORT 2014. *Bangladesh Demographic and Health Survey, 2007*. National Institute of Population Research and Training, Dhaka. Mitra& Associates and ORC Macro: Bangladesh and Calverton, MD, USA.

Noland, M., F. Danner, K. Dewalt, M. McFadden and J. M. Kotchen 1990. The measurement of physical activity in young children. *Research Quarterly for Exercise and Sport*, 61:146-153.

"Present Installed Generation Capacity (MW) as on 30 June, 2018". *bpdb.gov.bd. Bangladesh Power Development*

Board. Retrieved 17 July 2018.

Pica, R. 2003. *Your Active Child: How to Boost Physical, Emotional, and Cognitive Development through Age-Appropriate Activity*. Contemporary Books: Chicago.

Rahman, M. R., M. Sheema, M. Y. Ali, I. Ara and A. Javed 2018. Socio-environmental condition of rural women in Bangladesh. IOSR *Journal of Environmental Science, Toxicology and Food Technology*, 12 (2):09-16.

Raphael, D., H. L. Delisle and C.Vilgrain 2005. Households with undernourished children and overweight mothers: Is this a concern for Haiti? *Ecology of Food and Nutrition*, 44(2):147-165.

Sayer, L. C., S. M. Bianchi and J. P. Robinson 2004. Are parents investing less in children? Trends in mothers and fathers time with children. *American Journal of Sociology*, 110(1): 1-43.

Tahmeed, A., M. Mustafa, I. Santhia, A. S. Ahmed, R. Sabuktagin, M. M. Islam and A. Cravioto 2012. Nutrition of children and women in Bangladesh: Trends and directions for the future. *Journal of Health, Population and Nutrition*, 30(1): 1-11.