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Prevalence of Underweight and Effect of Nutritional Status on Academic Performance of Primary School Children in Chapainawabganj District, Bangladesh

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ABSTRACT

Introduction: The high prevalence of underweight among children is a serious health concern in Bangladesh. Nutritional status influences students' academic performance directly or indirectly. This study aimed to determine factors that affect the academic performance of students in primary schools. **Methods:** Data were collected from several schools and madrasahs in Chapainawabganj district, Bangladesh using multistage stratified sampling with proportional allocation technique. **Results:** The prevalence of underweight children was 32.3%, with 43.0% of them being girls and 21.4% boys. Multiple logistic regression analysis demonstrated that normal weight children were more likely ($p<0.05$) to obtain good results (GPA $\geq$3.50) than underweight children. Children with gestational age of 39 to 41 weeks were more likely to obtain good results than those whose gestational age was 37 and 38 weeks. Children who were breastfed for $\leq$24 months were less likely ($p<0.01$) to perform well academically (GPA$\geq$3.50) compared to their counterparts. Children whose parents had a higher income or higher education had a significantly better chance of obtaining good results compared to their counterparts. **Conclusion:** These results suggest that childhood nutritional status, parents' education and economic level are significant common factors which affect children's academic performance. Consequently, under-nutrition and poverty can be considered as the major problems for good academic performance of Bangladeshi children and requires attention.

Key words: Logistic regression, Primary School Certificate (PSC) examination, stepwise regression, underweight

INTRODUCTION

Body mass index (BMI) is an indicator of the nutritional status of a population and the BMI percentile can be used to determine the nutritional status of children (age range 2-19 years). A BMI percentile of over 95 is considered obese (over-nutrition); on the other hand a BMI percentile of less than 5 is considered underweight (undernutrition) (Barlow & Expert Committee, 2007). Under-nutrition and overnutrition have been shown to be a risk factor for disease. Obesity in children has been shown to be a risk factor

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for high blood pressure and high cholesterol, which are risk factors for cardiovascular disease (CVD) (Freedman *et al.*, 2007). Obese children are more likely to become obese adults (Biro & Wien, 2010) and adult obesity is associated with a number of serious health conditions including heart disease, diabetes, and some cancers (National Institute of Health, 1998). On the other hand underweight children are more likely to develop gastro-esophageal reflux disease (GERD), inflammatory bowel disease, chronic vomiting or diarrhea (Czinn & Blanchard, 2013).

Breastfeeding can play a key role in determining the growth and development of infants, consequently duration of breastfeeding is an indicator of the health and nutritional status of children. All nutrients required for an infant in the first six months of life are contained in the breast milk. It is recommended that infants not be given any complementary nutrient, weaning diet or plain water during this period (NIPORT 2013). The prevalence of undernutrition and overnutrition may provide useful information about child health, and reflect the general living environment of a given population. We would expect healthy school children (those with normal weights) to generally perform better than others in their school examinations.

In Bangladesh, the Primary School Certificate (PSC) examination is designed for preparing Bangladeshi students to proceed to their future studies. Getting good results will give them better chance to secure a place in better or more reputable secondary schools. A student who obtains grade A+ (GPA 5.00) and A (GPA 4.00-4.99) will be eligible for entrance into a good secondary school. Students from these schools can be expected to perform better in their Junior Secondary Certificate (JSC), Secondary School Certificate (SSC) and Higher Secondary Certificate (HSC) examinations. Subsequently, they may also find it easier to be accepted into good institutions of higher learning such as Bangladesh University of Engineering and Technology (BUET), medical colleges or other reputable public universities in the country.

A good education may empower human beings from ignorance and darkness. The goal of the primary education is to prepare a child with knowledge and skills to interact with peers and society. They will be taught to read and write in English and their mother tongue Bengali. At the end of level five, they will be assessed by the primary school certificate examination (PSC) before they proceed to higher education.

Bangladesh became one of the signatories of the UN Millennium Declaration in 2000 and has committed itself to achieving the eight Millennium Development Goals that assert a vision for the 21st century (Bruns, Mingat & Rakotomalala, 2003). UNESCO has initiated the Salamanca Declaration and Salamanca Framework that emphasises accommodating all students in Bangladesh regardless of their physical, intellectual, emotional, social, linguistic or other conditions (UNESCO, 1994).

Many studies show that parental socioeconomic, demographic and child health status are closely associated with students' academic achievement (Hamid *et al.*, 2011; Pan *et al.*, 2013). Parental employment might exert two contradicting effects on children's academic performance. On one hand, a family with a stable source of income would more likely be able to fulfill the physical needs of a child (Brown & Chu 2012; Noble *et al.*, 2012). Children suffering from chronic diseases are more likely to attain poorer adult outcomes, such as lower educational attainment, adverse health conditions, and lower social status (Case, Fertig & Paxson, 2005). A particularly potent conduit through which childhood health is linked to adult outcomes is education. Poor health impedes educational progress because a student with long standing health problems is not able to fully engage in or take advantage of learning opportunities at school or at home (Caleyachetty *et al.*, 2012).

Therefore, we designed this study to determine the prevalence of underweight among young Bangladesh school children and investigate the association between academic performance and other factors those were beyond the student's control.

METHODS

Student sample

The study sample consisted of 198 level six students from Chapainawabganj district in Bangladesh; 98 were boys and 100 girls. Age at the time of measurement, the students ranged in age from 10 to 14 years with the average age being 11.72±0.86 years. A 80% statistical power and 5% level of significance were considered for calculating sample size. There are three main educational systems in Bangladesh. Ordered by decreasing student numbers, they are: general education system, madrasah education system, technical-vocational education system. Multistage stratified sampling with proportional allocation technique was used for selecting the sample. The socio-economic background of the students was expected to be different for school and madrasah. In the final stage, we selected one school (general education system) and one madrasah at Nawalavanga Union, Chapainawabganj district, Bangladesh. There was no technical or vocational institute in Nawalavanga Union. Information was collected from the students with the permission of school authorities selected students and their parents were first asked about their socio-economic and demographic backgroud by using a standard questionnaire. Data collection was performed from May 2012 to August 2012 by one of the co-authors.

Methods

The BMI percentile was subdivided into four classes according to the most widely used categories of the BMI percentile for children and teenagers. These were: (i) Underweight - BMI less than the 5th percentile, (ii) Healthy Weight (normal weight)- BMI 5th percentile up to the 85th percentile, (iii) Overweight - BMI 85th to less than the 95th percentile, and (iv) Obese - BMI greater than or equal to the 95th percentile (Barlow & Expert Committee, 2007). Students were classified into two groups according to academic performance (result), (i) students who achieved GPA ≥3.50 and (ii) students who achieved GPA ≤3.49. Multiple logistic regression analysis was utilised in order to examine the association between academic performance (result) of children in Primary School Certificate (PSC) examination with their parents' socio-economic, demographic, health status and other variables. The underlying multiple logistic regression models corresponding to each variable are as follows:

$$\log [P/(1-P)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} \quad (1)$$

where, P = the probability of getting GPA ≥3.50 (coded 1)

$1 - P$ = the probability of getting GPA ≤3.49 (coded 0)

X_1 = body mass index (0 underweight, 1 healthy (normal weight))

X_2 = gender (0 for boy, 1 for girl)

X_3 = age (0, <12 years and 1, 12≥ years)

X_4 = father educational level (0 No, 1 Primary, 2 Secondary and 3 higher)

X_5 = mother educational level (0 No, 1 Primary, 2 Secondary and 3 higher)

X_6 = father's occupation (1 for service, 0 for farmer)

X_7 = mother's occupation (1 for service, 0 for housewife)

X_8 = number of family members (2 for ≤4, 1 for (5-6) and 0 for 7 and more)

X_9 = gestational age (1 for 39-41 weeks, 0 for 37 and 38 weeks)

X_{10} = birth place (1 for home, 0 for hospital)

X_{11} = duration of breast feeding (0 for ≤24 months, 1 for >24 months)

X_{12} = family income (0 for ≤5500 Taka, 1 for >5500 Taka)

β_0 = intercept term, and
β_i = unknown logistic regression coefficients (i = 1, 2, 3, …,12). The parameter β_i refers to the effect of Xi on the log odds such that $Y = 1$, controlling the other X_i. There is an important assumption in multiple logistic regressions, that there is no multicollinearity problem (Dependency of each to the other among the independent variables). However, there is no exact method to detect the multicollinearity problem in multiple logistic regression analysis.

In this study the magnitude of the standard error (SE) was used to detect the multicollinearity problem, if the magnitude of the SE was between 0.001 and 0.5, no evidence of multicollinearity was assumed (Chan, 2004). Finally, stepwise logistic regression analysis was used to choose the most influential variables for the children's academic performance. In a stepwise logistic regression analysis, both methods, forward LR and backward LR, compute the final step by subsequent adding (forward LR) or subtraction of (backward LR) variables. Both methods stop the iterative process, once a process step is reached which no longer improves results significantly compared to the last step taken. Backward elimination may have the advantage that it will take into consideration suppressor effects which might be lost in forward inclusion (Menard, 2002).

Statistical significance was accepted at $p < 0.05$. Statistical analyses were carried out using SPSS software (version 15.0) and Excel.

RESULTS

The age of the students varied from 10 to 14 years with the average being 11.72±0.86 years. There were about the same number of boys and girls in this study population. The prevalence of undernutrition (underweight) in our sample population was 32.3%. The value was higher among girls (43.0%) compared to boys (21.4%). The prevalence of healthy weight (normal weight) of children was 64.1% with 73.5% for boys and 55.0% for girls, while only 2.0% and 1.6% of children were overweight and obese, respectively (Table 1).

In terms of academic performance, 7.1% of the students scored excellent academic results [A+ (GPA=5.00)] while 26.8% and 15.2% students obtained A (4.00≤GPA≤4.99) and A-(3.50 ≤GPA≤3.99) respectively. More than 19% students obtained medium results (B, 3.00 ≤GPA ≤3.49); 23.7% scored B (2.00 ≤GPA ≤2.99). Only 8.1% students obtained very bad results (D, 1.00 ≤GPA ≤1.99) (Table 2).

Chi square (χ^2-test) test was utilised to determine the association between health and demographic factors with children's academic performance. The χ^2-test showed that body mass index ($p<0.01$), birth order ($p<0.05$), gestational age ($p<0.05$), age ($p<0.01$) and breastfeeding ($p<0.01$) were significantly associated with academic performance of the children (Table 3). Gender, place of birth and method of delivery did not show significant ($p>0.05$) association with academic performance (Table 3).

Table 1. Prevalence of underweight, normal weight, overweight and obese among school children

	Boys	*Girls*	*Total*
Number of students	98	100	198
Underweight (BMI< 5th percentile)	21.4%	43.0%	32.3%
Healthy Weight (normal weight) (5th ≤BMI< 85th percentile)	73.5%	55.0%	64.1%
Overweigh (85th≤BMI<95th percentile)	2.0%	2.0%	2.0%
Obese (≥ 95th percentile)	3.1%	0.0%	1.6%

Table 2. Frequency distribution of students obtained letter grade (LG) with grade point average (GPA)

Letter grade (Grade point, GP)	*Frequency*	*Percentage*	*Cumulative percentage*
A^+ (GPA=5.00)	14	7.1	7.1
A (4.00 ≤ GPA≤4.99)	53	26.8	33.8
A^- (3.50≤GPA≤3.99)	30	15.2	49.0
B (3.00≤GPA≤3.49)	38	19.2	68.2
C (2.00≤GPA≤2.99)	45	23.6	91.8
D (1.00≤GPA≤1.99)	18	8.2	100.0
Total	198	100.0	

Table 3. Association of nutritional indicators and some demographic factors with academic performance of school children

Variable	*Category (N, %)*	*Letter grade (LG)*		χ^2-*value*	*p-value*
		B and below (GPA≤3.49)	*A^- and above (GPA ≥3.50)*		
Body Mass Index	Underweight (64, 32.3%)	44(68.8%)	20(31.3%)	12.10	0.007
	Normal weight (127, 64.1%)	54(42.5%)	73(57.5%)		
	Overweight (4, 2.0%)	2(50.0%)	2(50.0%)		
	Obese (3, 1.5%)	1(33.3%)	2(66.7%)		
Gender	Boy (98, 49.5%)	44(44.9%)	54(55.1%)	2.90	0.089
	Girl (100, 50.5%)	57(57.0%)	43(43.0%)		
Born place	Hospital (37, 18.7%)	20(54.1%)	17(45.9%)	0.169	0.681
	Home (161, 81.3%)	81(50.3%)	80(49.7%)		
Delivery system	Normal (185, 93.4%)	95(51.4%)	90(48.6%)	0.042	0.837
	Caesarian (13, 6.6%)	6(54.5%)	5(45.5%)		
Birth order	First (14, 7.1%)	3(21.4%)	11(78.6%)	5.188	0.023
	Second and above (183, 92.4%)	97(53.0%)	86(47.0%)		
Gestational age	37-38 weeks (96, 48.5%)	55(58.5%)	39(41.5%)	4.703	0.030
	39-41 weeks (102, 51.5%)	42(42.9%)	56(57.1%)		
Age	Age <12 years (82, 41.4%)	62(75.6%)	20(24.4%)	33.893	0.0001
	Age≥12 years (116, 58.6%)	39(33.6%)	77(66.4%)		
Breastfeeding	<24 months (142, 71.7%)	81(57.0%)	61(43.0%)	7.311	0.007
	≥24 months (56 (28.3%)	20(35.7%)	36(64.3%)		

Multiple logistic regression analysis

The study sample was classified according to body weight, and socio-economic and demographic factors. As the prevalence of overweight and obesity among children was very low (3.6%), we decided to exclude these groups in our logistic regression analysis.

The specific multiple logistic regression model is:

$$\log [P/(1-P)] = \beta_0 + \beta_1 G + \beta_2 \text{Age} + \beta_3 \text{FEL} + \beta_4 \text{MEL} + \beta_5 \text{FOC} + \beta_6 \text{MOC} + \beta_7 \text{NFM} + \beta_8 \text{GA} + \beta_9 \text{BP} + \beta_{10} \text{DBF} + \beta_{11} \text{FI} + \beta_{12} \text{BMI} \quad (2)$$

The estimated model is:

Log [*P*/(1-*P*)]=6.12+0.77G - 2.56 Age-[1.99 (No vs higher) +2.01(Primary vs higher) +1.05 (secondary vs higher)]FEL -[1.99 (No Vs higher) +1.33(Primary vs higher) +1.88(secondary vs higher)]MEL -0.22FOC-

1.38 MOC-[0.60(5-6 members vs 4 and less members) +1.13(7 and more members vs 4 and less members)-1.15GA-0.44BP -2.09 DBF -1.21 FI-1.11BMI (3)

Since, the standard error of all independent variables was very low, there was no evidence of a multicollinearity problem. Multiple logistic regression analysis demonstrated a positive association between nutritional status (BMI) and academic performance of school children; healthy (normal weight) children were 0.331 times more likely ($p<0.05$) to obtain good results (GPA $\geq$3.50) (95% CI, 0.120-0.765) than malnourished (underweight) children. Twelve years and older children were 0.078 times more inclined [(95% CI, 0.032-0.212)] to get good academic results (GPA$\geq$3.50) ($p<0.001$) than their younger friends. Children of higher educated fathers' had a 0.136 probability of getting good results [(GPA$\geq$3.50) (95% CI, 0.069-1.597) ($p<0.05$)], compared to children whose fathers had no education [0.720 (95% CI, 0.044-0.775) ($p<0.05$)] and children whose fathers had primary or secondary education [0.414 (95% CI, 0.059-0.989) ($p<0.05$)]. Mother's educational level was positively associated with the child's academic performance; children of mothers who were higher educated had a 0.136 probability of obtaining GPA$\geq$3.50 [(95% CI, 0.038-0.577) ($p<0.01$)], compared to children of mothers with no education [0.720 (95% CI, 0.150-1.566) ($p<0.05$)] and children of mothers with primary or secondary education [0.414 (95% CI, 0.103-1.034) ($p<0.05$)]. The children of working mothers had a 0.253 better chance of obtaining good results [(GPA$\geq$3.50) (95% CI, 0.080-0.585) ($p<0.05$)] compared to children whose mothers were housewives. Children from small families ($\leq$4 members) were 0.324 times more likely to perform better academically [(95% CI, 0.124-1.550) ($p<0.05$)] than children from large families (7 and more members). Gestational age was positively associated ($p<0.05$) with obtaining GPA $\geq$3.50; students who were born between 39-41 weeks had a 0.316 times higher probability of getting GPA $\geq$3.50 [(95% CI, 0.127-0.679)] than those who were born between 37-38 weeks. Duration of breastfeeding was positively associated with academic perfor-mance of children, and students who were breastfed more than 24 months had a 0.123 higher probability of obtaining GPA$\geq$3.50 of 0.123 (95% CI, 0.083-0.300) than their counterparts. Students from higher-income families were 0.298 times more likely to get GPA $\geq$3.50 [(95% CI, 0.126-0.742) ($p<0.05$] than those from lower-income families (Table 4).

Stepwise logistic regression

Stepwise logistic regression (backward elimination) was used to find the most important factors which influence children's academic performance. The procedure of stepwise backward elimination started with the full equation and successive dropping of one variable at a time. The variables were dropped based on their contribution to the reduction of the squares error sum. The contribution of an individual's variable for each step was checked by the Wald statistic and change in -2Likelihood Ratio (LR). If all the Wald test values and the corresponding change in -2LR were significant, the full set of variables would be retained in the final step. The final step which included the BMI, age, parents' education, mother occupation, gestational age, duration of breastfeeding and family income were the most important predictors of children academic (Table 5).

DISCUSSION

The study was conducted in the Nawalavanga union of the Chapainawabganj district, Bangladesh on students who passed the Primary School Certificate (PSC) examination in 2011. The sample size was 198 students at level six, with 98 being boys and 100 girls.

Table 4. Multiple logistic regression estimates for the effects of nutritional indicators, parents' socio-economic and demographic factors on child academic performance

Variable	*Coefficient*	*SE*	*Wald*	*p-value*	*Odds ratio*
Gender (Boy vs Girl)	0.765	0.501	2.352	0.126	2.133
Body Mass Index (Underweight vs Normal weight)	-1.110	0.515	4.813	0.028	0.331
Age (<12 years vs 12 years and above)	-2.563	0.551	21.881	0.000	0.078
Father's education	-1.991	0.860	1.312	0.025	0.373
No education vs Higher education					
Primary education vs Higher education	-2.011	0.791	6.541	0.011	0.134
Secondary education vs Higher education	-1.051	0.760	1.903	0.016	0.350
Mother education	-1.990	0.771	6.791	0.009	0.136
No education vs Higher education					
Primary education vs Higher education	-1.334	0.646	0.261	0.020	0.720
Secondary education vs Higher education	-1.881	0.642	1.911	0.016	0.414
Father occupation (Farmer vs Service)	-0.221	0.503	0.201	0.659	0.801
Mother occupation (House wife vs Service)	-1.375	0.554	6.242	0.013	0.253
Number of family member	-0.602	0.553	1.166	0.282	0.552
5-6 members vs ≤4 members					
7 and more members vs ≤4 members	-1.131	0.782	2.091	0.048	0.324
Gestational age (37-38 weeks vs 39-41 weeks)	-1.150	0.471	6.022	0.014	0.316
Birthplace (Hospital vs Home)	-0.440	0.611	0.531	0.467	0.643
Duration of breastfeeding (≤24 months vs >24 months)	-2.091	0.491	18.340	0.001	0.123
Family income (≤5500 Taka vs >5500 Taka)	-1.211	0.501	5.831	0.016	0.298
Constant	6.12	1.311	21.800	0.000	

Prevalence of underweight

The study demonstrated that the high prevalence of underweight (32.3%) reflects malnutrition among Bangladeshi school children aged 10-14 years, while the prevalence of obesity was found in only 1.6% of the sample. More girls were underweight (43.0%) compared to boys (21.4%). Previous studies (Hawlader *et al.*, 2013; Mohsena, Mascie-Taylor & Goto, 2010) have reported on prevalence of underweight, overweight and obesity among Bangladeshi pre-school children, but to the authors' knowledge, there have been no studies on primary school children. The prevalence of underweight among Bangladeshi school children in our study was 32.3%, much higher than that of school children in Spain (6.4%) although the latter was based on a wider age group of 12-17 years (Gulías-González *et al.*, 2013). Prevalence of overweight (1.6%) was much lower in our study compared to this study (16.7 %). Another similar study based on 11-year-old school children in Italy reported prevalence rates of of 10.1% for underweight and 33.4% for overweight , respectively (Lazzeri *et al.*, 2008). A higher rate of poverty was probably the most important contributing factor for the high rate of underweight school children in Bangladesh. This is a rather alarming finding because children at this age require adequate nutrition to grow to their full physical and mental potential to mature into an adult. In many developing countries, women have a very important role in the family structure where they are supposed to take care of the husband, bear children and subsequently

Table 5. Summary of the stepwise (backward elimination) logistic regression analysis (final step, 6) for nutritional, parents' socio-economic and demographic factors

Variable	*Coefficient*	*SE*	*Wald*	*p-value*	*Odds ratio*	*95% CI for odds*		*Change in -2LR*
						Lower	*Upper*	
Body Mass Index (Underweight vs Normal weight)	-1.215	0.481	6.386	0.011	0.297	0.116	0.761	6.77
Age (<12 years vs 12 years and above)	-2.338	0.490	22.725	0.001	0.097	0.037	0.252	28.68
Father education								
No education vs Higher education	-1.375	0.792	3.019	0.042	0.253	0.054	1.193	12.47
Primary education vs Higher education	-2.457	0.763	10.364	0.001	0.086	0.019	0.382	
Secondary education vs Higher education	-1.599	0.728	4.825	0.028	0.202	0.048	0.842	
Mother education								
No education vs Higher education	-2.020	0.743	7.388	0.007	0.133	0.031	0.569	9.46
Primary education vs Higher education	-0.511	0.624	.672	0.012	0.600	0.177	2.036	
Secondary education vs Higher education	-0.917	0.616	2.216	0.037	0.400	0.119	1.337	
Mother occupation (House wife vs Service)	-1.123	0.508	4.883	0.027	0.325	0.120	0.881	5.21
Gestational age (37-38 weeks vs 39-41 weeks)	-1.223	0.438	7.794	0.005	0.294	0.125	0.695	8.37
Duration of breastfeeding (≤24 months vs >24 months)	-2.039	0.466	19.104	0.001	0.130	0.052	0.325	22.39
Family income (≤5500 Taka Vs >5500 Taka)	-1.060	0.472	5.040	0.025	0.346	0.137	0.874	5.23

take care of them. With 43.2% of primary school girls underweight, they may not be able to grow and achieve their full potential, and this may influence the progress of the society and country in future.

Students' demography and other factors

This study demonstrated that body mass index (BMI), gestational age and duration of breast feeding were the most important nutritional and demographic predictors for school children's academic performance. Multiple logistic regression analysis demonstrated that BMI was positively associated with children academic performance; healthy (normal weight) children were more likely to perform academically well compared to underweight children. To the best of our knowledge, the association between BMI and academic performance among Bangladeshi school children has not been reported before. A similar observation was reported among school children in Mauritius (Caleyachetty

et al., 2012). This study also showed that children born between 39-41 weeks of gestation were more likely to obtain better results than those born after 37-38 weeks of gestation. This finding is aligned with Williams *et al.* (2013) who revealed the relationships among gestational age at birth, maternal characteristics, and standardised test performance in Georgia's first-grade students. Duration of breastfeeding and child's academic performance has also a positive association as shown by a study of Oddy *et al.* (2010) which found that 10-year-old children who were predominantly breastfed for 6 months or longer in infancy had higher academic scores than children who were breastfed for less than 6 months. Our study showed that the effect of breastfeeding on educational outcomes differed according to gender; association between breastfeeding and examination outcome was more pronounced in boys (in mathematics, spelling, reading, and writing). Almost all Bangladeshi children under age 2 years living with their mothers were breastfed during the first year of their life, and breastfeeding continued through the second year for 90% of the children (NIPORT, 2013). In this study, we also found that students from small families had a higher chance of getting better results than those from a large families. Several studies from other parts of the world have demonstrated the same results (Sanchez, Montesinos & Rodriguez, 2013; Gutierrez-Domenech & Adsera 2012). Parents of big families may not have the financial resources and time to supervise their children. There is very little parental interaction with children in large families.

Parents' socio-economic and demographic factors

This study noted a positive association between parental socio-economic factors and education background with students' performance in Bangladesh. Children of educated parents were more likely to achieve better academic performance. It is also interesting to note that children of working mothers have a better chance of getting good results compared to those of housewives. The influence may be in the form of a positive role model for the children since the parents have gone through the education process. Total contact time with the mother did not contribute very much towards academic excellence of the children. In a recent study in Canary Island, Sanchez *et al.* (2013) revealed that parents' level of education, parents' expectations about academic achievement, socio-economic status (SES), and parents' control over the student's homework were useful predictors for high academic achievement based on logistic regression analysis. O'Neill *et al.* (2013) had the same findings and concluded that parents' socio-economic condition was a vital factor that affected student achievement. Well educated parents are more able to guide their children and contribute in shaping their future in a logistic way. These findings are aligned with other studies (Brown & Chu 2012; Noble *et al.*, 2012). It can also be indirectly inferred that we can expect educated parents to have a higher salary and be able to better support the family.

The limitation of this study is that we could only investigate the effect of selected social and environmental factors with academic performance of primary school children in this country. Another limitation is that there may still be selection bias in the sample population. We were not able to study other factors directly or indirectly related to academic performance of school children such as availability of private tutors, study hours, sleeping hours, social habits, participation in sports, indulgence in electronic games etc. A high prevalence of underweight in young Bangladesh school children, especially among girls, is currently our main concern. We would like to recommend that the government seriously monitor the situation and take necessary action to ensure young school children

receive adequate nutrition so that the future generation of the country can achieve their full physical and academic potential.

CONCLUSION

The prevalence of underweight among Bangladeshi primary school children was very high (32.3%), with school girls (43.0%) being affected much more than school boys (21.4%). Underweight is shown to be associated with lower academic achievement among our study population. Malnutrition is likely the main underlying factor for underweight and the negative influence on young children may be more far reaching than just academic achievement. This is a serious concern as many children especially young girls may not be getting adequate nutrition just before they enter the rapid growth period of puberty. In addition, other factors like BMI, parents' educational level, mother's occupation, family size, gestational period, duration of breast feeding and family income were shown to influence the students' performance in the Primary School Certificate (PSC) examination in Bangladesh.

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Conflict of interest

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