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Original Research Article

Effect of Dietary Intake and Socio-Economic Factor on Nutritional Status of Primary School Going Children: a Cross-Sectional Study in old Dhaka City, Bangladesh

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ABSTRACT

Though the economic growth of Bangladesh is increasing day by day, malnutrition remains one of the leading causes of child mortality and morbidity. The school age is the dynamic period of growth and development. The aim of this study is to assess the nutritional status and dietary pattern of primary school children in old Dhaka, Bangladesh and identify the risk factors of nutrition situation. This was a cross-sectional study conducted among 210 children aged 5 to 11 years at seven different primary schools in old Dhaka, Bangladesh. The sample was selected by multistage sampling from four than as of old Dhaka, Bangladesh. The majority (47.6%) of the participants came from low-income families, but about 41% and 44% spent high and moderate amount of money on foods, consequently. About 21.7% and 9.7% of the respondents were moderately underweight and overweight, respectively as indicated by Weight for age z-score (WAZ). In case of Height for age z-score (HAZ), 24.3% of the respondents were moderately stunting. The prevalence of thinness, overweight and obese among the participants were 22%, 11.9%, and 4.8%, respectively, as measured by BMI for age z-score (BAZ). The well-nourished children showed better school performance than the malnourished one. Significant association was found among food consumption score (FCS), individual dietary diversity score (IDDS), and anthropometric indices among the respondents. As malnutrition is prevalent among primary school children, so school health program with proper screening and better nutrition education should be recommended as early as possible.

Key words: Nutritional Status; School Age Children; Dietary Intake; Socio-Economic Factor; Old Dhaka.

INTRODUCTION

Malnutrition continues to be a primary cause of ill health and mortality among children in developing countries. It is a major public health problem and accounts for about half of all child deaths worldwide. [14] About 150 million children in developing countries are still malnourished and more than half of underweight children live in South East Asia Region. [14]

The best global indicator of children's well being is growth. Poor grow is attributable to a range of factors closely linked to overall standards of living and the ability of populations to meet their basic needs, such as access to food, housing and health care. Assessment of growth is the single measurement that best defines the nutritional and health status of children, and provides an indirect measurement of the quality of life of the entire population. [1]

Malnutrition studies use the assessment of the nutritional status of children 5 years old and younger as representative of the nutritional wellbeing of an entire population because this age group suffers the effects of malnutrition more severely [4] While the prevalence of malnutrition in the under 5 age group is important, in 2002 the UN's Standing Committee on Nutrition [11] began to promote research and interventions into the malnutrition of school age children, because of this age groups potential to experience "catch up" growth, for example, school-age children who were underweight early in life can grow to have a normal weight for age if their nutritional environment improves. [11]

Malnutrition is one of the important public health problems, affects large numbers of children in developing countries. Despite the economic growth observed in developing countries, malnutrition and particularly under-nutrition is still highly prevalent. [8]

School age is a dynamic period of physical growth as well as of mental development of the child. The nutritional status of school-aged children impacts their health, cognition, and subsequently their educational achievement. The school is an opportune setting to provide health and nutrition services to disadvantaged children. [9] Children in the age group of 5-14 years are often considered as school age. Since 1972, the United Nations Educational Scientific and Cultural Organization (UNESCO) consider 6-11 years as primary school age and 12-17 years as secondary school age for statistical purposes. [15] The foundation of good health and sound mind are laid during the school age period. [6]

Primary school children undergo a period of rapid growth, nutrient deficiencies at this age can lead to retarded growth, [7] anemia, [12] reduced immune function, [13] and impaired motor and cognitive development, [3] all of which may adversely affect academic performance through reduced learning capacity and poor school attendance. [10]

In the developing countries like Bangladesh, due to poor hygiene practices the school-age children often experience the increased burden of communicable diseases that decrease their ability to attend school regularly and to learn their full potential also. [17] A large fraction of the world's illness and death is attributable to communicable diseases. [5] Sixty-two percent and 31% of all deaths in Africa and Southeast Asia, respectively, are caused by infectious disease. [1]

The purpose of this study is to design a community health assessment, which focuses on public primary school-aged children (ages 5-11) in Old Dhaka, Bangladesh. An assessment of school-age children will both contribute to the knowledge base and influence nutrition interventions for the age group and identify the risk factors of nutrition situation.

METHODS AND MATERIALS

Study design and sampling

The study was carried out using a cross-sectional design. Two hundred ten primary school children, aged from 5 to 11 years, who were the students of classes I to class V of seven primary schools in the Old Dhaka, Bangladesh were selected for this study by using the following formula

$$n = \frac{\mathrm{Z}^2\mathrm{P}(1-\mathrm{P})}{\mathrm{d}^2} \times \mathrm{Designeffect}$$

Since, we didn't have any correct estimate of proportion of malnutrition among the study population, we average, Bangladesh national malnutrition data from WHO, and estimate P=0.27 and we assume that d= 0.07 and 15% drop rate was included.

Samples were collected using multistage sampling. Four than as in the Old Dhaka area were included. One government and one non-government school from each thane was selected by systematic sampling. A total of 30 primary school children were selected by systematic random sampling from each school. If there were more than one section in each class, the samples were selected from both sections. In case of

refusal to participate by a selected subject, the next name on the attendance register was invited to participate, keeping subsequent samples unchanged.

Consents from School Authority and Parents

The purpose of study was explained to the authority of each selected school and permission to carry out the work in their students was sought for. Some of the school administrations consented readily and some were not given permission to conduct the study in the school. Then we moved to next school for consent. Each selected students' parents were sincerely requested to participate give consent to include his or her child in the study.

Data Collection

The schools were visited for data collection on prefixed dates. The school administration and the students were informed the dates well advance of the visit.

Socio Economic Information

The part of the questionnaire that was designed to obtain socio-economic information was asked to parents of the selected students.

Anthropometric Data

Anthropometric data were recorded on the day of collection of dietary information.

Body Weight

Body weight was measured on a weight balance. The balance was calibrated every day before use. Body weight was measured bare footed to the nearest 0.1 kg with school uniform on. The average weight (0.5 kg) of the school uniform was later subtracted from the measured weight.

Height

Barefooted standing height was measured to the nearest 0.1 cm with a standard scale. Weight for age Z-score height for Z-score and BMI for age Z-score of the participants were calculated and compared with the World Health Organization. [16]

School Performance

Factors considered to measure school performance of the participants like attendance rate, marks attained in the last exam, participation in co-curriculum activity and participation in sports were asked the teacher to fill up in the questionnaire.

Dietary Information

Dietary information was collected by interviewing the parents of the participants. Food consumption score (FCS) was calculated based on the answer to recall the foods they consumed in the previous seven days.

Individual dietary diversity score for participants was calculated based on the intake of 8 food groups proposed by FANTA(2016) to calculate children individual dietary diversity score (IDDs) and categorize it into low, middle and high IDDS to understand dietary diversity.

Statistical Analysis

Various analytical techniques were used employing SPSS/version 21 for the analysis of the data. Univariate analysis comprised of simple frequency distribution of selected variable. Mean, median, standard deviation, ranges for all parameters were determined. Bivariate analysis was performed to determine the significant differences between groups in various independent variables. Anthropometric data of the participants were analyzed by using WHO anthro plus software.

RESULTS

Distribution of participants by age

About 42% of the students from each of the class (class one to five) were took part in this study from seven different primary schools in Old Dhaka. The distribution of the students by age is shown in Mean age of the participants were 95.23

in months, with a median of 95.38 in months. Majority of the participants were in (108 -119) months, being 25.7% of the total; 20.5% were (72-83) in months, 19.5% were in (84-95) months, 16.7% were in (96-107) months, 11.9% were in (61-71) months and 5.7% were in (120-131) months (Table 1).

Table 1: Distribution of the participants by age

Age (month)	Frequency	Percentage (%)
(61-71)	25	11.9
(72-83)	43	20.5
(84-95)	41	19.5
(96-107)	35	16.7
(108-119)	54	25.7
(120-131)	12	5.7

Family Income and Expenditure

The families of the participants were arbitrarily classified into low-income groups (up to BDT 10,000), middle-income group (BDT 10,001 to 15,000) and high-income group (greater than BDT 15,000) according to their monthly income. The majority of the participants (47.6%) came from small families. About 38.6% were from medium families. And the rest (13.8%) came from medium families (Table 2).

Table 2: Monthly income and expenditure on food of the participant's family

	Frequency	Percentage (%)
Family Income (BDT/month)		
Low (up to BDT 10,000)	100	47.6
Medium (BDT 10,001 to 15,000)	29	13.8
High (above BDT 15,000)	81	38.6
Expenditure on food (BDT/month)		
Low (up to BDT3,000)	31	14.8
Medium (BDT3,001 -5,000)	93	44.3
High(above BDT5,000)	86	41.0

Relationship between family expenditure on food and anthropometric indices

Family expenditure on food of the participants was classified into three categories (section 4.1.2.3) to examine the relationship of family income with various anthropometric indices of the participants. By bivariate analysis, significant association between family expenditure on food and anthropometric indices was found (table 3)

Table 3: Relationship between family expenditure on food and anthropometric indices

Family expenditure on food								
Anthropometric Indices	**Low (up to BDT 3,000) n=31**		**Medium (BDT 3,001-5,000) n=93**		**Large (above BDT 5,000) n=86**		**Pearson correlation**	**P-value**
	Mean	**±SD**	**Mean**	**±SD**	**Mean**	**±SD**		
WAZ	-.474	1.734	.979	1.155	1.037	1.206	.192	.006**
HAZ	.237	1.722	1.066	1.178	1.064	1.258	.109	.115
BAZ	-.822	1.420	.5640	1.258	0.557	1.626	.148	.032*

*indicates a coefficient that is statistically significant at p<0.05, **indicates at p <0.01

Nutritional status

Weight for age Z-score (WAZ)

Z-scores of weight for age were calculated based on, [16] (Table 4). Mean (±SD) Z-score of weight for age was 0.79(±1.371) with a median 0.96. The prevalence of underweight and overweight of the participants were 21.7% and 9.7% respectively.

Table 4: Z – Score for different anthropometric indices

Z – Score			
Anthropometric Indices			
	Mean	**±SD**	**Median**
WAZ	0.79	1.371	0.96
HAZ	0.94	1.329	1.02
BAZ	0.35	1.510	0.55

Table 5: Prevalence of malnutrition by age based on Weight-for-Age z-scores, Height-for-Age z-scores and BMI-for-age z-scores

Weight for age Z-score(WAZ)										Height for age Z-score (HAZ)									
		Severe Underweight (< –3 z-score)		Moderate Underweight (>= –3 and < –2 z-score)		Normal (>= –2 z-score)		Overweight				Severe Stunting (<–3 z–score)		Moderate Stunning (>= –3 and < –2 z–score)		Normal		Tall	
Age (Months)	Total No	N	%	N	%	N	%	N	%	Age (Months)	Total No	N	%	N	%	N	%	N	%
60-71	25			8	32	15	60	2	8	60-71	25			6	24	16	64	3	12
72-83	43			6	13.9	36	83.7	1	23.2	72-83	43			10	23.2	31	72.1	2	4.7
84-95	41			5	12.2	32	78.4	4	9.7	84-95	41			15	36.7	17	41.6	9	21.9
96-107	35			10	28.5	19	54.3	6	17.1	96-107	35			7	20	25	71.4	3	8.57
108-119	54			16	29.6	34	62.9	4	7.4	108-119	54			11	20.3	42	87.8	1	1.9
120-131	09					6	66.7	3	33.3	120-131	102			2	16.7	9	75	1	8.3
Total	207			45	21.7	145	68.6	20	9.7	Total	210			51	24.3	162	66.7	19	10

Table 5 to be continued…

BMI for age Z-score (BAZ)											
		Severe thinness (<-2 z-score)		Moderate thinness(>= -2 and <-1 z-score)		Normal (> = -1 z score)		Overweight (>1 and <2 z-score)		Obese (>=2 z-score)	
Age (months)	Total no.	N	%	N	%	N	%	N	%	N	%
60-71	25	3	12	12	48	8	32	2	8	0	0
72-83	43	2	4.6	9	20.9	29	67.4	2	4.7	1	2.3
84-95	41	5	12.2	3	7.32	28	68.3	4	9.8	1	2.4
96-107	35	1	2.7	6	17.14	20	57.1	6	17.1	2	5.7
108-119	54	3	5.6	3	5.55	38	70.3	8	14.8	2	3.7
120-131	12					5	41.7	3	25	4	33.3
Total	210	14	6.7	33	15.7	128	60.9	25	11.9	10	4.8

School Performance

For school performance of the participants' four factors attendance rate in the class, mark attained in the last exam, participation in co-curriculum activity and participation in sports were considered. Figure 1 shows that 74% of the well nourished and 19% of the malnourished children's attendance rate in the class was above 70%. About 29% of the well-nourished children got 70% marks in the last examination while for the malnourished children the percentage is around 9%. In case of participation of sports and co-curricular activity, the prevalence of well-nourished and malnourished children was 63%, 19% and 59%, 37% respectively.

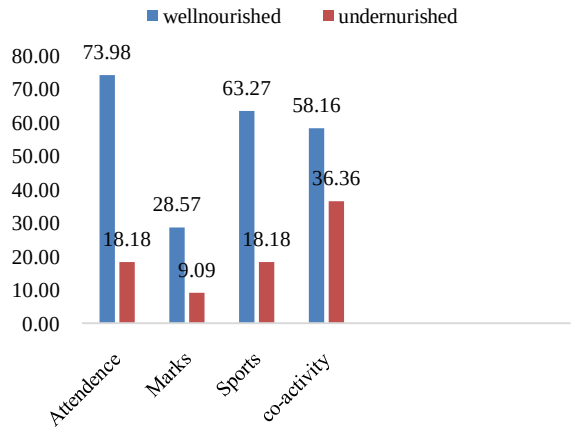

Figure1: Prevalence of school performance of well-nourished and undernourished participants.

Dietary Pattern

Frequency of food intake

Frequency of intake of different food groups of participants has been shown in Table 4.6. Cereal consumption of the participants was 100%. Intake of meat group and pulse were 39% and 29% respectively at least 4 times a week. Nearly 20% and 80% of the participants do not eat fruits and milk. On the other hand, 71% and 61% consumed pulse and milk less than 3 times a week.

Table 6: Intake of food group by the participants

Food groups	0 times	1-3 times	4-6 times
Cereal	0	0	100
Meat/fish/egg	0	61	39
Pulse	0	71	29
Vegetables	0	84	16
Fruits	20	63	17
Milk/milk products	80.5	9	10.5

Food Consumption Score (FCS)

The study revealed that both FCS and IDDS were found statistically significant to the anthropometric indices of the participants. Table 8 shows different food consumption score threshold for the participants.

Table 7: Food consumption score

FCS	Frequency	Percentage (%)
Poor	10	4.8
Borderline	141	67.1
Acceptable	59	28.1

Individual Dietary Diversity Score (IDDS)

Table 9 presents various IDDS threshold for participants.

Table 8: Child Dietary diversity score

IDDS	Frequency	Percentage (%)
Low (1-3 food groups)	21	10
Middle (4-5 food groups)	132	62.9
High(≥ 6 food groups)	57	27.1

Relationship between anthropometric indices and FCS and IDDS

Food consumption score (FCS) of participant's household were divided into three categories to examine the relationship of FCS with anthropometric indices. The

anthropometric indices of the participants with acceptable FCS were significantly higher compared with those of the participants with poor FCS threshold. By bivariate analysis statistically significant association between FCS and anthropometric indices was found (Table 10).

Table 9: Relationship between FCS and anthropometric indices

FCS								
Anthropometric Indices	**Poor(0-28) n=10**		**Borderline (28-42) n=141**		**Acceptable(> 42) n=59**		**Pearson correlation**	**P-value**
	Mean	**±SD**	**Mean**	**±SD**	**Mean**	**±SD**		
WAZ	-1.450	1.746	.8814	1.273	.9653	1.209	.245	.000***
HAZ	-1.179	1.186	.9872	1.247	1.197	1.245	.215	.002**
BAZ	-1.065	1.651	.4716	1.347	.322	1.742	.140	.043*

*Indicates a coefficient that is statistically significant at p<0.05, **indicates at p <0.01, ***indicates at <0.001

Individual dietary diversity score (IDDS) of participants were divided into three categories to examine the relationship of IDDS with anthropometric indices. The anthropometric indices of the participants with high IDDS were significantly higher compared with those of the participants with low IDDS threshold. By bivariate analysis statistically significant association between IDDS and anthropometric indices was found (Table 11).

Table 10: Relationship between IDDS and anthropometric indices

IDDS								
Anthropometric Indices	**Low (1 – 3 groups) n=21**		**Medium 4 – 6 groups) n=132**		**High (above 6 groups) n=57**		**Pearson correlation**	**P- value**
	Mean	**±SD**	**Mean**	**±SD**	**Mean**	**±SD**		
WAZ	.016	1.527	.668	1.338	1.142	1.277	.262	.000***
HAZ	.367	1.465	.891	1.323	1.148	1.269	.179	.009**
BAZ	-.305	1.438	.229	1.402	.675	1.593	.203	.003**

*Indicates a coefficient that is statistically significant at p<0.05, **indicates at p <0.01, ***indicates at <0.001

DISCUSSION

Malnutrition is a widespread and persistent problem in Bangladesh. A considerable number of studies have been carried out in the past decades to understand the extent and consequences of malnutrition in different Bangladeshi population groups. However these studies have tended to place emphasis on those who have been considered most vulnerable groups; i.e. infants, pre-school children, pregnant and lactating mothers. Nutritional status is important factor in school age children because of this group potential to experience "catch up" growth if their nutritional environment would improve.

The prevalence of stunting (24.3%), underweight (21.7%), thinness (22%) of the participants of this study based on HAZ, WAZ, BAZ was found lower compare to under-fiver children data of the NLiS country profile, Bangladesh,2014 (stunting-36.1%, underweight- 32.6%, wasting-14.3%). [16] The anthropometric finding was also lower in relation to that of the BDHS, 2014 data (stunting-36%, underweight-33%, wasting-14%). [2] The differences observed in prevalence between the present study and NLiS2014 and BDHS, 2014 likely due to the differences in the study design and sample size. This study was conducted in a sample representative of whole primary school children while others are not.

Socio-economic status of a population can be assessed as a function of a number of variables, such as family income, father's education and type of the residence etc. In the present study, majority of participants came from low-income group. Nutritional status of the participants were found greater than those of the participants comes from low-income families (Table 2).

Usual pattern of food intake revealed that a good percentage of participants do not

take milk (80%) and fruits (19%). Nearly 84% eat vegetables less than 3 times a week. On the other hand, moderate percentage of the participants takes meat/fish/egg (39%) and pulse (29%) at least 4 times a week. Food consumption score (FCS) of the household of the participants and the children individual dietary diversity score (IDDS) have been calculated. About 61% of participants household fall into borderline threshold while 28% and 4.8% fall into acceptable and poor threshold (Table 8). About 63% of the children take medium diversified diet while 27% high -diversified diet and 10% low diversified diet (Table 9).

Although the findings of this study can't be generalize but still it represents the similar findings of other studies. More critical analysis reveals that family income had the most significant influence on food habit and nutritional status of the primary school children. Hence, school health program with proper screening and better nutrition education can be recommended as early as possible.

CONCLUSIONS

The malnutrition of primary school going children became more prevalent in the present study; it is the high time for early detection and appropriate treatment of malnourished children in the elementary level. Otherwise it is not far when it will create immense burden for the nation. Moreover, further investigations are also needed to identify the risk factors of malnutrition among the primary school children.

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