International Journal of Contemporary Pediatrics
Fatema K et al. Int J Contemp Pediatr. 2023 Feb;10(2):134-141
http://www.ijpediatrics.com

pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20230075

Original Research Article

Nutritional status based on anthropometry among primary school children with and without school feeding program

Kanij Fatema[1]*, Ismat Ara[1], Mohammad E. Haque[1], Mohammad A. Rahman[2]

[1]Department of Nutrition and Biochemistry, National Institute of Prevention and Social Medicine, Dhaka, Bangladesh
[2]Upazila Health Complex, Kalukhali, Rajbari, Bangladesh

Received: 20 December 2022
Revised: 08 January 2023
Accepted: 10 January 2023

***Correspondence:**
Dr. Kanij Fatema,
E-mail: egirani.fatema@gmail.com

ABSTRACT

Background: Primary school period is a dynamic and growing period. So, school nutrition intervention promotes children's nutritional status, thereby improving the overall health status of a country as they are the nation's biggest investment. The objective of this study is to compare the nutritional status based on anthropometry among primary school children with and without a school feeding program.

Methods: A comparative cross-sectional study using simple random sampling to select 194 primary school children aged 6-13 years enrolled in two primary schools with (N=97) and without (N=97) school nutrition intervention in two upazilas in Rajbari district, Bangladesh. Data were collected from respondents with the assistance of guardians and teachers. Anthropometric data (height, weight, MUAC, body mass index for age Z score, height for age Z score, weight for age Z score,) were measured by anthro-plus software and overall data were analyzed by SPSS version 25.

Results: Of the total 194 respondents, the prevalence of stunting 9.3%, underweight 20.8%, thinness 27.8%, overweight 8.2%, and obesity 1.5% were observed. The prevalence of stunting 5.2%, underweight 21%, thinness 33%, and overweight 2.1% were found among the SFP group whereas 13.4% stunting, 20.5% underweight, 22.7% thinness, 14.4% overweight, and 3.1% obesity were found among without SFP group. The mean BMI-for-age Z scores were significantly lower (p=0.001) in the SFP group than in without SFP group. Socio-demographic characteristics may overrule this effect.

Conclusions: Findings suggest that determining the dietary pattern, and clinical signs and improving socio-demographic conditions may improve the nutritional status of the children with the school feeding program.

Keywords: School feeding program, Nutritional status, Anthropometry, Primary school children

INTRODUCTION

Child health is a growing concern all over the world with rapid economic growth and social changes. Nutritional status in childhood is the most important determinant of the health status of an adult person as its impact is seen on the socio-economic development of a nation. Malnutrition is a global problem that is affecting under five children easily. It is seen that 20-80% of primary school children are suffering from nutritional deprivation. Assessment of the nutritional status of children is an essential strategy for improving overall health.[1] Primary school age is a dynamic growth period that begins after the high mortality risk period in the preschool years and corresponds to the period from kindergarten to the secondary school period when adequate cognitive, affective and psychomotor achievement occurs. About 24% population of the less developed and 15% of that of the industrialized world are primary school-age children.[2] Nutritional status is assessed usually by anthropometry based on age, body weight, and height; several indices such as height-for-age, weight-for-height, and body mass index. The children are classified into three categories: stunting defined by low height-for-age, underweight defined by low weight-for-age, and wasting defined by low weight-for-height. Body mass index is a simple index commonly used to classify underweight, overweight, and obese. Usually stunting measures past (chronic) childhood under-nutrition, and underweight measures past (chronic) and present under-nutrition and wasting reflects current or acute under-nutrition.[3] Globally, it is seen that one-fourth of under-five children are stunted with 15% underweight, 8% wasted, and 6% overweight. In Sub-Saharan Africa the prevalence of stunting is 37%, underweight 21%, wasting 9%, and overweight 6%. In Ghana, the prevalence of stunting is 19%, wasting 5%, and underweight 11%.[4] South Asia has experienced high economic growth in the last decade and still has the highest rate and the largest number of undernourished children in the world.

In India, according to National Family Health Survey, about 45.5% of children are malnourished and 46% of India's children are underweight. Thus, India has the highest percentage of undernourished children in the world.[5] Nepal Demographic and Health Survey 2006 found 45% of under five children were underweight and 43% of children under five were stunted. Like other countries in the South Asia region, the prevalence of under-nutrition among children in Bangladesh is the highest in the world. The report of the Bangladesh Bureau of Statistics shows that the prevalence of underweight in boys (6-71 months) is 51.1%, wasting is 11.8%, and stunting is 48.5%. Globally school feeding program was introduced in South Africa in 1940 and was implemented on a large scale in China in 1970 and 1980. Few studies on the effects of school meals on the nutritional status of children have been reported. In Jamaica, the provision of a school breakfast benefited children's school attendance, achievements, and nutritional status, including height, weight, and body mass index.[6] When the UN World Food Program (WFP) collaborated with the government to launch the school feeding program in less food-secure areas of the country and in Bangladesh, the program started in 2002 by distributing fortified biscuits. European Union funded for distribution of tetra-pack milk and fortified biscuits in the same year. Land O' Lakes Foundation with the support of the US Department of Agriculture initiated a pilot project.[7] In 2000 a randomized control trial of a primary school-based fortification program in Bangladesh showed a 4.3% or 0.62 unit of Body Mass Index (BMI) increase in the treatment group compared to the control group. It is also seen a 15.7% improvement in Grade 4 test scores. SFP is being implemented in schools in poverty-stricken areas in our country. There are several types of school feeding that can be classified into two major groups: take-home rations, and in-school feeding programs including the provision of meals or snacks such as biscuits. In Bangladesh, the Government of the People's Republic of Bangladesh (GOB) launched the Food for Education (FFE) program on a large-scale pilot basis in 1993 for the 1st time. The program was designed to promote long-term human capital through education by transferring food to poor families of primary school-enrolled children.[8,9] Then in 2002 fortified biscuits were distributed in 33 upazilas, and in 2012 Dubai Cares and Gain jointly inaugurated a new pilot School Nutrition Program (SNP) sanctioned by GoB to provide a hot cooked meal to the primary school children. There is evidence from school feeding program evaluations that some programs improve children's nutritional status. But there are limited studies that showed the impact of school feeding programs on the nutritional status of school children. So, it is very much important to study the nutritional status based on anthropometry among primary school children with and without school feeding programs.

METHODS

Study location

The study was conducted in the two primary schools at two upazilas of Rajbari district, Bangladesh, one was the Khamarbari Government Primary School, Kalukhali, Rajbari, and the other was Moishala government primary school, Pangsha, Rajbari. The 1st school located at Kalukhali Upazila was with the school nutrition intervention. Here, the government provided biscuits as a school feeding program. Another school was located at Pangsha Upazila, where there was no school feeding program at that time. So, we chose two types of schools from two upazilas to compare nutritional status with and without a school feeding program.

Study design, population and sampling

A school-based comparative cross-sectional design was used. The study population was school-age children enrolled in primary schools within the Rajbari district and the age group was found to be of 6-13 years. In Rajbari, there are 45 primary schools within the Kalukhali Upazila and the school feeding program is running in all primary schools of Khalukhali Upazila. On the other hand, there are 179 primary schools in Pangsha Upazila, and the study place was in the municipality area. The total sample size was 194.

The sample size was determined using an alpha of 1.96 at 95% confidence interval with a permitted 80% power considering a 17% population prevalence of under-nutrition. This generated a sample size of 194; 97 each from with and without school feeding programs. Schools were selected purposively and then a simple random sampling technique was followed for the selection of respondents in different schools. Afterward, a sampling frame was made using the class register for each school. Then Daniel's random table was used for sampling and data were collected from selected respondents. Only pupils who were enrolled in the primary schools and available in that selected area at the time of data collection were eligible.

Inclusion criteria

Inclusion criteria for current study were; primary school children who would have enrolled in the primary school and available in that selected area at the time of data collection, the children who were willing to participate and give assent and legal guardians' consent was taken.

Exclusion criteria

Exclusion criteria for current study were; dropout primary school children were not included in the study and severely sick children.

Data collection tools and procedures

The study was conducted over one year starting from 1 January 2019 to 31 December 2019 through face-to-face interviews and physical examinations using a semi-structured questionnaire designed to achieve the study's objectives. The first stage involved the face-to-face answering of questionnaires usually by primary school children but in special situations, guardians and school teachers were allowed to supplement the interview or help the respondents. The second stage involved the anthropometric measurement of the children. The school assistant and Khude doctors (little doctors) of the schools helped to take weight, height, and measurement of mid-upper arm circumference. A weighing machine, height measuring tape, and white color MUAC tape were used to measure the children's weight, height, and mid-upper arm circumference. It took 20-30 minutes to take informed consent and interview. The study was granted an exemption by the Department of Nutrition and Biochemistry and was approved by the Institutional Review Board (IRB) at the National Institute of Preventive and Social Medicine (NIPSOM). Permission was taken from the Headmaster of the Moishala Government Primary School at Pangsha Upazila and from the Headmistress of Khamarbari Government Primary School at Kalukhali Upazila of Rajbari district. A complete assurance was given to them that all information provided by them would be kept confidential. After giving verbal and written consent from legal guardians and assent from primary school children they were recruited for the study.

Statistical analysis

Weight, height and MUAC measurements were converted to weight-for-age Z-scores (WAZ), height-for-age Z-scores (HAZ), body mass index (BMI), BMI-for-age Z-scores (BAZ) using 'WHO anthroPlus' verson 7.0 software. The resulting indices were used to determine the levels of underweight (WAZ<-2 SD), stunting (HAZ<-2 SD), thinness (BAZ<-2 SD) and overweight (BAZ>1 SD). Data entry and analysis were done using SPSS (version 25). Both descriptive and inferential statistics were used in analyzing and reporting findings. First, descriptive statistics-Frequency, Mean, SD, and Percentage, and second, inferential statistics-Chi-square, fisher exact-test, correlation, and one-way ANOVA were done. For categorical variables, frequency distribution and computation of percentages were done. Continuous variables were described in terms of Mean and SD. For the comparison of continuous variables, t-test was done. The Chi-square test and fisher exact test were used to determine whether there was any significant difference between expected frequencies and observed frequencies within categories. A p value <0.05 was considered to be significant.

RESULTS

Overall, the proportion of thin primary school children (wasted) was 27.8% while underweight was 20.8%. Moreover, 9.3% were stunted whereas 8.2% were overweight and 1.5% were obese. Total 33% of the primary school children who attended schools with school feeding program were thin (wasted) while 22.7% of those who attended schools without any feeding program were also thin (wasted) (Table 1).

Table 1: Nutritional status according to BMI-for-age Z-scores.

BMI-for-age Z-scores	School feeding	Non-school feeding	Total
	N (%)	N (%)	N (%)
+1SD to -2SD (normal BMI-for-age Z-scores)	63 (64.9)	58 (59.8)	121 (62.4)
>+1SD (overweight)	2 (2.1)	14 (14.4)	16 (8.2)
>+2SD (obesity)	0 (0)	3 (3.1)	3 (1.5)
<-2SD (thinness)	32 (33)	22 (22.7)	54 (27.8)
Total	97 (100)	97 (100)	194 (100)

Overweight was 2.1% among primary school children attending the SFP school and 14.4% among children attending school without the school feeding program. Moreover, no obese child was found in the school implementing the SFP as compared to 3.1% of children attending school without any feeding program. However, 64.9% of primary children with SFP school as against 59.8% of primary children without SFP school were normal BMI for Z scores. The prevalence of stunting was 9.3% (Table 2). However, stunting was high among children attending schools without any feeding program (13.4%) compared to those attending schools with feeding program (5.2%). 21% of those attending schools implementing the SFP were underweight as compared to 20.5% of children attending schools without any feeding program (Table 3).

Table 2: Nutritional status according to height-for-age Z-scores.

Height-for-age Z-scores	School feeding	Non-school feeding	Total
	N (%)	N (%)	N (%)
Upto -2SD (normal height-for-age Z-scores)	92 (94.8)	84 (86.6)	176 (90.7)
<-2SD to -3SD (moderate stunted)	3 (3.1)	10 (10.3)	13 (6.7)
<-3SD (severe stunted)	2 (2.1)	3 (3.1)	5 (2.6)
Total	97 (100)	97 (100)	194 (100)

Table 3: Nutritional status according to weight-for-age Z-scores.

Weight-for-age Z-scores	School feeding	Non-school feeding	Total
	N (%)	N (%)	N (%)
Upto -2SD (normal weight-for-age Z-scores)	60 (78.9)	66 (79.5)	126 (79.2)
<-2SD to -3SD (moderate underweight)	13 (17.1)	17 (20.5)	30 (18.9)
<-3SD (severe underweight)	3 (3.9)	0 (0)	3 (1.9)
Total	76 (100)	83 (100)	159 (100)

Table 4. Age and anthropometry of pupils attending schools with and without school feeding program.

Variables	School feeding (Mean±SD)	Non-school feeding (Mean±SD)	P value
Age (years)	9.19±1.48	9.19±1.46	0.310
Weight (kg)	24.79±5.89 (N=97)	26.27±6.72 (N=96)	0.104
Height	129.22±9.5 (N=97)	128.51±9.6 (N=97)	0.603
MUAC	18.91±2.23 (N=96)	18.61±2.61 (N=97)	0.397
BMI-for-age Z-score	-1.29±1.3 (N=97)	-0.60±1.54 (N=97)	0.001
WAZ	-1.14±1.10 (N=76)	-0.764±1.36 (N=83)	0.61
HAZ	0.793±0.07 (N=97)	0.794±0.11 (N=97)	0.917

Generally, no differences were observed in the mean age, weight, height, mid-upper arm circumference (MUAC), weight-for-age z-scores (WAZ), and height-for-age z-scores between primary school children attending schools with and without the school feeding program (Table 4).

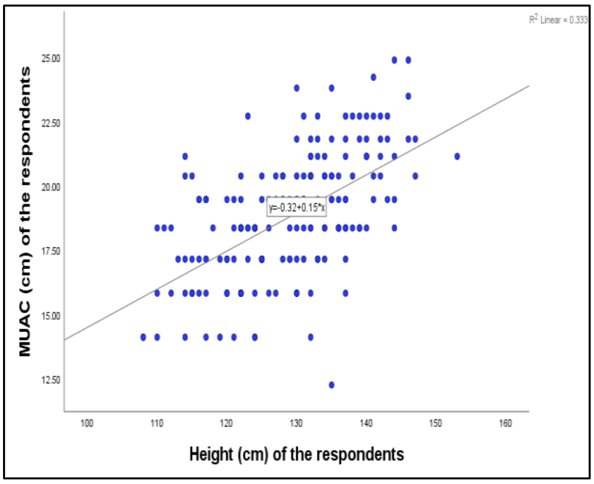

Figure 1: Correlation between the respondents' height (cm) and MUAC (cm).

However, children attending schools without the feeding program were found to have significantly higher BMI-for-age mean z scores (-0.60±1.54) compared to those attending schools with the feeding program (-1.29±1.3). We revealed the comparison of socio-demographic characteristics between SFP and without SFP school children (Table 5).

Sex, geographic location, parent's education, father's occupation, type of dwelling space, source of drinking water, and practice of hand washing were significantly different (p<0.05) between the two schools. Again, we saw among children attending SFP school that BMI-for-age Z-score was significantly higher in females (-0.5393±1.24943) in relation to males (-1.2262 ±1.37767). In the same way, BMI-for-age Z-score was significantly higher in the town area (-0.4948 ±1.35412) in relation to the village (-1.3202±1.25491).

The mean BMI-for-age Z-scores was maximum in graduate/post-graduate status, followed by secondary/higher secondary, primary, and no formal education status. There were statistically significant differences at the p<0.05 in BMI-for-age Z-scores for the three groups in the SFP school (Table 6).

Table 5: Socio-demographic characteristics of participants based on the type of school attended.

Variables		School feeding (%)	Non-school feeding (%)	P value
Age groups	5-7	18.6	14.4	0.310
	8-10	60.8	71.1	
	11-13	20.6	14.4	
Sex	Male	59.8	45.4	0.044
	Female	40.2	54.6	
Class	Lower Primary	37.1	36.1	0.432
	Middle Primary	43.3	50.5	
	Upper Primary	19.6	13.4	
Geographic location	Village	99	12.4	0.000
	Town	1	87.6	
Fathers occupation	Not Employed	1	1	0.000
	Farmer	38.1	1	
	Day labor	27.8	32	
	Businessman	13.4	34	
	Govt. service	0	10.3	
	Non-govt. service	8.2	8.2	
	Others	11.3	13.4	
Father's education	No formal education	28.9	20.6	0.024
	Primary	54.6	45.4	
	Secondary/Higher Secondary	13.4	21.6	
	Graduate/above	3.1	12.4	
Mother's occupation	Homemaker	81.4	80.4	0.112
	Government service	0	5.2	
	Non- Govt. service	0	1	
	Self-employed	11.3	9.3	
	Others	7.2	4.1	
Mothers education	No formal education	15.5	17.5	0.001
	Primary	73.2	47.4	
	Secondary/Higher Secondary	8.2	20.6	
	Graduate/above	3.1	14.4	
Monthly family income	≤10000	16.5	15.5	0.055
	10001-20000	52.6	35.1	
	20001-30000	16.5	25.8	
	>30000	14.4	23.7	
Children's no at home	1-2 Children	99	91.8	0.014
	3-4 Children	1	1	
	≥5 Children	0	7.2	
Type of dwelling space	Kancha	56.7	27.8	0.000
	Semi pacca	29.9	46.4	
	Pacca	13.4	25.8	
Source of drinking water	Tube-well	100	86.6	0.000
	Motor pump	0	9.3	
	Supply water	0	4.1	
Hand washing practice	Yes	86.6	94.8	0.048
	No	13.4	5.2	

One-way between groups analysis (ANOVA) was conducted among primary school children and indicated the mean BMI-for-age Z-scores was maximum in >30000 BDT (-0.4403 ±1.50044), followed by 20001-30000 BDT (-0.7871±1.58709), ≤10000 BDT (1.1587±1.49951), 10001-20000 BDT (-1.1773±1.29454). A post hoc test was conducted and revealed the mean BMI-for-age Z-scores for 10001-20000 BDT was significantly lower than

>30000 takas (Table 7). The correlation between the respondents' height (cm) and MUAC (cm) with and without school nutrition interventions is depicted in (Figure 1). It also revealed the mid-upper arm circumference of the respondents increased with the increase in height of the respondents. There was a significant positive moderate correlation between the MUAC of the respondents and the height of the respondents. (n=193, r=0.577, p=0.00).

Table 6: Relationship between BMI for age Z score and variables among pupils with SFP.

Variables		(%)	P value
Sex	Male	55	0.013
	Female	42	
Geographical area	Village	51	0.002
	Town	46	
Father's educational status	No formal education	22	0.013
	Primary	53	
	Secondary and or Higher Secondary	15	
	Graduate and or postgraduate	7	
Mother's educational status	No formal education	13	0.012
	Primary	62	
	Secondary and or Higher Secondary	12	
	Graduate and or postgraduate	10	

Table 7: Relationship between BMI-for-age Z-scores and monthly family income of the respondents (n=194).

Dependent variable	Monthly family income (Taka)	N	Statistics
BMI-for-age Z-scores	≤10000	31	F=2.670 p=0.049
	10001-20000	85	
	20001-30000	41	
	>30000	37	
Total	194		

DISCUSSION

The purpose of the study was to compare the nutritional status based on anthropometry among the primary school children enrolled in schools with and without school feeding programs. The key findings of the study were that the proportion of normal BMI-for-age Z-score was 64.9% in the school-feeding group compared to 59.8% of those in the without-school-feeding group. Moreover, 33% were thin (wasted) in the SFP group, and 22.7 % among without the SFP group. 2.1% overweight and obesity found in with SFP group as compared to 17.5% overweight and obesity found in without SFP group. More points, respondents without the SFP group were observed to have significantly high mean BMI-for-age Z-scores compared to those in the SFP group. The finding agrees with Ghana's finding, which reported the nutritional status of pupils attending public schools with and without school feeding programs.[4] Among SFP group, significantly high mean BMI-for-age Z-scores were also observed in female (-0.5393±1.24943) as against those in male (-1.2262±1.37767). Again, the mean BMI-for-age Z-score is significantly higher in the town area (-0.4948±1.35412) in relation to the village (-1.3202±1.25491) in respondents with the SFP group and there were statistically significant differences in BMI-for-age Z-scores for the three groups of educational status of parents. It was seen that among the SFP group the mean BMI-for-age Z-scores for postgraduate fathers and mothers were significantly different from parents who had no formal education. So, gender, geographic area, and educational status of parents likely had an effect on low mean BMI-for-age Z-scores among the SFP group. Further, the mean BMI-for-age Z-scores for monthly family income of more than 30000 BDT was significantly higher than the mean BMI-for-age Z-scores for monthly family income within 10001-20000 BDT in both schools. The proportion of normal height-for-age Z scores was 94.8% in the SFP group and 86.6% in the SFP group. It was also observed that the mean height-for-age Z score is slightly higher in attending respondents without school nutrition intervention as against those in respondents with school nutrition intervention but statistically not significant. About 5.2% of beneficiary respondents were stunted as against 13.4% of non-beneficiary respondents.

The proportion of normal weight-for-age Z-scores was 78.9% among beneficiary respondents as compared to 79.5% of non-beneficiary respondents. Moreover, the mean weight-for-age Z-scores in the without SFP group (-0.764±1.36) was more than that in with SFP group (-1.14±1.10) and it was a non-significant difference. There was a marginal difference observed between the proportion of underweight among the respondents who attended the school feeding program (21%) and those who attended school without any feeding program (20.5%). The non-significant findings about HAZ and WAZ correlated with the study conducted by Ghana, which reported the nutritional status of pupils attending public schools with and without a school feeding program.[4] The mean mid-upper arm circumference of respondents in the SFP group (18.91±2.23) was slightly more than that of the respondents in the without SFP group (18.61±2.61). Similarly, there was a marginal difference observed between the mean height [(129.22±9.5) (128.51±9.6)] and mean weight [(24.79±5.89) (26.27±6.72)] of the respondents in with and without school nutrition intervention and with a slight preponderance of height in SFP group and weight in without SFP group. There was a significant positive moderate correlation between the MUAC of the respondents and the height of the respondents.

To assess a better comparison of nutritional status between the two groups, socio-demographic characteristics were very important. The study explored different types of socio-demographic characteristics including age, gender, class, geographic location, parent's occupation and educational status, monthly family income, family size, family type, children number, type of dwelling space, source of drinking water, and hand washing practice. There was almost similar age distribution among the respondents in with SFP and without SFP groups. Among 194 respondents (each from with and without school nutrition intervention) mean age of respondents from with SFP group was 9.19±1.481 and from the without SFP group was 9.19±1.460. This finding seemed to follow the same patterns in Ghana from Agbozo, et al.[4] It was also seen 8-10 years were more prominent in both groups 128 (66%). Most of the respondents in the SFP group were male 54 (59.8%) and the rest of the respondents were female 39 (40.2%) whereas among those without the SFP group, male respondents 44 (45.4%) and female respondents 53 (54.6%). There was a significant difference ($p<0.05$) with respect to sex between the two groups whose findings were dissimilar to the study conducted by Zenebe et al.[10] Class distribution was divided into lower primary, middle primary, and upper primary and this finding is in line with other studies conducted in Ghana.[4] 96 (99%) of the respondents lived in the village and 1 (1%) lived in town from with SFP group whereas, among those without the SFP group, the corresponding figure were 12 (12.4%) and 85 (87.6%), respectively. However, significant differences in sex and geographic area were observed which were similar to the study of Agbozo et al.[4] Majority of the respondents 172 (88.7%) were Muslims, 20 (10.3%) were Sanatan, and the rest 2 (1%) were Christian in both groups. Fathers' occupations were divided into 7 categories: not-employed, farmer, day labor, businessman, and government. service, non-govt. service and other different occupations like potter, dairyman, confectioner, driver, shopkeeper, etc. The majority of the respondents' fathers were farmers 38.1% in with SFP group while the majority of the respondent's fathers were businessmen 34 % in the without SFP group but overall majority of respondents' fathers were day laborers 29.9%. A significant difference in fathers' occupations was found between the two groups. Again, mothers' occupations were categorized into a homemaker, govt. and non-govt. service holder, self-employed, and other different occupations like going abroad, working in garments temporarily, and working as a helping hand in another house. The majority of the respondent's mothers were homemakers in both groups. Guardians' occupations were dissimilar to the study of Agbozo et al.[4] The educational level of respondents' fathers and mothers was categorized into no formal education, primary education, secondary/higher secondary, and graduate/postgraduate. In the study, we did a Pearson's Chi-square test and got a p value for fathers' educational status 0.024 and for mothers' educational level 0.001. So, we could say there were significant differences with respect to both fathers' and mothers' educational status between the two groups. Again, the majority of the children with and without school nutrition intervention had 1-2 children at their home 95.4% followed by 5 or more than five children 3.6%, and 3-4 children 1%, and significant differences were found between groups. The educational status of the parents and family members was dissimilar to the study conducted in a pilot school in Bangladesh.[11] In addition, the majority of the children with and without school nutrition intervention had 2-4 family members 46.9% followed by 5-7 numbers 39.2% and ≥8 numbers (13.9%). Monthly family income and family members were found to be non-significant differences between groups which were similar to the study of Murayama et al.[11] In the present study significant differences in dwelling space of respondents, source of drinking water, and hand washing practice between groups were observed. Evaluation of the respondents' drinking water source showed that 93.3% used tube well water, followed by 4.6% motor pump, and 2.1% used supply water. The finding is consistent with the finding from the study in a selected rural community in Bangladesh which showed 75.9% of students used tube well water and 23.8% used supply water.[1]

Limitations

There are several limitations to our study. First, a simple random sampling was chosen, which might affect the result in the level of the young age group or in the sex strata. Secondly, there may have been reporting bias because much information was not known and the caretaker answered sometimes in a socially desirable way. Thirdly, the comparison may be hampered because of the selection of the schools in different geographic locations with gross socioeconomic disparity.

CONCLUSION

On the whole, the findings from this study have provided that the school nutrition intervention had impacted positively on the nutritional status of primary school children with school nutrition intervention based on anthropometric indicators, dietary status, and clinical findings. Nonetheless, there were higher percentages in some indices such as normal weight-for-age, overweight, obesity, underweight, and stunting in the children without school nutrition intervention. Therefore, findings from this study compared to other studies, are encouraging though some socio-demographic determinants influenced the school feeding program affect the evidence will be positively contributed to the knowledge of programmatic interventions.

ACKNOWLEDGEMENTS

The authors thank the National institute of preventive and social medicine (NIPSOM) for granting permission to carry out the study, and also all school heads and class teachers in the primary schools within the study area where the study was conducted. We appreciate school teachers and guardians who consented for their words to be part of the study and assisted in eliciting information from the children.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Shivaprakash NC, Joseph RB. Nutritional status of rural school going children (6 12 Years) of Mandya District, Karnataka. Int J Sci Study. 2014;2(2):39-43.
2. Adhikary M. Nutritional status among primary school children in an Upozila of Bangladesh. Northern Int Med College J. 2013;4(2):265-8.
3. Nowsin I, Begum N, Akbar EB, Alam MM. Study on nutritional status of rural school children of Bangladesh. Bangla J Physiol Pharmacol. 2014;30(1):6-10.
4. Agbozo F, Atitto P, Abubakari A. Nutritional status of pupils attending public schools with and without school feeding programme in Hohoe Municipality, Ghana. Food Nutr Res. 2017;5(7):467-74.
5. Shaikh MK, Kamble N, Bhawnani D, Bele S, Rao SR. Assessment of nutritional status among school children of Karimnagar, Telangana, India. Int J Res Med Sci. 2016;4(10):4611-7.
6. Murayama N, Magami M, Akter S, Hossain IA, Ali L, Faruquee MH, et al. A pilot school meal program using local foods with soybean in rural Bangladesh: effects on the nutritional status of children. Food Nutr Sci. 2018;9(4):290-313.
7. Afroze R, Mia MMU, Majumder MSI. School nutrition programme of BRAC and Banchte Shekha: a baseline report. research and evaluation division. Available at: https://bigd.bracu.ac.bd/publications/school-nutrition-program-of-brac-and-banchte-shekha-a-baseline-report/. Accessed on 20 November 2021.
8. Ahmed AU. Impact of feeding children in school: Evidence from Bangladesh. Available at: https://www.wfp.org/publications/impact-feeding-children-school-evidence-bangladesh-1. Accessed on 20 November 2021.
9. Ahmed AU, Del Ninno C. The food for education program in Bangladesh: An evaluation of its impact on educational attainment and food security. Available at: ttps://www.ifpri.org/publication/food-education-program-bangladesh. Accessed on 20 November 2021.
10. Zenebe M, Gebremedhin S, Henry CJ, Regassa N. School feeding program has resulted in improved dietary diversity, nutritional status and class attendance of school children. Italian J Pediatr. 2018;44(1):1-7.
11. Ara R, Hoque SR, Adhikary M, Uddin MN, Mahmood AR, Ferdousi SK. Nutritional status among the primary school children in a selected rural community. J Dhaka Med College. 2011;20(2):97-101.

Cite this article as: Fatema K, Ara I, Haque ME, Rahman MA. Nutritional status based on anthropometry among primary school children with and without school feeding program. Int J Contemp Pediatr 2023;10:134-41.