A Study On Nutritional Status And Dietary Habit Of School Children Associated With Socio Economic Status In Dhaka North City Corporation, Bangladesh

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Abstract:An improved intergeneration cycle of nutrition can eliminate the curse of malnutrition. The study aims to find out the current nutritional condition and dietary practices of the urban school children. A cross sectional study was conducted among 302 school children aged between 4-14 years in four private primary school of DNCC. Anthropometric measurements and socioeconomic condition were taken to assess nutritional status of the children. In addition dietary diversity score (HDDS) was calculated using FAO guideline 2006. Among total 302 children aged between 4-14 years 52.3% were boys and 47.7% were girls. 81.1% children had normal WAZ, while 87.8% attain normal HAZ and 91.7% had normal WHZ. 18.5% & 52.6% children respectively were normal (CDC & WHO BMI-for-age standards). About 52% of the participants had high HDDS. Whereas 89.7% children wash their hand before eating while 93.7% wash their hand after defecation among them 67% wash hand by soap and 40% brushes their teeth twice a day. BMI-for-age was found statistically significant (≥ 0.05) with family size & income, mothers' education and HDDS. The nutritional status and dietary habit of children were visibly good. The overall reduction of stunting, wasting and underweight in Bangladesh has been properly reflected in the present study.

Key words: Anthropometric indices, House hold dietary diversity score, Nutritional status, Schoolchildren,Socioeconomic status.

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I. Introduction

Nutritional status is an important index for measuring quality of life especially in children. The principal aim of the nutritional assessment of a community is to map out the magnitude and geographical distribution of malnutrition as a public health problem to discover and analyze the ecological factors that are directly or indirectly responsible [1]. In contrast well nourished people are a key resource for national development[2].

The health of children and youth is of fundamental importance [3]. Without ensuring optimal child's growth and development efforts to accelerate economic development may not be successful[4]. The school period is nutritionally significant because this is the prime time to build up body stores of nutrients in preparation for rapid growth of adolescence [5]. In children, protein/caloric deficient diet results in underweight, wasting and lowered resistance to infection, stunted growth and impaired cognitive development and learning[6][7][8][9]. The nutritional status of children does only reflect the socioeconomic condition of the family and social wellbeing of the community, but also the efficiency of health care system and the influence of the surrounding environment [10].

Malnutrition refers to under nutrition and over nutrition. Under nutrition have three commonly used comprehensive types named stunting, wasting and underweight measures by height-for-age, weight-for-height and weight-for-age indexes respectively [11].Over nutrition may describes as excess weight-for-age or overweight and the consequence of overweight is obesity is a term used to describe the excess accumulation of body fat which puts a person at increased risk of morbidity and premature death (WHO 1995) [12]. Malnutrition prevents children from reaching their full physical and mental potential [13] as well as diet is one of the prime determinants of health and nutritional status. An inadequate diet, poor in both quality and quantity has been one of the reasons for high levels of malnutrition in children [14].

Bangladesh is one of the few countries in the world where reductions in under nutrition have kept pace with the reduction of poverty [15]. According to Health Bulletin 2015, DGHS, Bangladesh, reported that the

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level of stunting has declined from 51% in 2004 to 36% in 2014. Wasting has declined from 17% in 2007 to 14% in 2014. The level of underweight has declined to 33% in 2014 from 43% in 2004[16].

Malnutrition not only affects individual buts its effect passed from one generation to the next as malnourished mother gives birth to infants who struggle to develop and thrive [17]. Adolescent mothers who are stunted by chronic under nutrition and they give birth to LBW babies. These children have a poor start in life and leads to stunting being underweight as a child and teenager. The high rate of adolescent pregnancies further exacerbates the situation as they are more likely to result in LBW baby and this cycle continues [18].

An improved intergeneration cycle of nutrition can eliminate the curse of malnutrition. The study aims to find out the current nutritional condition of the urban children. It will also reveal the concurrent dietary practices along with socioeconomic conditions of the urban community.

II. Materials and Methods

It is a cross sectional study (May 2016 to March 2017) to bring to light the nutritional status of school children aged between 4-14 years in Jaorshahara and Kuril of ward no. 17 in Dhaka north city corporation. The study was conducted in four private primary school named 'W', 'X', 'Y' & 'Z'.

Study sample: According to the definition of the children that all individuals under 18 are considered as children given by National children policy 2011 [19], a total of 302 children (from play group, class I, class III and class V were selected as study sample from the sampling frame of 511 school children. A total of 302 children from play group, class I, class III and class V were selected as study sample from the sampling frame of 511 school children.

Quantitative method: A structured questionnaire was used to collect data which was pretested in the similar school.

Data Collection: The anthropometric data were collected as follows:

Weight of the respondents was measured (to the nearest 0.1 kg) using standardized digital weight machine. The respondents were bare footed, minimum clothing and empty bladder and stomach. Edema waschecked before taking weight.**Height** of the respondents was measured (to the nearest 0.1 cm) using a locally made standardized height scale. Standardized techniques were followed like upright and straight, Frankfurt plane was horizontal, bare footed.

The Body Mass Index (BMI)-for-age charts for boys and girls aged 2 to 20 years were calculated by [weight (kg) / height (cm) / height (cm)] x 10,000. Based on CDC cut-off points, the respondents were divided into four nutritional categories based on BMI-for-age.

Socio-demographic information: The socioenomic information was collected including gender, religion, age, sex, parent's occupation and education, type of family, number of family members, housing condition, monthly family income and expenditure. The monthly income of the respondents was categorized into three economic groups : Low income group (LIG), Middle income (MIG),and High income (HIG).

Dietary Evaluation: Dietary diversity score (DDS) was calculated by using FAO guideline 2006 [20]. Household Dietary Diversity Score (HDDS) were categorized into 3 categories as follows.

Category	Range
Lowest dietary diversity	≤ 3 food groups
Medium dietary diversity	4 and 5 food groups
High dietary diversity	≥ 6 food groups

Data Analysis: Data were compiled, tabulated and analyzed using SPSS, ENA and MS Excel.

III. Result and discussion:

In the Table 1, socio-demographic characteristics (age, sex, study class, family size, housing condition, level of parents education and parents occupation) were shown. Out of three hundred and two (302) children 81 (26.8%) blong to the age group 4 to 6 years, followed by 115 (38.1%) school children from 7 to 9 years and 106 (35.1%) from 10 to 14 years. Among them 158 were boys which comprise to 52.3% and of the total 144 (47.7%) were girls. Whereas 71 children from play group, 78 children from class I, 73 children from class III and 80 children from class V participated in the survey. Again 74.8% children had family size of 1 to 3, while 16.9% and 8.3% had family size of 4 to 6 and ≥ 7 respectively. Most of participants' (65.6%) family lived in building followed by 19.9% lived in tin shades and 14.5% lived in halfwall & semi concrete building. Education level of majority of the mother (67.9%) and father (63.6%) of the school children were below SSC while 15.6%, 9.6% and 6.9% mothers were from SSC, HSC and above HSC level respectively, on the other hand 12.3%, 11.9% and 12.2% fathers were from SSC, HSC and above HSC level of education respectively. Also 85.0%

mothers were housewife, while 6.0%, 2.0% and 7.0% involved in govt. & non govt. office, business and others(day labor, maid, garments etc) occupation. Again 39.0% fathers of the school children involved in business, 36.8% involved in different govt. & non govt. office job and 24.2% were day labor, driver, rickshaw puller etc.

Table 1: Socio-demographic characteristics (Respondent school children & their family N=302)

Parameters	Indicators/Range	No. of Participants	Percentage (%)
Age	4-6 years	81	26.8
	7-9 years	115	38.1
	10-14 years	106	35.1
Total		302	100.0
Sex	Boy	158	52.3
	Girl	144	47.7
Total		302	100.0
Class	Play group	71	23.5
	Class I	78	25.8
	Class III	73	24.2
	Class V	80	26.5
Total		302	100.0
Family size	1-3	51	16.9
	4 to 6	226	74.8
	≥7	25	8.3
Total		302	100.0
Housing condition	Building	198	65.6
	Tin shade	60	19.9
	Half wall & semi concrete	44	14.5
Total		302	100.0
Parents education	Mother	Below SSC	205	67.9
		SSC	47	15.6
		HSC	29	9.6
		Above HSC	21	6.9
	Total	302	100.0`
	Father	Below SSC	192	63.6
		SSC	37	12.3
		HSC	36	11.9
		Above HSC	37	12.2
	Total	302	100.0
Parents occupation	Mother	Govt. & non govt. office	18	6.0
		Business	6	2.0
		Housewife	257	85.0
		Others (day labor, maid, garments etc)	21	7.0
	Total	302	100.0
	Father	Govt. & non govt. office	111	36.8
		Business	118	39.0
		Others (day labor, driver, rickshaw puller etc)	73	24.2
	Total	302	100.0

Distributions of income and expenditure of thefamilies: Wealth and malnutrition are clearly linkedin Bangladesh. The poorest have the highestrates of stunting as well as stunting trends reflectwidespread poverty. A significant drop instunting rates across wealth quintiles isnot seen until quintile 5 or the richest 10%by wealth [21]. MQSUN (Maximizing the Quality of Scaling up Nutrition Programs) report, 2015 showed the significant relation of nutritional status and income [22]. But in India, a 25% of the children from the top income quintile were stunted in 2006 [23]. Income per capita and child nutritional status was found to be less significant than expected(Gillespie & Allen, 2002) [24].In the present study income of the household's catagorizes according to quintile method, 1st 20% considerd as low income group, 21%-80% as middle income group and above 80% as high income group. About 67.2% respondents belong to middle income group. Whereas 15.9% and 16.9% were from lower income group and high income group respectively. The avarage income of low income group, middle income group and high ioncome group is 14,617 BDT, 32,805 BDT and 98,779 BDT respectively . While, the overall average expenditure of the family according to low, middle and high income group is 13,292 BDT, 26,312 BDT and 46,004 BDT respectively(Table: 2).

Table 2: Distribution of income and expenditures of the families

Family Income	No. of respondents	Percent (%)	Mean income in BDT	Mean expenditure in BDT

Low income group (7000-18000BDT)	48	15.9	14617	13292
Middle income group (18001-50000BDT)	203	67.2	32805	26312
High income group (above 50001)	51	16.9	98779	46,004
Total	302	100.0		

Distribution of family expenditure on food, education and health: In the Table 3,it was found that every household spends maximum money on food from their monthly income. Whereas expenditure on education of low, middle and high income group is 1,485 BDT, 2,655 BDT and 5,468 BDT respectively and expenses on health/medicine is 579 BDT, 1,200 BDT and 1,810 BDT respectively.

Table 3: Distribution of family expenditure on food, education and health

Income group	Expenditure on food	Expenditure on education	Expenditure on health/ medicine
Low income group	6,498	1,484	579
Middle income group	10,816	2655	1,199
High income group	15,942	5,468	1,809

Nutritional status of school children based on Z-score: Nutritional status of 196 school children out of 302 of the survey area were assessed according to three anthropometric indices of nutritional status: weight-for-age, height-for-age and weight-for-height Z-score referred to as underweight, stunting and wasting respectively. Table 4 revealed that 13.8% of the school childrens did not attain their required weight according to their age. About 81.1% were found normal weight according to their age. On the other hand, 11.7% school children were found stunted, 87.8% had normal height according to their age and 91.7% were found normal weight according to their height.

Table 4: Nutritional status of school children based to Z--score (N=196)

Weight-for-age Z-score (WAZ)			Height-for-age Z-score (HAZ)			Weight-for-height Z-score (WHZ) (assessed 36 out of 302 children aged between 4-5 years)		
	N	%		N	%		N	%
Underweight	27	13.8	Stunted	23	11.7	Underweight	0	0
Normal	159	81.1	Normal	172	87.8	Normal	33	91.7
Overweight	10	5.1	Tall	1	.5	Overweight	3	8.3
Total	196	100.0	Total	196	100.0	Total	36	100.0
Cutoffs points: ≤-2SD underweight; >-2SD to ≤+2SD normal; >+2SD overweight								

Nutritional status of school children based on BMI-for-age:BMIwas used to assess underweight, overweight, and risk for overweight, children's body fatness changes over the years as they grow. This is why BMI for children, also referred to as BMI-for- age [25]. The weight-for-stature curve does not show age-related changes while the BMI-for-age chart does show age related changes more accurately [26]. WHO recommends that in older children (>10 years) BMI forage should be used instead of weight for height to avoid errors inassessment due to changes of puberty [27]. BMI-for-age is the method recommended for screening overweight and underweight in children and adolescents from 2 to 20 years of age. BMI-for-age is a screening tool that may lead to further assessment to diagnose a specific health condition [28]. In the study we used a recently adopted nutrtitional status indicator named BMI-for-Age and assessed 302 school children aged between 4 to 14 years according to CDC BMI-for-age standards. According to Table 5, it was found that the prevalance of underweight and obese of the school children was 79.1% and 0.7% respectively. About 18.5% school children were normal and 1.7% found overweight. On the other hand 294 school children aged between 5 to 14 years were assessed according to WHO BMI-for-age standards. Study reveals the prevalence of underweight and obese of the school children was 32.8% and 3.3% respectively. About 52.6% school children were found normal and 8.6% found overweight.

Table 5: Nutritional status of school children based on BMI-for-age

	BMI-for-Age(according to CDC for 2-20 years children)[1] [**N=302**]		BMI-for-Age(according to WHO 5-19 years children)[2] [**N=294**]	
Nutritional status	N	%	N	%
Underweight	239	79.1	99	32.8
Normal	56	18.5	159	52.6
Overweight	5	1.7	26	8.6
Obese	2	.7	10	3.3
1.Using the BMI-for-Age Growth Charts, CDC;2. Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004.				

Cutoff points: [≤ -2SD z-score (≤ 18.50BMI) is considered as Underweight, >-2SD and ≤ +1SD z-score (equivalent to BMI 18.5-24.99) is Normal, >+1SD and <+2SD z-score (equivalent to BMI 25–29.99) is Overweight, >+2SD z-score (equivalent to BMI above 30) is Obese]

Although in this study several indicators were used to represent nutritional status of school children. It was found that the results were not consistant with the different indicators. According to CDC only 18.5% children were normal and in response to WHO standards about 52.6% children found normal. As such the study findings helped to figure out the importance of using of various indicators. As single indicator may not interpret the real scenario.

Household dietary diversity score (HDDS): The Nutritional status of children is dependent on several factors that include dietary intake that is in turn influence by food variety and frequency of food intake [29]. Dietary surveys are therefore one of the essential components of nutritional assessment. Assessing dietary adequacy in terms of quality and quantity is equally important. School age is a precious time for acquisition of skills that permits independence in eating and developing liking and disliking of food. Developments of good food habits and nutritional practices in early childhood establish the foundation for adult health [30]. Thus in this study HDDS was assessed and found that majority (52%) of the households had high HDDS followed by 5.3% and 42.7% had low and medium dietary diversity score respectively (Figure 1).
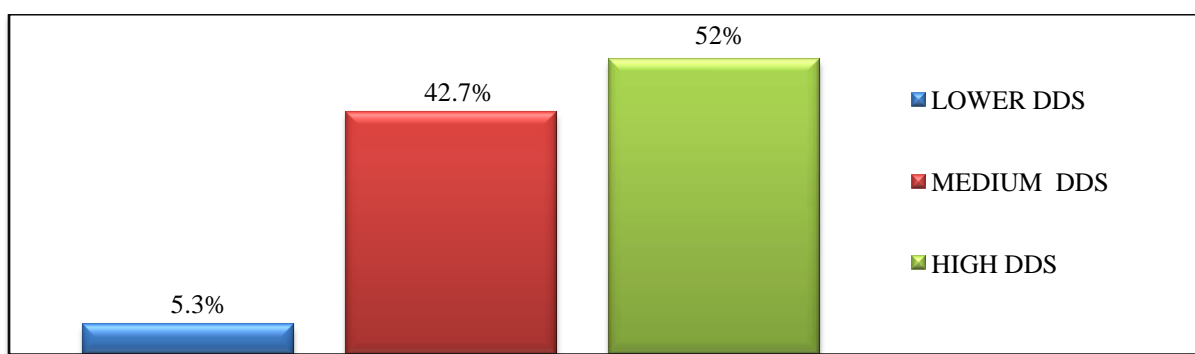

Figure 1: Household dietary diversity score

Hygiene practices among school children: In the Figure 2, hygiene practices among school children were shown. It was found that 89.7% school children wash their hands before eating while 10.3% did not. On the other hand 93.7% of the participants wash their hand after defecation 6.3% were found who do not wash their hand after defication however their parents or someone else assisted them in cleaning after defication. Majority of the children (67%) used soap washing hand while 24% and 9% used hand wash and both respectively. On the other hand 40% of the school children brush teeth twice a day and 60% of the them did not.
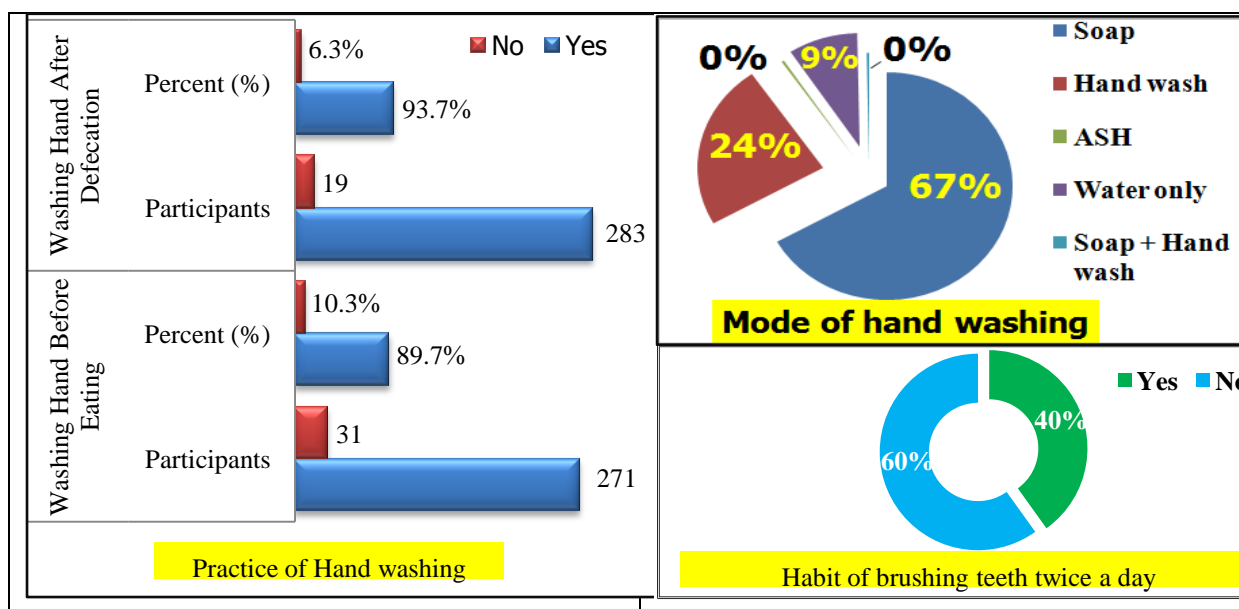

Figure 2: Hygiene practices among school children

Relationship between family size and different anthropometric indices: The families of the participant were divided into three catagories in order to analyze the relationship between family   sizes with various anthropometric indices of the participants. Where BMI for age Z-score and height-for-age(stunting) P-value was found statistically significant (P-value ≤0.05) but weight-for-age P-value was not statistically significant (Table 6).

Family Size	Anthropometric Indicators																				
	Weight-for-age (Underweight) (N=196)						Height-for-age (Stunting) (N=196)						BMI for age Z-score (N=302)								
	Underweight		Normal		Overweight		Stunted		Normal		Tall		Underweight		Normal		Overweight		Obese		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Small	4	2.0	38	19.4	2	1.0	5	2.6	39	19.9	0	.0	43	14.2	7	2.3	1	.3	0	.0	
Medium	23	11.7	108	55.1	6	3.1	18	9.2	119	60.7	0	.0	182	60.3	41	13.6	2	.7	1	.3	
Large	0	.0	13	6.6	2	1.0	0	.0	14	7.1	1	.5	14	4.6	8	2.6	2	.7	1	.3	
P-value	.190						.007						.011								

Table 6: Relationship between family size and anthropometric indices

Relationship between income and anthropometric indices: In Table 7 the relationship between family income and various anthropometric indices of the participants were shown. From the analysis association between income and BMI-for-age was found statistically significant (P-value ≤0.05) while P-value of WAZ and HAZ were not statistically significant with income of the respondents.

Family income	Anthropometric Indicators																				
	Weight-for-age (Underweight) (N=196)						Height-for-age (Stunting) (N=196)						BMI for age Z-score (N=302)								
	Underweight		Normal		Overweight		Stunted		Normal		Tall		Underweight		Normal		Overweight		Obese		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Lower	7	3.6	24	12.2	1	.5	6	3.1	26	13.3	0	.0	43	14.2	2	.7	2	.7	1	.3	
Middle	19	9.7	107	54.6	7	3.6	17	8.7	115	58.7	1	.5	160	53.0	41	13.6	1	.3	1	.3	
High	1	.5	28	14.3	2	1.0	0	.0	31	15.8	0	.0	36	11.9	13	4.3	2	.7	0	.0	
P-value	.298						.179						.020								

Table 7: Relationship between income and anthropometric indices

Relationship between mothers' education and anthropometric indices: Education levels of the parent's were divided into four catagories in order to examine the relationship between parent's education and different anthropometric indices of the participants. From the analysis, only BMI-for-age have statistical association between mother's education and anthropometric indices was found (P-value ≤0.05). On the other hand no statistical association were found between father's education and anthropometric indices (Table 8&9).

Table 8: Relationship between mother's education & anthropometric indices

Mothers Education	Anthropometric Indicators																				
	Weight-for-age (Underweight) (N=196)						Height-for-age (Stunting) (N=196)						BMI for age Z-score (N=302)								
	Underweight		Normal		Overweight		Stunted		Normal		Tall		Underweight		Normal		Overweight		Obese	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Below SSC	22	11.2	100	51.0	5	2.6	15	7.7	111	56.6	1	.5	171	56.6	30	9.9	2	.7	2	.7
SSC	2	1.0	26	13.3	3	1.5	4	2.0	27	13.8	0	.0	26	8.6	20	6.6	1	.3	0	.0
HSC	2	1.0	22	11.2	0	.0	3	1.5	21	10.7	0	.0	26	8.6	2	.7	1	.3	0	.0
Above HSC	1	.5	11	5.7	2	1.0	1	.5	13	6.7	0	.0	16	5.3	4	1.3	1	.3	0	.0
P-value	.299						.991						.003							

Table 9: Relationship between father's education and anthropometric indices

Fathers Education	Anthropometric Indicators																				
	Weight-for-age (Underweight) (N=196)						Height-for-age (Stunting) (N=196)						BMI for age Z-score (N=302)								
	Underweight		Normal		Overweight		Stunted		Normal		Tall		Underweight		Normal		Overweight		Obese	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Below SSC	21	10.7	96	49.0	6	3.1	16	8.2	106	54.1	1	.5	161	53.3	28	9.3	2	.7	1	.3
SSC	3	1.5	19	9.7	2	1.0	1	.5	23	11.7	0	.0	24	7.9	11	3.6	1	.3	1	.3
HSC	1	.5	22	11.2	1	.5	2	1.0	22	11.2	0	.0	25	8.3	10	3.3	1	.3	0	.0
Above HSC	2	1.0	22	11.3	1	.5	4	2.0	21	10.7	0	.0	29	9.6	7	2.4	1	.3	0	.0
P-value	.481						.935						.085							

IV. Conclusion

The nutritional status of school children were found noticeably good. The overall reduction of stunting, wasting and underweight among the children in Bangladesh has been properly reflected in the present study. Study shows that the hygiene condition is satisfactory among the respondents. It also revealed that people eat more diversified food now a day. The nutritional status of the schoolchildren is a sensitive indicator of the country's health, sustainable nutrition and economy. As Bangladesh has not yet been free from the curse of malnutrition, the ongoing effective policy and programs should be continued to achieve the sustainable development goal in the year of 2021.

V. Limitations of the study

Sample Inclusion criteria: Regular and those who agreed to provide interview willingly wereincluded.
Exclusion criteria: Students who were absent and below 4years and above 14 years were excluded. Moreover whose parents were not agreed to be interviewed was excluded from the sample.

References

[1]. A. Srivastava, S. E. Mahmood,P. M. Srivastava,Ved P. Shrotriya, and B. Kumar, Nutritional status of school-age children - A scenario of urban slums in India. *Arch. Public Health. 70(1):8.*2012 Apr17.doi: 10.1186/0778-7367-70-8PMCID: PMC3436633.
[2]. A. M. Z.Hussain, MQK. Talukder, T. Ahmed, Nutrition background paper to inform the preparation of the 7th five year plan.*1:8.*2015 January 10. Available from:http://sustainabledevelopment.un.org/focussdgs.html
[3]. PK. Raghava, School health.*Indian journal of community medicine. 30:1-3.* 2005

[4]. Anonymous. Life in the 21st century – A vision for all. *WHO Report*. 93. Geneva;1998.

[5]. S. Kumari, and R. Jain, Assessment of school children from rural Bihar. *Ind. J. Nutr. Dietet.42: 326-334.*2005.

[6]. A.R. Gowri, and H.J. Sangunam, Assessment of mental and motor abilities of school going children with anemia. *Ind. J. Nutr. Dietet.42: 99-105.*2005.

[7]. RuchikaHanda, FaizanAhamad,Kavindra Kumar KesariandRanuPrasad.Assessment of Nutritional Status of 7-10 Years School Going Childrenof Allahabad District: A Review. *Middle-East Journal of Scientific Research.3 (3): 109-115, ISSN 1990-923.* 2008

[8]. L. Liu, HL. Johnson, S. Cousens, J.Perin, S. Scott, JE. Lawn, I. Rudan, H. Campbell, R. Cibulskis, M. Li, C. Mathers, RE. Black, for the Child Health Epidemiology Reference Group of WHO and UNICEF. Global, regional,and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000.*Lancet.379:2151–61.* 2012

[9]. RE. Black, LH. Allen, ZA. Bhutta, LE. Caulfield, M. de Onis, M. Ezzati, C. Mathers, J. Rivera. Maternaland child undernutrition study group. Maternal and child undernutrition: globaland regional exposuresand health consequences. *Lancet. 371:243–60.* 2008.

[10]. Srivastava et al. Nutritional status of school-age children – A scenario of urban slums in india. *Archives public health. 70:8.* 2012.

[11]. World Health Organization. Physical status : The use and interpretation of anthropometry.*WHO technical report series no. 854.* Geneva: WHO, 1995.

[12]. World Health Organization. Physical status: The use and interpretation of anthropometry. *WHO technicalreport series no. 854.*Geneva: WHO,1995

[13]. Indira Bishroj Shashi. Weight measurement of primary school rural community of faizabad. *The Indian practitioner. 109(6):461.* 1990

[14]. R. P. Soni,MittuKatoch.Dietary adequacy of school going children in selected areas ofHimachal Pradesh (Sharma. and Chawla 2005)*. IOSR Journal of Humanities And Social Science (IOSR-JHSS).Volume 19, Issue 9, Ver. II (Sep. 2014), PP 85-90.*

[15]. FAO, WFP and IFAD. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. The state of food insecurity in the world 2012. FAO, Rome, 2012.

[16]. *Health bulletin, Bangladesh. 13:129-130.* 2015,

[17]. Bangladesh demographic and health survey, 2007.

[18]. World food program (WFP). Bangladeshnutrition strategy 2012-2016, p.7.

[19]. National children Policy 2011, Ministry of Women and Children Affairs, February 2011, p.3.

[20]. Candance Gabel,Ellen Schuster. HDDS Adopted from Texas A&M University and Iowa State University, 8/06.

[21]. Save the Children. Malnutrition in Bangladesh, 2015. Available from: https://www.savethechildren.org.uk/sites/default/files/images/Malnutrition_in_Bangladesh.pdf

[22]. NabeelaAhmed,Inka Barnett, &Richard Longhurst. Determinants of child undernutrition in Bangladesh literature review. *MQSUN Report.*April, 2015.

[23]. Health Report, India, 2015.

[24]. S. Gillespie &L. Haddad. Attacking the double burden of malnutrition in Asia and the Pacific(*Vol. ADB Nutrition and Development Series): Asian Development Bank.* 2001.

[25]. LD. Hammer, HC. Kraemer, DM. Wilson, PL. Ritter, SM. Dorn-busch, Standardized percentile curves of body mass index for children & adolescents. *Am J Dis Child,145:259–63.* 1991

[26]. WVR. Viewega, AB. Sood, A. Pandurangi, JJ. Silverman. Application of body mass index principles in a model el-ementary school: implications for overweight and obese children. *J Natl Med Assoc,96:468–75.* 2004.

[27]. GK. Mendhi, A.Barua, J. Mahanta. Growth and nutritional status of school age children in tea garden workers ofAssam. *J human Ecol.19(2):83-85.* 2006

[28]. Using the BMI-for-Age Growth Charts, CDC; Available at: https://www.cdc.gov/nccdphp/dnpa/growthcharts/training/modules/module1/text/module1print.pdf

[29]. A. Srivastava, S. E. Mahmood,P. M. Srivastava,Ved P. Shrotriya, and B. Kumar, Nutritional status of school-age children - A scenario of urban slums in India. *Arch. Public Health. 70(1):8.* 2012 Apr17. doi: 10.1186/0778-7367-70-8PMCID: PMC3436633.

[30]. R. P. Soni,MittuKatoch. Dietary adequacy of school going children in selected areas ofHimachal Pradesh (Sharma. and Chawla 2005)*. IOSR Journal of Humanities And Social Science (IOSR-JHSS).Volume 19, Issue 9, Ver. II (Sep. 2014), PP 85-90.*