NUTRITIONAL STATUS OF SCHOOL GOING CHILDREN (6-15 YEARS) IN A SEMI-URBAN AREA OF CACHAR DISTRICT, ASSAM

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ABSTRACT

BACKGROUND

The foundation of adequate growth and development is laid before birth, during childhood, and is followed during adolescence. Nutritional status is an important index for measuring quality of life especially in children. In this respect, understanding the nutritional status of children has far reaching implications on better development of future generations as well as future development of humanity. Malnutrition and diet are by far the biggest risk factors for the global burden of disease.

MATERIALS AND METHODS

A cross-sectional study was conducted to understand the malnutrition scenario among the rural school children of 6-15 years age group and interplay of different sociodemographic factors contributing to it. Anthropometric data were analysed using WHO Anthro Plus version 1.0.4 software for assessing the growth of the children and by using appropriate statistical methods.

RESULTS

The mean height of boys and girls of the study group was lower than WHO 2007 standards in all age groups. Of the 216 school children, 53, 31 and 111 were stunted/severely stunted, underweight/severely underweight, and thin/very thin, respectively. Both univariate and multivariate analysis revealed different associated sociodemographic factors contributing to poor nutritional status of children such as low socioeconomic status and poor educational background of their parents (p<0.05).

CONCLUSION

The causes of malnutrition are not only recent but also long term deprivation resulting to chronic malnutrition. Malnutrition results from the interaction of poor-quality diets and poor-quality health and care environments and behaviours, so urgent steps should be taken to improve nutritional status of school children.

KEYWORDS

School Children, WHO Reference Standard, Adolescent, Malnutrition.

BACKGROUND

Poor nutrition starts before birth, and generally continues into adolescence and adult life and can span generations. Chronically malnourished girls are more likely to remain undernourished during adolescence and adulthood, and when pregnant, are more likely to deliver low birth-weight babies.[1] Nutritional status is an important index for measuring quality of life especially in children. In this respect, understanding the nutritional status of children has far reaching implications on better development of future generations[2] as well as future development of humanity.[3] School age is a dynamic period of physical growth as well as of mental development of the child.[2] During the adolescent growth spurt, body requires lot of nutrients which should be stored in the body during childhood and if body stores are deficient it can result in adverse health consequences like growth retardation, scholastic backwardness and reduced work capacity.[4] Malnutrition manifests itself in many different ways: as poor child growth and development; as individuals who are skin and bone or prone to infection; as those who are carrying too much weight or who are at risk of chronic diseases because of excess intake of sugar, salt, or fat; or those who are deficient in important vitamins or minerals. Malnutrition and diet are by far the biggest risk factors for the global burden of disease: every country is facing a serious public health challenge from malnutrition. The economic consequences represent losses of 11 percent of gross domestic product (GDP) every year in Africa and Asia, whereas preventing malnutrition delivers $16 in returns on investment for every $1 spent.[5]

In adolescence, a second period of rapid growth [Fig. 1] may serve as a window of opportunity for compensating for early childhood growth failure, although the potential for significant catch-up is limited. Research evidence suggests that optimal nutrition during the brief period of pre-pubertal growth spurt, some 18 to 24 months immediately preceding menarche, results in catch-up growth from nutritional deficits suffered earlier in life.[6]

Studies addressing undernutrition are mostly restricted to under-5 populations, whereas very few studies have addressed school-going children to assess the magnitude of the problem. Hence, the present study was conducted to

understand the malnutrition scenario among the school children of 6-15 years age group in Cachar district of Assam.
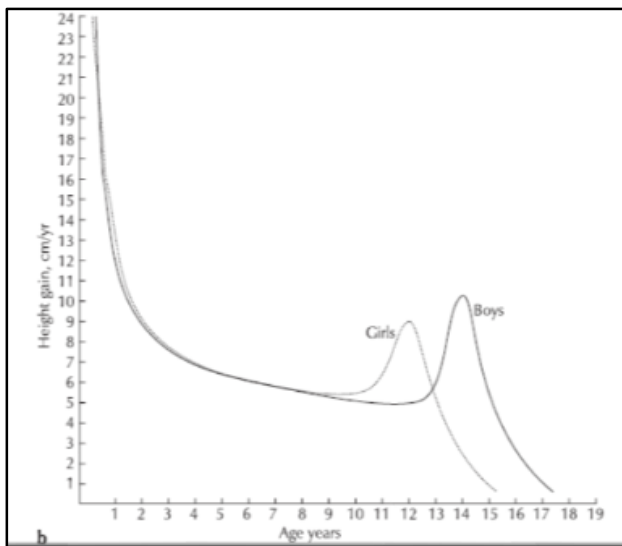

Figure 1. Source: Tanner J. Growth at Adolescence. Oxford: Blackwell Press, 1962.

1. To assess the nutritional status of rural school-going children of age group 6-15 years in Cachar district, Assam.
2. To study the interplay of different sociodemographic variables associated with the nutritional status.

MATERIALS AND METHODS

The present study was undertaken after ethical approval was obtained from the Institutional Ethics Committee of Silchar Medical College, Silchar. Study design adopted was a cross-sectional study. The sample size was calculated as 190 by using the formula: $n=Z^2PQ/D^2$ Where: n=minimum sample size Z= 1.96. P= 45%,[7] absolute precision of 10 % at 95% confidence interval with a design effect of 2.

The method of multistage sampling was used. There are 8 education blocks in Cachar district out of which Udharbond education block was selected randomly. Following which 3 government upper primary schools located nearby Silchar town were selected conveniently from total of 23 upper primary schools having total enrolment of 904 students. All children in the age group of 6-15 years of both sexes in these schools were included in the study.

They were divided into three groups 6-9 years, 9-12 years, 12-15 years by stratified random sampling. Total of 216 students were recruited for the study. For participation of the study subjects, parents/guardians were informed about the study objectives and verbal consent was obtained prior to inclusion in the study.

General information was collected by using a predesigned pretested questionnaire. Anthropometric measurements such as weight and height were recorded by using standard operating procedures. Weight was measured in a standard weighing (Bathroom). Weighing scale was calibrated every time before a new measurement was taken. Height was measured to the nearest 0.1 cm with no stretchable tape which was fixed to a vertical smooth wall and the subject was asked to stand erect without footwear on a firm/level surface

with his/her back against the wall, feet parallel, and hands hanging by the sides. Each measurement was done twice and the average of the two readings was recorded.

After collection, all data entered in Microsoft excel 2007 and analysed by suing Statistical Package for Social Sciences (SPSS) software version 16.0 and appropriate statistical tests were applied. For quantitative data like height, weight, mean and standard deviation was calculated and compared with WHO reference values. The group comparisons for the categorical variables were analysed using Chi square test. The group comparison for quantity variables were analysed using two tailed independent student t test.

Multiple logistic regression analysis was used and odds ratio calculated to find the strength of association. The p value of less than 0.05 was considered as statistically significant. For nutritional assessment, Z-scores of BMI for age, height for age and weight for age were computed and used to assess thinness/overweight/obesity, stunting and wasting respectively using the WHO new reference values for school boys and girls.

Anthropometric Data were Analysed using WHO Anthro Plus Version 1.0.4 Software for Assessing the Growth of the Children. The children were classified using the following Categories-

1. Stunting (chronic undernutrition) is defined as a low height for age. Children with z scores (HAZ) < −2 are considered as stunted and those with HAZ < −3 are severely stunted.
2. Underweight (mixed acute and chronic undernutrition) is defined as a low weight for age. Children with z scores (WAZ) < −2 are considered as underweight and those with WAZ < −3 are severely underweight.
3. Thinness (measure of body fat) is defined as a low body mass index. Children with z scores (BMIZ)< −2 are considered as thin and those with BMI < −3 are severely thin.
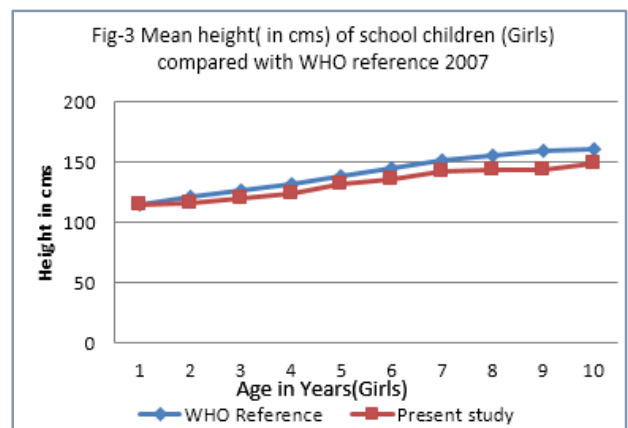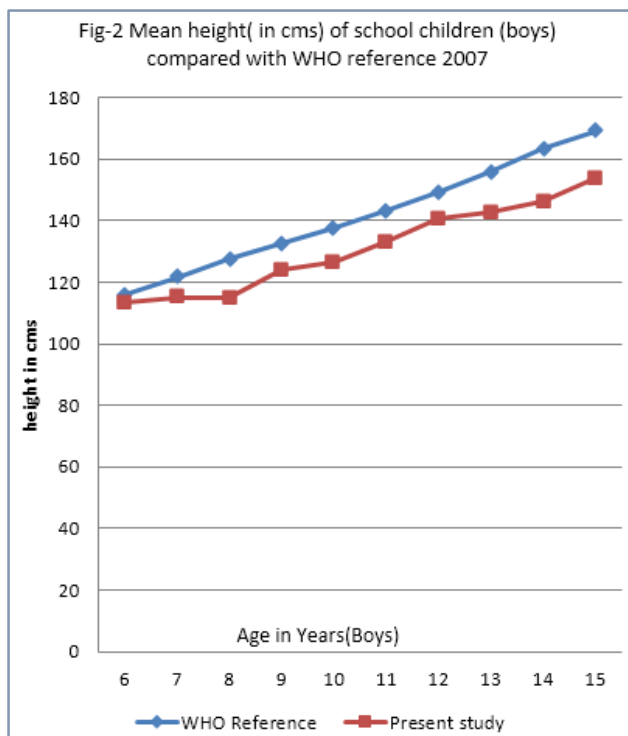
RESULTS

Overall 216 school children of age group between 6 and 15 years were surveyed. Majority of the study subjects were girls (62.5%) and the rest were boys (37.5%). Among the study subjects, similar distribution of higher percent of girls comparable to boys was reported by other authors.[8]

Mean age with standard deviation (SD) of girls and boys was 11.32 ± 2.18 yrs and 11.17 ± 2.17 yrs. respectively. Mean weight with standard deviation (SD) of girls and boys was 27.84 ± 7.54 kg and 26.07 ± 7.92 kg respectively. The mean height (with SD) of the girls was 136.64 ± 11.68 cm, whereas that of boys was 134.08 ± 12.02 cm. In the present study, the BMI was found to be 19.6 ± 3.6 and 20.8 ± 3.9 in boys and girls respectively in the age group of 10-14 years.

Table 1 shows that the mean weight of girls were more than the boys except for the age group of 7, 14, 15. Similar observation was reported by other authors.[9,10,11] The figures 2 and 3 show that the mean height of boys and girls of the study group was lower than WHO 2007 standards in all age groups.

Age/ Years	Sex	Mean Height	Standard Deviation	Mean Weight	Standard deviation
6	M	113.5	4.9	17.2	4.09
	F	114.3	2.5	18.7	1.53
7	M	115.1	5.01	17.8	2.76
	F	116.4	4.8	15.8	0.76
8	M	115	4.08	17	2.58
	F	119.9	5	18.9	2.18
9	M	124	1.22	20.5	0.71
	F	123.7	5.62	20	1.58
10	M	126.5	6.77	21.2	2.91
	F	132.2	7.44	23.9	4.41
11	M	132.9	6.29	23.4	3.27
	F	135.4	7.98	25.3	4.15
12	M	140.9	6.3	29.8	6.07
	F	142.1	8.49	32.3	7.74
13	M	142.8	9.14	31.6	7.06
	F	143.8	7.79	31.8	4.98
14	M	146.3	5.62	36	7.6
	F	143.3	8.9	34.2	6.15
15	M	153.6	13.51	35.7	10.97
	F	148.6	8.25	32.5	7.33

Table 1. Mean and Standard Deviation of Height & Weight

Fig-2 Mean height(in cms) of school children (boys) compared with WHO reference 2007

Fig-3 Mean height(in cms) of school children (Girls) compared with WHO reference 2007

Prevalence of malnutrition

Table 2 shows the nutritional status among school children. Out of 216 children, 53, 31 and 111 were stunted/severely stunted, underweight/severely underweight, and thin/very thin, respectively. The results highlighted the higher prevalence of malnutrition among younger children.

	Number	Percent
Height for age(N=216)		
Normal	163	75.46
Stunted	39	18.06
Severely stunted	14	6.48
Weight for age(N=49)*		
Normal	18	36.73
Moderately Underweight	23	46.94
Severely underweight	8	16.33
BMI(N=216)		
Normal	102	47.22
Thin	59	27.31
Very thin	52	24.07
Overweight	3	1.39

Table2. Prevalence of Malnutrition according to WHO Reference Growth Standards.

Note: *WA was calculated for student's age up to 10 years.

Variable	Present N (%)	Absent N (%)	Total	Chi Square	p-value
Religion					
Hindu	38 (46.91)	43 (50.08)	81	15.303	0.000
Muslim	29 (21.48)	106 (78.52)	135		
Sex					
Male	26 (32.1)	55 (67.9)	81	0.071	0.79
Female	41 (30.37)	94 (69.63)	135		
Age group					
6-9	7 (22.58)	24 (77.42)	31	10.007	0.007
9-12	34 (25.95)	97 (74.05)	131		
12-15	26 (48.15)	28 (51.85)	54		
Father's Occupation					
Business	10 (23.81)	32 (76.19)	42	9.27	0.026
Driver	19 (36.54)	33 (63.46)	52		
Skilled	12 (19.67)	49 (80.33)	61		
Unskilled	26 (42.62)	35 (57.38)	61		
Mother's Occupation					
HW	54 (28.88)	133 (71.12)	187	0.978	0.323
Working	11 (37.93)	18 (62.07)	29		
Type of Family					
Nuclear	55 (29.57)	131 (70.43)	186	1.313	0.252
Joint	12 (40.0)	18 (60.0)	30		
Mother's Education					
Ill	28 (46.67)	32 (53.33)	60	10.257	0.017
Primary	7 (21.21)	26 (78.79)	33		

Middle	15 (29.41)	36 (70.59)	51		
High	17 (23.61)	55 (76.39)	72		
No. of family members					
3-4	12 (31.58)	26 (68.42)	38	4.001	0.261
5-6	43 (37.39)	72 (62.61)	115		
7-8	9 (23.68)	29 (76.32)	38		
9-10	3 (18.75)	13 (81.25)	16		
Father's Education					
Ill	16 (35.56)	29 (64.44)	45	10.257	0.017
Primary	18 (48.65)	19 (51.35)	37		
Middle	15 (27.78)	39 (72.22)	54		
High	18 (22.50)	62 (77.50)	80		
Table 3. Association of Stunting with Sociodemographic Variable					

Note: Mothers=65, because 2 students' mothers expired.

Multivariate analysis of selected variables revealed that Illiterate mothers were 2.83 times and fathers who had education at primary level were 3.26 times more likely to have stunted children. Stunting was significantly more pronounced in higher age group, 3.18 times in the age group of 12-15 years compared to children in their age group of 6-9 years. The children of fathers working as unskilled workers were found 2.37 times more at risk to become stunted [Table-4].

Variable	Present (N=67)	Absent (N=149)	Odds Ratio	p-value
Age group				
Age 6-9[η]	7	24	1	
Age 9-12	34	97	1.2	0.698
Age 12-15	26	28	3.18	0.023
Father's occupation				
Self-employed[η]	10	32	1	
Driver	19	33	1.84	0.187
Skilled	12	49	0.78	0.615
Unskilled	26	35	2.24	0.052
Mother's Education*				
Ill	28	32	2.83	0.006
Primary	7	26	0.87	0.786
Middle	15	36	1.34	0.721
High[η]	17	55	1	
Father's Education				
Ill	16	29	1.9	0.118
Primary	18	19	3.26	0.005
Middle	15	39	1.32	0.487
High[η]	18	62	1	
Note: *Mothers=65, as 2 students' mothers expired				
[η] Reference group				
Table 4. Multivariate Analysis of Stunting with Sociodemographic Variable				

DISCUSSION
Mean Height and Weight
As shown in Table-1, the anthropometric measurements such as weight and height were found to be more in girls than in boys in all the age groups except in age 14 and 15 where mean height and weight of boys exceeded than that of girls which is in conformity with WHO growth reference values. The present observations were found to be comparable to other studies from similar socioeconomic conditions.[12,13,14,9,15] However, unlike the present findings studies done in other parts of the country showed that boys were heavier and taller than girls till the age of 10 years. From the age of 11 onwards, the mean height and weight of girls exceeded that of boys and similarly in another study in the age group of 13-14 years.[12,10]

In contrast to the present findings in a study done in semi-urban regions of Gujarat among 10-14 years school children the BMI was found to be 16.4 ± 3.3 and 16.6 ± 3 among the boys and girls respectively.[15]

The present study shows no significant differences in mean of height and weight of both boys and girls in same age groups except in at 10 years of age in which the heights of girls have significantly higher values than boys (t= 2.04 p=0.05). However, the differences in heights of the boys in between the age groups was found to be significant as in 8-9 years (t=4.52, p=0.01), 10-11 years (t=3.10, p=0.003), 11-12 years (t=4.24, p=0.0001), Similarly, in case of girls significant differences in heights were observed in 9-10 years (t=3.51, p=0.001) and 11-12 years ((t=2.70, p=0.009). Likewise, differences in weights of both boys and girls in between the age groups was found to show similar trend such as in girls 9-10 years (t=3.05, p=0.004) and 11-12 years (t=3.64, p=0.0007) of age groups whereas in case of boys it was in 8-9 years (t=2.83, p=0.047), 10-11 years (t=2.25, p=0.03) and 11-12 years (t=4.26, p=0.0001) age groups respectively.

This could be due to beginning of pubertal growth spurt in girls than boys.[16] Similarly, studies conducted in Assam and in other parts of the country showed that the mean height of girls are higher at the ages 10, 11, 12.[9,17,11]

Similar prevalence of malnutrition is reported from a study done among Jenukuruba tribal children reported 45.2% of children as having moderate underweight and 14.8% as having severe underweight.[18] Another study in the villages of Dharwad and Haliyal taluks reported 44.4% of children as underweight,[19] which is similar to the present study. Similar higher prevalence of 59.9% was reported among tea garden population of Assam.[20] One of the larger studies[21] of anthropometric status of rural school children in low income countries (Ghana, Tanzania, Indonesia, Vietnam and India) found the overall prevalence of underweight to be high in all five countries, ranging from 34 to 62% for underweight.

Prevalence of stunting and severe stunting in our study was 18.06% and 6.48% respectively. Similar prevalence of stunting as 19.8% and 17.9%, comparable to our study were reported by other authors.[22,23] In a study among Lodha tribal children[24] in a village of Paschim Medinipur, 9.7% children were found to be severely stunted which is similar to the present study.

Similar prevalence of thinness as 29% compared to our study.[25] However, in a study in Assam higher prevalence of thinness was found to be 53.9% among the tea garden workers.[13]

Association of Height for Age with Other Socio-demographic Variables

From table-3, it is observed that boys were found to be more stunted than girls but the difference was not significant. In contrast to this in another study significant difference was observed in prevalence among the boy than in girls.[8] Analysis showed no significant difference in prevalence of stunting in children living in joint than in nuclear type of family and on number of family members. However, there was significant association of stunting with father and/or mother educational attainment and occupation of father [Table-3]. The children belonging to Hindu family suffered more from stunting probably because in the studied population most of these families were from lower socioeconomic status and both parents had low level of education compared to children from Muslim family. Association of religion with malnutrition is not reported by other authors. So comparison could not be done on the present finding. Similar findings are reported by other authors from different settings.

CONCLUSION

During the recent years there have been an unprecedented number of interlinked global declarations and commitments to nutrition. The Decade of Action on Nutrition, adopted by the United Nations General Assembly in 2016, reinforces countries' commitment to achieve by 2025 the global nutrition targets adopted by the Member States of the World Health Organization. As found in the present study, the differences in the degree of growth failure in weight and height have implications for assessing the true prevalence of chronic malnutrition. Height for-age reflects achieved linear growth, and its deficits (stunting) indicate long-term cumulative inadequacies of health and nutrition.[26] Stunting of older children is a legacy of nutritional deprivation during early childhood.[27] This is also important for monitoring trends or evaluating the effects of interventions.[2,28]

Considering malnutrition in all its forms it requires urgent steps to improve malnutrition amongst the school children as Poor nutrition of children not only adversely affects the cognitive development of children, but also likely to reduce the work capacity in future.

Limitation of Study

The present study was conducted in rural school children from semi-urban area. Hence, further such studies in different population groups are required to conform the present findings and specific multipronged intervention models are to be designed to address the menace of malnutrition in south districts of Assam.

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