

Research Article**Prevalence of Under Nutrition and Poor Health Status among Primary School Children in Burdwan West Bengal****Dr. Purushottam Pramanik^{*1}, Subha Bose Banerjee², Santanu Dey³**^{1,2,3}Department of Physiology, Hooghly Mohsin College, Chinsurah, Hooghly, West Bengal, India, 712101***Corresponding author**

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Abstract: Under nutrition in children is a major problem in developing countries like India. Mid day meal program is introduced in Government schools to combat under nutrition. This study is an attempt to assess the health and nutritional status of school children those participate mid day meal of school. This study was conducted in three government schools of Burdwan district in West Bengal state. The subjects of this study were chosen at random irrespective of socioeconomic status and religion so that reflection of an overall picture of health status of study region could be achieved. Body weight and height was measured. Body mass index (BMI) and Rohrer Index was calculated. These were compared with existing international standards for evaluation of nutritional and health status of the selected subjects This study was conducted on 430 school going children (boys-203 and girls-223). The overall prevalence of underweight was 40.23% (173), thinness 55.11% (237) and stunting was 19.76% (85). All the above under nutrition indices were higher in boys than girls counterpart. Overall 42.32% (182) children were under very low health status (Rohrer index ≥ 1.12). It is concluded that there is a high prevalence of under nutrition among rural school children having age limit 5-9 years in Burdwan, West Bengal. Health education and nutrition interventions are needed on priority basis.

Keywords: Stunting, thinness, under weight, children, nutritional status, Rohrer index.

INTRODUCTION

The health and nutritional status of the children is an index of the national investment in the development of future manpower. 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 child deaths worldwide [1]. About 150million children in developing countries are still malnourished and more than half of underweight children live in South East Asia Region [1]. The high level of under nutrition in children in South Asia poses a major challenge for child survival and development. The best global indicator of children's well-being is growth. Poor growth is attributed to a range of factors closely linked to overall standards of living and the ability of populations to meet their needs such as access to food, housing and health care. Developing countries like India, account for about 40 percent undernourished children in the World which is mainly due to the dietary inadequacy in relation to their needs [2]. India has diverse agro-climatic regions, ethnic multiplicities, socio-cultural practices, life styles and eating habits which vary not only between states but also within districts [3]. Thus, there is a need for assessment of nutritional status in various parts of our country to

obtain a clear picture of status of mal-nutrition in various regions

School children constitute a major segment of the community whose health and nutritional status will indicate the changing trend of nutritional profile of a region. They are the inheritors of our past and seeds of our future. The main nutritional problems facing the school children include growth retardation, stunting, underweight, anemia and vitamin-A deficiency. There are concerted efforts to provide care to the children under six years of age through various national maternal and child health program for example ICDS. ICDS scheme is a comprehensive programmed for delivery of an integrated package of services to achieve the overall development of children [4]. In spite of its shortcomings; it has been quite successful in achieving its objectives [5]. "Mid-day meal Program" which is being run by the government of India in government run schools is another effort for improvement of health status of school children in age group 5-14 years.

Several studies have investigated the nutritional status of children and adolescents from different parts of India [6, 7]. In India alone, there are approximately 60 million children who are under weight [8]. This prevalence is higher in rural areas compared to urban areas [9]. However, India is now

also beginning to experience the emerging problem of overweight [10]. A recent study along Indian children in the age group of 6-18 years suggests the existence of double burden of underweight and overweight [11]. The present study was carried out to find out the nutritional status of the children having age limit 5-9 years receiving mid-day meal in school

MATERIALS AND METHODS

Area of study: This study was conducted in three semi urban schools of Burdwan district of West Bengal state. Midday meal program is being run by all selected schools and food prepared in the school premises itself.

Study subject: The study population consisted of students of class 1 to 4. The prior written permission of school authority was taken. Written consent from the parents of the students experimented in the study was obtained. The subjects of this study were chosen at random irrespective of socioeconomic status and religion so that reflection of an overall picture of health status of study region could be achieved. All students who were willing to participate in the study were included in the study. They were invited to answer the questionnaires, which dealt with background information such as age, physical activity and dietary habit. We excluded the students who are suffering from any chronic health condition and are using any medicines for long duration.

Measurement of body weight: Body weight was measured using bathroom scale accurate to 0.5kg. The scale was kept on a flat surface and adjusted with '0' mark. Now the subject was requested to step on it in bare feet. Weights were taken in light cloth. Weight was recorded to the nearest 0.5kg.

Measurement of body height: Height was measured using anthropometric rod. Height of the subject was recorded without footwear and expressed to the nearest 0.1cm.

Estimation of body mass index (BMI): BMI was calculated from the height and weight using following equation: $BMI (kg / m^2) = weight (kg) / height^2 (m)$. Estimation of Rohrer index (RI) Bold: RI was calculated from the height and weight using following equation: $RI (gm/cm^3) = body weight (gm) / height^3 (cm)$.

Determination of nutritional status: Nutritional status was evaluated using anthropometric indicators recommended by WHO experts committee. Height for age below 3rd percentile of NCHS/WHO reference values was classified as stunting [12]. Thinness was evaluated using WHO recommended age-specific cut off point based on WHO reference data [13]. Thinness was defined as BMI-for-age <5th percentile of WHO standard data. Over weight and obese were defined as BMI-for –age >85th percentile and >95th percentile respectively [14]. Underweight was assessed through weight for age according to WHO standard [15]. Prevalence of stunting was calculated at cut off level of 3rd percentile [16] on the basis of WHO standard [17].

Determination of health status: Health status was evaluated from Rohrer Index (RI) or Index of Corpulence. RI was computed using standard equation and classification was done following the international standard [18].

$$RI = Body weight (gm) \times 100 / stature^3 (cm).$$

Range variation of RI:

Very low	≤ 1.12
Low	1.13 to 1.19
Middle	1.20 to 1.25
Upper middle	1.26 to 1.32
High	1.33 to 1.39
Very high	≥1.40
Healthy range	1.2 to 1.6

Data analysis: the parameters taken were analyzed statistically to find out the mean and standard deviation of height, weight and BMI. These were compared with existing international standards for evaluation of nutritional status of the selected subjects.

RESULTS

Age and sex wise distribution of study subjects were given in table 1. This study includes 430 primary school going children which include 48.14% of boys and 51.86% girls. Age of the students varies between 5-9 years. Among 430 children 60 (13.96%) were belonging to age group 5 year, 112 (26.04%) were belonging to age group 6 year, 85 (19.76%) were belonging to age group 7 year, 99 (23.02%) were belonging to 8 year age group and74 (17.21%) were belonging to 9 years age group.

Table 1: Showing Distribution of study subjects according to age and sex

Age (Years)	Boys		Girls		Total	
	Number	%	Number	%	Number	%
5	30	6.98	30	6.98	60	13.96
6	53	12.32	59	13.72	112	26.04
7	36	8.37	49	11.39	85	19.76
8	44	10.23	55	12.79	99	23.02
9	44	10.23	30	6.98	74	17.21
Total	207	48.14	223	51.86	430	100

Age wise height, weight and BMI of study subjects were compared with WHO recommended values (table-2). All parameters of both boys and girls

were lower than WHO recommended values in all age group.

Table-2: Showing comparison of age specific means height, weight and BMI of children with respective median of WHO standard

Age (years)	Height (cm)		Weight (kg)		BMI (kg/m ²)	
	WHO standard	Present study	WHO standard	Present study	WHO standard	Present study
Boys						
5	112.9	108.77 ± 5.34	19.7	16.05 ± 1.67	15.3	13.56 ± 0.89
6	118.9	115.65 ± 5.67	21.7	17.43 ± 2.48	15.4	13.03 ± 1.62
7	124.5	119.30 ± 7.04	24.0	19.79 ± 3.87	15.6	13.83 ± 1.89
8	129.9	122.03 ± 5.57	26.7	20.08 ± 2.81	15.9	13.46 ± 1.42
9	135.2	126.56 ± 6.38	29.7	21.91 ± 3.75	16.2	13.60 ± 1.39
Girls						
5	112.2	107.39 ± 4.21	18.6	15.54 ± 1.01	15.2	13.51 ± 1.02
6	118.0	114.42 ± 5.89	20.6	17.00 ± 2.81	15.3	12.96 ± 1.70
7	123.7	117.34 ± 5.75	23.3	18.75 ± 2.63	15.5	13.56 ± 1.13
8	129.5	123.03 ± 5.00	26.6	20.46 ± 2.81	15.9	13.48 ± 1.34
9	135.5	126.48 ± 5.71	30.5	21.76 ± 2.43	16.3	13.60 ± 1.19

*Data represents mean ± SD

Age wise distribution of stunting boys and girls on the basis of WHO recommended standard was given in table-3. In boys and girls maximum stunting

was noted in age group 9 years and 7 years respectively. Overall stunting percentage was represented in fig 1. 23% boys and 17% girls were under stunting categories.

Table-3: Showing distribution of stunting (height for age) on the basis of WHO recommended standard

Age (years)	Boys		Girls	
	Number of subject	Stunting (%)	Number of subject	Stunting (%)
5	30	6 (20.00)	30	5(16.67)
6	53	4 (7.55)	59	5(8.47)
7	36	8 (22.22)	49	14 (28.57)
8	44	12 (27.27)	55	9 (16.36)
9	44	14 (31.82)	30	8 (26.67)

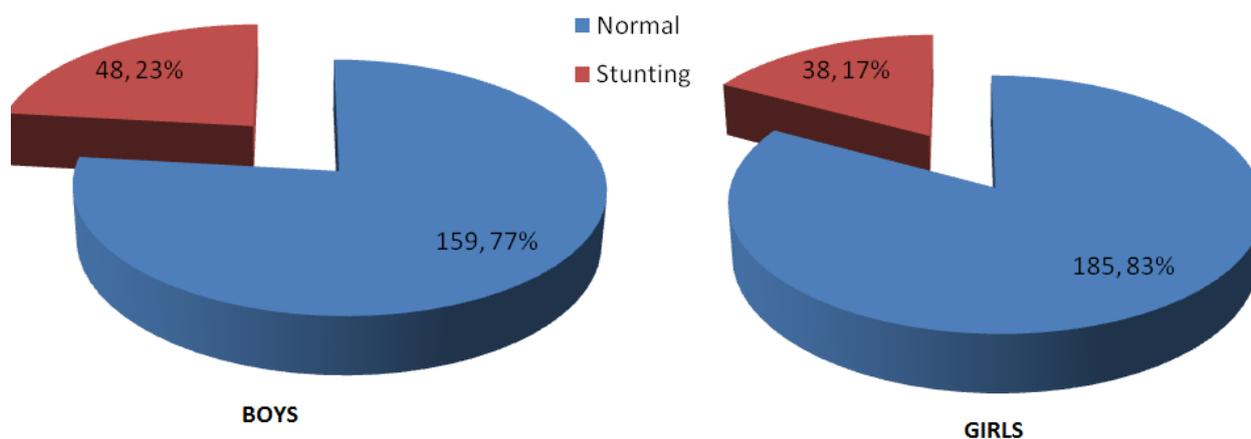


Fig -1: Prevalence of stunting among boys (a) and (b) girls aged 5 to 9 years on the basis of WHO recommended standard.

Showing Distribution of thinness according to age was represented by table-4 and overall thinness in figure 2 Maximum percentage of thinness was noted in

age group 9 year for boys and age group 8 years for girls' children. Overall percentage of thinness was more in boys than girls.

Table-4: Showing distribution of thinness (BMI for age) on the basis of WHO recommended standard

Age (years)	Boys		Girls	
	Number of subject	Thinness (%)	Number of subject	Thinness (%)
5	30	14 (46.67)	30	12 (40.00)
6	53	35 (66.04)	59	27 (45.76)
7	36	19 (52.78)	49	22 (44.90)
8	44	30 (68.18)	55	28 (50.90)
9	44	36 (81.82)	30	14 (46.67)

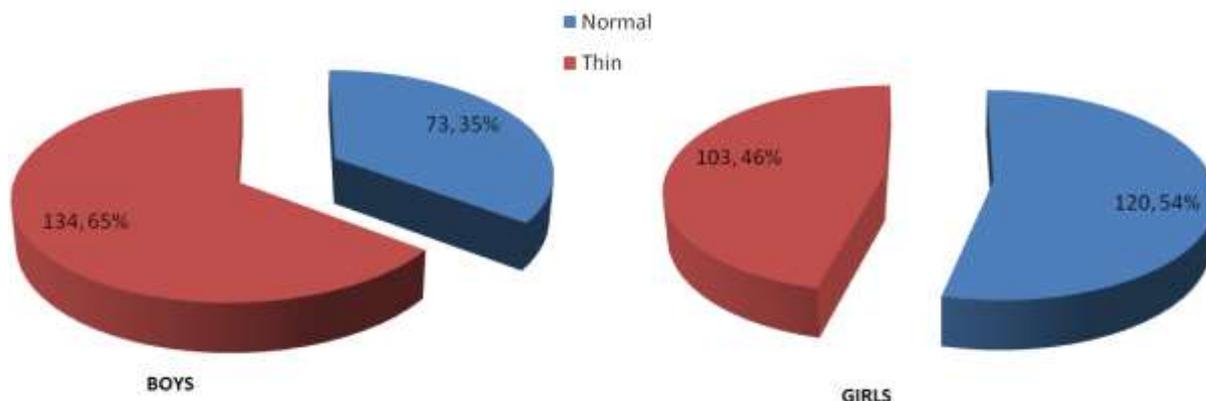


Fig-2: Prevalence of thinness among boys (a) and girls aged 5 to 9 years on the basis of WHO recommended standard.

Age wise distribution of underweight of boys and girls represented by table-5 and overall prevalence was represented by fig-3.

Overall prevalence of underweight was more in boys than girls counterpart. For both boys and girls maximum underweight was observed on age group 9 years.

Table-5: Showing distribution of underweight (weight for age) on the basis of WHO recommended standard

Age (years)	Boys		Girls	
	Number of subject	Underweight (%)	Number of subject	Underweight (%)
5	30	11 (36.67)	30	4 (13.33)
6	53	25 (47.17)	59	21 (35.59)
7	36	13 (36.11)	49	19 (38.77)
8	44	25 (56.82)	55	17 (30.91)
9	44	25 (56.82)	30	13 (43.33)

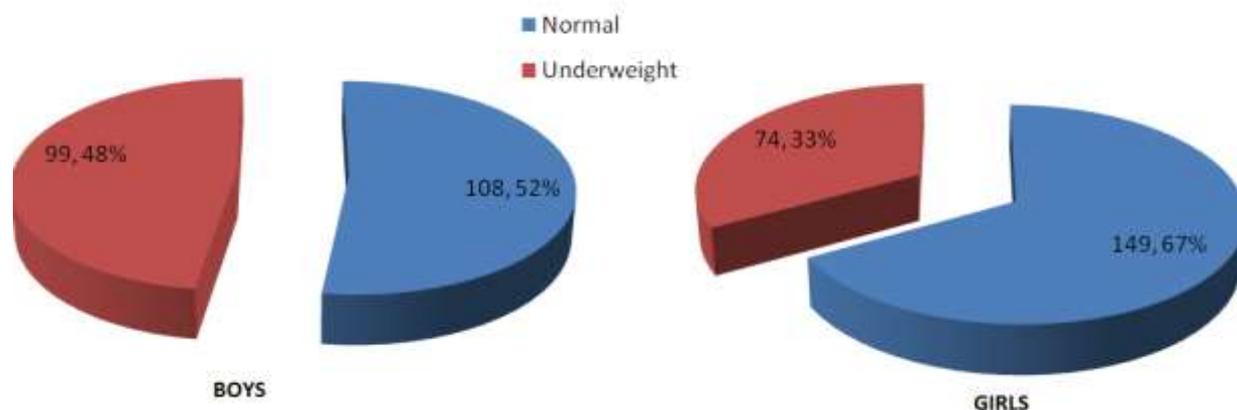


Fig-3: Showing Prevalence of underweight among boys (a) and girls (b) aged 5 to 9 years on the basis of WHO recommended standard.

Table-6 and Fig.4 exhibit the age wise and overall Rohrer Index of school children having age limit

5-9 years. Very low health status (RI<1.12) is found to be prevalent for both boys (63.6%) and girls (50%)

having age group 9 years. Overall 40% of girl and 45% of boys are under very low health status

Table-6: Showing distribution of children on the basis of health status (Rohrer Index)

Age	Health status (Rohrer Index)					
	Very low (≤ 1.12)	Low(1.13-1.19)	Middle (1.20-1.25)	Upper middle (1.26-1.32)	High (1.33-1.39)	Very high (≥ 1.40)
Boys						
5	3 (10.0%)	7 (23.3%)	5 (16.7%)	8 (26.7%)	4 (13.3%)	3 (10.0%)
6	22 (41.5%)	10 (18.9%)	11 (20.8%)	2 (3.8%)	4 (7.5%)	4 (7.5%)
7	17 (47.2%)	4 (11.1%)	8 (22.2%)	1 (2.8%)	2 (5.6%)	4 (11.1%)
8	24 (54.5%)	7 (15.9%)	2 (4.5%)	7 (15.9%)	3 (6.8%)	1 (2.3%)
9	28 (63.6%)	10 (22.7%)	3 (6.8%)	2 (4.5%)	1 (2.3%)	0 (0%)
Girls						
5	5 (16.7%)	6 (20.0%)	4 (13.3%)	7 (23.3%)	3 (10.0%)	5 (16.7%)
6	21(35.6%)	17 (28.8%)	5 (8.5%)	4 (6.8%)	7 (11.9%)	5 (8.5%)
7	19 (38.8%)	14 (28.6%)	10 (20.4%)	3 (6.1%)	2 (4.1%)	1 (2.0%)
8	28 (50.9%)	11 (20.0%)	7 (12.7%)	5 (9.1%)	2 (3.6%)	2 (3.6%)
9	15 (50.0%)	8 (26.7%)	4 (13.3%)	2 (6.7%)	1 (3.3%)	0 (0%)

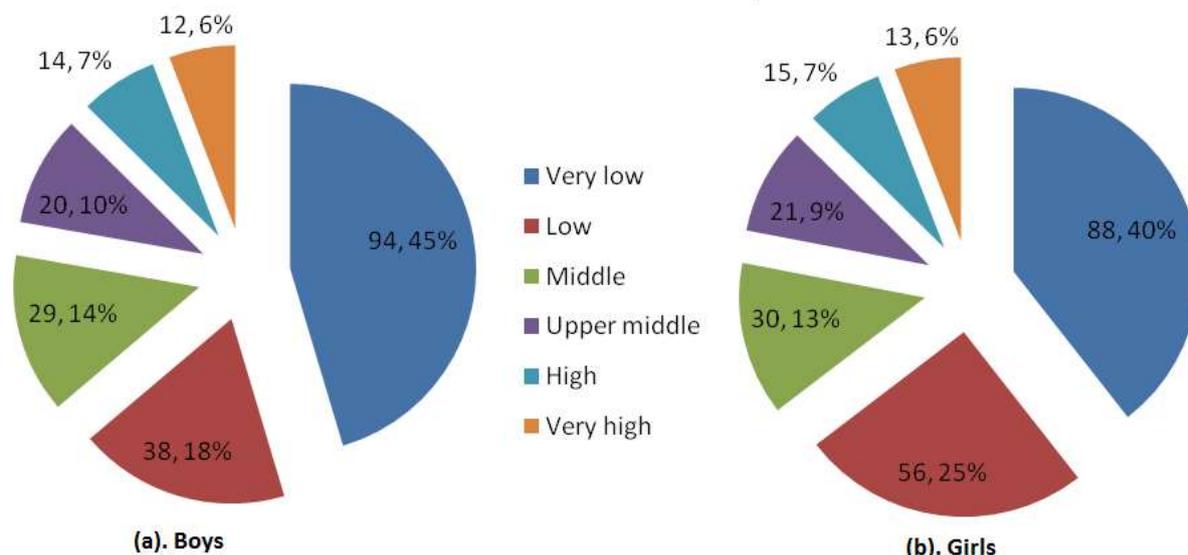


Fig.4: Showing overall distribution of selected boys (a) and girls (b) on the basis of Rohrer index

DISCUSSION

The aim of the study was to assess the nutritional status of children attending mid-day meal scheme in government primary school having age limit 5-9 years in West Bengal. Childhood one of the nutritional stress periods of life with profound growth comes with increased demand for energy, protein, minerals and vitamins[18]. Several studies have investigated the nutritional status of children from different parts of India [6, 7, 19]. In India alone, there are approximately 60 million children who are underweight [8].

According to the study 40% boys and 30% girls are stunted on the basis of WHO standard. Childhood stunting is one of the most significant impediments to human development, globally affecting approximately 162 million children under the age of 5 years. Stunting, or being too short for one’s age, is defined as a height that is more than two standard

deviations below the World Health Organization (WHO) recommended child Growth Standards median [20]. Stunting is a well-established risk marker of poor child development. Stunting before the age of 2 years predicts poorer cognitive and educational outcomes in later childhood and adolescence [21, 22], and has significant educational and economic consequences at the individual, household and community levels. Stunting is linked with the other global nutrition targets (anemia in women of reproductive age, low birth weight, childhood overweight, exclusive breastfeeding, and wasting).

The findings of BMI indicate that 65% of boys and 46% of girls children are thin according to WHO standard.. Thinness has implication on reproductive health. It can result in poor pregnancy outcome especially in terms of low birth weight and increased risk of infant mortality.

The new millennium has signaled an important transition for our species with more people being overweight and underweight globally. The result of the present study shows that Prevalence of underweight is 48% among boys and 33% among girls aged 5 to 9 years.

Finding regarding stunting, thinness and BMI coincide with the finding of Rohrer index. Significant percentage of boys and girls are under very low health status (RI<1.12).

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. [1] About 150 million children in developing countries are still malnourished and more than half of underweight children live in South East Asia Region (SEAR). The high levels of under nutrition in children in South Asia pose a major challenge for child survival and development. Besides poverty, there are other factors that directly or indirectly affect the nutritional status of children. Several studies showed that maternal education emerges as a key element of an overall strategy to address malnutrition [23].

CONCLUSION

The present study highlights the nutritional status of primary school going children. It shows stunting, thinness and underweight among the children. Thus their health status is poor. Therefore to reduce both forms of malnutrition, it is essential to educate and create awareness programs at the community levels. Health education programs are urgently required to promote healthy eating and physical activity. Further studies need to be conducted in order to understand clearly whether co-existence of stunting, thinness, and underweight among primary school going children is related to the influence of socio economic condition, dietary habit, and life style or any other.

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REFERENCES

1. Unicef.Stateofworld'schildren.2004.availablefrom: [Http://www.unicef.org/sowc/archive/english/the%20state%20of%20the%20world's%20children%202004.pdf](http://www.unicef.org/sowc/archive/english/the%20state%20of%20the%20world's%20children%202004.pdf)
2. Mitra M, Kumar PV, Chakrabarty S, Bharati P; Nutritional status of Kamar tribal children in Chhatisgarh. *Ind. J. Pediatrics.* 2007; 74: 381-384.

3. Vashisht RN, Krishnan K, Devial S; Physical growth and nutritional status of Garhwali girls. *Ind J. Pediatrician;* 2005; 72: 573-578.
4. Year of achievement and new initiatives. New Delhi; Government of India, Ministry of Human Resource Development, Department of Women and Child Development, 2007; 7.
5. Kapil U, Sachdev HPS; Recommendations: national consultation to review the existing guidelines in ICDS scheme in the field of health and nutrition. *Indian Pediatr.* 2002; 38: 721-731.
6. Singh N, Mishra CP; Nutritional status of adolescent girls of a slum community of Varanasi. *Indian JPub Health.* 2001; 45(4):128-134.
7. Venkaiah K, Damayanti K, Nayak MU, Vijayaraghavan K.; Diet and nutritional status of rural adolescents in India. *Eur J Clin Nutr.* 2002; 56(11): 1119-1125.
8. Nutrition for improved development out-comes, 5th report on the World Nutrition Status, United Nations Administrative Committee on Coordination/Standing Committee on nutrition, Geneva, Switzerland, 2004.
9. Smith LC, Ruel MT, Ndiaye A; Why is child malnutrition lower in urban than in rural areas? Evidence from 36 developing countries. *World Development.* 2005; 33(8): 1285-1305.
10. Mendez MA, Monteiro CA, popkin BM; Overweight exceed underweight among women in most developing countries. *Am J Clin Nutr.* 2005; 81(3): 714-721.
11. Srihari G, Eilander A, Muthayya S, Kurpad AV, Seshadri S; Nutrition status of affluent Indian school children: what and how much do we know. *Indian Pediatr,* 2007; 44(3): 204-213.
12. World Health Organization; Physical status: the use and interpretation of anthropometry. Report of WHO Expert Committee, technical Series 854.Geneva: World Health Organization, 1995; 270-276.
13. WHO.BMI for age. WHO reference 2007. available from: http://www.who.int/growthref/who2007_bmi_for_age/en/
14. Malhotra A, Jain S; Diet quality and nutritional status of rural adolescent girl beneficiaries of ICDS in North India. *Asia Pac J Clin Nutr.* 2007; 16 (Suppl): 8-16.
15. WHO. Weight for age. WHO reference 2007 <http://www.who.int/growthref/en/>
16. Prshant K, Shaw K; Nutritional status of adolescent girls from an urban slum area in South India. *Indian J pediatr.* 2009; 76: 501-504.
17. WHO. Height for age. WHO reference 2007. available from: http://www.who.int/growthref/who2007_height_for_age/en/
18. Gopalan C, Sastri BP, Balasubramanium SC; Nutritive value of Indian foods. Hyderabad; National Institute of Nutrition (ICMR).

19. Kanade AN, Joshi SB, Rao S; Under nutrition and adolescent growth among rural indian boys,” Indian Pediatrics, 1999; 36(2): 145-156.
20. World Health Organization (WHO) Child Growth Standards. available from: <http://www.who.int/childgrowth/en/>
21. Walker SP, Chang SM, Powell CA, Simonoff E, Grantham-McGregor SM; Early childhood stunting is associated with poor psychological functioning in late adolescence and effects are reduced by psychosocial stimulation. J Nutr. 2007; 137:2464–9.
22. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, *et al.*; the Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet 2013; 371:243–60. Doi: 10.1016/S0140-6736(13)60937-X.
23. Christiaensen L, Alderman H; Child Malnutrition in Ethiopia: Can Maternal Knowledge Augment The Role of Income? Africa Region Working Paper Series 2001; 22. available from: <http://www.worldbank.org/afr/wps/index.htm>.