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Prevalence of thinness among 6-12 years rural children of Kharagpur

A cross-sectional study in West Bengal, India

Subal Das[1], Debanita Addhya[2], Falguni Chakrabarty[3]

Abstract

Thinness is one of the biggest problems of children residing in rural or tribal areas in our country then their urban counterparts. Children are in growing age needs more varied nutrient to reach their full growth potential. Any obstruction during this stage leads to impaired physical and mental growth that furnishes poor productivity in their overall development. India is one of the most populated countries in the world having 13.0 % (approx) children of age range from 6-12. There were sparse information on nutritional status of children using the new internationally accepted body mass index (BMI) cut-off values are available, particularly from rural areas in India. The present cross-sectional study was undertaken to determine the prevalence of undernutrition using BMI among 6-12 years rural children of Kharagpur, Paschim Medinipur, District, West Bengal, India. A total of 500 (250 boys and 250 girls) children aged 2 to 12 years from five schools were measured. Commonly used indicators i.e., weight, height and BMI, were used to evaluate nutritional status. The overall prevalence of thinness was 77.6 % and 76.4 % among boys and girls, respectively. Girls are more undernourished (80.0 %), (80.5 %), (76.7 %) and (75.0 %) at age 6, 8, 9 and 12 years than their male counterpart (79.4 %), (77.1 %), (70.6 %) and (72.2 %) of the same age. However, Boys are more undernourished (81.1 %), (82.5 %) and (81.8%) at age 7, 10 and 11 years than the girls (74.4 %), (66.7 %) and (76.0 %) of same age. Grade I thinness is found to be most prevalent among boys in all ages except age 11 and 12 years followed by grade II and III. Grade III thinness is found to be most prevalent among girls in all ages except age 7, 9 and 11 years followed by grade II and I. Thus children of all ages are very thin and they are in very critical position with respect to their nutritional status is concerned. Immediate nutritional supplement programme is required to overcome this situation.

Key words: Rural, Body Mass Index, boys, girls, thinness.

Introduction

The World Bank estimates that India is ranked 2nd in the world of the number of children suffering from malnutrition, after Bangladesh (in 1998), where 47% of the children exhibit a degree of malnutrition. The prevalence of underweight children in India is among the highest in the world, and is nearly double that of Sub-Saharan Africa with dire consequences for mobility, mortality, productivity and economic growth (The World Bank 2009). As kids grow from grade-schoolers to preteens, there continues to be a wide range of "normal" regarding height, weight, and shape. Kids tend to get taller at a pretty steady pace, growing about 2.5 inches (6.35 centimeters) each year. When it comes to weight, though, kids often start gaining weight faster at around 8 to 9

1 Corresponding author. Senior Research Fellow, UGC-NET, Department of Anthropology, Vidyasagar University. Paschim Medinipur West Bengal, India Email: das_vu@rediffmail.com
2 Student, Department of Anthropology, Vidyasagar University.
3 Professor, Department of Anthropology Vidyasagar University

years of age. This is also a time when kids start to have feelings about how they look and how they're growing. It's common for girls in particular to worry about being overweight or "too big," while boys tend to be sensitive about being too short. (kidshealth.org/parent/growth/growth/growth_6_12.html). Adolescence is known to be a "second opportunity" for growth as it facilitates catch-up growth for children experiencing nutritional deficits in their early life. However, as discussed above, stunting appeared to be a persistent phenomenon beyond the 3rd year of life among rural children and it had significant impact at 10 + yrs of age. Thus, the majority of rural children enter adolescence with poor nutritional status (Shobha 2001). Despite recent achievement in economic progress in India, the fruit of development has failed to secure a better nutritional status among all children of the country. Growing evidence suggest there exists a socio-economic gradient of childhood malnutrition in India. The state of health of school-going children in India is far from satisfactory despite the fact that school health programs along with other nutritional programs have been in operation for several decades. School-going children constitute a sizeable section of India's population, i.e. about 27.0 %, which is easily accessible and also receptive. An early and convenient method of assessing nutritional status of growing children is anthropometry. Physical growth, in terms of weight and height, is considered an important parameter reflecting the pattern of growth and development in a community. In the developing countries, the growing children by and large are deprived of good nutrition on account of their poor socio-economic status, ignorance and lack of health promotional facilities. This nutritional deprivation results in relative stunting of growth (Khan 1990). The aim of the present study was to evaluate different grades of thinness using age- and sex specific body mass index (BMI) among 6-12 years old rural children using international cut-off points (Cole et al 2007).

Materials and Methods

Study Sample. The study was conducted in five (Inda Primary School, Jafala Adarsha Vidyalaya, Boradia Panchanan School, Bajrang Primary School and Satkul Adarsha Primary School) rural based primary schools of Kharagpur. Total of 500 students (250 boys and 250 girls) of age 6-12 years were measured. It is approximately 116 kms from Kolkata, the provincial capital of West Bengal.

The area. Medinipur the largest district 22o 51" N to 21o36'35" and 88o12'40" E to 86o35'50" E in West Bengal covers an area of 14.08 km2 with a total population of 8349890 (1991). Medinipur has chequered annals since ancient times. The district was named after ancient times. The district was named after all then of 'Medinikosha'. Medinipur town become the head quarters of the district Midnapore for independence against the British Raj. This study was conducted over two months i.e., April, 2011 and May, 2011. These schools are located approximately 16 km from Midnapore town & 121 km from Kolkata.

Measurement. Data were collected after obtaining the necessary approval from the Principal's of school. Ethical clearance was obtained from the Vidyasagar University Ethics Committee prior to the commencement of the study. Teachers of the children were informed about the objectives of our study before the commencement of measurement. Information on age (actual date of birth) was collected using a pretested questionnaire by school registers (records) among all subjects with the help of questionnaire. Weight (kg) and height (cm) measurements were taken on each subject by (DA) author following the standard techniques (WHO 1995). Body mass index was computed following internationally accepted standard equation as (BMI) = weight (kg)/height (m2). Nutritional status was evaluated using the age- and sex- specific cut-off points of BMI (Table 1) as described by Cole et al. (2007). Grades III, II, and I of thinness refer to severe, moderate, and mild undernutrition. Technical errors of measurements (TEMs) were found to be within reference values (Ulijaszek and Lourie 1994) and thus not incorporated in statistical analyses. One-way ANOVA (F-test) was performed to test for age differences in means of weight, height, and BMI. All statistical analyses were undertaken using the SPSS Statistical Package. Statistical significance was set at $P < .05$.

Results

Mean, standard deviation (in parentheses), t- test and F- test (ANOVA) of Weight (WT; kg), Height (HT; cm) and BMI (kg/m2) of 6 to 12 years boys and girls are presented in Table 2. Marked growth trend in weight was

observed in all ages except for (9 - 10 years) with increasing age in boys were noted. Significant sex difference in weight (t= 2.62; p <0.01) among 6 years children were observed. Significant differences between ages in weight (F = 13.968; p < 0.001) among boys and (F = 36. 504; p < 0.001) among girls were observed. Height among boys and girls also shows increasing trend except for (9-10 years) boys; significant age difference among boys (F = 23.798; p < 0.001) and among girls (F = 50.940; p < 0.001) was also observed. Significant sex difference in mean BMI (t= 2.04; p<0.05) among 6 years were observed. Significant differences of ages in mean BMI among boys (F = 2.222; p < 0.042) and among girls (F = 5.809; p < 0.001) were also clearly observed.
Table 3 presents the prevalence of thinness (Chronic energy deficiency or CED Grade I, II and III) among the studied children. Result reveal that prevalence of undernutrition (age and CED grades combined) among boys and girls were (77.6 %) and (76.4 %) respectively. It is also observed that children of all ages have very high frequency of thinness both in boys and girls. Girls are more undernourished (80.0 %), (80.5 %), (76.7 %) and (75.0 %) at age 6, 8, 9 and 12 years than their male counterpart (79.4 %), (77.1 %), (70.6 %) and (72.2 %) of the same age. However, Boys are more undernourished (81.1 %), (82.5 %) and (81.8%) at age 7, 10 and 11 years than the girls (74.4 %), (66.7 %) and (76.0 %) of same age. Grade I thinness is found to be most prevalent among boys in all ages except age 11 and 12 years followed by grade II and III. Grade III thinness is found to be most prevalent among girls in all ages except age 7, 9 and 11 years followed by grade II and I.

Table 1: **BMI (kg/m^2) Cut-off Points for Thinness Grades III, II and I for 2-18 Years Old Children** (Cole et al. 2007)

Age (Years)	Boys Thinness*			Girls Thinness*		
	Grade III (< 16.0)	**Grade II (16.0 - 16.9)**	**Grade I (17.0 - 18.49)**	**Grade III (< 16.0)**	**Grade II (16.0 - 16.9)**	**Grade I (17.0 - 18.49)**
6	12.50	13.15	14.07	12.32	12.93	13.83
7	12.42	13.08	14.04	12.26	12.91	13.86
8	12.42	13.11	14.15	12.31	13.00	14.02
9	12.50	13.24	14.35	12.44	13.18	14.28
10	12.66	13.45	14.64	12.64	13.43	14.61
11	12.89	13.72	14.97	12.95	13.79	15.05
12	13.18	14.05	15.35	13.39	14.28	15.62

*All values are in kg/m^2.

Discussion

The primary observation of this study was that the prevalence of stunting, defined according to the criteria used in this study, has decreased dramatically among school children, compared with the findings in earlier studies conducted among different groups. Successive waves of NFHS brings to the fore widespread under nutrition among the Indian children, however it shows a declining trend during the inter survey period. Though, the latest estimates as provided by the NFHS 3, highlights the continuance of high overall levels of child malnutrition in India. As we find here, prevalence of child malnutrition in India is widely varied across the states and also across rural and urban areas. The underfed still outnumber the overfed in the developing world among Asian, African and Latin American populations. In spite of the economic development in the region, undernutrition remains an important public problem in many Asian countries (Wickramasinghe et al 2004). Undernutrition is a significant problem and continues to be a cause of morbidity and mortality among children in developing countries like India (Nandy et al 2005, UNICEF 2006). The recent study of Cole et al (2007) has stated that undernutrition is better assessed as thinness (low body mass index for age) than as wasting (low weight for height). Prior to this

report, there were no suitable thinness and overweight/obesity cut-offs for 2-18 years age group (Cole et al 2000, 2007). The uses of these new cut-off points are suggested to encourage direct comparison of trends in childhood thinness and overweight/obesity worldwide. Moreover, these cut-offs provide a classification of thinness and overweight/obesity for public health purposes at the national level. The limitations of present study is small sample size in some age groups and inability to employ any strict sampling strategy, which may make the district and state level extrapolation of the sample questionable. However, the results of the present study clearly indicated that the nutritional situation of these children was not satisfactory with very high rates of thinness among boys and girls (77.6 %) and (76.4 %) respectively.

The comparative prevalence of thinness among 6-12 school children is presented in Table 4 and Figure (1). A previous study using the same international cutoff values among school children of other studies reported lower prevalence of thinness than the present one (77.0 %) followed by Paschim Medinipur (67.2 %) (Bisai et al 2010), Purba Medinipur (62.2 %) (Chakraborty and Bose 2009), Dibrugarh (53.9 %) (Medhi et al 2006), Midnapore & Purulia (44.5 %) (Bose and Bisai, 2008) and Bankura (23.1 %) (Bose et al 2008) reported lowest prevalence of thinness among all the studied population. Thus the present study revealed that the nutritional status of the school children was in very critical situation not only the present one but also other studied population. To overcome this problem more state specific policies should be designed on a priority basis, to arrest the level of thinness and improve the nutritional status of children.

Table 2: **Mean, standard deviation, t value and F (ANOVA) of the various Wt, Ht and BMI in 6-12 years boys and girls of Kharagpur**

Variables	Sex	Age (Years)							F	P
		6	7	8	9	10	11	12		
WT (kg)	M	15.97 (2.50)	17.05 (2.28)	18.89 (3.46)	21.45 (4.81)	21.01 (4.05)	21.84 (3.63)	23.22 (6.75)	13.968	0.001
	F	14.67 (2.04)	17.00 (2.18)	18.37 (2.92)	19.91 (3.72)	22.10 (4.64)	23.36 (5.29)	26.12 (6.29)	36.504	0.001
	t	2.62**	0.11	0.76	1.72	-0.99	-1.13	-1.43		
HT (cm)	M	109.24 (6.88)	112.60 (6.15)	118.97 (6.32)	124.29 (7.91)	123.30 (8.45)	125.23 (8.46)	125.59 (11.46)	23.798	0.001
	F	106.80 (6.06)	113.50 (6.14)	118.20 (5.36)	122.60 (8.41)	126.09 (9.00)	128.40 (10.13)	133.53 (10.04)	50.940	0.001
	t	1.71	-0.65	0.61	1.00	-1.25	-1.16	-2.39		
BMI (kg/m^2)	M	13.31 (0.95)	13.41 (0.90)	13.26 (1.35)	13.73 (1.69)	13.69 (1.24)	13.84 (1.26)	14.44 (2.13)	2.222	0.042
	F	12.82 (1.15)	13.17 (0.98)	13.10 (1.38)	13.14 (1.25)	13.75 (1.54)	13.99 (1.54)	14.43 (1.74)	5.809	0.001
	t	2.04*	1.15	0.55	1.88	-0.16	-0.35	0.03		

Significant at ** $p < 0.01$; * $p < 0.05$ level.

Conclusion

School children of the present study (both sexes) were observed to be under very critical nutritional stress. Present study shows an area based health and nutritional report that will help to understand the state specific policy makers to design and implement on a priority basis, keeping in view the nature of inequality in health status among boys and girls in this school children and its differential characteristics across the district, state and country[4].

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Table 3**: Percentage distribution of nutritional status based on age and sex of the studied sample**

Age (Years)	Boys				
	Thinness Grade III	Thinness Grade II	Thinness Grade I	Overall CED (III+II+I)	Normal
6 (n=34)	20.6	26.5	32.4	79.4	20.6
7 (n=37)	13.5	27.0	40.5	81.1	18.9
8 (n=48)	27.1	16.7	33.3	77.1	22.9
9 (n=51)	21.6	19.6	29.4	70.6	29.4
10 (n=40)	10.0	32.5	40.0	82.5	17.5
11 (n=22)	13.6	50.0	18.2	81.8	18.2
12 (n=18)	38.9	11.1	22.2	72.2	27.8
Girls					
6 (n=50)	32.0	22.0	26.0	80.0	20.0
7 (n=43)	23.3	25.6	25.6	74.4	25.6
8 (n=41)	31.7	24.4	24.4	80.5	19.5
9 (n=43)	30.2	32.6	14.0	76.7	23.3
10 (n=24)	29.2	20.8	16.7	66.7	33.3
11 (n=25)	24.0	20.0	32.0	76.0	24.0
12 (n=24)	37.5	16.7	20.8	75.0	25.0

Table 4: **Comparative prevalence of undernutrition using BMI (Thinness) among different studies with present study of India**

Studied Children	Age group	n	Prevalence (%)	References
Bankura District, West Bengal	6-14	454	23.1	Bose *et al.*, 2008
Purba Medinipur, West Bengal	5-10	569	62.2	Chakraborty and Bose, 2009
Dibrugarh district, Assam	6-14	304	53.9	Medhi *et al.*, 2006
Paschim Medinipur, West Bengal	2-13	119	67.2	Bisai et al., 2010
Paschim Medinipur and Puruliya district, West Bengal	10-15	2016	44.5	Bose and Bisai, 2008
Paschim Medinipur, West Bengal	6-12	500	77.0	**Present Study**

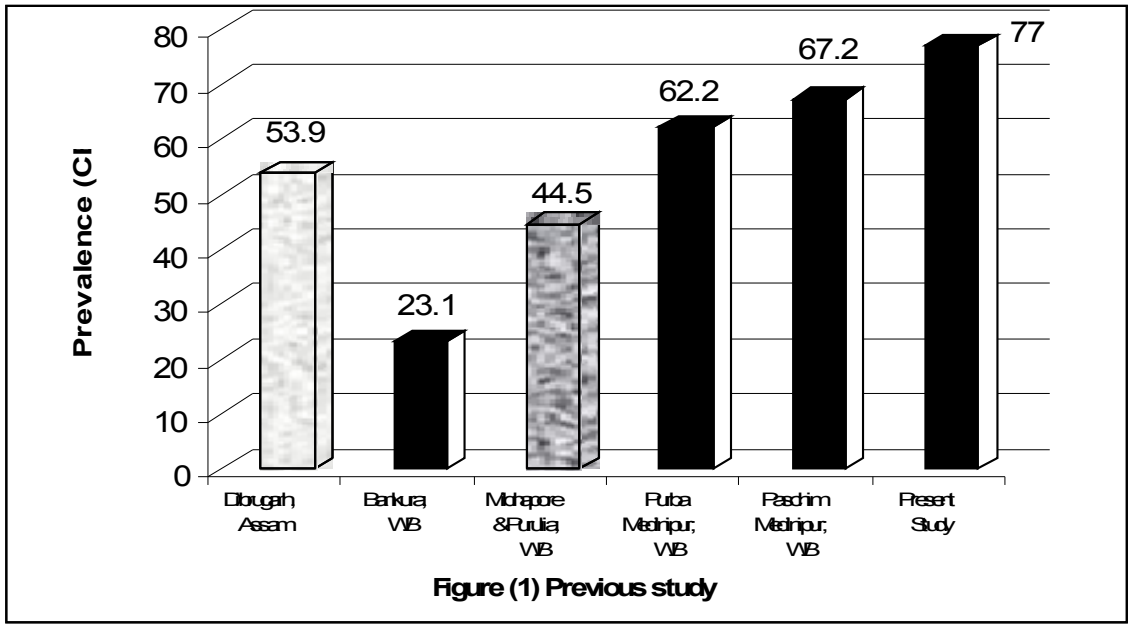

Figure (1) Previous study

References

"World Bank Report". Source: The World Bank (2009). Retrieved 17.08.2011. "World Bank Report on Malnutrition in India".

Growth and Your 6 to 12 Year Old. http://kidshealth.org/parent/growth/growth_6_12.html. Retrieved 12.08.2011

Rao Shobha (2001). Nutritonal sta tus of the Indian population. *J.Biosci*, 26 (4 suppl): 481-9.

Khan, A.Z., N.I. Singh, S.B. Hasan, S.N. Sinha and M. Zaheer (1990). Anthropometric Measurements in Rural School Children. doi: 10.1177/146642409011000512 *Perspectives in Public Health*. Vol. 110 no. 5: 184-186.

Cole, T.J., K.M. Flegal, D. Nicholls, A.A. Jackson (2007). "Body mass index cut offs to define thinness in children and adolescents: international survey". *BMJ*, Vol. 335: 194-198.

World Health Organization, "Physical Status: (1995). The Use and Interpretation of Anthropometry", *TRS* -854. Geneva, World Health Organization.

Ulijaszek, S.J. and A.J. Lourie (1994). *Errors of measurements*. In: Ulijaszek, S. J. & Mascie Taylor, C. G.N. (eds.): *Anthropometry*.

Wickramasinghe, V.P., S.P. Lamabadusuriya, N. Atapattu, G. Sathyadas, S. Kuruparanantha, P. Karunarathne (2004). "Nutritional status of schoolchildren in an urban area of Sri Lanka", *Ceylon Med. J.*, Vol 49: 114-118.

Nandy, S., M. Irving, D. Gordon, S.V. Subramanian, G.S. Davey (2005). Poverty, child undernutrition and morbidity: new evidence from India. *Bulletin of the World Health Organisation*, 83 (3):210–216.

UNICEF, "*Report Progress for Children (2006). A report card on nutrition*". New York: UNICEF.

Cole,T.J., M.C. Bellizzi, K.M. Flegal, W.H. Dietz (2000). "Establishing a standard definition for child overweight and obesity worldwide: international survey". *BMJ*, Vol. 320: 1240-1243.

Bisai, S., T. Ghosh , G. K De and K. Bose (2010). Very High Prevalence of Thinness among Kora-Mudi Tribal Children Paschim Medinipur District of West Bengal, India. *EJBS* 3 (1); April-June: 43-49.

Chakraborty, R., K. Bose (2009). "Very high prevalence of thinness using new international body mass index cut off points among 5-10 year old school children of Nandigram, West Bengal, India", *J. Res. Med. Sci.*, Vol. 14: 129-133.

Medhi, G.K., A. Barua, and J. Mahanta (2006). "Growth and Nutritional Status of School Age Children (6-14 Years) of Tea Garden Worker of Assam", *Journal of Human Ecology*, Vol. 19: 83-85.

Bose, K., and S. Bisai (2008). "Prevalence of undernutrition among rural adolescents of West Bengal, India", *J. Trop. Pediatr.*, Vol. 54: 422-423.

Bose, K., S. Bisai and S. Mukherjee (2008). "Anthropometric characteristics and nutritional status of rural school children", *Intern. J. Biol. Anthropol.*, Vol 2: No: 1.