

## Thinness Among Hill Kharia Children and Adolescents of Purulia Using Body Mass Index Cut-Off Points

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### ABSTRACT

Children and adolescents are in the transitional phase when they are ready for adulthood. Scanty information on nutritional status of tribal children and adolescents, using the new internationally accepted body mass index (BMI) cut-off values, is available, particularly from rural areas in India. The present cross-sectional study was undertaken to determine the prevalence of undernutrition using BMI among 4–18-year-old Hill Kharia children and adolescents of Purulia District, West Bengal, India. A total of 136 (71 boys and 65 girls) children and adolescents aged 4 to 18 years from three villages was studied. Commonly used indicators, i.e., weight, height, and BMI, were used to evaluate nutritional status. The overall prevalence of thinness was 52.2 and 53.8% among boys and girls respectively. The prevalence of thinness (Gd-III, Gd-II, and Gd-I) was 33.8, 9.9, and 8.5% among boys and 32.3, 7.7, and 13.8% among girls respectively, based on the new international thinness cut-offs. The prevalence of thinness was higher among the girls than their male counterparts. The prevalence of the grade-I thinness was more among both boys and girls with the new international cut-offs. Hill Kharia children and adolescents of both sexes were observed to be under serious and critical nutritional stress.

**Keywords:** Body Mass Index, boys, girls, thinness

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### INTRODUCTION

Childhood stage is one of the important stages of human growth; physical growth of children is the result of both environmental and genetical factors and their interaction. Any alteration in the environmental factors (viz., nutrition, hygiene, etc.) leads to the alteration of the

genetic potential of the children, i.e., they fail to reach their potential for catch-up growth. On the other hand, adolescence is a transitional phase when children approach adulthood. Due to hormonal changes in this stage, growth accelerates in height, weight, etc. At this stage, growth is faster than at any stage of postnatal life. Adolescence represents a window of opportunity to prepare for a healthy adult life. During adolescence, nutritional problems originating earlier in life

can potentially be corrected, in addition to addressing of current ones. It is also a timely period to shape and consolidate healthy eating and lifestyle behaviors, thereby preventing or postponing the onset of nutrition-related chronic diseases in adulthood [1].

Undernutrition, a part of malnutrition is a general term for a situation caused by an improper or inadequate diet and nutrition. According to World Health Organization, hunger and malnutrition is the single gravest threat to the world's public health and malnutrition is by far the biggest contributor to child mortality, present in half of all cases [2].

There are an estimated 350 to 400 million children under 18 years suffering from hunger in the world today. On the Global Hunger Index, India ranks 66<sup>th</sup> out of 68 countries [3].

There is scanty information on nutritional status of tribal children and adolescents using the new internationally accepted body mass index (BMI) cut-off values, particularly from rural areas in India. The BMI is known to track significantly from childhood, to adolescence, and then to adulthood [4].

The BMI should therefore be assessed and monitored during childhood and adolescence to allow for early, and perhaps more effective, intervention strategies. Therefore, there is a need to develop a database on the nutritional status of the children and adolescents, using these cut-off values, from different parts of the country to enable the government and other non-governmental agencies to formulate policies and initiate strategies for their well-being. During the last two decades, anthropometric measurements have become the measures of choice for determination of nutritional status among children and adolescents. It has now been well established that the BMI is the most appropriate, inexpensive, non-invasive tool to use to determine the nutritional status [5].

In this communication, an attempt has been made to assess the current nutritional status of the Hill Kharia tribal children and adolescents of Purulia district, West Bengal, India. Growing evidence suggests that in India the gap in prevalence of underweight children among the rich and the poor households is increasing over the years with wide regional differentials [6].

## MATERIALS AND METHODS

The present study was cross-sectional and community-based, conducted in three different villages of Purulia district that are situated about 250 km from Kolkata city, the provincial capital of West Bengal. The subjects of the study were selected through a purposive village level survey among the children and adolescence. A total of 136 (71 boys, 65 girls) children and adolescence (aged 4 to 18 years) subjects was studied during September 2010. Purulia district, a part of the Chhotanagpur Plateau in India constitutes an area of particularly low agricultural productivity and a high incidence and severity of poverty. The Hill Kharia (Indo-Aryan language speaking) tribals live in different states of India. In West Bengal, they are in West Midnapur, Bankura, and Purulia districts. The majority are in Purulia. They are called "Pahari (Hill) Kharia" because they live in the midst of forest and depend upon forest produces [7]. Anthropometric data were collected from three villages, viz., Damodarpur, Rahhidi, and Mangura, which is about 250 km from the provincial capital of the state of West Bengal. All available children and adolescents belonging to this ethnic group in these villages and having no apparent acute disease or disorders were considered for this survey. Data were collected after obtaining the necessary approval from the village and block authorities and parents were informed about the objectives before the commencement of measurement. The

institutional ethical committee approved the data schedule. Information on age, gender, weight, and height were collected on a pre-tested questionnaire by house-to-house visit following interview and examination. Anthropometric measurements such as height and weight were made by the first author (SD) following the internationally accepted standard techniques (WHO) [5].

Height and weight measurements were recorded to the nearest 0.1 cm and 0.5 kg respectively. The BMI was computed following the standard formula:

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m}^2\text{)}$$

BMI cut-off points were followed to define thinness. The age and sex specific cut-off values were established based on international survey [8]. The subjects were selected through simple random sampling method in all 7 villages. Student's t-test and ANOVA test were undertaken to test for sex and age differences in weight, height, and BMI. All statistical analyses were performed using the SPSS statistical package. Statistical significance was set up to p value less than 0.05.

**Table I** Mean and Standard Deviation of Weight, Height and BMI of 4–8 years old Hill Kharia Tribal Children and Adolescence.

Age (Years)	Boys			Girls		
	Weight (kg)	Height (cm)	BMI (kg/m <sup>2</sup> )	Weight (kg)	Height (cm)	BMI (kg/m <sup>2</sup> )
4	11.0 (3.1)	85.6 (7.2)	15.1 (4.1)	9.2 (1.9)	84.7 (6.4)	12.8 (1.7)
5	15.1 (3.7)	104.2 (9.0)	13.8 (1.9)	12.8 (1.4)	97.1 (4.1)	13.5 (1.1)
6	14.8 (6.9)	98.9 (14.4)	14.4 (2.6)	17.1 (4.2)	107.4 (15.2)	14.8 (2.4)
7	20.5 (1.5)	116.9 (3.2)	15.0 (0.9)	16.7 (1.7)	110.9 (7.3)	13.6 (1.0)
8	20.1 (5.3)	117.6 (14.0)	14.2 (0.9)	18.5 (2.2)	115.3 (5.8)	13.9 (1.5)
9	22.6 (3.8)	123.2 (7.8)	14.8 (0.8)	21.6 (6.4)	123.3 (13.2)	13.9 (1.5)
10	25.0 (4.3)	129.4 (9.5)	14.8 (0.8)	22.5 (4.8)	124.1 (9.0)	14.5 (1.1)
11	24.0 (3.1)	133.4 (4.6)	13.5 (1.9)	--	--	--
12	21.5 (5.7)	125.2 (8.3)	13.6 (1.8)	31.9 (1.5)	138.4 (2.6)	16.7 (1.4)
13	39.8 (4.6)	151.9 (6.9)	17.2 (0.4)	34.3 (2.1)	142.6 (2.6)	16.9 (0.9)
14	--	--	--	31.3 (15.2)	145.4 (7.1)	14.5 (5.8)
15	--	--	--	40.0 (1.4)	154.4 (4.5)	16.8 (0.4)
16	42.5 (2.1)	155.4 (4.2)	17.6 (0.1)	34.3 (2.9)	140.1 (4.4)	17.4 (0.9)
17	44.0	159.3	17.3	47.0 (12.7)	151.4 (4.5)	20.4 (4.3)
18	49.0	156.6	20.2	40.0 (4.9)	148.9 (6.4)	18.0 (0.7)

The prevalence of thinness (among boys and girls) of the Hill Kharias of Purulia, West Bengal, is shown in Table II. From this table it can be inferred that, in general, the overall prevalence of thinness (undernourished) was more among the girls (Gd-III = 13.8%, Gd-II = 7.7%, and Gd-I = 32.3%) than boys (Gd-III = 8.5%, Gd-II = 9.9% and Gd-I = 33.8%). There

were no significant sex differences in mean weight, height, and BMI between boys and girls. But, significant age differences were observed in weight ( $F = 38.051, p < 0.001$ ), in height ( $F = 42.915, p < 0.001$ ), and in BMI ( $F = 3.881, p < 0.001$ ). The overall prevalence of thinness (52.9%) was very high among the studied Hill Kharia children and adolescence.

**Table II** Percentage Distribution of Nutritional Status Based on Age and Sex of the Studied Sample.

Age (Years)	Boys					Girls				
	n	Thinness Grade-I	Thinness Grade-II	Thinness Grade-III	Normal	n	Thinness Grade-I	Thinness Grade-II	Thinness Grade-III	Normal
4	13	30.8	7.7	15.4	46.2	7	0	14.3	57.1	28.6
5	14	28.6	21.4	14.3	35.7	6	50.0	--	16.7	33.3
6	5	40.0	40.0	0	20.0	7	28.6	14.3	0	57.1
7	5	20.0	0	0	80.0	5	20.0	40.0	0	40.0
8	9	44.4	11.1	0	44.4	7	14.3	14.3	14.3	57.1
9	8	25.0	0	0	75.0	10	40.0	0	20.0	40.0
10	6	66.7	0	0	33.3	4	50.0	0	0	50.0
11	3	33.3	0	33.3	33.4	2	50.0	0	50.0	0
12	0	0	0	0	0	4	25.0	0	0	75.0
13	2	0	0	0	100.0	5	40.0	0	0	60.0
14	0	0	0	0	0	2	0	0	50.0	50.0
15	0	0	0	0	0	2	100	0	0	0
16	2	0	0	0	100.0	2	50.0	0	0	50.0
17	1	0	0	0	100.0	2	50.0	0	0	50.0
18	1	0	0	0	100.0	2	50.0	0	0	50.0
<b>Total</b>	<b>71</b>	<b>33.8</b>	<b>9.9</b>	<b>8.5</b>	<b>47.9</b>	<b>65</b>	<b>32.3</b>	<b>7.7</b>	<b>13.8</b>	<b>46.2</b>

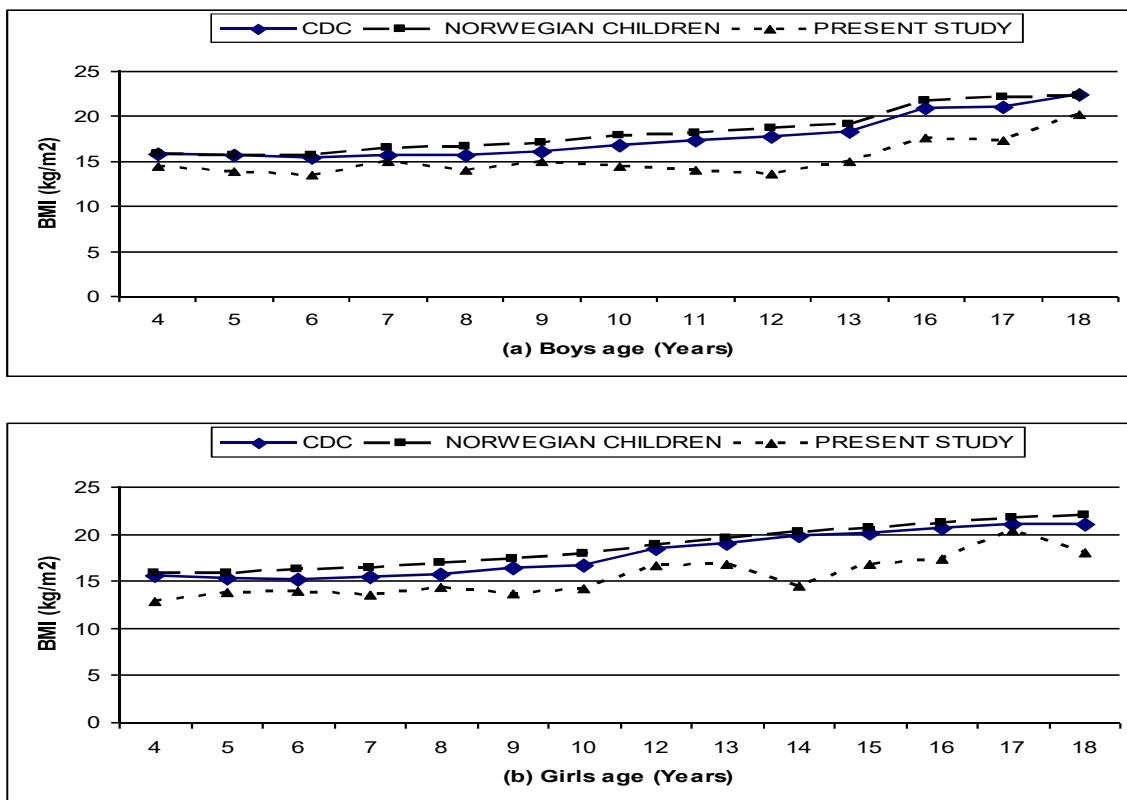
## DISCUSSION

New growth reference enabling the assessment of three thinness categories in 2–18-years-old children and adolescent have been issued recently based on different samples and different ways to assess the cut-offs [8].

The prevalence of child undernutrition in India varies widely across the states and also across rural and urban areas. Malnutrition among children and adolescents is a serious public health problem internationally, especially in developing countries. In a recent study, Cole et al [8] have stated that undernutrition is better assessed

(low BMI for age) than as wasting (low weight for height). Prior to this report, there were no suitable thinness cut-offs for 2-18 years age group [8]. The uses of these new cut-off points are suggested to encourage direct comparison of trends in childhood thinness worldwide. Moreover, these cut-offs provide a classification of thinness for public health purposes at the national level. Based on our study, the prevalence of thinness among Hill Kharia children and adolescents of Purulia clearly indicated that the nutritional situation was very poor with 52.9% of overall thinness. Girls were more thin (53.8%) than boys (52.2%). The limitation of our study was the small sample size and the population being a mono-ethnic group.

Figures 1 (a) and (b) present the overall comparison of the mean of BMI ( $\text{kg}/\text{m}^2$ ) of the 4–18 years old subjects of the present study with CDC data [9] and Norwegian children [10]. It is clear from Figure 1 (a) that Hill Kharia boys aged 4–18 years were lagging behind the CDC as well as Norwegian children in BMI status and they were more likely to grow into thin adults. Similarly Figure 1 (b) shows the Hill Kharia girls were more likely to grow into thin (for ages) adults with low BMI than CDC [9] and Norwegian children [10]. This might have an impact on their physical status and rates of morbidity and mortality as well as their working capacity in adulthood.



**Fig. 1 (a) and (b)** The 50<sup>th</sup> centile values of BMI ( $\text{kg}/\text{m}^2$ ) of the CDC, Norwegian children with present study

## CONCLUSIONS

Hill Kharia children and adolescents of both sexes were observed to be under serious and critical nutritional stress. Present study shows a community based health and nutritional report that will help the state specific policy makers to design and implement a policy on a priority basis, keeping in view the nature of inequality in health status among boys and girls in this ethnic group and its differential characteristics across the state and country.

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