Prevalence of stunting and thinness among Bengali children and adolescent boys of Agartala, Tripura, India

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ABSTRACT

This study was conducted to determine the prevalence of stunting and thinness using height and weight based indicators among Bengali children and adolescent school boys of Agartala, aged between 8 to 16 years. This cross-sectional study was carried out in the rural areas of Agartala through school visits. Subjects were selected using a multistage cluster sampling method. Height and weight were measured using standard procedures and body mass index (BMI) was also computed. Height-for-age below 3rd percentile value of WHO reference and Indian reference was classified as stunting. BMI-for-age below 5th percentile value of WHO reference was classified as thinness. A total of 208 boys participated in this study. Prevalence of stunting was 20% relative to WHO reference, which reduced to almost 10% while using Indian reference data. Prevalence of thinness was 42%. Bengali boys of Agartala were showing high prevalence of stunting but lower thinness values than that of Bengali boys of Kolkata. This study reveals a moderate prevalence of stunting and high prevalence of thinness among our study boys. Poor socio-economic status seems to contribute to this moderate to high prevalence of undernutrition.

INTRODUCTION

Undernutrition continues to be the principal cause of ill-health and premature mortality and morbidity among children and adolescents of developing counties [1, 2]. The prevalence of undernutrition is a major public health concern in many of the developing countries in Asia also. Due to its immense population size, socio-economic disparities, illiteracy and inadequate access to health facilities, India is no exception. As a result, assessments of nutritional status have the potential to play significant roles in formulating developmental strategies in this country [3]. India shows the highest occurrence of childhood undernutrition in the world [4] and it has been estimated that more than half of Indian children are undernourished [5].

The technique of anthropometry has been successfully utilized by different researchers to assess and document the growth and nutritional status of various human communities [6]. Prevalence of undernutrition during childhood is considered to have highly detrimental effects on health in those children who survive to adulthood [7]. Therefore, studies are needed to document the intensity of stunting and thinness among such vulnerable children and adolescents from the north-east region of India.

Bengalis are one of the second largest single ethnic group in the world and primarily belong to Indo-Aryan stock. Ethnically, the Bengali population is a heterogeneous [8]. They are mostly concentrated in the state of West Bengal and Tripura. Tripura is a sub-Himalayan hilly state of north-east India, located between 23º 45" North longitudes and between 91º 30" East longitudes. It is bounded on the north, west, south & south-east by the international boundary of Bangladesh.

In north-eastern India, different communities show variation in the rates of undernutrition [9-13]. But there is very little information available about the undernutrition status of the Bengali boys of Tripura. The aim of the present study includes the assessment of prevalence of stunting and thinness among Bengali boys using international and national references and also to compare the prevalence of stunting and thinness with Bengali boys from West Bengal.

MATERIALS AND METHOD

Design of this study was cross-sectional. Agartala the capital city of Tripura was the site for this study. Bengalis represent almost 70% of the total state population, although more than nineteen classified tribes reside in the state [13]. This study was conducted using data obtained from rural peri-urban areas of Agartala, through a school based survey using multistage cluster

sampling method. Anthropometric data were collected from 208 children (age 8-11 years) and adolescent (age 12-16 years) Bengali boys. A pre-tested questionnaire was administered by personal interview method to the one adult member of the household, to obtain information on socio-economic variables. The study was carried out between February to October 2013. Permission was obtained from the authorities of every school and the Institutional Ethical Committee of Tripura University to conduct the study. Informed written consent was obtained from one of the parents and in addition assent was taken from the subject before conducting the study.

Barefoot height was measured to the nearest 1 mm in centimeters (cm) using an anthropometer (GPM Swiss made). Body weight was measured to the nearest 0.5 kg with a manual weighing scale (Libra), with the subject barefoot and wearing minimal apparel. The balance was checked against a standard weight after weighing each subject. Body mass index (BMI) was calculated using the formula weight (Kg) divided by height in square meters (m^2). Standard anthropometric techniques [14] were used to take all these measurements. Data on age were based on school records and birth certificates given by the parents. The inclusion criterion was apparently normal healthy boys in the age group of 8 to 16 years. The exclusion criterion was a significant clinical history. However, individuals with doubtful age were also excluded from the study.

The intra-observer TEM values for all the measurements was calculated and was found well below the maximum acceptable TEM reference values [15]. Cross-sectional averages (mean) and standard deviation (SD) between age 8 to 16 years of variables like height, weight and BMI were calculated. All statistical analyses were undertaken using the SPSS Statistical Package.

Nutritional status was assessed using WHO recommended anthropometric indicators [7]. Height-for-age below 3rd percentile and below -2 Z score of WHO reference value [16] was classified as stunting. Prevalence of stunting (<3rd percentile) was also estimated using Indian reference data [17]. The prevalence of thinness was evaluated using BMI-for-age below 5th percentile and below -2 Z score of the WHO reference value. Prevalence rates were compared with the Bengali boys of Kolkata [18].

RESULTS

The Bengali boys belong to the upper-lower and lower-middle socioeconomic class as evaluated from Kuppuswamy's socioeconomic status scale [19].

The prevalence of stunting in relation to the cutoffs recommended by WHO are shown in Table 1. The overall prevalence of stunting was moderate: 20.67% and 19.23% with use of the 2 cutoffs (ie, <3rd percentile and < -2 Z scores), respectively. No clear age trend was observed in the prevalence. Prevalence rate ranged from 3.85% in 8 years to 41.67% at 13 years below the 3rd percentile and below -2 Z scores. While using Indian reference data, the prevalence of stunting came down to 10.58%. Mean height of Bengali boys shows an increasing pattern as age advances.

The prevalence of thinness with use of the 5th percentile and the 2 Z score of the WHO reference data as cutoffs are represented in Table 2. The overall prevalence of thinness (42.31%) was doubled that of stunting. Prevalence rate ranged from 29.17% in 10 years to 45.45% at 16 years. When we used the 2 Z score cutoff as a basis of comparison, the prevalence of thinness was considerably lower in most age groups, with an overall prevalence of 34.62%. Mean BMI values increases with advancement of age. The age wise comparison of stunting and

Table 1 : Prevalence of stunting (height-for-age) among Bengali boys of Agartala.

Age (years)	n	Height (cm) Mean SD	< 3rd Percentile[#]	<–2 Z score[#]	< 3rd Percentile[$]
8	26	128.25 = 5.05	1 (3.85)*	1 (3.85)	0
9	24	129.37 = 4.36	2 (8.33)	2 (8.33)	0
10	24	134.64 = 3.98	2 (8.33)	2 (8.33)	0
11	21	136.59 = 8.24	8 (38.1)	8 (38.1)	6 (28.57)
12	20	145.33 = 8.47	4 (20)	4 (20)	1 (5)
13	24	147.50 = 9.59	10 (41.67)	10 (41.67)	6 (25)
14	25	157.22 = 10.43	5 (20)	4 (16)	2 (8)
15	22	162.81 = 7.76	4 (18.18)	4 (18.18)	4 (18.18)
16	22	163.01 = 6.08	7 (31.82)	5 (22.73)	3 (13.64)
All ages	208		43 (20.67)	40 (19.23)	22 (10.58)

Using the WHO reference data [16]. $ Using Indian reference data [17].
*Values in the parentheses are percentage.

Table 2 : Prevalence of thinness (BMI-for-age) among Bengali boys of Agartala.

Age (years)	n	BMI (kg/m²)	< 5th Percentile[#]	< 2 Z score[?]
		Mean ± SD		
8	26	14.75 ± 1.59	9 (34.62)*	6 (23.08)
9	24	14.42 ± 1.30	10 (41.67)	8 (33.33)
10	24	15.84 ± 2.19	7 (29.17)	7 (29.17)
11	21	15.24 ± 1.79	9 (42.86)	7 (33.33)
12	20	15.28 ± 1.36	8 (40)	8 (40)
13	24	16.06 ± 2.46	12 (50)	9 (37.5)
14	25	16.52 ± 2.48	14 (56)	11 (44)
15	22	17.96 ± 3.15	9 (40.91)	7 (31.82)
16	22	17.52 ± 2.14	10 (45.45)	9 (40.91)
All ages	208		88 (42.31)	72 (34.62)

#Using the WHO reference data [16].   *Values in the parentheses are percentage.

thinness between Bengali boys of Agartala and Bengali boys of Kolkata are shown in Figure 1 and 2 respectively.

DISCUSSION

Although many studies have been carried out on the anthropometric assessment of nutritional status in preschool children [20] much less such information can be found about school going children and adolescents. This study is applying the recent WHO reference data [16] and Indian reference data [17] to the rural Bengali boys of north-east India.

Using the two cutoffs, ie, <3rd percentile and <-2 Z scores of the WHO reference data, the prevalence of stunting among Bengali boys of the present study (20.67% and 19.23% respectively) was found to be higher than the Bengali boys of Kolkata (11.2% and 9.4% respectively). While with use of <3rd percentile of the Indian reference data, the prevalence of stunting among Bengali boys of the present study (10.58%) was found to be lower than the Bengali boys of Kolkata (11.2%). The prevalence of thinness determined by the cutoff <5th percentile of the WHO reference data, was found 42.31% among our study boys, which is low than the Bengali boys of Kolkata (50.5%).

The results show that with use of two cutoffs (<3rd percentile
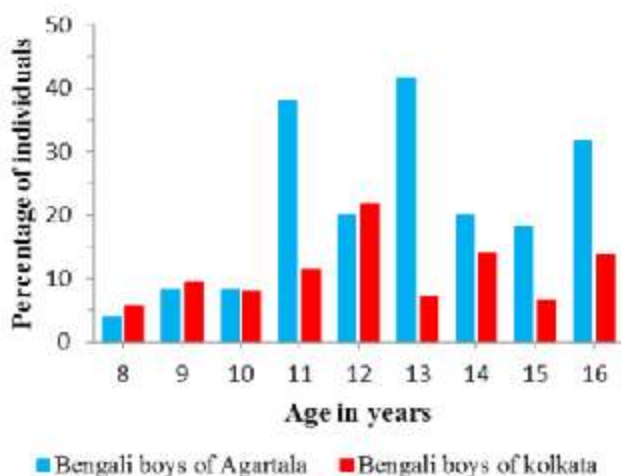
Figure 1: Comparative frequency of stunting among Bengali boys of Agartala and Bengali boys of Kolkata.
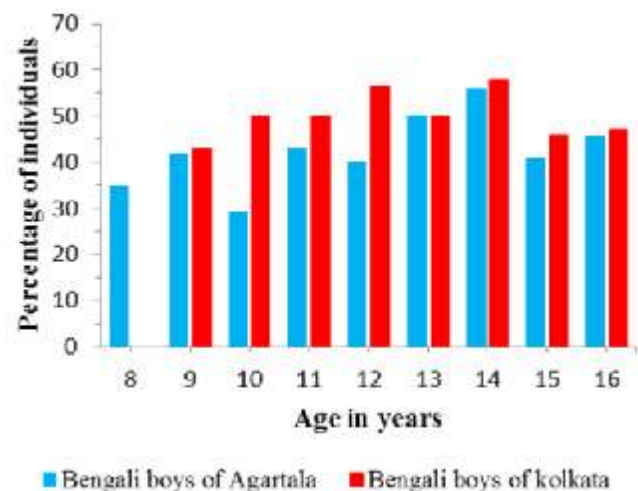
Figure 2: Comparative frequency of thinness among Bengali boys of Agartala and Bengali boys of Kolkata.

and < -2 Z scores) of the height-for-age WHO reference, the overall prevalence rate of stunting in the Bengali boys of Agartala was slightly different (20.67% and 19.23% respectively). This fluctuation was probably to some extent related to the relatively small sample size. The Bengali children and adolescent boys of Agartala show moderate prevalence of stunting and high prevalence of thinness. Thus the undernutrition (thinness) status of Bengali boys of Agartala is better than that of Bengali boys of Kolkata. Poor nutrition and lower socioeconomic condition of the Bengali boys from rural areas of Agartala may be adversely influencing their health and nutritional status. In this study, considering the demographic and socioeconomic characteristics of the study population, the moderate to high prevalence of stunting and thinness estimated by using the WHO reference data is likely to reflect true levels of malnutrition. However, future study including more number of subjects across the Tripura state would provide a clearer picture regarding the nutritional status of the Bengalis.

The NCHS reference data was used for the estimation of prevalence of stunting and thinness among Bengali boys of Kolkata [18]. It was stated that the high prevalence of thinness among the boys were providing inappropriate results due to use of the NCHS data as reference. Our studied boys are from rural background whereas Kolkata boys are from urban areas. This rural-urban difference in the prevalence of stunting and thinness among Bengali boys of the present study and the Bengali boys of Kolkata may be accounted for the differences in the socio-economic status of both the populations.

The Indian reference data used in this study are originally based on results from the upper socioeconomic strata from all regions of India in 1992, these data are now 2 decades old [17]. There is a need for development of a nationwide reference data in India for the adolescent group including different ethnic backgrounds, conducted with use of a common protocol.

CONCLUSION

Bengali boys from rural areas of Agartala, had high rates of undernutrition (thinness), overall was 42.31%. These rates of undernutrition (thinness) were lower than Bengali boys of Kolkata. The overall prevalence of stunting was 20%, using the Indian reference data stunting reduced to almost 10%. The present findings generated through population-based survey will have useful policy implication to address health and nutritional needs of the Bengali boys of Tripura.

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