

Sex variations in anthropometric variables of Santal children of Birbhum district, West Bengal, India

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Abstract

A cross sectional study was undertaken to assess the anthropometric characteristics among 400 pre-primary and primary school going Santal children aged 4 to 11 years which includes 217 boys and 183 girls of Bolpur Sriniketan Block, Birbhum, West Bengal. Anthropometric measurements of age, sex, height, weight, head circumference, chest circumference, waist circumference, hip circumference, Mid Upper Arm Circumference (MUAC), bicep skinfold and tricep skinfold were recorded using standard procedure. In general the present study reveals that the mean value of Height and Weight of the boys are greater than that of the girls but in case of BMI the mean value of girls are greater than that of the boys. The mean value of Head Circumference, Chest Circumference and Waist Circumference of the boys are greater than that of the girls but in case of Hip Circumference and Mid-Upper-Arm Circumference the mean value of girls is greater than that of the boys. The mean value of both the Biceps and Triceps skinfolds of boys are slightly greater than that of the girls. In conclusion, it could be demonstrated that the sex variations in the anthropometric characteristics among the studied Santal children are insignificant and caused due to the differential trends of physical growth and development pattern in several anthropometric dimensions.

Keywords: Anthropometry, Birbhum, children, Santal, tribal, West Bengal.

Introduction

Childhood is a period of rapid growth after infancy. The monitoring of children's anthropometric status is a fundamental tool for the evaluation of their health conditions and a unique opportunity for obtaining objectives measures for the health assessment of a population. Anthropometry has been used during childhood and adolescence in many contexts related to

health and nutritional status. It is well recognized worldwide that anthropometric measurements are essential to diagnosis of undernutrition. Due to its simplicity and low cost, anthropometric evaluations give simple and reliable estimation of undernutrition prevalence. Measures obtained from anthropometry can be sensitive indicators of health, development and growth in infants and children. Thus, anthropometric

examination is an almost mandatory tool in any research on health and nutrition condition in childhood.

The best global indicator of children's well being is growth. The assessment of growth not only serves as a means of evaluating the health and nutritional status of children but also provide an excellent measure to decide future action. Growth is the fundamental physiological process that characterizes childhood. Secular trends in growth show the level of health of the population group. Growth monitoring is a screening tool to diagnose nutritional chronic systemic and endocrine diseases at an early stage. Growth monitoring has the potential for significant impact on mortality even in absence of nutrition supplementation or education. Growth trends are an essential tool in paediatric practice. Their value resides in helping to determine the degree to which physiological needs for growth and development are being met during important childhood period.

Pavement dwelling is likely to aggravate malnutrition among its residents due to extreme poverty, lack of dwelling and access to food and their exposure to polluted environment. Paucity of information about nutritional status of street children compared to that among urban slum dwellers, squatters or rural/tribal population is quite evident. The study revealed the magnitude of Protein Energy Malnutrition (PEM) and few associated factors among a sample of 435 under fives belonging to pavement dweller families and selected randomly from clusters of such families, from each of the five geographical sectors of Calcutta city. Overall prevalence of PEM was found almost similar (about 70%) to that among other 'urban poor' children viz., slum dwellers etc., but about 16% of them were found severely undernourished (Grade III & V of IAP

classification of PEM). About 35% and 70% of street dweller children had wasting and stunting respectively. Severe PEM (Grade III & IV) was more prevalent among 12-23 months old, girl child; those belonged to illiterate parents and housewife mothers rather than wage earners. It also did increase with increase of birth rate of decrease of birth interval (Ray et al., 1999).

The prevalence of under nutrition among Santal children was carried out to determine the prevalence of under nutrition among the Santal children of Purulia district of West Bengal. The study was carried out to determine the prevalence of undernutrition among the Santal children of Purulia district of West Bengal. 442 Santal children (216 boys and 226 girls) aged 5-12 years were taken from randomly selected schools of Balarampur and Baghmundi areas of Purulia. Nutritional status was analyzed by Z-score values according to the height-for-age, weight-for-age and weight-for-height reference data of National Center for Health Statistics (NCHS). The prevalence of undernutrition among Santal children was as follows: stunting (17.9%), underweight (33.7%) and wasting (29.4%). Severe (below -3 Z-score) stunting, underweight and wasting were found in 4.98%, 7.92% and 9.51% of Santal children, respectively. In girls, prevalence of stunting (21.7%) and wasting (35.8%) was higher in comparison to boys (13.8% stunting and 22.7% wasting) (Chowdhury et al., 2008).

Another study was carried out on 4457 school going children to investigate the physical growth as well as nutritional status of West Bengal. Standard anthropometric methods were applied to measure the height and weight of the children. The children were selected randomly from the low socioeconomic groups as per guidance of State Government. The study shows that

average height of girls was more than boys. From the view of weight for age, nutritional status from light of height for age, physical growth as well as nutritional status of boys was affected nutritionally. The weight for age classification shows that no child of 12+ year age was normal. Only 5.14% children of 12+ year age were found with normal physical growth considering the nutritional status from view of height for age (Manna et al., 2011).

A community based, a study was conducted during June to December 1999 in Amdanga Block of North 24 Parganas district, West Bengal. Among a sample of 143 girls (10-19 years), were selected through multistage sampling procedure. Data was collected by interviewing the girls and their parent, whenever necessary using predesigned, pretested, semi structured schedule. Overall prevalence of 'thinness' and 'stunting' were found to be 14.7% and 37.8% respectively. There were no significant association ($p > 0.05$) of thinness on stunting with per capita monthly family income and literacy status of parents. Common nutritional deficiency disorder were anaemia (44.8%), dental caries (25%) (Das and Biswas, 2005).

Anthropometric measurements such as weight, skinfolds thickness, arm and hip circumferences are commonly used to assess the nutritional status of children and adults. The use of anthropometry as an indicator of nutritional and health status of children has now been well established (WHO, 1995). Anthropometry is the single most portable, universally applicable, inexpensive and non invasive method available to assess the size, proportions and composition of the human body (WHO, 1995). It is the means of quantifying variations in body size, shape and composition. It has been recognised one of the most fundamental practical techniques of the human biological studies, since almost every biological function in some way or other

related to one or other aspects of the physical dimensions of the body (Weiner and Lourie, 1981).

In view of this, the present investigation was undertaken to study the sex variations in anthropometric variables among pre-primary and primary school going Santal children aged 4 to 11 years of Bolpur Sriniketan Block, Birbhum, West Bengal, India.

Methods and methods

The present study was carried out in Bolpur Sriniketan Block of Birbhum district, West Bengal. A total of 400 school going children aged 4 to 11 years which includes 217 boys and 183 girls were studied. Anthropometric measurements particularly height, weight, head circumference, chest circumference, waist circumference, hip circumference, Mid Upper Arm Circumference (MUAC), bicep skinfold and tricep skinfold were recorded using standard procedure.

Prior permission and ethical approval was obtained from local community leaders as well as relevant authorities before commencement of the study. All anthropometric measurements were made using the standard techniques of Lohman et al., (1988). Height, head circumference, chest circumference, waist circumference, hip circumference, Mid Upper Arm Circumference (MUAC) were recorded to the nearest 0.1 cm.

Body weight and skinfolds (biceps and triceps) were measured to the 0.5 kg and 0.2 mm respectively. Height was measured using anthropometer and weight was measured using standard weighing scale. Circumferences and skinfolds were measured using steel tape measures and Harpenden skinfold callipers respectively. Technical errors of measurements (TEM) were computed and they were found to be within acceptable limits (Ulijaszek and Kerr, 1999). BMI was computed using the following standard

equation: $BMI = \text{weight (kg)}/\text{height}^2 \text{ (m}^2\text{)}$. Means, standard deviations (SD), minimum and maximum values of all anthropometric variables were computed. All statistical analyses were undertaken using the Statistical Package for Social Science (SPSS v16.0) program.

Results and Discussion

The descriptive statistics (Ranges, Means, Standard Deviations and Median Values) of the anthropometric variables of both boys and girls (combined) are represented in Table 1. The height ranges between 84.00 cm and 151.50 cm; the mean and Standard Deviation 116.44 and (+/-) 13.58 respectively. The weight ranges between 10.00 kg and 39.00 kg; the mean and Standard Deviation values are 19.74 and (+/-) 5.56 respectively. The BMI ranges between 8.66 kg/m² and 19.80 kg/m²; the mean and Standard Deviation values are 14.32 and (+/-) 1.70 respectively. In the circumference measurements Hip circumference shows maximum mean values 56.01 cm (SD +/- 6.08) whereas MUAC shows least mean values 15.49 cm (SD +/- 1.63). The mean values of Biceps and Triceps skinfolds are 4.36 mm (SD +/- 1.60) and 7.36 mm (SD +/- 2.30).

Table 2 shows the descriptive statistics of the anthropometric variables of the boys. The height ranges between 84.70 cm and 149.50 cm; the mean and Standard Deviation values are 117.03 and (+/-) 14.34 respectively. The weight ranges between 10.00 kg and 39.00 kg; the mean and Standard Deviation values are 19.85 and (+/-) 5.85 respectively. The BMI ranges between 8.66 kg/m² and 19.66 kg/m²; the mean and Standard Deviation values are 14.22 and (+/-) 1.70 respectively. Table 3 shows the descriptive statistics of the anthropometric variables of the girls. The height ranges between 84.00 cm and 151.50 cm; the mean and Standard Deviation values

are 115.73 and (+/-) 12.61 respectively. The weight ranges between 10.00 kg and 38.50 kg; the mean and Standard Deviation values are 19.63 and (+/-) 5.22 respectively. The BMI ranges between 9.98 kg/m² and 19.80 kg/m²; the mean and Standard Deviation values are 14.44 and (+/-) 1.71 respectively.

The World Health Organization (WHO) defined health in its broader sense in its 1948 constitution as "A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". A related concern is that anthropometric indicators or nutrition in India for both adults and children are among the worst in the world. Furthermore the improvement of this measures are of nutrition appears to be slow relative to the might be expected in the light of International experience and of India's recent high rates of economic growth. Indeed according to National Family Health Survey, the proportion of underweight children remained virtually unchanged between 1998-99 and 2005-06 from 47%-46% for the age group of 0-3 years. The Indian economy has recently grows at historically unprecedented rates and is now one of the fastest growing economics in the world.

Health is pre-requisite for human development and is essentially concerned with the wellbeing of common man. Health is a function not only of medical care but also of the overall integrated development of society, cultural, economic, educational, social and political. The health status of a society is intimately related to its value system, philosophical and cultural traditions, and social economic and political organizations. Each of this aspect has a deep influence on health, which in turn influences all these aspects.

Gender diversity is the major problem all over the world, which impact on the health status of the children. We cannot take

measurements of the gender diversity but we can measure the health condition of the children. After the analysis, we can compare

the health of both sexes as well as social condition of the particular population.

Table 1. Descriptive Statistics of the Combined Studied Children (N=400).

Variables	Minimum	Maximum	Mean	Std. Deviation
Height (cm)	84.00	151.50	116.44	13.58
Weight (kg)	10.00	39.00	19.74	5.56
BMI (kg/mt sq)	8.66	19.80	14.32	1.70
Head Circumference (cm)	42.90	58.80	48.61	2.07
Chest Circumference (cm)	46.20	72.50	54.97	4.64
MUA Circumference (cm)	11.60	21.20	15.49	1.63
Waist Circumference (cm)	43.00	66.50	52.05	4.48
Hip Circumference (cm)	42.50	72.50	56.01	6.08
Biceps Skinfold (mm)	1.50	9.60	4.36	1.60
Triceps Skinfold (mm)	3.10	15.40	7.36	2.30

Table 2. Descriptive Statistics of the Studied Boys (N=217).

Variables	Minimum	Maximum	Mean	Std. Deviation
Height (cm)	84.70	149.50	117.03	14.34
Weight (kg)	10.00	39.00	19.85	5.85
BMI (kg/mt sq)	8.66	19.66	14.22	1.70
Head Circumference (cm)	42.90	55.10	48.93	2.05
Chest Circumference (cm)	46.20	72.50	55.50	4.87
MUA Circumference (cm)	11.60	21.00	15.38	1.68
Waist Circumference (cm)	43.00	65.00	52.07	4.39
Hip Circumference (cm)	42.50	72.50	55.68	6.33
Biceps Skinfold (mm)	1.50	9.60	4.36	1.64
Triceps Skinfold (mm)	3.10	15.40	7.38	2.42

Table 3. Descriptive Statistics of the Studied Girls (N=183).

Variables	Minimum	Maximum	Mean	Std. Deviation
Height (cm)	84.00	151.50	115.73	12.61
Weight (kg)	10.00	38.50	19.63	5.22
BMI (kg/mt sq)	9.98	19.80	14.44	1.71
Head Circumference (cm)	44.00	58.80	48.22	2.04
Chest Circumference (cm)	46.20	72.50	54.35	4.29
MUA Circumference (cm)	12.80	21.20	15.63	1.55
Waist Circumference (cm)	44.20	66.50	52.03	4.60
Hip Circumference (cm)	43.70	72.00	56.39	5.76
Biceps Skinfold (mm)	2.00	9.60	4.35	1.57
Triceps Skinfold (mm)	3.20	13.80	7.33	2.17

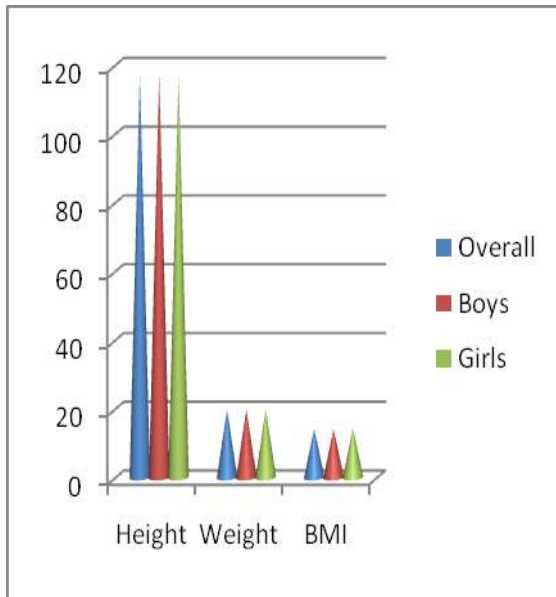


Figure 1. Sex variations in Height, Weight and BMI of the studied children.

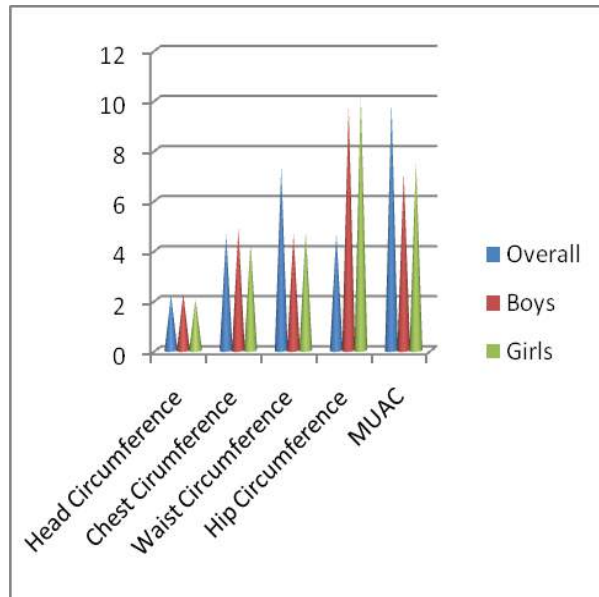


Figure 2. Sex variations in circumferences of the studied children.

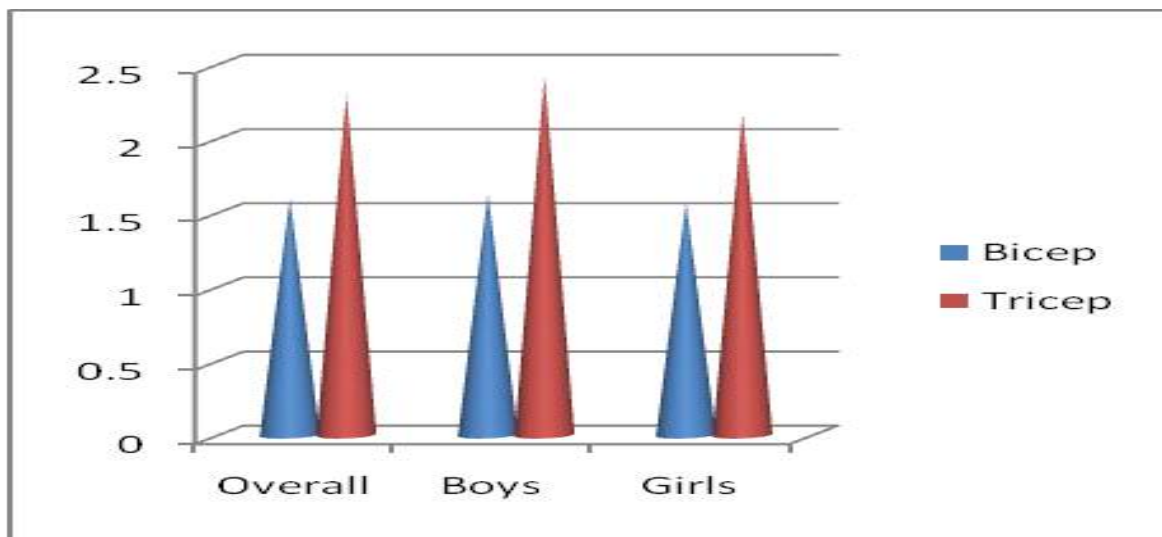


Figure 3. Sex variations in skinfolds of the studied children.

One of the major health problems in many developing countries including India is widespread prevalence of undernutrition among primary school children. The scourge of undernutrition is even more acute among rural children. Recent studies worldwide have investigated the nutritional status of primary school children among various ethnic groups. However, such studies are absent from rural West Bengal and thus information on

anthropometric and nutritional status of rural primary school children are lacking. In general the present study reveals that the mean value of Height and Weight of the boys are greater than that of the girls but in case of BMI the mean value of girls are greater than that of the boys (Figure1). The mean value of Head Circumference, Chest Circumference and Waist Circumference of the boys are greater than that of the girls but in case of Hip

Circumference and Mid-Upper-Arm Circumference the mean value of girls is greater than that of the boys (Figure 2). The mean value of both the Biceps and Triceps skinfolds of boys are slightly greater than that of the girls (Figure 3). In conclusion, it could be demonstrated that the sex variations in the anthropometric characteristics among the studied Santal children are insignificant and that may be due to the differential trends of physical growth and development pattern in several anthropometric dimensions.

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