

DOI: <https://doi.org/10.52756/ijerr.2018.v16.001>

**Physical growth pattern and nutritional status among adolescent Bhumij boys of Khatra Block, Bankura District, West Bengal, India**

**Mithu Bhadra<sup>1</sup>, Pabitra Paul<sup>2</sup>, Tanima Das<sup>2</sup> and Ashish Mukhopadhyay<sup>3\*</sup>**

<sup>1</sup>Assistant Professor, Department of Anthropology, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India; <sup>2</sup>Research Scholar, Department of Anthropology, West Bengal State University, Barasat, West Bengal, India; <sup>3</sup>Assistant Professor, Department of Anthropology, Acharya Prafulla Chandra College, New Barrackpore, West Bengal, India

**\*Corresponding Author:** drashishmukherjee@gmail.com

**Abstract**

A cross-sectional study of 238 adolescent Bhumij boys aged 11-16 years of Khatra block, Bankura district of West Bengal, India was undertaken to study their physical growth and nutritional status. The subjects were classified into six age groups: 11-11.9 (n=35), 12-12.9 (n=41), 13-13.9 (n=39), 14-14.9 (n=45), 15-15.9 (n=40), 16-16.9 (n=38). Physical growth status (estimated by height and weight) was compared with national standard. Nutritional status (undernutrition) was determined by the age and sex specific BMI cut-offs (less than fifth percentile values) based on the National Health and Nutrition Examination Survey (NHANES I). Results shows that studied Bhumij boys were slightly shorter than the national standard at each age and heavier at late adolescence. The overall rate of undernutrition was 53.36%. The rates of undernutrition varied between 47.37% among 16 year olds to 57.50% at age 15 years. There was a gradual increasing trend of undernutrition from 11 to 15 years. Thereafter, there was a slight declining trend in the rates of undernutrition at age 16 (47.37%) years. In general, this study provided facts that the adolescent Bhumij boys had alarming rates of undernutrition. These rates of undernutrition were; in general, agree with the earlier Indian studies but higher than those found among adolescents in several developing countries.

**Keywords:** Adolescents, Anthropometry, Bhumij, growth, undernutrition.

**Introduction**

According to the World Health Organization (WHO 1957), 'health is the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. Anthropometrics can be sensitive indicators of health, growth and development in infants and children. In particular anthropometry has been used during adolescence in many contexts related

to nutritional status (WHO, 1995). Nutrition is an essential aspect of health. It is the science of foods, nutrients and other substance there in, their action, interaction and balance in relation to health and disease, the process by which the organism ingests, digests, absorbs and utilizes nutrients and dispose of their end products.

Nutritional assessment is an evaluation of the nutritional status of individuals or populations through measurements of food and nutrient intake and evaluation of nutrition - related health indicators. The American Dietetic Association defines nutritional assessment as “a comprehensive approach, completed by a registered dietitian, to defining nutritional status that uses medical, nutrition and medication histories; physical examination; anthropometric measurements and laboratory data” (Lee and Nieman, 2003). According to World Health Organization, the ultimate purpose of nutritional assessment is to improve human health (Beghin et al., 1988).

Malnutrition (undernutrition or over nutrition) is an impairment of health either from a deficiency or excess or imbalance of nutrients. It creates lasting effect on the growth and development of a person. Undernutrition and over nutrition are of public health significance among adolescent all over the world. By undernutrition we refer to an inadequate quantity of food. It results in loss of weight and such disturbances as low basal metabolic rate, lower blood pressure, slow pulse, dry skin, insomnia and fractures from osteoporotic changes in the bones. Nutritional edema, burning sensations in the hands and feet are common symptoms in chronic starvation. General poverty, a high rate of illiteracy, low family income, lack of proper diet concept and various socio-cultural factors contribute to this type of health problems. Anthropometry has been used during adolescence in many contexts related to nutritional status (WHO, 1995).

Measures obtained from anthropometry can be perceptive indicators of health. It has now been well established that the height, weight and body mass index (BMI) are the simple markers of physical status and fitness (WHO, 1995). BMI is the most appropriate and universally accepted variable for determining nutritional status among adolescents (Himes and Bouchard 1989; Must et

al., 1991; Rolland-Cachera, 1993). Several recent studies (Kanade et al., 1999; Singh and Mishra, 2001; Venkaiah et al., 2002) have investigated nutritional status of adolescents from different parts of India. However, there is very little information on the nutritional status of adolescent boys from West Bengal (de Onis et al., 2001; Woodruff and Duffield, 2002). The present investigation was undertaken to assess the physical dimensions and nutritional status among adolescent Bhumij boys aged 11-16 years of Khatra block, Bankura district of West Bengal, India.

### **Materials and Methods**

The data were collected by field survey in Gorabari Gram Panchayat area under the CD Block Khatra of Bankura district, Bengal, India. The field site is situated in a tribal dominated remote rural area about 50 km from Bankura city centre. Permission was obtained from the local authorities prior to the commencement of the study. All subjects completed a pre-tested questionnaire. Verification of age was done from the birth records or school certificates. The subjects were mostly belonged to lower income group families of Bhumij tribal group - an Austro-Asiatic endogamous ethnic group of West Bengal. A total of 238 adolescent Bhumij boys, aged 11-16 years were purposely selected and studied. The subjects were classified into six age groups: 11-11.9 (n=35), 12-12.9 (n=41), 13-13.9 (n=39), 14-14.9 (n=45), 15-15.9 (n=40), 16-16.9 (n=38).

Different anthropometric measurements (height, weight, circumferences and skinfolds) were made in the present field survey but only two basic variables (height and weight) and a single derived variable (BMI) have been used for present interpretation. All the anthropometric measurements were taken following the standard techniques recommended by Lohman et al., (1988) and BMI was computed using the standard equation:  $BMI (kg/m^2) = Weight (kg) / Height^2 (m^2)$ .

Nutritional status was evaluated using the World Health Organization (WHO, 1995) recommended age and sex specific cut-off points of BMI based on the National Health and Nutrition Examination Survey (NHANES I) percentile values (WHO, 1985). Undernutrition (thinness) was defined as BMI < 5<sup>th</sup> percentile values of NHANES I. This cut-off point has been utilized by several recent studies worldwide on undernutrition among adolescents (Venkaiah et al., 2002; Woodruff and Duffield, 2002).

At the preliminary stage of the present interpretation, intra-observer technical errors of measurements (TEM) were calculated based on replicate measurements on 30 randomly selected subjects. But the results were fell within acceptable ranges when compared with other research (Ulijaszek and Lourie 1994; Ulijaszek and Kerr, 1999). Therefore, TEM was not incorporated in further statistical analyses.

The distribution of all the metric variables was checked for normality at the initial stage of data analyses. The distributions of height and weight were normal except BMI. However, to maintain consistency as well as for the simplicity in presentation of results all distributions were assumed to be normal. Therefore, parametric statistics were utilized.

Necessary data were collected on a pre-designed "Survey Form" and transferred from data sheets onto a computer database package. All the entries were double-checked for any possible keyboard mistake. The data file was edited and revised methodically and then transformed into statistical program software. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, Version 16).

## **Results and Discussion**

A comparative evaluation of physical dimensions (height and weight) of the Bhumij boys was attempted with the national standard recommended by the Indian Council of Medical

Research (ICMR, 1989). Result reveals that Bhumij boys were slightly shorter than the national mean standard at each age. On the other hand, considering body weight Bhumij boys had similar mean values at early adolescence but was heavier at late adolescence (Table 1).

In general, the overall rate of undernutrition was 53.36% (Table 2). The rates of undernutrition varied between 47.37% among 16 year olds to 57.50% at age 15 years. There was a gradual higher incidence of undernutrition from 11 to 15 years. Thereafter, there was a slight declining trend in the rates of undernutrition at age 16 (47.37%) years.

Adolescence is a period of rapid growth and maturation in human development (Bhadra et al., 2001). Adolescence is a period of increased nutritional requirements and adolescent anthropometry varies significantly worldwide (WHO, 1995; Himes and Bouchard, 1989; Bhadra et al., 2001). There is scanty information on the physical and nutritional status of adolescents particularly among tribal groups. Therefore, there is a need to develop a database from different parts of the country. In this communication an attempt has been made to assess the current physical growth pattern and nutritional status of adolescent Bhumij boys of Khatra block of Bankura district, West Bengal.

The mean height, weight of the Bhumij boys of this study were almost similar to those reported among rural adolescent boys in a recent study from India (Venkaiah et al., 2002). Comparing with a study conducted among Bengalee adolescents of Kolkata Metropolitan (Mukhopadhyay et al., 2005), it is clear that mean height and weight of the Bhumij boys were slightly lower but BMI was somewhat similar to those of the urban adolescents.

Undernutrition is documented public health problem contributed substantially to children's survival (Rahmathullah et al., 1990). In the present investigation more than half (53.36%) of the Bhumij adolescent boys was undernourished. The

**Table 1. Comparison of height and weight by age groups of the adolescent Bhumij boys with national standard (ICMR, 1989).**

Age Groups	Height (cm)		Weight (kg)	
	Present Study (Bhumij Boys) Mean (SD)	ICMR - 1989 (Indian Boys) Mean (SD)	Present Study (Bhumij Boys) Mean (SD)	ICMR - 1989 (Indian Boys) Mean (SD)
11.0-11.9	131.35 (5.82)	133.40 (9.73)	24.15 (5.34)	25.90 (6.33)
12.0-12.9	135.81 (7.12)	138.30 (10.14)	27.28 (6.29)	28.50 (6.10)
13.0-13.9	142.52 (7.69)	144.60 (9.76)	31.34 (7.16)	32.10 (6.82)
14.0-14.9	148.37 (6.91)	150.10 (10.03)	36.26 (7.42)	35.70 (7.62)
15.0-15.9	153.83 (5.87)	155.50 (10.01)	40.67 (6.93)	39.60 (8.36)
16.0-16.9	157.49 (6.46)	159.50 (9.75)	45.74 (5.81)	43.20 (7.88)

**Table 2. Nutritional status of Bhumij boys by age groups based on percentile values of BMI according to WHO (1995).**

Age Groups	Sample Size	Normal		Undernourished	
		No.	%	No.	%
11.0-11.9	35	17	48.57	18	51.43
12.0-12.9	41	19	46.34	22	53.66
13.0-13.9	39	18	46.15	21	53.85
14.0-14.9	45	20	44.44	25	55.56
15.0-15.9	40	17	42.50	23	57.50
16.0-16.9	38	20	52.63	18	47.37
11.0-16.9	238	111	46.64	127	53.36

**Acknowledgements**

The authors would like to thank all subjects who participated in the study. The authors thankfully acknowledged the assistance and cooperation extended by the local villagers and the officials of the Golabari Gram Panchayat, Khatra.

**References**

Ahmed, F., Zareen, M., Khan, M. R., Banu, C. P., Haq, M. N. and Jackson, A. A. (1988). Dietary patterns, nutrient intake and

growth of adolescent school girls in urban Bangladesh. *Pub. Health Nutr.* 1: 83-92.  
 Beghin, I., Cap, M. and Dujardin, B. (1988). A guide to nutritional assessment. World Health Organization, Geneva, Switzerland.  
 Bhadra, M., Mukhopadhyay, A. and Bose, K. (2001). Body mass index, regional adiposity and central body fat distribution among Bengalee Hindu girls : A Comparative Study of Pre-menarcheal and

- Menarcheal Subjects. *Acta. Med. Auxol.* 33: 39-45.
- Bhadra, M., Mukhopadhyay, A. and Bose, K. (2004). Sex differences in anthropometric characteristics among 11-14 year old urban Bengalese of North 24 Parganas, West Bengal, India. *Anthropologie.* XLII: 137-140.
- Bose, K. and Mukhopadhyay A. (2004). Nutritional Status of Adolescent Bengalee Boys of Nimta, North 24 Parganas, West Bengal. *Indian Pediatrics.* 41: 632-633.
- De Onis, M., Dasgupta, P., Saha, S., Sengupta, D. and Blossner, M. (2001). The National Center for Health Statistics reference and the growth of Indian adolescent boys. *Am. J. Clin. Nutr.* 74: 248-253.
- Himes, J. H. and Bouchard, C. (1989). Validity of anthropometry in classifying youths as obese. *Int. J. Obes.* 13: 183-193.
- ICMR (1989). Growth and physical development of Indian infants and children. (Technical Report Series No. 18). Indian Council of Medical Research, New Delhi.
- Kanade, A. M., Joshi, S. B. and Rao, S. (1999). Undernutrition and adolescent growth among rural Indian boys. *Indian Pediatrics.* 36: 145-156.
- Kurz, K. M. (1996). Adolescent nutritional status in developing countries. *Proc. Nutr. Soc.* 55: 321-331.
- Lee, R. D. and Nieman, D. C. (2003). Nutritional assessment. Blackwell, New York.
- Lohman, T. G., Roche, A. F. and Martorell, R. (1988). Anthropometric Standardization Reference Manual. Human Kinetics Books, Chicago.
- Mukhopadhyay, A., Bhadra, M. and Bose, K. (2005). Regional adiposity, body composition and central body fat distribution of 10–16 year old Bengalee boys of Nimta, North 24 Parganas, West Bengal, India. *Collegium Antropologicum.* 29: 487-492.
- Must, A., Dallal, G. E. and Dietz, W. H. (1991). Reference data for obesity: 85<sup>th</sup> and 95<sup>th</sup> percentiles of body mass index (wt/ht<sup>2</sup>) and triceps skinfold thickness. *Am. J. Clin. Nutr.* 53: 839-846.
- Rahmathullah, L., Underwood, B. A., Thulasiraj, R. D., Milton, R. C., Ramaswamy, K., Rahmathullah, R. and Babu, G. (1990). Reduced mortality among children in Southern India receiving a small weekly dose of vitamin A. *N. Engl. J. Med.* 323: 929–935.
- Rolland-Cachera, M. F. (1993). Body composition during adolescence: methods, limitations and determinants. *Hormone Research.* 39(Suppl. 3): 25-40.
- Singh, N. and Mishra, C. P. (2001). Nutritional status of adolescent girls of a slum community of Varanasi. *Indian J. Public Health.* 45: 128-134.
- SPSS. (1996). Statistical Package for Social Sciences. Standard version 7.5.1 for Windows. SPSS Inc., Chicago.
- Ulijaszek, S. J. and Lourie, J. A. (1994). Intra- and inter observer error in anthropometric measurement. In: Ulijaszek, S. J., Mascie-Taylor CGN (eds). Anthropometry: the individual and the population. Cambridge University Press, Cambridge. Pp. 30-55.
- Ulijaszek, S. J. and Kerr, D. A. (1999). Anthropometric measurement error and the assessment of nutritional status. *Brit. J. Nutr.* 82: 165-177.
- Venkaiah, K., Damayanti, K. and Nayak, M. U., Vijayaraghavan, K. (2002). Diet and nutritional status of rural adolescents in India. *Eu. J. Clin. Nutr.* 56: 1119-1125.
- Woodruff, B. A., Duffield, A., Blanck, H., Larson, M. K., Pahari, S. and Bhatia, R. (1999). Prevalence of low body mass index and specific micronutrient deficiencies in

adolescents 10-19 y of age in Bhutanese refugee camps, Nepal, October 1999. *Centers for Disease Control and Prevention, Atlanta.*

Woodruff, B. A. and Duffield, A. (2002). Anthropometric assessment of nutritional status in adolescent populations in humanitarian emergencies. *Eu. J.Clin. Nutr.* 56: 1108-1118.

WHO. (1957). Measuring levels of health. Technical Report Series No. 137, World Health Organization, Geneva.

WHO. (1985). Measuring nutritional status. World Health Organization, Geneva.

WHO. (1995). Physical Status: The Use and Interpretation of Anthropometry. Technical Report Series No. 854. World Health Organization, Geneva.