International Journal of Experimental Research and Review (IJERR)
©Copyright by International Academic Publishing House (IAPH)
ISSN: 2455-4855 (Online) ***Original Article***
Received: 5th May, 2017; **Accepted:** 18th June, 2017; **Published:** 30th June, 2017

Evaluation of health and nutritional status of adolescent Muslim of North Dum Dum, West Bengal, India

Mithu Bhadra[1], Shubhrakanti Baul[2], Biswajit Mahapatra[3] and Ashish Mukhopadhyay[4*]

[1]Department of Anthropology, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India; [2]Department of Anthropology, West Bengal State University, Barasat, West Bengal, India; [3]Department of Anthropology, Vidyasagar University, Midnapore, West Bengal, India; [4]Department of Anthropology, Acharya Prafulla Chandra College, New Barrackpore, West Bengal, India.

***Corresponding Author:** apcc1960@gmail.com

Abstract

An anthropometric cross-sectional study of urban Bengalee Muslim boys (n=350) aged 11-17 years of North Dum Dum, West Bengal, was undertaken to study their health and nutritional status. The subjects were classified into seven age groups: 11-11.9 (n = 48), 12-12.9 (n = 53), 13-13.9 (n = 45), 14-14.9 (n = 49), 15-15.9 (n = 51), 16-16.9 (n = 58), 17-17.9 (n = 46). Physical status (estimated by height and weight) was compared with national standard (ICMR, 1989). Nutritional status (undernutrition) was determined following (WHO, 1995) the age and sex specific BMI cut-offs (less than fifth percentile values) based on the National Health and Nutrition Examination Survey (NHANES I). Analyses of the results demonstrated that Bengalee Muslim boys were slightly taller than the national standard at each age and heavier at late adolescence. The overall rate of undernutrition was 53.14%. The rates of undernutrition varied between 41.67% among 11 year olds to 65.31% at age 14 years. There was a gradual increasing trend of undernutrition from 11 to 14 years. Thereafter, there was a slight declining trend in the rates of undernutrition at ages 15 (58.82%), 16 (53.45%) and 17 (52.17%) years. In general, this study provided facts that the urban adolescent Muslims 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: Adolescent, BMI, muslim, nutritional anthropometry, stature, weight.

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'. 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).

An individual requires a wide range of nutrients to keep him/her healthy and active. They derive these nutrients from their daily diet. An inadequate intake of nutrients could lead to malnutrition and deficiency disease. Malnutrition refers to inadequacy of some key element in the diet, such as proteins, minerals or vitamins. It greatly affects reproduction and infant survival. A malnourished body is the victim of a number of deficiency diseases. Protein deficiency leads to kwashiorkor, retarded growth of the body, apathy, fatty liver and diarrhoea. Deficiency of proteins, iron, folic acid and vitamin B_{12} gives rise to anaemia which is most common among children and, expectant and nourishing mothers. Vitamin A deficiency produces night blindness and dermatosis. There are many other diseases like rickets, pellagra, beriberi, goiter etc. associated with deficiencies of nutrients in human food. Malnourished mothers have more difficult labor, more premature births, more children born with birth defects, higher prenatal mortality and generally lower birth weights of newborns. Children born to malnourished mothers are already at a disadvantage. They are smaller and behind in most aspects of physical development. Due to lack of proper nutrition, the overall growth of children is either retarded or not up to the standard levels. Apart from that, a low nutritional status of the individual also makes them more prone to other diseases; in other words – a lower health status (Lee and Nieman, 2003).

Malnutrition (undernutrition or overnutrition) 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 overnutrition 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 sensitive indicators of health, physical growth and development in infants, children and adolescents. 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 11-17 year old Muslim boys of North Dum Dum, West Bengal.

Materials and Methods

The data were collected by field survey in North Dum Dum area under the district of North 24 Parganas, West Bengal, India. The field site is situated in an urban area within the block Barrackpur II about 20 kms from Kolkata 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 middle-class Bengalees who belonged to Muslim community - a Bengali speaking endogamous ethnic group of West Bengal. A total of 350 Muslim adolescent boys, aged 11-17 years were randomly selected and studied. The subjects were classified into seven age groups by one-year interval: 11-11.9 (n = 48), 12-12.9 (n = 53), 13-13.9 (n = 45), 14-14.9 (n = 49), 15-15.9 (n = 51), 16-16.9 (n = 58), 17-17.9 (n = 46).

A total of fourteen anthropometric measurements (height, weight, six circumferences and six skinfolds) were made by trained investigators 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^{th} 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.

The socio-demographic and anthropometric data were collected on a pre-designed "Questionnaire" 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, 1996).

Results and Discussion

The means and standard deviations of the anthropometric characteristics by age groups of the boys are presented in Table 1. There was a positive linear increasing trend in mean height and weight between 11 and 17 years of age. Mean BMI increased progressively from 14.45 kg/m^2 at age 11 years to 18.74 kg/m^2 at 17 years. The net increase in height, weight and BMI from 11 to 17 years is 30.12 cm, 27.17 kg and 4.29 kg/m^2, respectively.

A comparative evaluation of physical dimensions of the Muslim boys was attempted with the national standard recommended by the Indian Council of Medical Research (ICMR, 1989). Result reveals that Bengalee Muslim boys were slightly taller than the national mean standard at each age. On the other hand, considering body weight Muslim boys had similar mean values at early adolescence but were heavier at late adolescence (Table 2).

Table 1. Physical status by age groups of the adolescent Muslim boys.

Age Groups	Sample Size	Height (cm) Mean (SD)	Weight (kg) Mean (SD)	BMI (kg/m^2) Mean (SD)
11.0-11.9	48	137.42 (7.12)	25.29 (6.34)	14.45 (1.71)
12.0-12.9	53	142.85 (6.79)	28.53 (7.16)	15.61 (2.34)
13.0-13.9	45	148.36 (8.44)	33.97 (8.34)	16.26 (1.87)
14.0-14.9	49	155.63 (6.94)	37.69 (8.42)	16.93 (2.07)
15.0-15.9	51	159.73 (7.58)	43.55 (7.82)	17.54 (2.43)
16.0-16.9	58	164.17 (8.47)	48.27 (6.93)	18.13 (1.96)
17.0-17.9	46	167.54 (6.86)	52.46 (7.28)	18.74 (2.19)
11.0-17.9	350	151.65 (10.54)	37.26 (9.81)	16.49 (1.97)

Table 2. Comparison of height and weight by age groups of the adolescent Muslim boys with national standard (ICMR, 1989).

Age Groups	Height (cm) Present Study (Muslim Boys) Mean (SD)	ICMR - 1989 (Indian Boys) Mean (SD)	Weight (kg) Present Study (Muslim Boys) Mean (SD)	ICMR - 1989 (Indian Boys) Mean (SD)
11.0-11.9	137.42 (7.12)	133.40 (9.73)	25.29 (6.34)	25.90 (6.33)
12.0-12.9	142.85 (6.79)	138.30 (10.14)	28.53 (7.16)	28.50 (6.10)
13.0-13.9	148.36 (8.44)	144.60 (9.76)	33.97 (8.34)	32.10 (6.82)
14.0-14.9	155.63 (6.94)	150.10 (10.03)	37.69 (8.42)	35.70 (7.62)
15.0-15.9	159.73 (7.58)	155.50 (10.01)	43.55 (7.82)	39.60 (8.36)
16.0-16.9	164.17 (8.47)	159.50 (9.75)	48.27 (6.93)	43.20 (7.88)
17.0-17.9	167.54 (6.86)	161.40 (10.45)	52.46 (7.28)	45.70 (9.07)

Table 3. Nutritional status 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	48	28	58.33	20	41.67
12.0-12.9	53	28	52.83	25	47.17
13.0-13.9	45	21	46.67	24	53.33
14.0-14.9	49	17	34.69	32	65.31
15.0-15.9	51	21	41.18	30	58.82
16.0-16.9	58	27	46.55	31	53.45
17.0-17.9	46	22	47.83	24	52.17
11.0-17.9	350	164	46.86	186	53.14

Table 4. Comparative frequency of undernutrition among adolescents of different countries.

Reference study	Area / Population	Sex	Undernourishment
Kurz, 1996	Bombay, India	Both	53.00%
Kurz, 1996	Nepal	Both	36.00%
Kurz, 1996	Benin, West Africa	Both	23.00%
Cookson et al., 1998	Dadaab, Kenya	Both	61.00%
Woodruff et al., 1998	Kakuma, Kenya	Both	57.00%
Woodruff et al., 1999	Nepal	Both	34.00%
de Onis et al., 2001	India	Boys	50.50%
Venkaiah et al., 2002	India	Boys	67.00%
I R C, 1997	Kakuma, Kenya	Boys	75.00%
Present Study	West Bengal, India	Boys	53.14%

In general, the overall rate of undernutrition was 53.14% (Table 3). The rates of undernutrition varied between 41.67% among 11 year olds to 65.31% at age 14 years. There was a higher incidence of undernutrition from 11 to 14 years. Thereafter, there was a slight declining trend in the rates of undernutrition at ages 15 (58.82%), 16 (53.45%) and 17 (52.17%) years. Relative frequencies of undernutrition of different countries show a comparable result (Table 4).

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 Bengalee adolescents. 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 health and nutritional status of urban adolescent Muslim boys of North Dum Dum, West Bengal.

The mean height, weight and BMI of the Muslim boys of this study was higher than those reported among rural adolescent boys in a recent study from India (Venkaiah et al., 2002). Comparing with a latest study conducted among Bengalee adolescents of Kolkata Metropolitan (Mukhopadhyay et al., 2005), it is clear that mean height and weight of the Muslim boys were slightly higher but BMI was somewhat lower than 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 (53.14%) of the Muslim adolescent boys was undernourished. The extent of undernutrition was higher to those reported among two rural Nepali findings studied by Kurz, 1996 (36%) and Woodruff et al., 1999 (34%); and remarkably higher than those observed among African adolescents reported by Kurz, 1996 (23%) and Bangladeshi adolescents studied by Ahmed et al., 1998 (16%). The incidence of undernutrition was quite higher than those reported among urban Bengalee adolescent boys (38%) in a latest study from West Bengal (Bose and Mukhopadhyay, 2004). On the contrary, the prevalence of undernutrition was satisfactorily lower than those reported among rural adolescent boys (67%) in a landmark study from nine states of India (Venkaiah et al., 2002). However, the level of undernutrition observed in the present study agrees with other Indian studies reported by Kurz, 1996 (53%) and de Onis et al., 2001 (51%). In conclusion, this study provided following key messages :

(1) Physical dimensions of urban Muslim boys had greater mean values in height and weight than earlier rural findings as well as national mean standard.

(2) Muslim adolescent boys of the present study had quite high rates of undernutrition (overall = 53.14%).

(3) There were age variations in the rates of undernutrition and the prevalence of undernutrition was lower in the earlier age groups.

References

Ahmed, F., Zareen, M., Khan, M. R., Banu, C. P., Haq, M. N., Jackson, A. A. (1998). 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 Bengalees 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.

Cookson, S. T., Woodruff, B. A. and Slutsker, L. (1998). Prevalence of anemia and low body mass index among adolescents 10-19 y of age in refugee camps in Dadaab District, Kenya. Centers for Disease Control and Prevention, Atlanta, G. A.

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.

Indian Council of Medical Research (ICMR) (1989). Growth and physical development of Indian infants and children. (Technical Report Series No. 18). Indian Council of Medical Research, New Delhi.

International Rescue Committee. (1997). Nutritional status of school aged children in Kakuma refugee camp. International Rescue Committee, Nairobi.

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: 85th and 95th percentiles of body mass index (wt/ht^2) 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 Varanarsi. *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 C.G.N. (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., Nayak, M. U. and Vijayaraghavan, K. (2002). Diet and nutritional status of rural adolescents in India. *Eu. J. Clin. Nutr.* 56: 1119-1125.

Woodruff, B. A., Slutsker, L. and Cook, S. T. (1998). Prevalence of anemia and low body mass index in adolescents 10-19 y age in Kakuma camp, Kenya. Centers for Disease Control and Prevention, Atlanta,G. A.

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.

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

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

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