Int. J. Exp. Res. Rev., Vol. 4: 34-39 (2016)

International Journal of Experimental Research and Review (IJERR)

ISSN: 2455-4855 *Original Article*

ANTHROPOMETRIC ASSESSMENT OF NUTRITIONAL STATUS OF MUSLIM ADOLESCENTS OF DEGANGA, NORTH 24 PARGANAS, WEST BENGAL, INDIA.

Argina Khatun[1], Mithu Bhadra[2]*, Ashish Mukhopadhyay[3] and Kaushik Bose[1]

[1]Dept. of Anthropology, Vidyasagar University, Midnapore, West Bengal, India; [2]Dept. of Anthropology, Dinabandhu Mahavidyalaya, Bongaon, West Bengal, India; [3]Dept. of Anthropology, A.P.C. College, New Barrackpore, West Bengal, India.

*** Corresponding author**

Abstract

A cross-sectional study of 1068 Bengali Muslim boys (n=522) and girls (n=546) aged 10-17 years of Deganga, Barasat, North 24 Parganas, West Bengal, India, was undertaken to study their age and sex differences in nutritional status. The subjects were classified into eight age groups: 10-10.9 years (n = 56, 62), 11-11.9 (n = 63, 73), 12-12.9 (n = 65, 82), 13-13.9 (n = 77, 79), 14-14.9 (n = 84, 78), 15-15.9 (n = 71, 70), 16-16.9 (n = 60, 55), 17-17.9 (46, 47). Individuals falling below the age and sex specific fifth percentile of the World Health Organization (WHO) recommended National Health and Nutrition Examination Survey (NHANES I) were defined as undernourished. The overall rate of undernutrition was 41.67%. The rates of undernutrition of boys varied between 23.33% among 16 years old to 72.73% at age 13 years. The rates of undernutrition of girls varied between 11.43% among 15 years old to 58.90% at age 11 years. The prevalence of undernutrition (combining all ages) varied between boys (52.49%) and girls (31.32%). In general, this study provided evidence that the Bengalee Muslim adolescents had moderate rates of undernutrition. These rates were, in general, lower than those reported in other developing countries including previous Indian studies.

Key words: Muslims, Bengalees, Adolescents, Undernutrition, BMI, Sex Differences.

Introduction

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; Bose and Mukhopadhyay, 2004). According to World Health Organization, the ultimate intention of nutritional assessment is to improve human health (Beghin et al., 1988). Malnutrition (under nutrition or over nutrition) which refers to an impairment of health either from a deficiency or excess or imbalance of nutrients, is of public health significance among adolescent all over the world. It creates lasting effect on the growth, development and physical fitness of a person. It is well recognized worldwide that anthropometric measurements are indispensable in diagnosing undernutrition. It has now been well established that the body mass index (BMI) is the most appropriate variable for determining nutritional status among adolescents (WHO, 1995; Himes and Bouchard 1989; Must et al., 1991; Rolland-Cachera, 1993). Several recent studies have investigated nutritional status of adolescents

from different parts of India (Kanade et al., 1999; Singh and Mishra, 2001; Venkaiah et al., 2002). However, there is scanty information on the nutritional status of Muslim adolescents from rural West Bengal. The present interpretation was attempted to evaluate the overall prevalence of undernutrition and to assess age-sex trends in the level of undernutrition among 10-17 year old Bengalee Muslim adolescents of North 24 Parganas, West Bengal.

Materials and Methods

The investigation was carried out among adolescent Muslim boys and girls in three secondary schools in Deganga block, North 24 Parganas, West Bengal. The schools are situated in a rural area approximately 38 km to the east from the heart of the city of Kolkata and approximately 17 km from the Barasat town. Barasat is the administratative headquarters of the district of North 24 Parganas, West Bengal, India.

One thousand and sixty eight adolescent school students (boys, n=522 and girls, n=546) participated in this study. The age range of the subjects was 10 to 17 years. Official approval and ethical consent were obtained from the school authorities prior to the commencement of the study. All the subjects were informed of the purpose and procedures of this study.

A total of twelve anthropometric measurements (height, weight, five circumferences and five skin folds) were made in the present field survey but only two basic variables (height and weight) and a single derived variable (body mass index) have been used in the present report. All the anthropometric measurements were taken following the standard techniques recommended by Lohman et al., (1988) and body mass index (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).

Technical errors of measurements (TEM) were calculated and the results were found to be within reference values cited by Ulijaszek and Kerr (1999). Therefore, TEM was not incorporated in statistical analyses. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, Version 7.5.1, 1996).

Results

The means and standard deviations of the anthropometric characteristics by age groups of the boys and girls are presented in *Table 1*. Height of boys and girls increased progressively (37.09 cm and 25.02 cm) from 10 to 16 years. Weight of boys showed a steady positive age trend from 13 (28.28 kg) to 16 (50.09 kg) years of age. Weight of girls showed a steady positive age trend from 10 (23.90 kg) to 15 (43.27 kg) years of age. Mean BMI of boys increased progressively by 3.85 kg/m^2 from 10 years to 17 years with a pause at age 14 and 17 years. Mean BMI of girls increased gradually by 4.42 kg/m^2 from 10 years to 15 years.

In general, the overall rate of undernutrition was 41.67% (*Table 2*). The frequency of undernutrition of boys (combining all ages) varied between 23.33% among 16 years old to 72.73% at age 13 years. The rates of undernutrition of girls varied between 11.43% among 15 years old to 58.90% at age 11 years. Distinctive age variations in the change of the rate of undernutrition was observed in both sexes (*Figure 1*).

Table 1 : Age and sex variation in anthropometric characteristics of 10 – 17 years old rural Bengalee Muslim adolescents.

Age groups (years)	Sex	Height (cm)	Weight (kg)	Body mass index (kg/m^2)
10.0-10.9	Boys (n=56)	127.58 (4.70)	23.66 (2.46)	14.51 (1.00)
	Girls (n=62)	127.71 (4.59)	23.90 (2.89)	14.63 (1.26)
11.0-11.9	Boys (n=63)	131.55 (6.00)	26.01(4.26)	14.98 (1.87)
	Girls (n=73)	133.28 (5.34)	26.34 (4.89)	14.78 (2.28)
12.0-12.9	Boys (n=65)	135.77 (5.76)	28.98 (7.99)	15.56 (3.17)
	Girls (n=82)	140.95 (6.04)	30.54 (6.19)	15.30 (2.42)
13.0-13.9	Boys (n=77)	136.09 (6.30)	28.28(5.11)	15.18 (1.81)
	Girls (n=79)	146.80 (7.45)	37.09(6.84)	17.09 (2.19)
14.0-14.9	Boys (n=84)	145.83 (9.91)	34.95(7.87)	16.27 (2.19)
	Girls (n=78)	149.45 (5.82)	39.59 (6.24)	17.68(2.33)
15.0-15.9	Boys (n=71)	158.06 (11.05)	46.09(10.77)	18.43 (4.15)
	Girls (n=70)	150.56 (5.46)	43.27 (7.88)	19.05 (3.07)
16.0-16.9	Boys (n=60)	164.67 (5.97)	50.09 (7.00)	18.45 (2.22)
	Girls (n=55)	152.73 (4.76)	42.65 (5.85)	18.27 (2.30)
17.0-17.9	Boys (n=46)	163.51 (5.10)	49.06 (5.47)	18.36 (1.97)
	Girls (n=47)	151.82 (5.98)	43.31 (6.21)	18.76 (2.22)
Standard deviations are presented in parentheses				

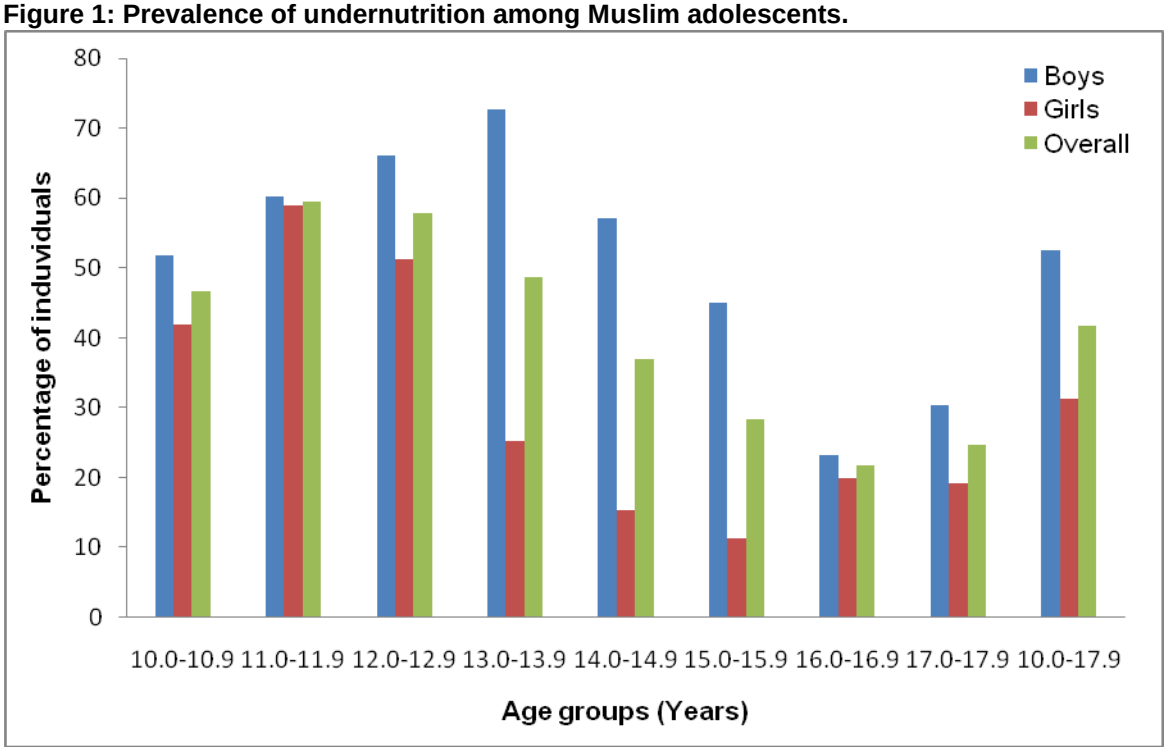
Table 2 : Prevalence of undernutrition (based on < 5th percentile of BMI) of 10 – 17 years old rural Bengalee Muslim adolescents.

Age groups (years)	Normal		Undernourished		Overall Undernourished
	Boys	**Girls**	**Boys**	**Girls**	**Boys + Girls**
	No (%)	No (%)	No (%)	No (%)	No (%)
10.0-10.9	27 (48.21)	36 (58.06)	29 (51.79)	26 (41.94)	55 (46.61)
11.0-11.9	25 (39.68)	30 (41.10)	38 (60.32)	43 (58.90)	81 (59.56)
12.0-12.9	22 (33.85)	40 (48.78)	43 (66.15)	42 (51.22)	85 (57.82)
13.0-13.9	21 (27.27)	59 (74.68)	56 (72.73)	20 (25.32)	76 (48.72)
14.0-14.9	36 (42.86)	66 (84.62)	48 (57.14)	12 (15.38)	60 (37.04)
15.0-15.9	39 (54.93)	62 (88.57)	32 (45.07)	8 (11.43)	40 (28.37)
16.0-16.9	46 (76.67)	44 (80.00)	14 (23.33)	11 (20.00)	25 (21.74)
17.0-17.9	32 (69.57)	38 (80.85)	14 (30.43)	9 (19.15)	23 (24.73)
All ages	248 (47.51)	375 (68.68)	274 (52.49)	171 (31.32)	445 (41.67)
Standard deviations are presented in parentheses					

Table 3: Comparative frequency of undernutrition among adolescents of different countries.

Reference study	Area / Population	Sex	Date of survey	Under-nourishment
Kurz, 1996	Bombay, India	Both	1992-93	53.00%
Kurz, 1996	Nepal	Both	1992-93	36.00%
Kurz, 1996	Benin, West Africa	Both	1992-93	23.00%
Cookson et al., 1998	Dadaab, Kenya	Both	1998	61.00%
Woodruff et al., 1998	Kakuma, Kenya	Both	1998	57.00%
Woodruff et al., 1999	Nepal	Both	1999	34.00%
Mukhopadhyay et al., 2000	Kolkata, India	Both	2000	36.49%
Present study	**Deganga, India**	**Both**	**2015**	**41.67%**
de Onis et al., 2001	India	Boys	1982-83	50.50%
Venkaiah et al., 2002	India	Boys	1996-97	67.00%
I R C, 1997	Kakuma, Kenya	Boys	1997	75.00%
Mukhopadhyay et al., 2000	Kolkata, India	Boys	2000	41.08%
Present study	**Deganga, India**	**Boys**	**2015**	**52.49%**
Venkaiah et al., 2002	India	Girls	1996-97	40.00%
I R C, 1997	Kakuma, Kenya	Girls	1997	55.00%
Ahmed et al., 1998	Dhaka, Bangladesh	Girls	1995	16.00%
Mukhopadhyay et al., 2000	Kolkata, India	Girls	2000	30.61%
Present study	**Deganga, India**	**Girls**	**2015**	**31.32%**

Figure 1: Prevalence of undernutrition among Muslim adolescents.



Boys demonstrated a steady increased in the rate of undernutrition from 10 to 13 years of age. Thereafter, the rate decreased from 14 to 16 years then increased at age 17 years. Contrarily, among girls there was a substantial increase in the rate of undernutrition from 10 to 11 years of age followed by a distinctive decrease from 12 to 15 years. Thereafter, there was an increase at the 16 years and a slight decrease at 17 years.

Discussion

Adolescence is a period of increased nutritional requirements and adolescent anthropometry varies significantly worldwide (WHO, 1995; Himes and Bouchard, 1989; Bhadra et al., 2001). Undernutrition is documented public health problem contributed substantially to children's survival (Rahmathullah et al., 1990). There is scanty information on the nutritional status of Bengalee Muslim adolescents. Therefore, there is a need to develop a database of adolescent undernutrition from different parts of the country. The mean height, weight and BMI of the Bengalee Muslim boys and girls of this study was higher than those reported among rural adolescents in a recent study from India (ICMR, 1996). The BMI of the boys and girls of the present study was lower than a recent study of Sonowal Kachari of Assam, Northeast India (Singh et al., 2014).

In the present investigation more than half (41.67%) of the rural Bengalee Muslim adolescents was undernourished **(*Table 3*)**. The extent of undernutrition was higher than those reported by two Nepalese study, i.e., 36% (Kurz, 1996) and 34% (Woodruff et al., 1999); and markedly higher than those observed among rural African adolescents reported by Kurz (1996) (23%). However, the rate of undernutrition of the present study is higher to those of urban Bengalee adolescents of Kolkata (36.49%) (Mukhopadhyay et al., 2000) but significantly lower than those reported by one Indian study (53%) (Kurz, 1996) and two Kenyan investigations, i.e., 61% (Cookson et al., 1998) and 57% (Woodruff et al., 1998).

Considering sex variation, the rate of undernutrition among adolescent boys of the present study (52.49%) is distinctively higher than the two recent Indian studies: one of urban

boys of Kolkata (50.50%) studied by de Onis et al., (2001) and another of urban Bengalee boys of Kolkata (41.08%) studied by Mukhopadhyay et al., (2000) but lower than rural boys of nine provinces of India (67%) reported by Venkaiah et al., (2002). The same is remarkably lower than those of Kenyan refugees (75%) reported by International Rescue Committee (1997). On the other hand, the rate of undernutrition among adolescent girls of the present sample (31.32%) demonstrated a significantly higher rate of undernutrition compared to Bangladeshi girls (16%) studied by Ahmed et al., (1998), and urban Bengalee girls of Kolkata (30.61%) studied by Mukhopadhyay et al., (2000) but lower than Kenyan refugee girls (55%) and rural Indian girls (40%) reported by IRC (1997) and Venkaiah et al., (2002) respectively. In conclusion, this study provided three vital messages:

1. Rural Muslim adolescents of North 24 Parganas, West Bengal, had sensible rates of undernutrition (overall = 41.67%).
2. There were straightforward age and sex variations in the rates of undernutrition prevalent among the studied samples.
3. These rates of undernutrition of the present study were lower than other developing countries and specifically lesser than earlier Indian findings.

Acknowledgements

The Principals and the authorities of the schools are thankfully acknowledged for their help during data collection. Thanks are also due to the students who participated in this study.

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