

Research Article

Health status of pre-menarcheal and post-menarcheal adolescent girls in West Bengal, India

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ABSTRACT

Background: Under nutrition in children and adolescents is a major problem in developing countries like India. Age at menarche is a significant indicator of growth in girls. There are significant differences in anthropometric and body composition characteristics between pre and post-menarcheal girls. These raised our interest to evaluate anthropometrically the health status of pre-menarcheal and post-menarcheal girls.

Methods: This study was conducted in six government schools of Bankura and Hooghly district in West Bengal state. The subjects of this study were chosen at random irrespective of socioeconomic status and religion so that reflection of an overall picture of health status of study region could be achieved. Body weight and height was measured. Body mass index (BMI) and Rohrer Index was calculated. These were compared with existing international standards for evaluation of nutritional status of the selected subjects. Student t test was used to estimate the significance of difference between pre-menarcheal and post-menarcheal girls. $P < 0.05$ was considered as significant.

Results: Significant percentage of adolescent girls was stunted, thin and underweight. Overall prevalence of stunting, thinness and underweight was 36%, 29.6% and 29.7% respectively. Percentage of all the above indices was higher in pre-menarcheal girls than post-menarcheal girls. Health status of adolescent girls was very poor. Very low health status is found to be prevalent.

Conclusion: It is concluded that there is a high prevalence of under nutrition among adolescent girls. The prevalence is much more in pre-menarcheal girls than post-menarcheal counterpart. There is very high prevalence of low health status of the adolescent girls. Health education and nutrition interventions are needed on priority basis.

Keywords: Pre-menarcheal girls, Post-menarcheal girls, Health status, Stunting, Thinness

INTRODUCTION

Adolescence is a journey from the world of childhood to the world of adulthood. This period is very crucial since these are the formative years in the life of an individual when major physical, psychological and behavioral changes take place. Adolescence is a vulnerable period in human life cycle when nutritional requirements increase due to adolescent growth spurt. This period is characterized by rapid increase in height and weight and hormonal changes resulting in sexual maturation.¹ Adolescence, one of the nutritional stress periods of life

with profound growth, comes with increased demand for energy. Protein, minerals and vitamins.² Malnutrition, both under nutrition and over nutrition resulting from imbalance of nutrients is of public health significance among adolescents across the world.³ The coexistence of overweight/obesity and underweight is rather common in developing countries and is found to be increased proportionally over time.^{4,5} In India adolescents constitute 21.4% of the population⁶ that comprises one-fifth of the total population. The health and nutritional status of the children is an index of the national investment in the development of future manpower. Several studies have

investigated the nutritional status of children and adolescents from different parts of India.^{7,8} In India alone, there are approximately 60 million children who are under weight,⁹ this prevalence is higher in rural areas compared to urban areas.¹⁰ However, India is now also beginning to experience the emerging problem of overweight.¹¹ A recent study along Indian children in the age group of 6-18 years suggests the existence of double burden of underweight and overweight.¹²

The health of adolescents attracted global attention in the past two decades. Poor nutritional status during adolescence is an important determinant of health outcomes. A study conducted in rural Maharashtra found that more than half of the adolescents were thin but only 2% were overweight. The prevalence of thinness was significantly higher in early adolescence than in later and more among girls than boys.¹³ In other study conducted among adolescents of tea garden workers in Assam, the prevalence of stunting was found to be more among girls than among boys and overall, half of the adolescents were stunted and most of them were thin.¹⁴

Adolescent girls constitute nearly one tenth of Indian population.¹⁵ Their current nutritional status will decide the wellbeing of the present as well as the future generations. Under-nutrition among these girls is associated with reduced lean body mass, lack of muscular strength and decreased work capacity.¹⁶ Moreover, underfed girls are at risk of stunted mothers who are likely to suffer obstetric complications and to deliver low birth weight babies.¹⁷ In the absence of effective nutritional interventions, the low birth weight girls become the next generation of stunted mothers, thus perpetuating the vicious cycle of malnutrition

But still studies on the health and nutritional status of adolescent girls are a few and many more studies in different sections of the society are required. In this context I undertook a study to investigate nutritional as well as health status of adolescent girls of Bengali ethnicity.

METHODS

Area of study: This study was conducted in rural and urban areas of Bankura and Hooghly district in West Bengal state. The data was collected from six government schools (mid-day meal schools). Midday meal program is being run by all selected schools and food prepared in the school premises itself.

Study subject: The prior written permission of school authority was taken. Written consent from the parents of the students experimented in the study was obtained. The subjects of this study were chosen at random irrespective of socioeconomic status and religion so that reflection of an overall picture of menstrual health status of study region could be achieved. All students who were willing to participate in the study were included in the study. They were invited to answer the questionnaires, which

dealt with background information such as age, physical activity and dietary habit. We excluded the students who are suffering from any chronic health condition and are using any medicines for long duration.

Measurement of body weight: Body weight was measured using bathroom scale accurate to 0.5kg. The scale was kept on a flat surface and adjusted with '0' mark. Now the subject was requested to step on it in bare feet. Weights were taken in light cloth. Weight was recorded to the nearest 0.5kg.

Measurement of body height: Height was measured using anthropometric rod. Height of the subject was recorded without footwear and expressed to the nearest 0.1cm.

Estimation of body mass index (BMI): BMI was calculated from the height and weight using following equation: $BMI (kg / m^2) = weight (kg) / height^2 (m)$.

Estimation of Rohrer index (RI): RI was calculated from the height and weight using following equation: $RI (gm/cm^3) = body weight (gm) \times 100 / height^3 (cm)$

Determination of nutritional status: Nutritional status was evaluated using anthropometric indicators recommended by WHO experts committee. Height for age below 3rd percentile of NCHS/WHO reference values was classified as stunting.¹⁸ Thinness was evaluated using WHO recommended age-specific cut off point based on WHO reference data.¹⁹ Thinness was defined as BMI-for-age <5th percentile of WHO standard data. Over weight and obese were defined as BMI-for-age >85th percentile and >95th percentile respectively.²⁰ Underweight was assessed through weight for age according to WHO.²¹ Prevalence of stunting was calculated at cut off level of 3rd percentile²² on the basis of WHO.²³

Determination of health status: Health status was evaluated from Rohrer Index (RI) or Index of Corpulence. RI was computed using standard equation and classification was done following the international standard.²⁴

$RI = Body weight (gm) \times 100 / stature^3 (cm)$.

Range variation of RI:

Very low ≤ 1.12

Low 1.13 to 1.19

Middle 1.20 to 1.25

Upper middle 1.26 to 1.32

High 1.33 to 1.39

Very high ≥ 1.40

Healthy range 1.2 to 1.6

Statistical analysis: the parameters taken were analyzed statistically to find out the mean and standard deviation of height, weight and BMI. These were compared with existing international standards for evaluation of nutritional status of the selected subjects. Student t test was used to estimate the significance of difference between

premenarcheal and post menarcheal girls. $P < 0.05$ was considered as significant.

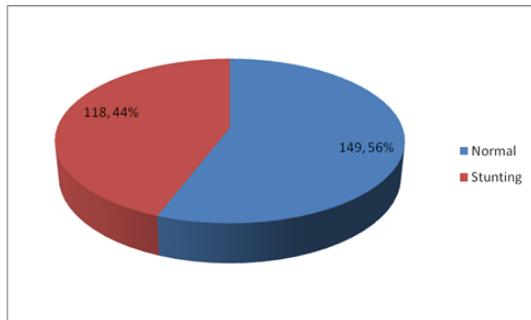
RESULTS

A total 770 adolescent girls (276 pre-menarcheal and 503 post-menarcheal) were studied. Table 1 shows the age wise distribution of the subjects. Age of pre-menarcheal adolescent girls varies from 9 years to 14 years where as post-menarcheal girls range from 10-16 years.

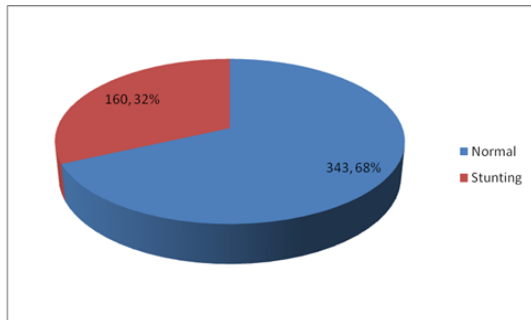
Table 1: Distribution of pre-menarcheal and post-menarcheal girls according to age.

Age (years)	Pre-menarcheal	Post-menarcheal	Total
9	23	-----	23
10	74	18	92
11	81	50	131
12	31	93	124
13	42	144	186
14	16	81	97
15	-----	62	62
16	-----	55	55
Total	267	503	770

Figure 1 and Table 2 show the prevalence of stunting (height for age less than 3rd percentile) as per NCHS standard. The overall prevalence of stunting was 44% for pre-menstrual adolescent girls and 32% for post-menarcheal girls (Figure 2). The age wise prevalence of stunting was highest in the age group of 10 years and 13 years for pre-menarcheal girls and 10 years for post-menarcheal girls (Table 2).

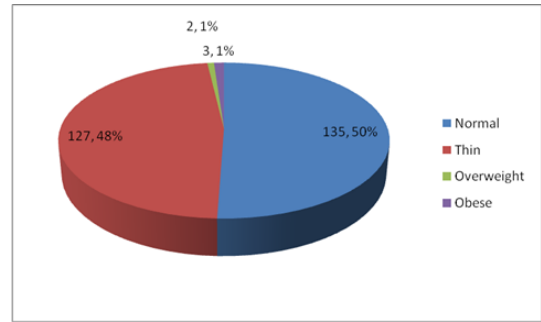


A

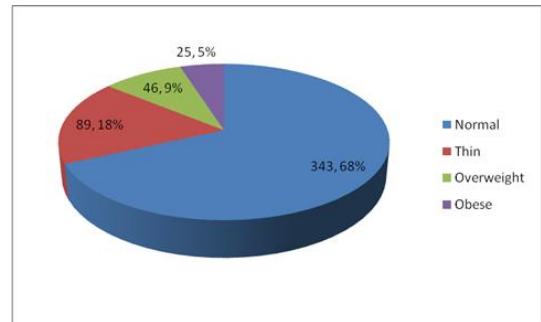


B

Figure 1: Body height status of pre menarcheal (A) and post menarcheal (B) girls.

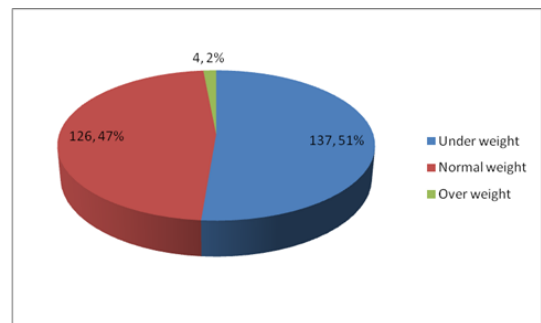


A

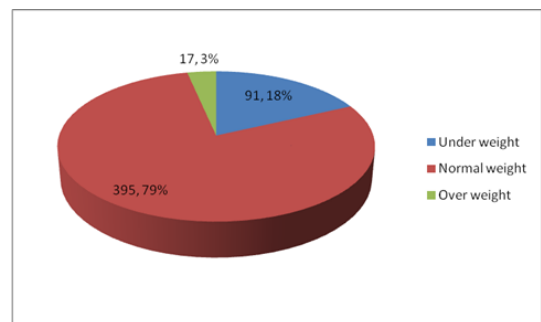


B

Figure 2: Body weight status of pre menarcheal (A) and post menarcheal (B) girls.



A



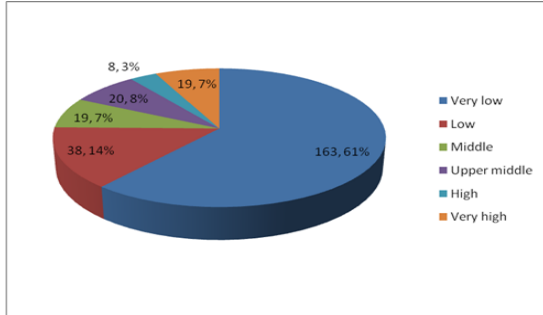
B

Figure 3: Nutritional status of Pre menarcheal (A) and post menarcheal (B) girls on the basis of BMI.

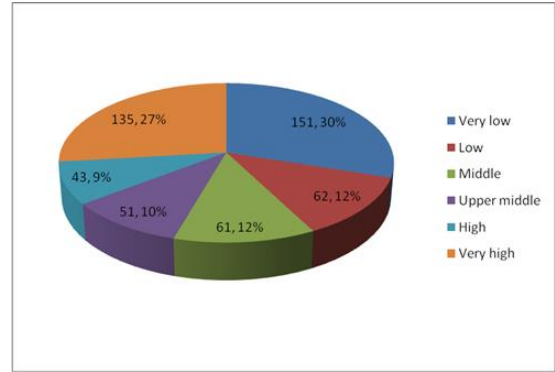
Overall prevalence of underweight (weight for age less than 5th percentile) was 51% for pre-menstrual adolescent

girls and 18% for post-menarcheal girls (Figure 2). Age wise prevalence of underweight was highest for age group 10 years for pre-menarcheal girls, age group 15 years for post-menarcheal girls and age group 9 years for overall (Table 3).

Fig. 3 represents the prevalence of thinness (BMI for age less than 5th percentile) as per NCHS standard. 48% pre-menarcheal girls and 18% post-menarcheal girls are under thinness. The age wise prevalence of thinness was highest for age group 9 years (Table 3).



A



B

Fig.4: Health status of Pre menarcheal (A) and post menarcheal (B) girls on the basis of RI

Table 5 and Fig. 4 exhibit the Rohrer Index of adolescent pre and post-menarcheal girls. Very low health status (RI<1.12) is found to be prevalent (61% for pre-menarcheal girl, 30% for post-menarcheal girls and 40.8% overall).

Table 2: Age wise prevalence of stunting of pre-menarcheal and post-menarcheal girls.

Age	Pre- menarcheal girls		Post menarcheal girls		Overall girls	
	n	Stunting	n	Stunting	n	Stunting
9	23	6 (26.1%)	-----	-----	23	6 (26.1%)
10	74	44 (59.5%)	18	7 (38.9%)	92	51 (55.4%)
11	81	20 (24.7%)	50	11 (22.0%)	131	31 (23.7%)
12	31	15 (48.4%)	93	29 (31.2%)	124	44 (35.5%)
13	42	25 (59.5%)	144	53 (36.8%)	186	78 (41.9%)
14	16	8 (50.0%)	81	25 (30.9%)	97	33 (34.0%)
15	-----	-----	62	15 (24.2%)	62	15 (24.2%)
16	-----	-----	55	20 (36.4%)	55	20 (36.4%)
Total	267	118 (44.2%)	503	160 (31.8)	770	278 (36.1 %)

Table 3: Age wise prevalence of underweight of pre-menarcheal and post-menarcheal girls.

Age	Pre- menarcheal girls		Post- menarcheal girls		Overall girls	
	n	Underweight	n	Underweight	n	Underweight
9	23	14 (60.9%)	-----	-----	23	14 (60.9%)
10	74	51 (68.9%)	18	2 (11.1%)	92	53 (57.6%)
11	81	22 (27.2%)	50	5 (10.0 %)	131	27 (20.6%)
12	31	12 (38.7%)	93	16 (17.2%)	124	28 (22.6%)
13	42	25 (59.6%)	144	26 (18.1%)	186	51 (27.4%)
14	16	13 (81.2%)	81	14 (17.3%)	97	27 (27.8%)
15	-----	-----	62	16 (25.8%)	62	16 (25.8%)
16	-----	-----	55	12 (21.8%)	55	12 (21.8%)
Total	267	137 (51.1%)	503	91 (18.1%)	770	29.6%)

Table 4: Age wise prevalence of thinness of pre-menarcheal and post-menarcheal girls.

Age	Pre- menarcheal girls		Post menarcheal girls		Overall girls	
	n	Thinness	n	Thinness	n	Thinness
9	23	12 (52.2%)	-----		23	12 (52.2%)
10	74	39 (52.7%)	18	2 (11.1%)	92	41 (44.6%)
11	81	28 (34.6%)	50	7 (14 %)	131	35 (26.7%)
12	31	10 (32.3%)	93	25 (26.9%)	124	35 (28.2%)
13	42	26 (61.9%)	144	31 (21.5%)	186	57 (30.6%)
14	16	12 (75%)	81	12 (14.8%)	97	24 (24.7%)
15	-----	-----	62	18 (29.0%)	62	18 (29.0%)
16	-----	-----	55	7 (12.7%)	55	7 (12.7%)
Total	267	127 (47.6)	503	102 (20.3)	770	229 (29.7%)

Table 5: Health status (Rohrer index) of pre-menarcheal and post menarcheal girls.

RI	Health status	Number (%) of girls		
		Pre menarcho	Post menarcho	Overall
≤ 1.12	Very low	163 (61)	151 (30)	314 (40.8)
1.13 to 1.19	Low	38 (14)	62 (12)	100 (13.0)
1.20 to 1.25	Middle	19 (7)	61 (12)	80 (10.4)
1.26 to 1.32	Upper middle	20 (8)	51 (10)	71 (9.2)
1.33 to 1.39	High	8 (3)	43 (9)	51 (6.6)
≥ 1.40	Very high	19 (7)	135 (27)	154 (20)

DISCUSSION

In the present study it was observed that overall prevalence of stunting as per NCHS was 36% for adolescent girls having age limit 9-16 years. This prevalence was more for pre-menarcheal adolescent than post-menarcheal adolescent girls. This reflects the fact that average Indian build is probably poorer than that considered in the NCHS population. A high prevalence of stunting is an indicator of chronic energy deficiency. A recent study in South India showed that 47% of adolescent irrespective of sex were stunted.²⁵ In another study in rural North India among school children recorded a prevalence of stunting as 41% as per NCSH.²⁶ Another study on adolescent in rural community of Bangladesh reported a prevalence of 48% according to NCHS standard.²⁷ Thus the prevalence of short stature was lower when compare to adolescent of other Indian region as well as Bangladesh. The better socioeconomic conditions in West Bengal namely per capita income and political stability may be responsible for above observation.²⁵

BMI is an age independent anthropometric criteria. It is an indicator of nutritional status. Prevalence of thinness in respect to BMI was found to be 29.7%. Various authors have reported the prevalence of thinness among adolescent girls to be 14.7%, 30.1%, 41.3% and 59%.^{28,29,26,30} The heterogeneous population studied by the individual authors from different ethnic and geographical backgrounds may explain the variations in the results.

In the presence study prevalence of underweight among overall girls was 29.6% although prevalence was higher

in pre-menarcheal group than post-menarcheal girls. Venkaiah et al.³¹ reported that the prevalence of underweight is higher (53.1%) in boys than in girls (39.5%)

Our study presents health status of adolescent girls having age limit 9-16 years. It was assessed by Rohrer Index. Overall 40.8% of adolescent girls are under very low health status. Situation of pre- menarcheal girls was worse (61%) in compare to post-menarcheal girls (30%).

CONCLUSION

It is concluded that prevalence of stunting, thinness and under nutrition is very common among adolescent girls. Thus their health status is poor. Condition of pre-menarcheal girls was worse than post-menarcheal girls. This probably puts the community at a greater risk as these adolescent girls are approaching the marriageable age and would bear children. The poor health status would definitely reflect on the health of future generation.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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