

Age at Menarche and Anthropometric Status of School Girls in Rangpur, Bangladesh

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Abstract

Introduction: Menarche is a key indicator in pubertal development. This is a biological and social measure of a girl's healthy transition from childhood into adolescence or young adulthood. Menarche mainly depends on genetic and environmental factors.

Objective: The aim of the present study was to observe the prevailing normal menarcheal age and height-weight at that age as well as the correlation between them among the school going girls of Rangpur.

Materials and Methods: This cross-sectional descriptive study was carried out from July 2014 to June 2015 among 200, female students (100 rural and 100 urban). Two schools, one from Rangpur city and other from a rural area of Rangpur division were purposively selected for the study. Purpose and procedure of study were explained to the target population and 100 volunteers who had their menstruation started 6 months prior to the time of data collection were selected for the study. Required variables (date of birth, date of menarche, height and weight) were recorded and the data were analyzed using microsoft Excel and SPSS-16.0.

Results: The mean menarcheal age in case urban students was 11.8±0.8 years and in case of rural students was 13.6±0.8 years (range: 12-16 years). The mean weight, height and body mass index (BMI) were respectively 46.5 ± 8.4 kg, 153.2 ± 6.6 cm, 19.8 ± 3.2 kg/m² in urban and 40.0 ± 4.2 kg, 146.4 ± 3.8 cm, 18.6 ± 1.5 kg/m² in rural subjects. Statistically significant differences were observed at all levels (p<0.001).

Conclusion: Urban girls were observed significantly taller and heavier than the rural girls at the age of menarche and had significantly early menarche.

Key-words: Menarche, Age, Height, Weight.

Introduction

The age of first menstrual cycle, menarche is the most significant indicator of growth and sexual maturation in girls and the most accurately recalled indicator of puberty¹. This event is the last in the series of events involved in the process of normal pubertal development. Knowledge about the various factors regulating the onset age of menarche has the potential to improve understanding of female reproductive health². This ultimately will be able to promote the health of women as well as their offspring. Variations in the timing of puberty are marked between well of and underprivileged population. A marked delay in menarche is reported in underprivileged and socially lagging behind girls³. Although the main timing of puberty is influenced by genetic factors, other factors such as geographical location, general health status, nutrition and socioeconomic status affect the onset of menstruation and its progression as well⁴. Nutritional status has an important role in attainment of menarche. Factors like dysfunctional family relationship, maternal depression and father's absence may have association with early attainment of menarche⁵.

Age at menarche has a positive relation with the deposition of fat in the body. Fatness triggers menarche. Developing a method of estimating a minimum weight for a particular height is necessary. It is observed that puberty starts earlier in medium-obese girls (with 20 to 30 % overweight than normal) than in girls with normal weight (16 to 23.7% of body weight). In contrast, girls with malnutrition have a delay in menstruation⁶. Body mass index (BMI) significantly correlates with prolonged menstrual cycle and menses. The girls with higher BMI experience a significantly longer menstrual cycle and in addition longer menstruation compared to their normal weight compartment⁷. The increased body fat reflected by higher BMI in girls may be related to Leptin (protein product encoded by the obese gene). Leptin stimulates the secretion of gonadotropin-releasing hormone (GnRH) by the hypothalamus and this hormone results in stimulation of the pituitary-ovarian axis which in turn stimulates a pubertal surge of gonadotropin⁴. Some studies suggest that the age at menarche

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is related more to body fat distribution. In this regard, higher gluteofemoral adiposity is reported to be associated with a lower menarcheal age⁸.

Girls, who attain menarche at a late age, tend to achieve a greater height as an adult than girls who attained menarche at earlier age^{9,10}. This relationship is explained by the earlier fusion of the growth plate in girls due to an increase in the production of ovarian estrogens associated with menarche⁹. The practical implication is that girls who had an early menarcheal age are more likely to have short stature as adults, which has adverse psychological impact on the long run¹. Some study also did not observe any relation of height to the onset of menarche¹¹.

Improved consciousness of attainment of proper weight requires planned counseling is required and for that the prevailing social status at the different strata of society should be found out. For this reason the present study was designed to find out the age of menarche, weight-height at that time and correlation between them among the school going girls of urban as well as rural regions of a peripheral division (Rangpur) of Bangladesh.

Material and Method

This descriptive cross-sectional study was conducted at the Department of Anatomy Rangpur Medical College Rangpur, during the period, July 2014 to June 2015. Two schools of Rangpur, one from the city and other from a rural area, were purposively selected. Ethical aspects were addressed. The objective of the study was explained to study population and 100 students were finally selected from each school, those who were volunteers and had their menstruation started within 6 months prior to the time of data collection. After taking the written consent of each of the participants, data were collected. Date of birth and date of menarche were collected by interviews and measurements were taken one by one. The measurements included the height and weight of each respondent and all findings were recorded on a spreadsheet. Height was measured while the subject was standing without footwear, to the nearest 0.1 cm, using a portable stadiometer. Weight was measured with the subject standing and wearing light clothes to the nearest 0.1 kg using a digital weight machine. The computer program, SPSS-16.0 was used for statistical processing. Statistical analysis was done by unpaired students t test and the significance level was set at $p < 0.05$.

Results

The mean menarcheal age in case of urban students was 11.8 ± 0.8 years and in case of rural students that was 13.6 ± 0.8 years (range: 12-16 years). The mean height and weight of the urban students were 153.2 ± 6.6 cm and 46.5 ± 8.4 kg and that of rural students were 146.4 ± 3.8 cm and 40.0 ± 4.2 kg respectively. The differences between means were significantly higher ($p < 0.001$) in case of urban students than the rural students (Table-I).

Table-I: Distribution of the subjects by height, weight and body mass index (BMI)

Variables	Subject		p-value
	Urban (n=100) Mean \pm SD (Range)	Rural (n=100) Mean \pm SD (Range)	
Height (cm)	153.2 ± 6.6 (130 -165)	146.4 ± 3.8 (139 -157)	0.001*
Weight (kg)	46.5 ± 8.4 (30-68)	40.0 ± 4.2 (29-51)	
Body mass index(Kg/m ²)	19.8 ± 3.2 (14.0-30.7)	18.6 ± 1.5 (14.6-21.2)	

* Differences are highly significant.

The highest proportions of urban students (36%) were observed between 151 & 155 cm and rural students (41%) were observed between 141 & 145 cm for height (Figure-1). A positive correlation between age and height was observed in urban and rural students (Figure-2) but the relation did not reach to the significant level (correlation coefficient, $r=0.053$, $p > 0.05$) and in rural students (correlation coefficient, $r=0.145$, $p > 0.05$).

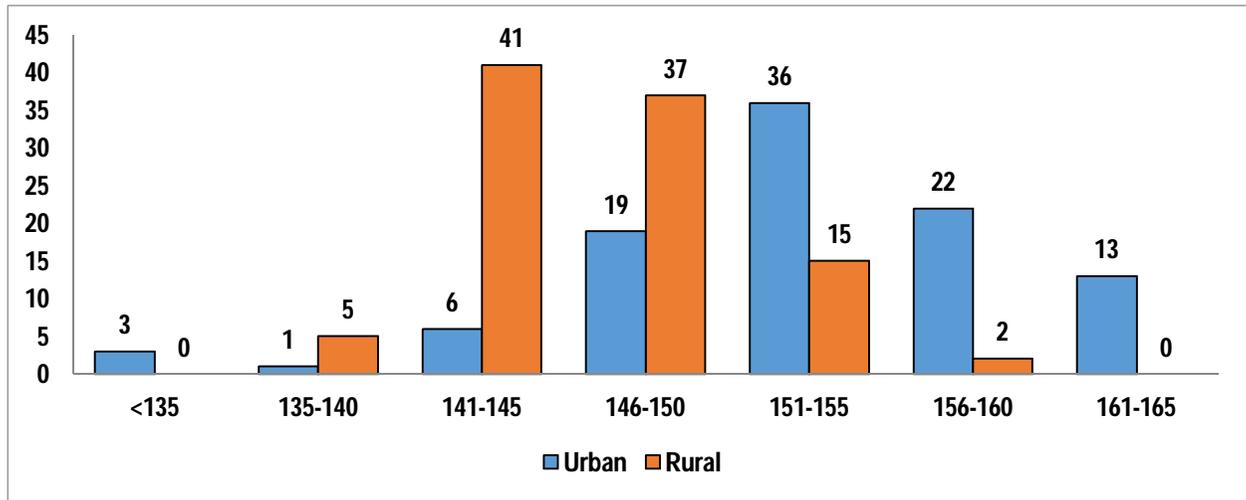


Figure-1: Distribution of urban (n=100) and rural (n=100) students according to stature.

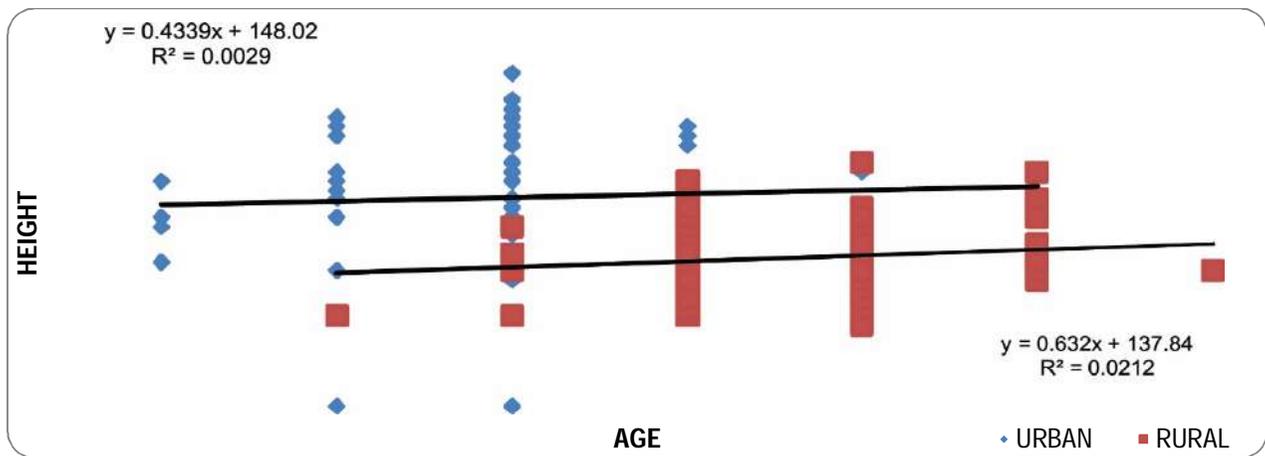


Figure-2: Nonsignificant positive correlation between age and height in urban (n=100) and rural (n=100) students.

The highest proportions of students were found between 41 & 50 kg weight in urban girls and in between 31 & 40 kg weight in rural girls (Figure-3). The proportions of urban students and rural students in the highest distribution were 50% and 51% respectively. Significant positive correlations between age and weight in urban and rural students (correlation coefficient, $r = 0.196$, $p < 0.05$) and in rural students (correlation coefficient, $r = 0.341$, $p < 0.001$) were observed (Figure-4).

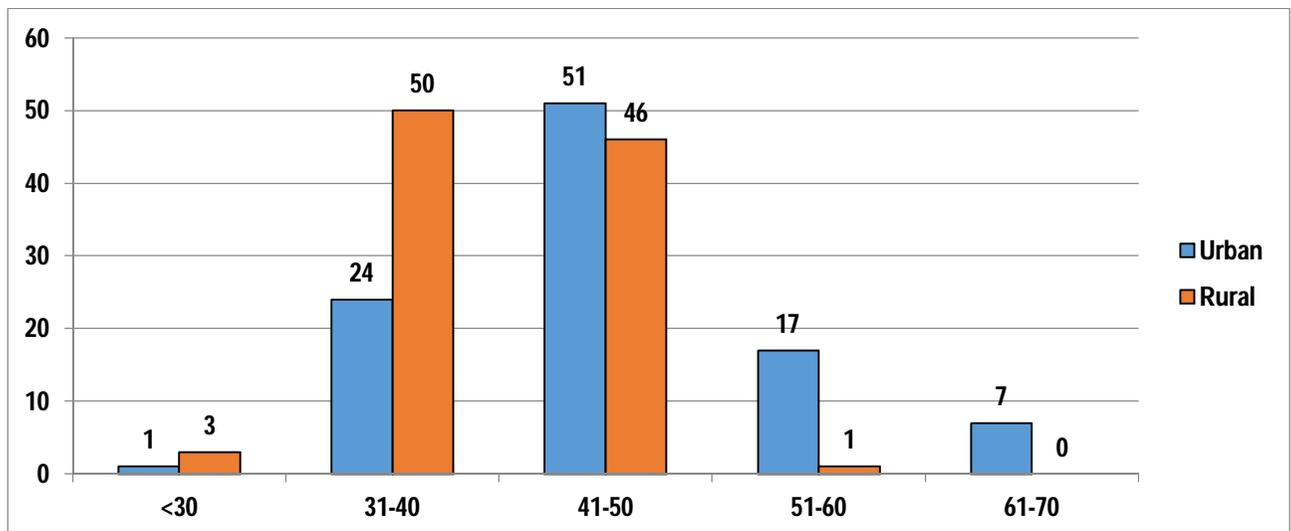


Fig-3: Distribution of urban (n=100) and rural (n=100) students according to weight.

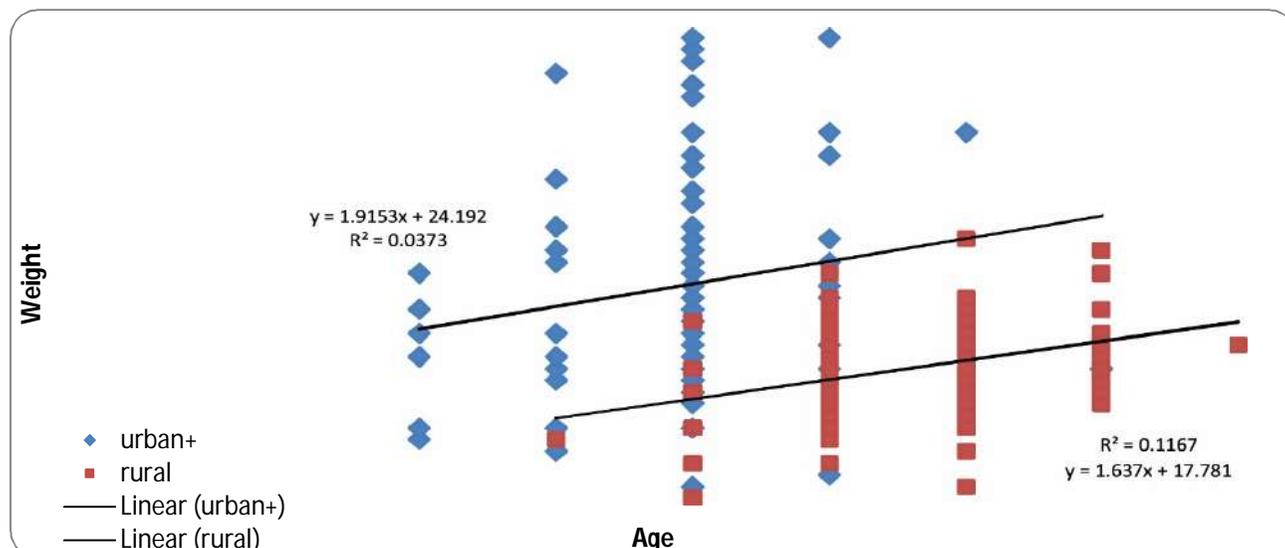


Figure-4: Significant positive correlation between age and weight in urban(n=100) and rural(n=100) students.

Discussion

Menarche is an important transition event in the female life cycle. It is the most striking event in the whole process of puberty of female¹². It reflects numerous health aspects of a population, including the timing of sexual maturation, growth and nutritional status as well as environmental condition¹³. Socioeconomic status affects the onset of menstruation and its progression^{13,14}.

In this study, the range of the age on menarche of the girls was 10-16 years. Mean menarche ages of urban and rural students were 11.8 & 13.6 years respectively, which is significantly higher ($p < 0.001$) in urban than rural students. Chowdhury et al¹⁵ observed that the mean age at menarche had strong correlation with weight, height and per capita food expenditure. The present study indicates that girls who attained menarche at an early age were significantly heavier, taller and with high BMI. The mean height of the urban students was 153.2 ± 6.6 cm and that of rural students was 146.4 ± 3.8 cm. The difference was statistically significant ($p < 0.001$) and urban students were taller than the rural students. Rahmawati et al¹⁶ worked on 371 urban and 286 rural girls with the age range 7-15 years of different areas of Indonesia and observed that the mean heights were 139.0 ± 5.6 cm and 134.5 ± 5.6 cm respectively which are less than the findings of the present study. Pejhanet al¹⁷ conducted a study on 130 female students in Iran. Their mean menarche age was 12.5 ± 1.4 years and the study found that the mean height of girls was 156.1 ± 3.6 cm which is higher than the finding of this study.

The present study revealed that the mean body weights were 46.5 ± 8.4 kg and 40.0 ± 4.2 kg in urban and rural students respectively and the differences are statistically significant ($p < 0.001$). Mean weight and BMI were observed 51.4 ± 10.7 kg and 18.5 kg/m^2 respectively in a study in Iran on 488 adolescent girls of 11-17 years of age¹⁸. The weight was higher, but BMI was lower than the present study. Menarcheal age of mother and

daughter's height were identified as the predictors of daughter's menarcheal age too¹⁹.

It is observed in different studies that girls, attaining menarche at late age, tend to achieve a greater height at adult age than girls attaining menarche at earlier age^{1, 20}. Nutritional status has an important role in the attainment of menarche as well as dysfunctional family relationships, maternal depression and father absence could be associated with early attainment of menarche⁵. Adequate intake and absorption of calcium, phosphorus, vitamins A, C & D are required for the normal development and maintenance of bone. Regulation of circulating calcium level is affected by the Parathyroid hormones and calcitonin too. Besides these, other factors including growth hormones, thyroid hormones, oestrogen, androgen, different prostaglandins and glucocorticoids also play important roles in the maintenance and turnover of bone tissue²¹.

Conclusion

The findings of this study revealed the present scenario related to girls' pubertal health of less developed urban and rural areas of Bangladesh. Further descriptive studies to find out the causative factors will help to plan counseling program for the upcoming generation to get health mothers of the nation.

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