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Original Research Article

Nutritional status and age of menarche in adolescent girls in urban and rural area schools

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ABSTRACT

Background: There are various factors that influences the age of menarche which includes genetic, nutritional status, socioeconomic status and environmental conditions. Further it has also proved that the malnutrition has delayed the age of menarche. Thus, the present study focuses on the study of relation between the nutritional status and age of menarche among the adolescent girls in a rural and urban area in Tamilnadu, India.
Methods: It is a community based cross-sectional study done in the adolescent girls of age between 11 to 15 years studying in school in the city of Chennai, India and surrounding rural areas. A total of 602 post-menarcheal adolescent girls were included in the study. The participants who were post-menarcheal were asked to recall the year and month of menarche and was noted. To assess the nutritional status, the parameters weight, height and waist circumference were determined.
Results: The association between the age of menarche and BMI was studied. The study showed that there was an association with a Pearson coefficient (r) value of - 0.252 which is statistically significant ($p<0.001$). The association between the age of menarche and waist to height ratio was studied. The study showed that there was an association with a Pearson coefficient (r) value of - 0.261 which is statistically significant ($p<0.001$).
Conclusions: This study has confirmed that the nutritional status has association with the age of menarche and is the contribution to the reduction in the mean of age of menarche in this geographical area.

Keywords: Adolescent girls, Body mass index, Menarche, Nutritional status, Waist to height ratio

INTRODUCTION

Menarche, the first menstrual cycle in the adolescent's period of life is the late event of puberty and indicates the sexual maturation of the girl.[1] The age of menarche occurs normally between 11 to 14 years.[2] There are various factors that influences the age of menarche which includes genetic, nutritional status, socioeconomic status and environmental conditions.[3-5] There is a substantial decrease in age at menarche in the 21st century with a significant improvement in nutrition and the process of change in food habits. Many studies have also shown that weight gain and body mass index (BMI) has influence in reduction of the age of puberty.[6,7] Further it has also proved that the malnutrition has delayed the age of menarche.[8] WHO defines 'Adolescents' as individuals in the 10-19 years of age group.[9] The nutritional status and age of menarche among the adolescent girls are not well documented in many parts of India. Thus, the present study focuses on the study of relation between the nutritional status and age of menarche among the

adolescent girls in a rural and urban area in Tamilnadu, India.

METHODS

It is a community based cross-sectional study done in the adolescent girls of age between 11 to 15 years studying in school in the city of Chennai, India and surrounding rural areas. A total of 602 post-menarcheal adolescent girls were included in the study and the study was conducted between June 2019 to September 2019.

Inclusion criteria

- School going girls of age between 11 to 15 years.
- Those who have attained menarche.

Exclusion criteria

- Girls who could not recall their menarche age.
- Those who had any chronic disease conditions.

Informed consent was obtained from the participants' parents and from school administrative before the start of the study. The participants who were post-menarcheal were asked to recall the year and month of menarche and was noted. To assess the nutritional status, the parameters weight, height and waist circumference were determined.[10] Weight, height and waist circumference were measured using standard instruments. BMI was calculated with the weight and height measurements.

Data were subjected to descriptive statistics. Pearson correlation coefficient (r) was done to find the association between the age of menarche with BMI and waist height ratio.

RESULTS

A total of 602 post-menarcheal adolescent girls were subjected to the study in which many participants were predominantly belong to the age of 15 years (33.9%) which was followed by 14 years (29.7%) and 13 years (22.3%) (Table 1). The 11 years was represented by only 2.7% of the total menarcheal adolescent girls.

Table 1: Frequency of post-menarcheal adolescent girl in different ages.

Age in years	Frequency
11	16 (2.7%)
12	69 (11.5%)
13	134 (22.3%)
14	179 (29.7%)
15	204 (33.9%)
Total	602 (100%)

The mean age of menarche is 148.82±10.79 months which is approximately 12.33 years (Table 2). However, a maximum of 176 months was found in this study. The minimum age of menarche in the present study was 116 months. The table further shows the BMI values of the study population and it was found that the mean value of BMI was 20.62±4.12, the highest was 48.5 and lowest was 13.49. The waist to height ratio was determined among the study population. The mean value was found to be 0.49±0.062, with highest of 0.75 and lowest of 0.37.

Table 2: Mean values of age of menarche, BMI and waist to height ratio.

Parameters	Minimum	Maximum	Mean ±SD
Age of menarche in months	116	176	148.82±10.79
BMI	13.49	48.45	20.62±4.12
Waist to height ratio	0.37	0.75	0.49±0.062

The association between the age of menarche and BMI was studied by subjecting the data to find the correlation coefficient. The study showed that there was an association with a Pearson coefficient (r) value of - 0.252 which is statistically significant ($p<0.001$) (Figure 1). The BMI is indirectly proportional to the age of menarche. The girls with high BMI index attain the menarche early in their life.

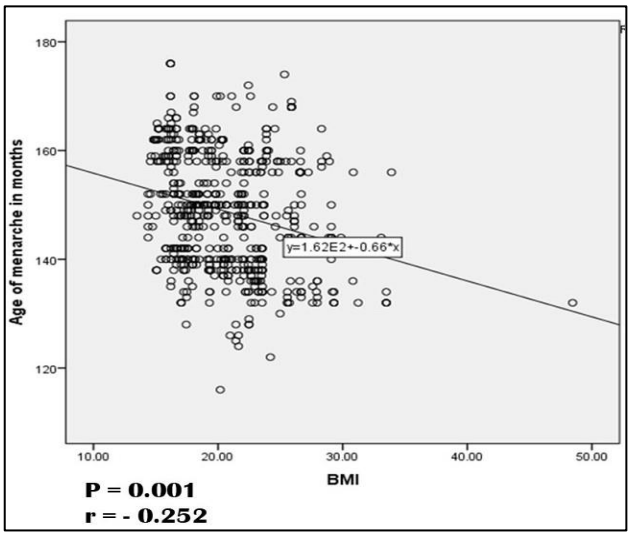

Figure 1: Association between age of menarche and BMI.

Many studies have shown that there is an association between the waist to height ratio which is an important index of nutritional status. The association was studies by performing correlation coefficient of the data taking waist to height as independent variable and the age of menarche as the dependent variable. The study showed that there was an association with a Pearson coefficient (r) value of - 0.261 which is statistically significant ($p< 0.001$) (Figure 2). Thus, there is an indirect relationship

between waist to height ratio and age of menarche. The nutritional status has definitive role to play in the age of menarche.

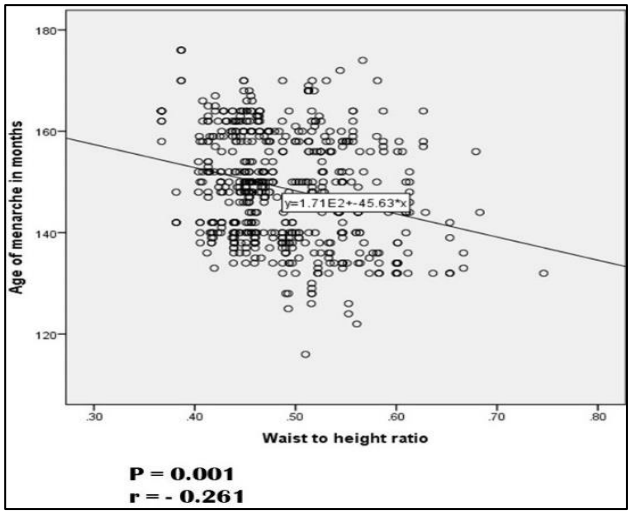

Figure 2: Association between age of menarche and waist to height ratio.

DISCUSSION

The present study was done to find out the influence of nutritional status with the age of menarche as there are no studies in this part of the country. The study showed that the average age of menarche is 12.33 years among the study participants. In a similar study conducted recently in Brazil, it was found that the mean age of menarche is 11.7 years which is closer to the mean age obtained in this study.[11] In a Korean study, the mean age of menarche has been reported as 12.7 years.[12] In a study conducted in United States, the mean age of menarche is 12.8 years in white girls and 12.2 years in black girls.[13] Looking on to the current scenario the mean age of the menarche is between 12 to 13 years throughout the world except the study reported recently in Brazil.

The age of menarche is found to be influenced by several factors in which the nutritional status is one.[14] Hence an attempt was done in the present study to determine the association between the age of menarche and nutritional status. The BMI and waist to height ratio are some of the indices for nutritional status.[15] The association was studied by doing regression analysis to find the Pearson's correlation coefficient (r) by taking BMI and waist to height ratio as independent variable and age of menarche as dependent variable. A scatter plot was made with regression line to find the association between the independent and dependent variable along with the value of Pearson's correlation coefficient.

The regression analysis showed that there is a negative correlation between the BMI and age of menarche. The participants having high BMI values has attained the menarche early. This study is in line with the similar studies conducted wherein similar results were obtained.[16-19] Thus, it is evident that the BMI is the influencing factor of the age of menarche. Similarly, the regression analysis showed that there is a negative correlation between the waist to height ratio and age of menarche. The participants who attained the menarche early has high waist to height ratio. This is again similar to many studies conducted around the world.[20-21] The present study has been conducted in the city of Chennai and surrounding rural areas where not much data is available regarding the nutritional status and age of menarche. The results obtained in this part of country is similar to many such conducted in other parts of the world.

CONCLUSION

The present study has confirmed the age of menarche is similar to other parts of the world and has reduced considerably in last few decades. The nutritional status has been attributed to the reduction in the age of menarche. This study has confirmed that the nutritional status has association with the age of menarche and is the contribution to the reduction in the mean of age of menarche in this geographical area.

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