

# Age at menarche and its relation with nutritional and socioeconomic status—A study among adolescent school girls

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## Abstract

**Background:** Adolescence is a transition period in life from a dependent child to an independently functioning adult. Menarche is an important event occurring in girls during this period. Many factors are contributing to these changes, mainly improvement in nutritional and socioeconomic statuses, especially in developing countries such as India, and have many social, medical, and medicolegal implications.

**Objective:** To find out age at menarche and its relation with nutritional status and socioeconomic status among adolescent school girls.

**Materials and Methods:** A descriptive study was carried out among 350 adolescent school girls of the age group 9–16 years in Thiruvananthapuram, a well-populated city in Kerala, India. Stratified random sampling technique was used to give due representation to schools controlled by government, aided, and private sectors. Data were entered in Epi info statistical package and analysis done using Epi info and SPSS statistical packages and Microsoft excel work sheet.

**Results:** The mean age at menarche was  $12.1 \pm 1.19$  years, which was less than that observed in studies conducted in various parts of world and India, which also showed a statistically significant association with body mass index and socioeconomic status.

**Conclusion:** Fall in the age of menarche has made young girls more vulnerable to the potential hazards of sexual abuse, unprotected sexual activity, earlier unintended pregnancy, illegal abortions, and sexually transmitted diseases. Parents, family, and the community at large also can play a vital role in the appropriate development of adolescents.

**KEY WORDS:** Age at menarche, nutritional and socioeconomic statuses, adolescent girls, Thiruvananthapuram city

## Introduction

The origin of adolescent medicine dates back to nineteenth century, when a few English physicians took a special interest in growth and development of adolescents and

their disorders. First attempt to organize the clinical case of adolescents occurred in Great Britain. Most important, however, were that the studies of normal growth and development started in the 1920s and 1930s. The modern scientific concept of adolescence began with the now famous work of G. Stanly Hall (father of psychology of adolescence), “Adolescences,” first published in 1904.<sup>[1]</sup>

Adolescence generally means the age group of 10–19 years. They constitute 22.5% of the total population.<sup>[2,3]</sup> This period is a transition period in life from a dependent child to a sexually mature independently functioning adult. During this period, significant changes occur in the body both externally and internally. Menarche is an important event occurring in

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girls during this period, which denotes that the girl has attained physical maturity. Age at menarche generally varies from 11 to 14 years.<sup>[4]</sup>

Data from all over the world show that menarche has been occurring at a younger and younger age each decade. Over the past 150 years, age at menarche has become earlier in all the developed countries by 2 to 3 years.<sup>[5]</sup>

The trend toward early sexual maturation is currently being replicated in developing countries and in those now westernized in diet, medical care, and reduced childhood mortality.

Many factors are contributing to these changes such as:

- improvement in nutrition;
- improvement in socioeconomic status;
- genetic factors;
- climate and race differences;
- exercise;
- family characteristics and ethnic factors, and so on.

But, more important are improvement in nutrition and improvement in socioeconomic status, especially in developing countries such as India.

A study on decreasing age at menarche is important because of the following reasons:

1. Attainment of physical maturity at an early age may be mentally distressing to the child because of lack of knowledge regarding sexual development and behavior.<sup>[6]</sup>
2. Adolescent girls may not be mentally mature enough to exercise the right decision. So, they may become victims of sexual assaults, earlier pregnancy, and related physical and psychological problems.<sup>[3]</sup> Many studies have shown that majority of rape victims were in adolescent age group.
3. Another potential hazard is early sexual activity, which can lead to earlier unintended pregnancy, abortion, and sexually transmitted diseases.<sup>[7,8]</sup> Statistics shows that, in India, 17% of all births occur to women in the age group of 15–18 years.<sup>[3]</sup>
4. Both early menarche and obesity are individual risks for breast carcinoma.
5. Another disease that has been linked to early sexual activity is cancer of uterine cervix. The risk of developing this cancer doubles if the first intercourse is at younger age (14–15 years).<sup>[3]</sup>

This study attempts to find out age at menarche and its relation with nutritional status and socioeconomic status among adolescent school girls.

## Materials and Methods

A descriptive school-based study was carried out among adolescent school girls of the age group 9–16 years (studying in fifth to 10th standard) in Thiruvananthapuram city, Kerala, India. The study sample included 350 adolescent girls studying in schools selected by stratified random sampling technique to give due representation to schools controlled by government,

aided, and private sectors. Five schools were included in the study; from each school, one division was selected at random from one standard, and 350 girls who have attained menarche within 1 year of the study were selected as study sample (this was done to get the approximate nutritional status at the time of menarche). The study period extended from June 2003 to December 2003. School girls and schools that were not willing to participate and girls with known endocrine disorders, chronic ailments, and on steroid therapy were excluded from the study. Data were collected after obtaining institutional ethical committee clearance and informed written consent from the heads of the institutions. Details regarding date of birth, age at menarche, and socioeconomic and educational statuses were collected using a semi-structured questionnaire by personal interview.

## Ethical Considerations

Data were collected after obtaining institutional ethical committee clearance and informed written consent from the heads of the institutions.

## Statistical Analysis

Height and weight were measured using standardized instruments. Body mass index (BMI) was calculated using height and weight. Data were entered in Epi info statistical package and analysis done using Epi info and SPSS statistical packages and Microsoft excel work sheet.

## Results

### Age at Menarche

Majority (60.9%) attained menarche between 11 and 13 years. The mean age at menarche was 12.1 years with standard deviation (SD) of 1.19. Lowest and highest ages at menarche were 8 years 10 months and 16 years 1 month, respectively.

### Body Mass Index and Age at Menarche

Of 350 observations, the mean body mass index (BMI) was 18.165 kg/m<sup>2</sup> with SD 2.92 kg/m<sup>2</sup>. Lowest and highest BMIs were 10.81 and 28.13 kg/m<sup>2</sup>, respectively. Mean age at menarche was 11.96 years with SD 1.196 years in high BMI group (46%) and was 12.15 years with SD 1.16 years in low BMI group (54%), and the difference was significant statistically (ANOVA, *F* statistic = 4.9729, *P* = 0.0264).

### Socioeconomic status and Age at Menarche

Upper and upper middle classes showed mean age at menarche of 11.899 and 11.910 years, respectively, and lower middle class and lower class showed 12.48 and 12.063 years, respectively, with a statistically significant  $\chi^2$  (*P* = 0.0022) and ANOVA (*P* = 0.0049) values.

### Type of Diet

Among 350 girls, 340(97.1%) were nonvegetarians and only 10 vegetarians.

**Table 1:** Age at menarche

| Age at menarche in years (upper limit excluded) | Frequency (%) |
|---|---------------|
| 8–11  | 53 (15.1)     |
| 11–13   | 213 (60.9)    |
| 13 and above                                    | 84 (24)       |
| Total   | 350 (100)     |

### Religion

Majority were Hindus (66.3%), followed by Christians (24.9%), Muslims (8%), and others (0.9%) in proportion to religious distribution of general population.

### Type of Family

Nuclear family ranked first with 252 students (72.4%), followed by extended, 61 (17.5%), and joint families, 35 (10.1%), which showed a clear shift of trend from the traditional joint family system toward nuclear family system, which may be one reason for better nutritional and socioeconomic statuses of the population in our state.

### Educational Status of Parents

Fathers of 181 (51.7%) and mothers of 160 (45.7%) students were educated above 10th standard.

### Occupation of Parents

Fathers of majority of students [217 (62.0%)] were involved in clerical, semi-professional, and professional jobs, but mothers of only 87 (24.9%) were having similar jobs.

## Discussion

In this study, the mean age at menarche was 12.1 (SD, 1.1852) years, which was much less than that obtained from studies conducted in various other parts of India such as studies conducted by Bagga and Kulkarni<sup>[9]</sup> (12.58 ± 1.03 years in Maharashtra Brahmin and 12.60 ± 0.86 years in Maratha girls), Gupta et al.<sup>[10]</sup> (13.2 years), Reddy and Radhika<sup>[11]</sup> (13.83 ± 0.87 years), and Chatterjee and Mandal<sup>[12]</sup> (13 years).

A study conducted by Whincup et al.<sup>[13]</sup> in England revealed average age at menarche to be 12 years and 11 months.

Another study conducted by Padez and Rocha<sup>[14]</sup> among Portugal school girls showed findings similar to this study (12.03 ± 1.26 years).

According to Tanners,<sup>[5]</sup> age at menarche follows a secular trend. But, in this study, such a comparison was not possible because of lack of previous studies from this region.

In this study, majority of girls attained menarche between 11 and 13 years (60.9%), similar to observations in previously conducted studies by Chang et al.<sup>[15]</sup> (55.6% between 11 and 13 years), Bagga and Kulkarni<sup>[9]</sup> (63.3% between 12 and 13 years), and Reddy and Radhika<sup>[11]</sup> (64.4% between 13 and 14 years).

In this study, minimum age at menarche was 8 years 10 months and 53 (15.1%) of girls attained menarche before reaching 11 years [Table 1]. This finding is in agreement with the studies conducted by Whincup et al.,<sup>[13]</sup> where 11.8% had their first period before leaving primary school, and by Bagga and Kulkarni,<sup>[9]</sup> where 18.2% (66) attained menarche before 12 years of age. However, according to Chang et al.,<sup>[15]</sup> 29.5% (121) attained menarche before 11 years of age.

Adolescents with BMI values less than 18.5 kg/m<sup>2</sup> were considered to be suffering from chronic energy deficiency.<sup>[16]</sup> In this study, 189 (54%) girls belong to low BMI group and the remaining 161 (46%) were normal or overweight girls (43% and 3%, respectively), and increase in BMI is significantly associated with decrease in age at menarche [Table 2], which is in agreement with previously conducted study by Gupta et al.,<sup>[10]</sup> where BMI more than 18.5 kg/m<sup>2</sup> was significantly associated with menstrual status. The study by Bagga and Kulkarni<sup>[9]</sup> revealed that body weight was significantly associated with age at menarche. However, according to Chang et al.,<sup>[15]</sup> height spurt was more related to age at menarche than weight and BMI.

In this study, girls belonging to high socioeconomic status matured earlier than those belonging to low socioeconomic status [Table 3], with a highly significant ANOVA value ( $P < 0.0049$ ). Similar results were observed by Bagga and Kulkarni<sup>[9]</sup> and Reddy and Radhika<sup>[11]</sup> in their studies.

## Conclusion

In this study, the mean age at menarche was 12.1 ± 1.19 years, which was less than that observed in studies conducted in various parts of world and India, which also showed a

**Table 2:** Body mass index and age at menarche

| Body mass index (kg/m <sup>2</sup> ) | Age at menarche (years) |            |            | Total number of students | Mean age at menarche (SD) |
|--------------------------------------|-------------------------|------------|------------|--------------------------|---------------------------|
|                                      | 8–11                    | 11–13      | Above 13   |                          |                           |
| 18.5 or more                         | 31                      | 97         | 33         | 161 (46%)                | 11.96 (1.196)             |
| Less than 18.5                       | 22                      | 116        | 51         | 189 (54%)                | 12.15 (1.162)             |
| Total, <i>n</i> (%)                  | 53 (15.1)               | 213 (60.9) | 84 (16.35) | 350 (100)                |                           |

SD, standard deviation.

ANOVA, *F* statistic 4.9729;  $P = 0.0264$ .

**Table 3:** Socioeconomic status and age at menarche

| Socioeconomic status | Age at menarche (years) |             |             | Total number of students (%) | Mean age at menarche (SD) |
|----------------------|-------------------------|-------------|-------------|------------------------------|---------------------------|
|                      | 8–11                    | 11–13       | Above 13    |                              |                           |
| Upper                | 6                       | 18          | 5           | 29 (8.3)                     | 1.899 (1.0088)            |
| Upper middle         | 26                      | 102         | 25          | 153 (43.7)                   | 11.910 (1.009)            |
| Lower middle         | 8                       | 63          | 40          | 111 (31.7)                   | 12.48 (1.2366)            |
| Lower                | 13                      | 30          | 14          | 57 (16.3)                    | 12.063 (1.241)            |
| Total                | 53 (15.1%)              | 213 (60.9%) | 84 (16.35%) | 350 (100)                    |                           |

SD, standard deviation.

$\chi^2 = 20.5585$ ;  $df = 6$ ,  $P = 0.0022$ ; ANOVA,  $F$  statistic = 5.751,  $P = 0.0049$

statistically significant association with BMI and socioeconomic status.

Fall in the age of menarche has made young girls more vulnerable to the potential hazards of sexual abuse, unprotected sexual activity, earlier unintended pregnancy, illegal abortions, and sexually transmitted diseases. There is a lack of knowledge among adolescents regarding sexual development and behavior; moreover, they may not be mentally mature enough to exercise the right decision. So, they have to be reassured that these physical mental and emotional changes are a normal process of development.

A large number of adolescent populations are at the middle and high school levels; teachers, therefore, necessarily can play a crucial role in the right development of adolescents. Parents, family, and the community at large also can play a vital role in the development of adolescents. Specialized counseling services by governmental and nongovernmental agencies can substantially bridge the gap.

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