

# Correlation of age at menarche and height in Iranian student girls living in Gorgan -Northeast of Iran

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## Abstract

**Objective:** To see the association of age at menarche with adult height in girls living in Gorgan - North of Iran.

**Methods:** This study included 100 female university students (aged 18-21 years) born between 1985-1988 and 200 intermediate school students (aged 12-15 years) born between 1992-1994. Age at menarche and its association with height were studied. Data was analyzed by SPSS v11. 5 software. Pearson correlation was used to determine the relation between menarcheal age and height.

**Results:** There was a significant difference in the age of menarche between intermediate school students ( $12.20 \pm 1.45$  years) and university students ( $13.54 \pm 1.30$  years). This decreased by 68.54 days per 1-year. The significant positive association was between age at menarche and height. Height of students with menarche at an earlier age was less ( $P < 0.05$ ). There was no significant difference in menarche age in the different socioeconomic classes.

**Conclusion:** Girls living in Gorgan - North of Iran acquire menarche at an early age. Students with earlier menarche reach a shorter adult height (JPMA 58:426;2008).

## Introduction

Menarche at an early age is a risk factor for breast cancer and overweight.<sup>1,2</sup> Furthermore, early maturation is an important public health concern because of its relationship with early beginning of sexual activity. Studies have found that hormonal changes at puberty influence

ovarian cancer risk particularly in younger women. Ovarian cancer seems to be associated with age at menarche and attained adult height.<sup>3</sup>

Several studies have documented a trend towards earlier pubertal development in developed countries. This decline in puberty age has been observed in developing

countries during recent years.<sup>4,5</sup> In United States, the average age of menarche declined from 12. 53 years in 1988-1994 to 12. 34 years in 1999-2002.<sup>6</sup> This was a fall by 2. 3 months.

A number of investigations have revealed a correlation between menarche and adult height. The results of Onland-Moret et al study showed that women who have menarche earlier, grow taller soon. However, women with early menarche have a shorter adult height when compared with women who have menarche at a later age.<sup>7</sup>

In several countries the age of menarche decreased but adult height was not affected. Other studies have shown a correlation between earlier age at menarche and shorter adult height.<sup>8-11</sup>

There is limited published data on age at menarche in Iran and presently no publications are available on this subject from Gorgan - northeast of Iran .

This study was therefore undertaken to determine the current age at menarche in Gorgan and to identify its association with socioeconomic status. In addition, we investigated whether there was a correlation between age at menarche and adult height between two groups; school age students and university students.

### Subjects and Methods

This study was performed in Gorgan - northeast of Iran during academic year 2005-2006.

Gorgan is the centre of Golestan province of Iran. The city is located 400 km Northeast of Tehran (Iran's capital) and 20 km south of the Caspian Sea. Gorgan has a moderate and humid climate known as "the moderate Caspian climate" and has a population of 250 thousand.

### Sample collection and participation (subjects)

There are three levels of compulsory education in Iran: Elementary (Grade) school (5 years), Intermediate (Guidance) School (3 years) and Secondary school (4 years). Children at 6 years age enter these compulsory education systems. The study participants included 100 students from school and universities each. The school students were 200 healthy girls from the Intermediate School ages between 12-15 years who were born between 1992 and 1994.

The University students were 100 healthy girls between 18-21 years who were born between 1985 and 1988. They belonged to northern parts of Iran, Tehran, Mazandran, Guilan, Semnan and Golestan provinces.

### Data collection

The research data were collected by filling a

questionnaire to detect the age at menarche and socio-demographic features of the girl students. The questionnaires were delivered to the girls by ten midwives.

Girls with chronic disorders as Thalassaemia and type I diabetes were excluded. Questionnaire forms were filled by students and additional information obtained with interview. The questionnaires included age, weight, height, age at menarche, socioeconomic status and residence location in village or town (urban or rural). The girls heights and weights were measured without shoes and light clothing by a trained midwife of the research team. Weight (W) was distributed into four groups: W1: 30-39 Kg, W2: 40-49 Kg, W3: 50-59 Kg, W4: 60-69 Kg. Height (H) was divided into three groups: H1: 120-139 cm, H2: 140-159 cm and H3: 160-179 cm.

Place of residence divided into: R1: village or R2: town.

**Ethical consideration:** Study design was approved by the relevant ethical committee of Gorgan University of medical sciences. All participants gave informed consent.

**Statistical analysis:** All data collected was expressed as Means  $\pm$ SD. Data were subjected to one-way analysis of variance.  $P < 0. 05$  was considered significant. Pearson correlation was used to determine the relation between menarcheal age and height.

Multiple regression analysis was used to reveal the effects of menarcheal age and socioeconomic status on height.

### Results

The mean age at menarche and height of girls is shown in the table. The age at menarche of the intermediate school students varied from 11 to 15 years with a mean of 12. 20 $\pm$ 1. 45 years.

Intermediate school students had menarche at an earlier age (12.20  $\pm$  1. 45 years) compared to university students (13.54  $\pm$  1.30 years) ( $P < 0.05$ ). The age at menarche of intermediate school students decreased by 68.54 days per year.

**Table. Demographic features of school and university students.**

Groups	Weight (kg)	Age(year)	Height (cm)	Menarche age (year)
Intermediate School students n=200	47.31 $\pm$ 9.29	13.39 $\pm$ 1.76	*148.15 $\pm$ 31.73	*12.20 $\pm$ 1.45
University students n=100	58.44 $\pm$ 9.66	20.58 $\pm$ 2.13	160.30 $\pm$ 22.76	13.54 $\pm$ 1.30

\*  $P < 0.05$

Table . Mean  $\pm$ SD of weight, age, height, age at menarche and mother age in intermediate school and university students. There are significant differences between age at menarche and height between two groups ( $p > 0. 05$ ).

Pearson correlations were positive for age at menarche and height. These students had earlier menarche and short adult height when compared to students who had menarche at a later age and taller height .

Age at menarche of students in height groups H1, H 2 and H 3 were  $12.67 \pm 1.118$ ,  $12.06 \pm 0.893$  and  $11.75 \pm 0.77$  years respectively. Height of students with earlier age at menarche was less ( $P < 0.05$ ).

Although the menarcheal age was found to be lower in girls with higher socioeconomic status, there was no significant difference between the various socioeconomic classes.

## Discussion

The results of this study showed that the age of menarche of school students decreased significantly compared to university students who were older and had attained menarche earlier.

The age at menarche has declined in many countries. Several studies have documented a trend towards earlier pubertal development in developed countries, and this decline has been observed in developing countries during recent years.<sup>4,5</sup> But the exact causes of this trend have not been identified. The trend in age at menarche and adult height is probably related to changes in the nutritional, hygienic and health status of population.<sup>12,13</sup>

Several characteristics, such as obesity, height, and skeletal maturation, are known to influence sexual development.<sup>14,15</sup> Likewise several studies have reported that girls with higher body weight, higher body mass index, more body fat, and greater height reach their menarche earlier.<sup>10,16</sup>

A study by Friedman et al revealed racial differences in menarcheal age. They found that black girls had experienced menarche, on an average 3 months earlier than white girls (12.3 vs 12.6 years), and during the 20-year study period, the median menarcheal age decreased by approximately 9.5 months among black girls versus approximately 2 months among white girls.<sup>17</sup>

Wronka and Pawlinska-Chmara showed girls from families with high socio-economic status to experience menarche at an earlier age than girls from families with lower socio-economic status. They found an association between age at menarche and socio-economic characteristics (urbanization, population size, education of parents and number of children in the family).<sup>18</sup> Anderson and Must were of the opinion that changes in the population distribution of race/ethnicity and relative weight should be considered when interpreting trends in age at menarche.<sup>6</sup>

In our study we found a trend to earlier age of

menarche in girls born between 1985 and 1994. But the mean age at menarche was different from that in most European and North American countries, which may reflect environmental as well as genetic factors and racial differences that may also influence school girls in Gorgan.

In our study we found that the age at menarche was not influenced by the socioeconomic status which again indicates that environmental factors play a more important role. We observed in our study that students with earlier menarche reached a shorter adult height.

In a cohort study by Onland-Moret et al, women who had menarche earlier, grew taller, however they acquired a shorter adult height when compared to women who had menarche at a later age.<sup>7</sup> In several countries it is reported that age at menarche has decreased and adult height has increased, however a number of studies have shown a correlation between early age of menarche and shorter adult height.<sup>8-11</sup> Our findings are consistent with these studies.

Chang et al explained that height velocity reached a peak one year before menarche and stopped increasing within one year after menarche.<sup>14</sup> The relation has been explained by the earlier closure of epiphyseal growth disks, because of the increase in ovarian estrogen.<sup>7</sup>

A stoppage in menarche allows additional growth of the long bones before the epiphyses unite and consequently a taller adult height is achieved. Therefore, the menarcheal age most likely has an important influence on the growth of long bones.<sup>7</sup>

Our results conclude that there is a trend toward earlier pubertal development in Iranian population; also that the different socioeconomic status does not influence the age at menarche, but the age at menarche influences adult height.

## Acknowledgment

The authors appreciate Gorgan University of medical sciences for financial support. We are also very grateful to the midwifery students who helped us with the data collection.

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