Age at menarche in girls born from 1985 to 1989 in Mazandaran, Islamic Republic of Iran

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ABSTRACT This cross-sectional study was carried out on 2246 girls born between 1985 and 1989 to determine the age of menarche in Mazandaran province, northern Islamic Republic of Iran. Six cities were selected randomly and cluster sampling used to select high-school students in urban and rural areas. Students with malnutrition, anaemia and chronic infections such as tuberculosis were excluded. The mean (standard deviation) age of menarche was 12.5 (1.1) years, 95% CI: 12.45–12.55 years. The most frequent occurrence of menarche was in summer and least frequent in winter. Menarche age was significantly higher in girls living in rural areas and with fathers with lower education.
Introduction

The first episode of menstruation is called menarche and is an indicator of the start of puberty in women [1]. Although the role of gonadotropins in menarche is not fully established, the influence of heredity, social class, nutrition and physical or emotional stress on physical maturation and age at menarche has been established in different populations [2].

The age at menarche seems to be decreasing in industrialized countries [3]. Before 1900, the average age at menarche in the United States was greater than 14 years [4]. This has been attributed to improvements in socioeconomic conditions, nutrition and general health [3,4]. However, the average age at menarche has not changed during the last 20 to 30 years in the United Kingdom and is now 12.9 years [5].

Early menarche (before 12 years) is a risk factor for breast cancer [6] and is associated with a risk of obesity in postmenopausal women with breast cancer [7]. A relationship has also been shown between early menarche and increasing severity of painful menstruation, and pregnancies at a younger age [8,9]. In the Islamic Republic of Iran determining the menarche age has an important role in terms of religious laws concerning the puberty of women. It is also essential to provide education in preparation for starting menstruation, and about the concurrent start of fertility. Since there is little information on the age at menarche of teenagers in the Islamic Republic of Iran, this study was carried out to determine the menarche age in teenage girls (born 1985–89) in Mazandaran province, in the north of the country.

Methods

We conducted a cross-sectional study on 2246 girls aged 12–16 years, who were in the 6th–10th grades of high school in urban and rural areas of Mazandaran province.

Using cluster sampling we first randomly selected 3 cities in the western part and 3 cities in the eastern part of the province in 2002. The sample size of each city was proportionally allocated according to the number of girl students in each city and the required sample was selected randomly within each school and each grade. Our inclusion criteria were menstruating girls with body mass index greater than 18.5 kg/m². Students with malnutrition, anaemia and chronic infection such as tuberculosis and also major thalassaemia were excluded from our study.

The data were collected using a specially designed questionnaire: date of birth, date of first menstruation (if occurred), residence area, mother’s and father’s educational level, residence area (rural/urban), father’s occupation and maternal age.

We used SPSS, version 10 for data analysis. The mean menarche age and its confidence interval (CI) were estimated. The chi-squared test was used to test significance and associations were analysed using analysis of variance and analysis of covariance model t-test.

Results

Out of 2246 girls aged 12–16 years, the 1797 who were menstruating were included in the study. A total of 471 girls (20.9%) reported that their first menstruation occurred before ending primary school. The mean (SD) of menarche age was 12.5 (1.1) years, CI: 12.5–12.6 years. The mean menarche age in western parts of the province was 12.6 (1.0) years and in the eastern parts was 12.4 (1.0) years. The age at menarche in different cities is shown in Table 1. The mean age at menarche in the urban areas was 12.4
The first menstruation occurred significantly more often in summer (36.7% of girls) than in winter (18.0%) \((P < 0.05)\); autumn and spring were 22.0% and 23.3% respectively.

The results of analysis of variance showed a significant relation with father’s educational status and the mean menarche age (Table 2) \((P < 0.001)\); higher menarche age was associated with having an illiterate or low education father. This relation persisted after adjusting for possible confounding factors such as mother’s education, father’s occupation and residence area using analysis of covariance. However, we did not observe a significant relationship between maternal education and paternal occupation with age at menarche.

### Discussion

The mean age of menarche in this study, 12.5 years (95% CI 12.4–12.5), is less than that reported in Wincup’s study of British teenagers: 13.1 years (95% CI: 12.8–13.2) in southern England, 12.9 years (95% CI: 12.7–13.2) in north-west England and 12.9 years (95% CI:12.6–13.2) in south Wales [5]. In comparison to other studies in other provinces in the Islamic Republic of Iran there are few previous data about the age at menarche of Iranian teenage girls. The average age at menarche among girls aged 12–20 years in Shiraz in 1991 was 13.05 years [10].

#### Table 1 Age at menarche in different cities in Mazandaran province, Islamic Republic of Iran

<table>
<thead>
<tr>
<th>City</th>
<th>No.</th>
<th>Mean age at menarche (years) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babol</td>
<td>703</td>
<td>12.5 (12.4–12.6)</td>
</tr>
<tr>
<td>Mahmoudabad</td>
<td>131</td>
<td>12.6 (12.5–12.8)</td>
</tr>
<tr>
<td>Sari</td>
<td>446</td>
<td>12.4 (12.3–12.5)</td>
</tr>
<tr>
<td>Tonkabon</td>
<td>85</td>
<td>12.7 (12.5–12.9)</td>
</tr>
<tr>
<td>Behshar</td>
<td>294</td>
<td>12.9 (12.4–12.7)</td>
</tr>
<tr>
<td>Noor</td>
<td>138</td>
<td>12.9 (12.4–12.8)</td>
</tr>
<tr>
<td>Total</td>
<td>1797</td>
<td>12.5 (12.5–12.6)</td>
</tr>
</tbody>
</table>

\(CI = \text{confidence interval.}\)

#### Table 2 Age at menarche in relation to father’s education level

<table>
<thead>
<tr>
<th>Father’s educational level</th>
<th>No.</th>
<th>Mean age at menarche (years) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>237</td>
<td>12.6 (12.5–12.8)</td>
</tr>
<tr>
<td>Read and write only</td>
<td>517</td>
<td>12.6 (12.5–12.7)</td>
</tr>
<tr>
<td>High school</td>
<td>290</td>
<td>12.4 (12.2–12.5)</td>
</tr>
<tr>
<td>Diploma</td>
<td>434</td>
<td>12.3 (12.2–12.4)</td>
</tr>
<tr>
<td>University</td>
<td>292</td>
<td>12.4 (12.3–12.6)</td>
</tr>
<tr>
<td>Total</td>
<td>1770</td>
<td>12.5 (12.5–12.6)</td>
</tr>
</tbody>
</table>

\(CI = \text{confidence interval.}\)
The effect on the hypothalamic–pituitary set point at puberty and, in combination with low body weight, may prolong the pubertal state, which is evidence of an effect of environmental factors on the menarche age \([15]\). The effect of race \([16]\) and socioeconomic \([17]\) and education \([18]\) status on the age of first menstruation in different populations has been shown before. With regard to educational factors, our results are consistent with studies by Dehbashi and Zarian \([10]\) and by Allameh et al. \([11]\) which have reported that an increase in parental education level decreases the menarche age. This may be due to the girl’s improved nutrition and socioeconomic status.

A decreasing age at menarche has several disadvantages. Sexual activity starts earlier in teenage girls, which in North America and Europe leads to an increase in the rate of pregnancies among young women \([19]\). It has been shown that pregnancy among teenagers increases the risk of adverse pregnancy outcome in mothers and babies up to 6 times and the risk of morbidity and the risk of neonatal pathology up to 2 times \([9]\).

In our study, the seasonal pattern of age of first menstruation is different from those reported in European countries \([20]\). We observed a higher frequency of first menstruation in summer. In other studies the lowest frequency of first menstruation was observed in the fall \([10,12]\).

According to the findings of this study, the mean menarche age in teenage girls in urban areas was lower than rural areas. This is probably related to behaviour and lifestyle. Rural girls have more access to open space with more opportunities for daily activities and lower calorie intake in comparison to urban girls who live in more confined conditions in apartments with fewer activities and are less likely to be underweight. This result is also consistent with those reported by Ikaraoha et al. \([20]\). Research consistently indicates that girls with a higher percentage of body fat are more likely to reach menarche at a younger age than are thinner girls \([21,22]\). Children who are not athletically active also have an earlier menarche \([23]\).

In conclusion, almost 1 in 5 girls reaches menarche while at primary school, so appropriate health information should be provided for them. This needs to be taken into account when providing sanitary facilities for girls in primary schools.

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**References**


