

# Age at Menarche among School Adolescents Girls in Saudi Arabia: Environmental Factors

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## Abstract

**Background:** Menarche is the first menstrual period of a girl at puberty. The timing of menarche is significant for health in future life. Saudi Arabia has developed immensely over the last three decades as evidenced by the economic and health sectors throughout all parts of the vast Kingdom. The current study measured the menarche age of school adolescents Girls in Saudi Arabia and explored environmental factors that could impact the onset of menarche. **Method:** This cross-sectional study was conducted on 1486 healthy Saudi school adolescents' girls between 10 - 19 years old. The data were collected in 2016 using self-administered questionnaires. Health status, dietary intake, physical activities and parent's education were recorded along with other environmental factors. Data were analyzed using SPSS version 17.1. **Results:** Out of 1486, 767 girls (51.6%) had experienced menarche with a mean age of  $12.46 \pm 1.57$ ; 681 girls (45.8%) had experienced menarche at age of 13 - 15; 38 girls (2.6%) had experienced menarche at age of 16. A significant association between menarche and social factors was detected. Besides, the study discovered a significant association between menarche and the lifestyle of the studied groups.

## Keywords

Menarche, Adolescents Girls, Saudi Arabia

## 1. Introduction

The first menstrual cycle in the adolescent's life is called menarche. It is a late event of puberty and an important indicator of sexual maturation. This milestone typically occurs within two to three years after puberty onset and is characterized by thelarche<sup>1</sup>, which is represented by the development of the mammary bud [1].

<sup>1</sup>Thelarche is usually the first clinically recognizable stage of puberty and typically occurs between 10 and 12 years of age and is characterized by the appearance of a "breast bud".

Regarding the age group, menarche usually occurs between the ages of 12 and 13 years. Approximately 50% - 80% of the variation in puberty onset age and milestones is determined by genetic and environmental factors; however, the substantial decline at the age at menarche between the early 19th century and the mid-20th century was associated with a significant environmental factor like improvement in nutrition and living conditions during the process of modern civilization [2].

Earlier menarche is associated with an increased risk of some diseases, such as breast cancers, gynecological cancers and various cardiovascular diseases [3].

Girls with early menarche exhibited elevated blood pressure and glucose intolerance compared with girls who matured later. Overall, earlier menarche (before 12 years) results in higher mortality [3]. On the other hand, there is a positive correlation between early menarche and high bone mineral density. Recent data suggest that age at menarche is significantly associated with body composition, insulin sensitivity and blood lipid levels [4].

The declining trend in the age at menarche has undergone an apparent stabilization since the 1960s. However, in the last two decades, a trend toward menarche anticipation has been reported, especially in developing countries [5].

Identification of the environmental factors that contribute to puberty and the timing of menarche may add to our understanding of the physiological mechanism of this trait and the associated fertility and health risks in Saudi Arabia.

In the light of the abovementioned and according to the importance of determining the age at menarche in adolescents and its psychological and physical impacts, this study was conducted to verify the age at menarche and its related environmental factors among school adolescent's girls in Saudi Arabia.

## 2. Materials and Methods

Following the cross-sectional descriptive approach, this study was conducted to determine the age at menarche and its related environmental factors among school adolescent's girls in Saudi Arabia.

The total population of Saudi Arabia is 30,493,418 and the study sample was 1486 of Saudi school adolescents' girls between ages 10 and 19. The study sample was calculated according to the following formula:

$$n = Z_{1-\alpha/2}^2 (1-p) / \varepsilon^2 P$$

The sample included adolescents from all regions of Saudi Arabia as follow:

Parentage	Region
35.15	The Central Region
41	The Western Region
2.35	The Southern Region
16.5	The Eastern Region
11.05	The Northern Region

The data were collected in 2016 using self-administered questionnaires. Health status, dietary intake, physical activities and parents' education were recorded along with other environmental factors. Data were analyzed using SPSS version 17.1.

The researchers chose questionnaires since interviews would be difficult due to the sensitivity of this issue in the Saudi community.

The first part of the questionnaire was about the place of living. The second part of the questionnaire was about age at menarche and school grade at which menarche has started (Early menarche was defined as, <12-year, normal menarche as  $\geq 13$  and <15-year, and late menarche as  $\geq 16$ -year). The third part of the questionnaire was about social factors (*i.e.* type of housing, parents' occupation, parents' education) and health status (*i.e.* diet, daily intake of soda, milk, fruits, and vegetables). In addition, this part included questions about type and duration of physical exercises (*i.e.* running, dancing, jogging, swimming, or other sports) along with other daily habits (*i.e.* reading, watching TV, gaming, and sleeping).

Data were expressed as number (percentage). Comparisons were performed by Chi-square test for categorical variables. Logistic regression models were used to evaluate the association between menarche and study variables while adjusting for various confounders. Analysis of the data was carried out using SPSS 17.1.

### 3. Results

In this study, 1486 Saudi school adolescents' girls between 10 - 19 years old from the five main regions of Saudi Arabia were targeted in this study. Depending on the population ratio of each region, Central (35.15%), Western (41%), Southern (2.35%), Easter (16.5%) and Northern (11.05%), students from all socio-economic classes were enrolled in the study. The mean age and standard deviation (SD) of the study group were 12.46 ( $\pm 1.57$ ) years. Most of the participants (80%) were the first and second child of the family and lived in their personal houses. Only 9.2% of mothers and 14% of fathers had an academic education.

#### 3.1. Demographic Data

**Table 1** shows the demographic data of the target sample. It shows that there was no significant difference in the mean age at menarche between Saudis and non-Saudis. The number of girls who had early menarche is 767 (51.6%) in all regions and the number of girls who had normal menarche is 681 (45.8%) in all regions. However, the number of girls who had late menarche is 38 (2.6%). The result shows that there is no significant association between the age of menarche and region of living where the highest "Early" percentage was in the eastern and central areas: 297 and 206 respectively.

(767) 51.6% of the entire sample had early menarche while 681 (45.8%) had normal menarche and 38 (2.6%) of the sample had late menarche.

**Table 1.** Demographic data.

Characteristics	Early (NO. %)	NORMAL (NO. %)	Late (NO. %)	P	Chi-square
<b>Nationality</b>					
Saudi	735% - 49%	662% - 44.5%	36% - 2.4%	0.312	2.330
Non-Saudi	32% - 2.2%	19% - 1.3%	2% - 0.1%		
<b>Region</b>					
East	297% - 20.0%	250% - 16.8%	12% - 37.6%	0.151	12.004
Western	147% - 9.9%	123% - 8.3%	13% - 19.0%		
South	66% - 4.4%	53% - 3.6 %	2% - 8.1%		
North	51% - 3.4%	60% - 4.0%	0% - 7.5%		
Central	206% - 13.9%	195% - 13.1%	11% - 0.7%		
<b>Age at menarche</b>	767% - 51.6%	681% - 45.8%	38% - 2.6%	-	-

*P* value significant on 0.05.

### 3.2. Social Characteristics

**Table 2** shows that a large number of girls who have a mother with low income had menarche early and normal, while girls who have mothers with a universal degree had early normal menarche. However, fathers' occupation and education have no association with the age of menarche. The results show that girls who live in their own houses have menarche at early and normal age; this could be related to the economic situation of the family.

### 3.3. Life Style

**Table 3** shows that there is a significant relationship between doing sports, drinking soda, eating fast food and sedentary behavior. Those who are not doing exercises have menarche at early and normal ages. Those who drink soda 2 - 3 times per week have menarche at early and normal age. Girls with sedentary behavior for more than 5 hours have menarche at early and normal age.

## 4. Discussion

The mean age of menarche in our study was  $12.46 \pm 1.57$ , with the minimum and maximum age of 10 and 19 years old. This finding is similar to the study in Kuwait (12.41 years) [6], Istanbul (12.74 years) [7], Tehran (12.68 years) [8], Maharashtra, India (12.62 years) [9], Chile (12.7 years) [10], France (12.5 years) [11], Poland (12.77 years) [12], Spain (12.83 years) [13], and different from South Ethiopia (13.9 years) [14], Ethiopia, Mekelle (14.24 years) [15], Nigeria (13.66 years) [16], Uganda (13.3 - 13.6 years) [17], and North Korea (16 years) [18].

The difference in the menarche age can be due to environmental and social factors. For example, it is stated that African girls have a higher age at menarche [19]. Early menarche was seen in 10.3% of students compared to 8.5% in Kuwait [6], 7.8% in white American girls [20], and 6.1% in Nigeria [16]. The various rates of early menarche may be due to the different definition in different studies.

**Table 2.** Social characteristics.

Characteristics	Early (NO. %)	NORMAL (NO. %)	Late (NO. %)	P	Chi-square
<b>Father's occupation</b>					
High income	233% - 15.7%	205% - 13.8%	14% - 0.9%	0.909	1.005
Middle income	379% - 25.5%	341% - 23.0%	18% - 1.2%		
Low income	155% - 10.4%	133% - 9.0%	6% - 2.0%		
<b>Mother's occupation</b>					
High income	22% - 1.5%	18% - 1.2%	6% - 0.4%	0.001	21.317
Middle income	275% - 18.5%	236% - 15.9%	11% - 0.7%		
Low income	470% - 31.6%	427% - 28.7%	21% - 1.4%		
<b>Father's education</b>					
Uneducated	52% - 3.5%	32 - 2.2%	4% - 0.3%	0.084	16.596
Preparatory	112% - 7.5%	131% - 8.8%	4% - 0.3%		
Secondary	205% - 13.8%	190% - 12.8%	6% - 0.4%		
Universal	285% - 19.2%	232% - 15.6%	15% - 1.0%		
Master	74% - 5.0%	55% - 3.7%	5% - 0.3%		
Doctorate	39% - 2.6%	41% - 2.8%	4% - 0.3%		
<b>Mother's education</b>					
Uneducated	101% - 6.8%	94% - 6.3%	7% - 0.5%	0.001	46.544
Preparatory	135% - 9.1%	132% - 8.9%	5% - 0.3%		
Secondary	165% - 11.1%	136% - 9.2%	9% - 0.6%		
Universal	329 - 22.1%	273 - 18.4%	8 - 0.5%		
Master	24 - 3.1%	34 - 2.3%	61 - 4.1%		
Doctorate	13 - 1.7%	12 - 0.8%	31 - 2.1%		
<b>Housing type</b>					
Property	583% - 39.2%	553% - 37.2%	27% - 1.8%	0.032	6.912
Rent	184% - 12.4%	128% - 8.6%	11% - 0.7%		

**Table 3.** Life style characteristics.

Characteristics	Early (NO. %)	NORMAL (NO. %)	Late (NO. %)	P	Chi-square
<b>Doing exercise</b>					
Every day	65% - 4.4%	96% - 6.5%	11% - 0.7%	0.001	34.056
No	395% - 26.6%	313% - 21.1%	14% - 0.9%		
2 - 3 times/week	140% - 9.4%	133% - 9.0%	9% - 0.6%		
4 - 5 times/week	74% - 5.0%	42% - 2.8%	3% - 0.2%		
Monthly	93% - 6.3%	97% - 6.5%	1% - 0.1%		
<b>Drinking Soda</b>					
Every day	97% - 6.5%	109% - 7.3%	10% - 0.7%	0.012	19.682
No	125% - 8.4%	105% - 7.1%	4% - 0.3%		
2 - 3 times/week	269% - 18.1%	252% - 17.0%	12% - 0.8%		
4 - 5 times/ week	82% - 5.5%	83% - 5.6%	8% - 0.5%		
Monthly	194% - 13.1%	132% - 8.9%	4% - 0.3%		
<b>Eating fast food</b>					
Every day	26% - 1.7%	17% - 1.1%	4% - 0.3%	0.002	24.733
No	65% - 4.4%	62% - 4.2%	3% - 0.2%		
2 - 3 times/week	322% - 21.7%	267% - 18.0%	11% - 0.7%		
4 - 5 times/ week	36% - 2.4%	55% - 3.7%	7% - 0.5%		
Monthly	318% - 21.4%	280% - 18.8%	13% - 0.9%		

## Continued

## Sedentary behavior

Hour	117% - 7.9%	110% - 7.4%	6% - 0.4%	0.055 0.9152.054
3 hours	146% - 9.8%	118% - 7.9%	9% - 0.6%	
4 hours	120% - 8.1%	109 - 7.3%	7% - 0.5%	
More than 5 hours	384% - 25.8%	344% - 23.1%	16% - 1.1%	

In the current study, the high percentage of Saudi girls have menarche at early (<12-year) and normal (as  $\geq 13$  and <15-year) ages. This is due to a variety of environmental factors like socioeconomic status, mother occupation, mothers' education, and housing type affected the age at menarche. The results have revealed the existence of a strong association between mother's occupation and menarche at an early age. In addition, the study revealed strong association between mother's education and early menarche where those have mothers with a universal degree have menarche at a normal age. Girls who live in their own house had menarche at a normal age. In short, those who belong to the high class and live with less stress had menarche at a normal age.

Regarding food habits, the study has shown that girls who have healthy food consumption had menarche at a normal age, yet those who consume carbonated drinks regularly had early menarche. Besides, girls consuming fast food at high rates had menarche at a late age.

Finally, maintaining a healthy life with periodical exercising lead to normal menarche, but having no exercises leads to having menarche at an early age.

Finally, out of 1486, 767 girls (51.6%) had experienced menarche with a mean age of  $12.46 \pm 1.57$ ; 681 girls (45.8%) had experienced menarche at age of 13 - 15; 38 girls (2.6%) had experienced menarche at age of 16. A significant association between menarche and social factors was detected. Besides, the study discovered a significant association between menarche and the lifestyle of the studied groups.

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