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Comparison of Menarche Age between Two Generations

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Authors' contributions

This work was carried out in collaboration between all authors. Author NHK designed the study, wrote the protocol and wrote the first draft of the manuscript. Author RG managed the literature searches and analyses of the study performed the spectroscopy analysis. Author MSS managed the experimental process. All authors read and approved the final manuscript.

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ABSTRACT

Background: During the past century, the mean age at menarche among the North West Iranian girls has decreased. The aim of this study was to compare the age of menarche between two generations and to determine the effect of BMI on the menarche age.
Materials and Methods: This cross –sectional study was carried out on 2029 girls of 9-17 years of age during September 2012 to May 2014 in North-West of Iran. Participants were selected by multistage random cluster sampling from school students in urban and rural areas. After measuring their height and weight, relevant data were collected through a questionnaire. Data were analyzed by chi-square, independent-t test and Pearson bivariate correlation Coefficients, using SPSS 16.
Results: Out of 2029 girls' age 9-17 years, the 1600 who were menstruating included in the study. The mean age of menarche in daughters and their mothers were 12.58±1.3 and 13.22±1.22 years, respectively. There was a significant positive correlation between mothers' and daughters' menarche age (r = 0.33, *P*= 0.001). However, a negative significant relation was observed between

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menarche age and BMI (r= 0.24 *P*< 0.001).
Conclusion: We found that the mean age of menarche was different in comparison with the previous generations. The age at menarche of obese girls is significantly earlier normal weight.

Keywords: Menarche; comparison; girls; North-West of Iran.

1. INTRODUCTION

Menarche is the culmination of physiological and anatomic processes of puberty [1]. Menarche is a first menstrual period in girls. Menarche is a sign of growing up and becoming a woman. Girls experience menarche at different ages. The time of menarche is influenced by the female biology, as well as genetic, nutritional factors, especially environmental and racial factors [2,3]. It can happen as early as about age 9 or up to age 15. Some studies have suggested that the median age of menarche in world is 14years, and there is a later age of onset in Asian populations compared to the West [4]. The average age of menarche is about 12.5 years in the United States, 12.72 years in Canada and 12.9 years in the UK [5-7]. A study on Turkish girls, found the median age at menarche to be 12.74 years [8].

Correct prediction of menarche age in girls facilitates the opportunity to prepare them for every change that they will experience during this period. Several studies have shown that in Iran, during the last years, the age of menarche has been decreased [9-13]. This issue is a cause of concern for mothers and sometimes for doctors. Evaluation of puberty stage in a population requires exact reference values for comparison. There is limited data on age at menarche in our population and interpretation has been limited because of the racial and area composition. The aim of this study is to compare the age of menarche between two generations and to determine the effect of BMI on the menarche age.

2. MATERIALS AND METHODS

This descriptive cross-sectional study was conducted on 2029 girls' age of 9 – 17 years during September 2012 to May 2014 in North-West of Iran. In order to avoid socioeconomic bias, cluster sampling was conducted in multiple areas of education. The form used to collect data included questions on date of birth, date of first menstruation in daughters and their mothers, educational levels and occupation of parents. Body weight to the nearest 0.1 kg was measured with a digital balance and height to the nearest 1 mm was measured with a Stadiometer (Holtain, Wales and UK). The time of the measurement of the height and weight is consistent with the timing of menarche. BMI was calculated as weight divided by squared height (kg/m^2), participants were categorized as follows: Underweight, BMI < 5th percentile; normal weight, BMI between 5th to 85th percentile; overweight, BMI between 85th 95th percentile; and obese, BMI > 95th percentile. Inclusion criteria were menstruating girls. Exclusion criteria were: past history of cardiovascular, respiratory, renal or thyroid disease, diabetes mellitus and drug history (glucocorticoid, contraceptive…..). Regarding the ethical issue, Informed consent was obtained by parents and, where appropriate, by children. The method used was completely harmless; the personal information of all cases was kept confidential. The study protocol was approved by the independent Ethics committee and was conducted in accordance with the declaration of the Helsinki guidelines. Data analysis was performed using chi-square, independent t-test and Pearson correlation Coefficients. A *P* value < 0.05 was considered statistically significant.

3. RESULTS

Out of 2029 girls' age 9-17 years, the 1600 who were menstruating were included in the study. The mean age of daughters was 12.08±2.91 years. The mean age of menarche in daughters and their mothers were 12.58±1.3 years (ranging between 10.1 and 15.8 years) and 13.22±1.22 years (ranging between 10.6 and 16 years) respectively. Correlation coefficient analysis showed a significant positive correlation between mothers' menarche age and daughter's (r = 0.33, *P*= 0.001) (Table 1), and a negative significant relation between menarche age and BMI (r= 0.24, *P*< 0.001). The mean age of menarche was significantly higher in normal weight girls (BMI<85^{th}) than overweight or obese (BMI>95^{th}) girls (*P*< 0.001) (Table 2).

Table 1. Mean age at menarche of mother and daughter in North-Western of Iran

	Minimum*	Maximum*	Mean*	SD*	P-value
Menarche age of mothers	10.6	16	13.22	1.22	0.001
Menarche age of daughters	10.1	15.8	12.58	1.3	0.001

**All of ages were considered based on year*

Table 2. Mean age at menarche in relation to body mass index

Percentile of BMI	Number	Mean age at menarche Years(mean ±SD)	P-value
<5%	261	13.17±1.09	0.001
5-85%	743	12.39±1.21	0.001
85-95%	325	11.85±1.20	< 0.001
>95%	271	11.73±1.41	< 0.001
Total	1600	12.58±1.30	-

4. DISCUSSION

In this descriptive cross-sectional study, mean age of menarche in the north-west of Iran was 12.08±2.91 years. We found a decrease in the average age of menarche in daughters in comparison with their mothers. In national health survey with a sample size of two projects 88 220 and 10 228 people across the country, age of menarche in Iranian girls in years of 1369 and 1378 was 13.65±1 and 13.86±1.51 years respectively 12). Also in this study, the average age of menarche in cold provinces was higher than tropical regions, while the age at menarche in present study was lower than in Golestan province (13.19 yr), Khorasan province (12.5 yr) and south of Iran (12.91 yr) [9-11,13].

The age at onset of 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 (5-11). Age of menarche in this study was lower than most advanced countries like America (12.5 year), Canada (12.7 years) and United Kingdom (12.9 years) [5-7].

In several studies from the neighboring country of turkey, it has been reported that the age at menarche has decreased. Our findings are consistent with these studies.

Ersoy B et al. [14] reported that the mean age of menarche was 12.82 years in the Turkish girls. Semiz S et al. [15] also reported that the average menarche age was 12.4 years.

The exact causes of this trend have not been identified. The trend in age at menarche is probably related to the changes in nutritional, hygienic and health status of population [12-15].

Several characteristics, such as obesity, height, and skeletal maturation, are known to influence sexual development [4,15-18]. We observed a negative relationship between age at menarche and body mass index, so that the mean of menarche age was significantly higher in normal weight girls (BMI<85th) than overweight or obese (BMI>85th) girls. These findings are similar to the results in the Korean girls [19].

Likewise numerous studies have reported that girls with higher body weight, higher body mass index, more body fat, and greater height reach their menarche earlier [19-23].

In our study we found a trend to earlier age of menarche in girls when compared with their mothers who had menarche at a later age (12.08 vs. 13.22), this indicates that within a generation, age at menarche 0. 64 years has decreased. The results of this study is similar to the results of Ainy et al. that mean age of menarche in girls and their mothers was 12.8 and 13.6 years respectively [20]. Wronka and Pawlinska-Chmara showed that girls from families with high socio-economic status will experience menarche at an earlier age than girls from families with lower socio-economic status. They found relation between age at menarche and socio-economic characteristics (urbanization, population size, education of parents and number of children in the family [21]. In general, studies from both developed and developing countries have found that living in urban areas, having a father of higher occupational class and having parents with higher educational levels are associated with earlier menarche [22-24]. Only a few studies

similar to our study found that the age at menarche was not influenced by the socioeconomic status [25].

5. CONCLUSION

The finding of our study showed that there is a trend toward earlier menarche in Iranian girls living in north-west, mean age of menarche was different in comparison with the previous generation. Also different socioeconomic status does not influence the age at menarche, but there is significant negative correlation between menarche age and body mass index.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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