

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

M.A. Delavar<sup>1</sup> and K.O. Hajian-Tilaki<sup>2</sup>

عمر بدء الإحاضة في الفتيات المولودات في ما بين عامي 1985 و 1989 في محافظة مازندران، جمهورية إيران الإسلامية  
مولود دلاور، كريم الله حاجيان-تلاقي

**الخلاصة:** أجريت هذه الدراسة المستعرضة على 2246 فتاة وُلِدْنَ في ما بين عامي 1985 و 1989، بُغية تحديد عمر بدء الإحاضة في محافظة مازندران بشمالي جمهورية إيران الإسلامية. وقد تم اختيار ستة مدن عشوائياً، وأُبعثت طريقة أخذ العينات العنقودية لانتقاء طالبات المدارس الثانوية في المناطق الحضرية والريفية. واستُبعدت من الدراسة الفتيات المصابات بسوء التغذية، وفقر الدم، والعداوى المزمنة مثل السل. وقد وُجد أن العمر الوسطي لبدء الإحاضة هو 12.5 سنة بانحراف معياري 1.1، عند فاصلة الثقة 95%: 12.45 – 12.55 عاماً. وكان بدء الإحاضة أكثر حدوثاً في الصيف وأقل حدوثاً في الشتاء. كما كان عمر بدء الإحاضة أعلى بنسبة يُعْتَدُّ بها إحصائياً لدى الفتيات اللاتي يُقِمْنَ في المناطق الريفية ومع آباء ذوي مستوى تعليمي منخفض.

**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.

## L'âge des premières règles chez les filles nées entre 1985 et 1989 dans le Mazandaran en République islamique d'Iran

**RÉSUMÉ** Cette étude transversale menée auprès d'un échantillon de 2246 filles nées entre 1985 et 1989 avait pour objectif de déterminer l'âge des premières règles dans la province du Mazandaran, au nord de la République islamique d'Iran. Six villes ont été sélectionnées au hasard et la sélection des collégiennes dans les zones urbaines et rurales a fait appel à la méthode de l'échantillonnage en grappe. Ont été exclues les collégiennes souffrant de malnutrition, d'anémie ou de maladies infectieuses comme la tuberculose. L'âge moyen (écart type) des premières règles était de 12,5 (1,1) ans (IC<sub>95%</sub> : 12,45-12,55 ans). Les règles survenaient pour la première fois le plus fréquemment en été, beaucoup plus rarement en hiver. L'apparition des premières règles s'est avérée significativement plus tardive chez les filles habitant les zones rurales et dont le père avait un faible niveau d'instruction.

<sup>1</sup>Department of Midwifery; <sup>2</sup>Department of Social Medicine and Health, Babol University of Medical Sciences, Babol, Islamic Republic of Iran (Correspondence to M.A. Delavar: moloodaghajani@yahoo.com). Received: 23/06/05; accepted: 05/09/05

## 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/m<sup>2</sup>. 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

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

City	No.	Mean age at menarche (years) (95% CI)
Babol	703	12.5 (12.4–12.6)
Mahmoudabad	131	12.6 (12.5–12.8)
Sari	446	12.4 (12.3–12.5)
Tonkabon	85	12.7 (12.5–12.9)
Behshar	294	12.9 (12.4–12.7)
Noor	138	12.9 (12.4–12.8)
Total	1797	12.5 (12.5–12.6)

CI = confidence interval.

(1.1) years, significantly lower than in rural areas 12.6 (1.1) years ( $P < 0.001$ ).

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]. The Fertility Health Research Centre of Isfahan, in a study of 2410 Isfahan girls aged 8–18 years in 1996, reported that the average age at menarche was 13.01 years [11]. In another study in Shiraz in 1999, among a sample of 1862 girls aged 12 to 15 years, the average age was 12.4 years [12].

Compared with studies in other countries, Ryan et al. reported that the mean age of menarche was 12.7 years in the United States [13]. Whincup et al. also reported that the average menarche age of a 1982–86 birth cohort in England and Scotland was 12.9 years [5]. In another study the mean age of menarche among 338 sporting women was 13.8 years [14]. Saar et al. concluded that energy drain may have a modulator

**Table 2 Age at menarche in relation to father's education level**

Father's educational level	No.	Mean age at menarche (years) (95% CI)
Illiterate	237	12.6 (12.5–12.8)
Read and write only	517	12.6 (12.5–12.7)
High school	290	12.4 (12.2–12.5)
Diploma	434	12.3 (12.2–12.4)
University	292	12.4 (12.3–12.6)
Total	1770	12.5 (12.5–12.6)

CI = confidence interval.

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 Ikaraoaha 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.

### Acknowledgements

We would like to thank the Deputy of Research Affairs in Babol University of Medical Sciences for financial support and we would also like to thank Masomehe Nader Nattag and Layla Ahmadi for data collection and Dr Naimion for data entry.

### References

1. Macquarie J. *Below the belt. An owner's guide to gynaecology*, 1st ed. Melbourne, Australia, Text Publishing, 1994:19–31.
2. Hopwood NJ et al. The onset of human puberty: biological and environment factors. In: Bancroft J, Reisch JM, eds. *Adolescence and puberty*. New York, Oxford University Press, 2001:29–49.
3. Chodick G et al. Secular trends in age at menarche, smoking, and oral contraceptive use among Israeli girls. *Preventing chronic disease*, 2005, 2(2):A12.
4. Drife J, Magowan B. *Clinical obstetrics and gynecology*, 1st ed. Philadelphia, WB Saunders, 2004:105–12.

5. Whincup PH et al. Age of menarche in contemporary British teenagers: survey of girls born between 1982 and 1986. *British medical journal*, 2001, 322:1095–6.
6. Hirshaut Y, Pressman PI. *Breast cancer: the complete guide*, 3d ed. New York, Bantam Books, 2000:30–5.
7. Wasserman L et al. Correlates of obesity in postmenopausal women with breast cancer: comparison of genetic, demographic, disease-related, life history and dietary factors. *International journal of obesity*, 2004, 28(1):49–56.
8. Balbi C et al. Influence of menstrual factors and dietary habits on menstrual pain in adolescence age. *European journal of obstetrics, gynecology, and reproductive biology*, 2000, 91(2):143–8.
9. Repke J. Adolescence: managing pregnancy and unplanned pregnancy. *Contemporary reviews in obstetrics and gynaecology*, 1989, 34(4):96–124.
10. Dehbashi S, Zarian Z. *Survey menarche age in Shiraz in 1994*. Abstracts of the 3rd Iranian Congress of Obstetrics and Gynecology, 1997:49.
11. Allameh Z et al. *Survey of puberty in Isfahan in 1996*. Abstracts of the 3rd Iranian Congress of Obstetrics and Gynecology, 1997:65.
12. Ayatollahi SMT, Dowlatabadi E, Ayatollahi SAR. Age at menarche in Iran. *Annals of human biology*, 2002, 29(4):355–62(8).
13. Ryan KJ, ed. *Kistner's gynecology and women's health*, 7th ed. St Louis, Mosby, 1999:257.
14. Malina RM, Ryan RC, Bonci CM. Age at menarche in athletes and their mothers and sisters. *Annals of human biology*, 1994, 20:417–22.
15. Saar E et al. Age at menarche: the influence of environmental condition. *International journal of biometeorology*, 1988, 32:33–5.
16. Kimm SYS et al. Racial divergence in adiposity during adolescence: the NHLBI growth and health study. *Pediatrics*, 2001, 107(3):E43.
17. Roberts DF, Danskin MJ, Chinn S. Menarcheal age in Northumberland. *Acta paediatrica scandinavica*, 1975, 64:845–52.
18. MacMahon B. *Age at menarche: United States, 1973*. Rockville, National Center for Health Statistics, 1974 (DHEW publication HRA 74-1615).
19. Ejidokun O et al. Sex education should begin in primary school [letter]. *British medical journal*, 1999, 318:57.
20. Ikarahoa CI et al. Menarchial age of secondary school girls in urban and rural areas of Rivers State, Nigeria. *Online journal of health and allied sciences*, 2005, 4(2) (<http://www.ojhas.org/issue14/2005-2-4.htm>, accessed 29 July 2007).
21. Adair LS, Gordon-Larsen P. Maturational timing and overweight prevalence in US adolescent girls. *American journal of public health*, 2001, 91:642–4.
22. Anderson SE, Dalla GE, Must A. Relative weight and race influence average age at menarche: Results from two nationally representative surveys of US girls studied 25 years apart. *Pediatrics*, 2003, 111:844–50.
23. Arulkumaran S et al, eds. *Essentials of gynecology*, 1st ed. New Delhi, Jaypee Brothers, 2004:199–204.