Sociodemographic factors and age at natural menopause in Shiraz, Islamic Republic of Iran

S.M.T. Ayatollahi,[1] H. Ghaem[1] and S.A.R. Ayatollahi[1]

العوامل الاجتماعية والديموغرافية والعمرية في مرحلة الإياس الطبيعي، في شيراز بجمهورية إيران الإسلامية

سيد محمد تقي آية اللّهي، هالة قائم، سيد عليرضا آية اللّهي

الخلاصة: مع تزايُد مأمول الحياة، تتزايد أهمية الإياس menopause بالنسبة لصحة المرأة. وقد قام الباحثون بتسجيل العمر عند الإياس الطبيعي لدى السيدات، في دراسة شاملة لجميع القطاعات وسُكَّانيَّة المُرْتَكَز في شيراز بجمهورية إيران الإسلامية، في صيف عام 2000. ولقد أظهرت المقابلات التي أُجريت مع 948 من النساء اللواتي تم اختيارهن في سن الإياس، أن العمر الوسطي مضافاً إليه أو منقوصاً منه الانحراف المعياري في سن الإياس كان 48.3 عام ± 5.3 عاماً (بفاصلة ثقة 95٪ باعتبار أن العمر الوسطي كان يتراوح بين 48.0 و48.6) وكان العمر النَّاصف median 49 عاماً. وتمثلت العوامل الاجتماعية والديموغرافية وعوامل السلوك الصحي المتعلقة بالعمر الوسطي المبكر تعلُّقاً يُعْتَدُّ به إحصائياً في مَنْ لم يتزوَّجْنَ مطلقاً (44.7 عام)، وفي ذَوَات مستوى الدخل المتدني (47.4 عام)، وفي ذَوَات المستوى الاجتماعي المنخفض (45.8 عام)، وفي مدخِّنات التبغ (47.9 عام)، وفي المتزوجات من غير ذوي القربَى (48.1 عاماً).

ABSTRACT With increasing life expectancy, menopause is an increasingly important aspect of women's health. We recorded the age at natural menopause among women in a population-based cross-sectional study in Shiraz, Islamic Republic of Iran, in summer 2000. Interviews with 948 randomly selected menopausal women showed the mean (standard deviation) age at menopause was 48.3 (5.3) years (95% CI: 48.0–48.6), median 49 years. The sociodemographic and health behaviour factors that were significantly related to early mean age of menopause were: never married (44.7 years), low income level (47.4 years), low social class (45.8 years), tobacco use (47.9 years) and non-consanguineous husband (48.1 years).

Facteurs sociodémographiques et âge au moment de la ménopause naturelle à Chiraz (République islamique Iran)

RÉSUMÉ Avec l'allongement de l'espérance de vie, la ménopause est un aspect de la santé de la femme de plus en plus important. Nous avons enregistré l'âge à la ménopause chez les femmes dans le cadre d'une étude transversale dans une population définie à Chiraz (République islamique d'Iran) durant l'été 2000. Les entretiens avec 948 femmes ménopausées sélectionnées au hasard ont montré que l'âge moyen (écart type) à la ménopause était de 48,3 (5,3) ans (IC 95 % : 48,0-48,6), avec une médiane de 49 ans. Les facteurs sociodémographiques et relatifs au comportement en santé qui étaient significativement liés à l'âge moyen précoce de la ménopause étaient les suivants : le fait de ne s'être jamais mariée (44,7 ans), le faible niveau de revenus (47,4 ans), la classe sociale inférieure (45,8 ans), la consommation de tabac (47,9 ans) et la non-consanguinité de l'époux (48,1 ans).

[1]Department of Biostatistics and Epidemiology, Shiraz University of Medical Sciences, School of Health, Shiraz, Islamic Republic of Iran (Correspondence to S.M.T. Ayatollahi: ayatolahim@sums.ac.ir).
Received: 18/09/02; accepted: 07/10/03

Introduction

The menopause is an important stage in the life of every woman. With a current life expectancy for women of nearly 70 years in the Islamic Republic of Iran, women can now expect to live one-third of their adult lives beyond menopause. Current knowledge about menopause and its potential effect on the subsequent quality of life for women remains incomplete and even controversial. Although menopause, as a major event affecting the reproductive system, is usually included as an extraneous variable in research studies, little is known from reliable studies about the epidemiology of the event itself as an independent variable. Reports of several studies show that the age at natural menopause is influenced by a number of physical [*1–6*], sociodemographic [*1,7–14*] and behavioural characteristics [*2,10–12,15,16*].

In view of the importance of age of menopause for women's health, and considering the shortage of related information in the Islamic Republic of Iran [*13,17*], we performed a study to determine the average age of natural menopause in a sample of women in Shiraz city and to measure its association with sociodemographic factors. Our data were compared with data from other population-based research.

Methods

Place of study

Shiraz, one of the 5 principal cities of the Islamic Republic of Iran, is the centre of Fars province. The city is located 1000 km south of the capital Tehran and 100 km north of the Gulf, at an altitude of 1500 m above sea level. It has a Mediterranean climate and a population of 1.2 million, of whom 84% are literate (Iran Literacy Movement, unpublished report, 1998). The city is both the most developed city in the southern region and the cultural capital of the country.

Sample

Women who had lived in Shiraz for at least 1 year and had experienced natural menopause were included in this study.

Administratively, Shiraz is divided into 7 large mailing zones, each with distinct social, cultural, economic and health characteristics. Each large postal zone is divided into many smaller zones depending on the population density, such that the number of houses is proportional to the size of each of these zones. Since an adequate sampling frame of the target population was unavailable, a 2-stage cluster sampling was applied. Within each larger postal zone, every other smaller postal zone was selected randomly. A random start point was then chosen from each of the selected zones and the houses were visited by 2 research teams, each of which was responsible for visiting homes from one side of the street (left or right). Applying this procedure, a total of 948 women who had undergone natural menopause were selected from 79 clusters each of size 12. Only 7 women refused to participate in this study; they were replaced by 7 other subjects randomly selected from the related zones. This procedure did not have any impact on the results.

Questionnaire and interview

A structured questionnaire was designed to study a range of factors: physical characteristics of the woman (height, weight, arm circumference, handedness), sociodemographic data (birthplace, marital status, consanguinity, ancestorship, occupation, education, income) and health behaviour (exercise, smoking). The woman's age was taken from her birth certificate which is an accurate record in the Islamic Repub-

lic of Iran. The age of menopause was directly recorded for those women who could remember the date correctly; women who could not remember were assisted by reference to dates of important events, the date of last confinement, the age of last child and information provided by the husband or close relatives. Age at menopause (recorded to the nearest half year) was defined as the age of spontaneous cessation of regular menstrual bleeding for 1 year or more [*18*]. Around 60% of respondents could remember their menopausal age accurately and 40% had to estimate it by recall.

The weight of the subject was measured to the nearest 0.1 kg taken without shoes and with minimum clothing. Height was measured to the nearest millimetre with the subject standing on a flat surface erect against a wall using a tape measure and headboard. Body mass index (BMI) was calculated. Mid upper arm circumference was measured in mm on the left hand using a graded flexible plastic tape.

The survey was conducted between July and September 2000. On average, each interview lasted 30 minutes. One member of each of the 2 research teams were responsible for interviewing each subject face-to-face. Each team consisted of 3 members supervised by a trained midwife with a bachelor degree. Other members of each team were senior experts of medical records who were trained especially for this research in how to fill in the questionnaires. Thereafter they personally visited all women under investigation and completed the questionnaires.

Statistical analysis

The classification of the participants by socioeconomic status was done using principal component analysis. The information was analysed using *SPSS*, version 10. Means, standard deviations (SD), medians and 95% confidence intervals (CI) were calculated. For comparisons between 2 means, Student *t*-test was used, and to contrast the difference between means in variables with more than 2 groups, analysis of variance with Duncan's multiple range was applied.

Results

The mean (SD) age at menopause in the 948 women was 48.3 (5.3) years (95% CI: 48.0–48.6) with a median of 49 years.

Table 1 presents mean and median age at natural menopause according to some physical (arm circumference, height, weight, BMI) and personal characteristics (birthplace, handedness and ancestorship). None of these factors was found to be related to menopausal age.

Table 2 presents the mean and median age at natural menopause according to socioeconomic and health behaviour characteristics. Educational level and marital status were not significantly related to age at menopause, although comparing women who were never and ever married did show a significant difference. Social class (based on occupational status of the husband), family income and consanguinity were significant factors. Exercise and cigarette smoking were not significantly related to age at menopause, although tobacco use through smoking of water pipes ("hubble-bubble", *kalyan*) was a significant factor.

Thus the groups of women with an early mean age of menopause were those who were never married (44.7 years, $P < 0.006$), of low income level (47.4 years, $P < 0.002$), of low social class (45.8 years, $P < 0.001$), tobacco users (47.9 years, $P < 0.014$) and having a non-consanguineous husband (48.1 years, $P < 0.027$).

Table 1 **Mean and median age at natural menopause according personal characteristics**

Variable	No. of women	%	Mean (SD) age (years)	95% CI	Median age (years)	Test	*P*–value
Arm circumference (cm)						ANOVA	0.073
< 29	454	47.9	47.9 (5.8)	47.5–48.3	49		
29–32	274	28.9	48.7 (5.1)	48.4–49.0	50		
> 32	220	23.2	48.6 (4.5)	48.3–48.9	49		
Height (cm)						ANOVA	0.879
< 150	379	40.1	48.1 (5.6)	48.2–48.9	49		
150–155	331	35.0	48.3 (5.2)	47.9–48.6	49		
> 155	236	24.9	48.4 (5.0)	48.1–48.7	49		
Weight (kg)						ANOVA	0.206
< 55	256	27.1	47.8 (6.0)	47.4–48.2	50		
55–65	312	33.0	48.2 (5.5)	47.8–48.6	49		
> 65	378	40.0	48.6 (4.6)	48.3–48.9	49		
Body mass index (mg/kg²)						ANOVA	0.152
≤ 20	57	6.0	47.8 (6.5)	47.4–48.2	49		
20–24.9	247	26.1	47.8 (5.8)	47.4–48.2	49		
25–29.9	363	38.4	48.3 (5.2)	47.9–48.6	49		
≥ 30	279	29.5	48.8 (4.7)	48.5–49.0	50		
Handedness							
Left	48	5.1	49.0 (5.0)	48.7–49.3	50	ANOVA	0.589
Right	869	91.7	48.2 (5.4)	47.8–48.5	49		
Both	31	3.3	48.6 (4.7)	48.3–48.9	50		
Birthplace						***t***-test	0.142
Rural	251	26.5	47.7 (5.6)	47.3–48.1	48		
Urban	697	73.5	48.5 (5.2)	48.2–48.8	49		
Ancestorship						***t***-test	0.161
Descendant of Prophet[a]	79	8.2	47.5 (6.4)	47.1–47.9	49		
Other	869	91.8	48.3 (5.2)	47.9–48.6	49		
Total	948	100.0	48.3 (5.3)	48.0–48.6	49		

[a]***Descended from the Prophet Muhammad*** ﷺ
SD = standard deviation.
ANOVA = analysis of variance.

Using principal component (PC) analysis, 5 interrelated variables were analysed: father's level of education (FE), mother's level of education (ME), family social class (SC), woman's occupation status (WO) and family income (FI). These were reduced to 3 independent principal components which explained 86% of the variation: PC1 = +0.51FE +0.49ME +0.46SC +0.41WO +0.33FI (cultural status); PC2 = –0.26FE –0.14ME +0.27SC – 0.45FO +0.80FI (economic status); PC3 = –0.09FE –0.48ME +0.46SC +0.60WO +0.44FI (social class).

Table 2 **Mean and median age at natural menopause according to sociodemographic and health behaviour characteristics**

Variable	No. of women	%	Mean (SD) age (years)	95% CI	Median age (years)	Test	*P*-value
Marital status							
Single	17	1.8	44.7 (5.8)	44.3–45.1	45	ANOVA	0.074
Married	567	59.8	48.4 (5.3)	48.1–48.7	49		
Widowed	344	36.3	48.2 (5.4)	47.8–48.5	49		
Divorced	8	8.0	47.0 (4.7)	46.7–47.3	48		
Separated	12	1.3	49.1 (2.8)	48.9–49.3	49		
Never married	17	1.8	44.7 (5.8)	44.3–45.1	45	*t*-test	0.006
Ever married	931	98.2	48.3 (5.3)	47.9–48.6	49		
Consanguinity							
No	661	71.0	48.1 (5.3)	47.8–48.4	49	*t*-test	0.027
Yes	270	29.0	48.9 (5.2)	48.6–48.9	50		
Educational level (woman)							
Illiterate	463	48.5	48.1 (5.7)	47.6–48.6	49	ANOVA	0.774
Elementary	321	33.5	48.4 (4.7)	47.3–49.5	49		
High school	131	13.8	48.8 (5.7)	47.8–49.8	49		
University	40	4.2	48.7 (5.6)	47.0–50.4	50		
Educational level (husband)							
Illiterate	556	58.6	48.1 (5.6)	47.7–48.4	49	ANOVA	0.765
Elementary	282	29.7	48.5 (4.9)	48.2–48.8	49		
High school	72	7.6	48.8 (4.6)	48.5–49.1	49		
University	38	4.0	48.7 (5.8)	48.3–49.1	50		
Occupation (woman)							
Unemployed[a]	851	89.1	48.3 (5.2)	47.9–48.6	49	ANOVA	0.114
Unskilled manual[a]	16	1.7	45.3 (9.4)	40.7–54.7	48		
Semi-skilled manual[b]	5	0.5	48.6 (3.6)	46.9–50.3	49		
Clerical[b,d]	5	0.5	50.6 (6.7)	44.9–56.3	52		
Managerial[b,c]	17	1.8	48.3 (4.4)	46.3–50.2	50		
Professional[b,d]	61	6.4	48.6 (5.1)	47.3–49.9	50		
Occupation (husband)							
Unemployed[a]	83	8.8	46.6 (6.8)	46.2–47.0	47	ANOVA	0.001
Unskilled manual[a]	51	5.4	45.8 (6.6)	45.4–46.2	46		
Semi-skilled manual[b]	165	17.4	47.7 (5.2)	47.4–48.0	49		
Skilled manual[b]	208	21.9	48.6 (4.8)	48.3–48.9	49		
Clerical[b,d]	164	17.3	48.3 (4.7)	48.0–48.6	50		
Managerial[b,c]	176	18.6	49.5 (4.8)	49.2–49.8	50		
Professional[b,d]	101	10.7	49.1 (5.5)	48.7–49.4	50		

Table 2 **Mean and median age at natural menopause according to sociodemographic and health behaviour characteristics *(concluded)***

Variable	No. of women	%	Mean (SD) age (years)	95% CI	Median age (years)	Test	*P*-value
Income							
Poor[a]	160	16.9	47.4 (5.0)	47.1–47.7	48	ANOVA	0.002
Low[a]	314	33.1	47.9 (5.7)	47.5–48.3	49		
Middle[a]	250	26.4	48.3 (5.2)	47.9–48.6	49		
High[b]	224	23.6	49.4 (4.9)	49.1–49.7	50		
Exercise							
No	766	80.8	48.2 (5.4)	47.9–48.5	49	*t*-test	0.312
Yes	182	19.2	48.7 (5.1)	48.4–49.0	49.5		
Cigarette smoking							
Yes	47	5.0	47.2 (5.2)	46.9–47.5	47	*t*-test	0.364
No	901	95.0	48.3 (5.3)	47.9–48.6	49		
Water pipe smoking (no. per day)							
0[a]	676	78.3	48.4 (5.3)	48.1–48.7	49	ANOVA	0.014
1–4[a,b]	209	22.0	48.5 (5.0)	48.2–48.8	49		
5–14[c]	52	5.5	46.0 (6.1)	45.6–46.4	47		
≥ 15	11	1.2	46.8 (4.7)	46.5–47.1	46		

[a,b,c]Values having different superscripts letters are significantly different (Duncan multiple comparison test).
SD = standard deviation.
ANOVA = analysis of variance.

Discussion

Ascertaining the average age at natural menopause remains a topic of general interest, so too does the influence of biological and social factors and intra- and inter-cultural differences. There is considerable uncertainty as to what factors affect the timing of menopause. Genetic and racial factors have recently been proposed to be the most important determinants of age at natural menopause [*19*]. In addition to genetic factors, several behavioural (smoking, nutrition, sociodemographic factors) [*1,8–13,16,19*] and anthropometric factors [*1,6,16*] are also associated with age at menopause.

The mean age at menopause in our study was 48.3 years. It is generally accepted that the average age at menopause is about 51 years in industrialized countries [*2,5,11,12,20*], but data are inconsistent for the developing world because of methodological problems. Definitions may differ across studies so that pooling information from several published sources may be inappropriate. Table 3 presents a worldwide comparison of age at natural menopause during the past quarter century. Mean age at natural menopause in our study was lower than most studies in Europe, Australia and the United States of America [*2,4,11,12,19*], Japan [*21*] and China [*8*],

Table 3 **Worldwide comparison of age at natural menopause during the past quarter century**

Continent/country	Year of study	No. of women	Mean age (years)	Median age (years)	Reference
Africa					
Egypt	1999	289	46.7	–	[***1***]
Nigeria	1990	563	48.4	48	[***9***]
Kenya (west)	1997	1 078	–	48.3	[***23***]
America					
USA[a]	1989	2 014	–	50.7	[***2***]
Mexico	1996	472	46.5	47	[***7***]
USA[a]	1997	185	–	51.5	[***20***]
USA	2001	14 620	–	51.4	[***11***]
Asia					
China	1991	124	49.8	50	[***8***]
Islamic Republic of Iran (north)	1992	400	47.3	–	[***13***]
Islamic Republic of Iran (centre)	2000	404	49.3	–	[***17***]
Lebanon	2001	298	–	49.3	[***10***]
UAE	1998	742	47.3	48	[***16***]
Australia					
Australia	1998	5 961	–	51	[***12***]
Europe					
Finland	1994	1 713	–	51	[***19***]
Italy[a]	2000	4 300	50.9	–	[***5***]

[a]Prospective studies (others retrospective).
USA = United States of America.
UAE = United Arab Emirates.

but higher than Egypt and the United Arab Emirates [*1,16*].

Age at natural menopause was not associated with weight in our study, which concurs with an American study [*2*]; however, a significant association was observed in an Egyptian study [*1*]. Height showed no significant association with menopausal age, which contradicts with the results of a prospective study carried out in the United States [*2*]. Several studies have established a significant association between age at natural menopause and BMI [*1,5,6*]. Although our underweight subjects experienced menopause earlier than obese women, this relationship was not statistically significant.

Left-handed women have been reported to experience menopause earlier than right-handed subjects [*3,4*]. Our study did not confirm this association, which supports the findings of Pavia et al. [*22*].

The mean age at natural menopause of never married women was significantly lower than ever married subjects, which

concurs with the findings of others [*10,11,14*].

Lower social class was highly associated with early menopausal age in our study ($P < 0.001$), which is in accordance with other findings [*2,7,12*]. Some other studies, however, did not establish this association [*8–10,13*]. Three independent factors explained 86% of the variation in menopausal age: cultural status, economic status and social class.

Cigarette smoking has been shown in many studies to be an associated factor that lowers the age of natural menopause [*2,5,10–12,15,16,20*], whereas a few studies have not identified smoking as a determinant of menopausal age [*9,13*]. Our study falls in the latter category. This may be because cigarette smoking is not culturally acceptable among women in the Islamic Republic of Iran and is therefore uncommon. However, smoking of water pipes ("hubble-bubble", *kalyan*) was common among this group of older women (28.7% of the sample) and showed a significant association with menopausal age ($P < 0.014$).

Although the majority (> 80%) of our study population were illiterate or had elementary education, the cultural and religious importance of menopause means that women in this study were able to remember their menopausal age accurately and its precision was quite reliable. While 2 other limited clinic-based studies on menopausal age have been carried out in the Islamic Republic of Iran, this is the first population-based study and we conclude that the results may be generalized to other urban populations in the country.

Acknowledgement

This work was supported by grant no. 79-1143 from Shiraz University of Medical Sciences.

References

1. Hidayat NM et al. Correlates of age at natural menopause: a community-based study in Alexandria. ***Eastern Mediterranean health journal***, 1999, 5(2):307–19.
2. Brambilla DJ, McKinlay SM. A prospective study of factors affecting age at menopause. ***Journal of clinical epidemiology***, 1989, 42(11):1031–9.
3. Dane S, Reis N, Pasinliogu T. Left-handed women have earlier age of menopause. ***Journal of basic and clinical physiology and pharmacology***, 1999, 10(2):147–50.
4. Leidy LE. Early age at menopause among left-handed women. ***Obstetrics and gynecology***, 1990, 76(6):1111–4.
5. Meschia M et al. Determinants of age at menopause in Italy: results from a large cross-sectional study. ***Maturitas***, 2000, 34(2):119–25.
6. Monninkhof EM, Van der Schouw YT, Peeters PH. Early age menopause and breast cancer: are leaner women more protected? A prospective analysis of the Dutch DOM cohort. ***Breast cancer research and treatment***, 1999, 55(3):285–91.
7. Garrido-Latorre F, Lazcano-Ponce EC, Lopez-Carrillol L. Age of natural menopause among women in Mexico City. ***International journal of gynaecology and obstetrics***, 1996, 53(2):159–66.
8. Chang C, Chow SN, Hu Y. Age of menopause of Chinese women in Taiwan. ***International journal of gynaecology and obstetrics***, 1995, 49:191–2.

9. Okonofua FE, Lawal A, Bamgbose JK. Features of menopause and menopausal age in Nigerian women. ***International journal of gynaecology and obstetrics***, 1990, 31(4):341–5.

10. Reynolds RF, Obermeyer CM. Age at natural menopause in Beirut, Lebanon: the role of reproductive and lifestyle factors. ***Annals of human biology***, 2001, 28(1):21–9.

11. Gold EB et al. Factors associated with age at natural menopause in a multiethnic sample of midlife women. ***American journal of epidemiology***, 2001, 153(9):65–74.

12. Do KA et al. Predictive factors of age at menopause in a large Australian twin study. ***Human biology***, 1998, 70(6): 1073–91.

13. Akbarian A et al. Age at menopause and its influencing factors in Rey, Teheran. ***Journal of Feiz***, 1999, 11:46–52 [in Persian].

14. Sievert LL, Waddle D, Canalik K. Marital status and age at natural menopause: considering pheromonal influence. ***American journal of human biology***, 2001, 13(4):479–85.

15. Parazzini F, Negri E, La Vecchia C. Reproductive and general lifestyle determinants of age at menopause. ***Maturitas***, 1992, 15(2):141–9.

16. Bener A et al. Consanguinity and the age of menopause in the United Arab Emirates. ***International journal of gynaecology and obstetrics***, 1998, 60(2):155–60.

17. Tabatabaie BA. Mean age at menopause in Yazd and hormone use. ***Journal of Shaheed Sadouqi University of Medical Sciences***, 2000, 8(1):31–4 [in Persian].

18. Sowers MR, La Pietr MT. Menopause: its epidemiology and potential association with chronic diseases. ***Epidemiology reviews***, 1995, 17:287–302.

19. Luoto R, Kaprio J, Uutela A. Age at natural menopause and socio-demographic status in Finland. ***American journal of epidemiology***, 1994, 139(1):64–76.

20. Bromberger JT et al. Prospective study of the determinants of age at menopause. ***American journal of epidemiology***, 1997, 145(2):124–33.

21. Kono S et al. Age of menopause in Japanese women: trends and recent changes. ***Maturitas***, 1990, 12(1):43–9.

22. Pavia M et al. Handedness, age at menarche, and age at menopause. ***Obstetrics and gynecology***, 1994, 83(4): 579–82.

23. Noreh J et al. Median age at menopause in a rural population of western Kenya. ***East African medical journal***, 1997, 74(10):634–8.