

Age at Natural Menopause and Related Factors in Isfahan, Iran

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Objective: This study was aimed to evaluate the age at natural menopause and related factors among women in a population based study in 2015 in Isfahan, Islamic Republic of Iran.

Methods: In this cross-sectional study 960 menopausal women were selected by cluster sampling. Demographic, socioeconomic, lifestyle behavior and reproductive history aspects were collected using a structured questionnaire. Woman and her husband's educational level and occupation with family income were the variables to construct socioeconomic status using principal component analysis.

Results: Mean and median of natural menopause age were 48.66 and 48 years, respectively. Women body mass index (BMI) more than 30 kg/m² had significantly higher menopausal age than women with lower BMI (*P* value = 0.022). The mean of menopausal age was not statistically significant in regard to marital status, physical activity, smoking status, menarche age, age at first pregnancy and history of abortion. Menopause age with pregnancy numbers and age at last pregnancy had a significant positive association. Women with better socioeconomic status had significantly higher natural menopause age. Multiple linear regression shows significant relationship between lower age at menopause with higher age at marriage, higher number of pregnancy and lower socioeconomic status.

Conclusion: Age at menopause in our studied sample is similar to previous estimates reported for other Iranian populations. Age at marriage, higher number of pregnancy and lower socioeconomic status were the significant factors in relations to age at menopause. (**J Menopausal Med 2016;22:87-93**)

Key Words: Age factors · Iran · Menopause · Socioeconomic factors

Introduction

Menopause represents the end of a woman's reproductive life, and is defined as the permanent cessation of menstruation resulting from the loss of ovarian follicular activity.¹ The natural menopause can vary greatly between individuals and on average, occurs naturally at the age of 51 years in industrial countries and is 48 years in poor and non-industrialized countries.²⁻⁴ The timing of menopause

is a known risk factor for several chronic diseases like coronary heart disease, osteoporosis and cancers. Some studies reported that early menopause is associated with increased mortality from cardiovascular diseases,⁵⁻⁸ and older age at menopause increases the risk of breast cancer.⁹ So, determine of the factors influencing the timing of menopause is important.

The age at natural menopause can be vary among different population and is influenced by a number of

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sociodemographic, physical and behavioral characteristics.¹⁰⁻¹² A median age of 51.4 years is reported as menopause age in the Western world.¹² Among American and European populations, ages between 48 and 52 years is reported for occurrence of natural menopause.¹³ In some studies 49 to 50 years is reported for age at menopause for Asian women.^{14,15} In 2004 the mean age at menopause has been reported 50.4 years for Iranian women but after 2004 studies in different part of Iran reported 46.9 to 49.6 years as age at menopause. The findings show that compared to other societies menopause age in Iran is relatively within earlier ages.¹⁶⁻²⁰

Age at menopause is a complex outcome related to a number of factors, genetic, reproductive history, lifestyle and socioeconomic status.²¹⁻²³ Previous studies have demonstrated a relationship between ages at menopause with socioeconomic status, smoking, nulliparity, low levels of education, low weight gain during early childhood, body mass index (BMI), infectious disease, marital status and other factors.²⁴⁻²⁷

The number of postmenopausal women is increasing and nearly one third of women's life spends in the postmenopausal period. In the other hand age at menopause has been associated with risk for the onset of several chronic diseases, so identifying the factors associated with menopause age is necessary. We therefore conducted a study to determine average age at menopause and its main associated factors among women in Isfahan, Iran.

Materials and Methods

This cross-sectional population-based study was conducted on menopausal women in Isfahan, Iran at the year of 2015. The ethics committee of Isfahan University of Medical Sciences investigates and approves the study. Studied women were selected via two-stage sampling method, by cluster sampling for selection of health centers as cluster and then by random sampling method determine the required samples from each cluster. Women lower than 75 years old were eligible for the study if they gave their verbal informed consent to participate in the study and were residents of Isfahan city for at least 5 years.

Eligible women were interviewed by the fully trained graduate student interviewers using a structured questionnaire. The questionnaire included demographic, socioeconomic, lifestyle behavior and reproductive history aspects. The outcome of interest in this questionnaire was the assessment of age at natural menopause which was obtained by asking a woman to recall her age at the last menstrual period and the time passed since then. Also, every woman was asked whether she was menstruating or not during the last 12 months to minimize the effect of recall error. Other variables were hypothesized as covariates of age at menopause. Demographic variables were birth year, BMI, marital status, educational attainment, employment status. BMI, defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). Reproductive history characteristics were: age at menarche, age at first and last pregnancy, number of pregnancy and history of abortion. Lifestyle characteristics were: physical activity, smoking status, and amount, and alcohol consumption. Also, socioeconomic status was determined through principal component analysis using four variables included; woman educational level, woman and her husband's occupation and family income. Socioeconomic status was categorized in three low, intermediate and high status using 25% and 75% percentiles.

All statistical analyses were done using SPSS software for Windows version 20 (SPSS Inc., Chicago, IL, USA). Descriptive data are reported as mean \pm standard deviation (SD), or number (percent) as appropriate. Independent sample t-test was used to assess age at natural menopause in variables in two categories. One-way analysis of variance (ANOVA) was used to assess age at natural menopause in variables more than two categories. Pearson correlation coefficients was used to assess the association between age at natural menopause and continues variables. Multiple linear regression analysis was used to assess association of age at natural menopause with independent variables of interest. The enter method as the standard method was used to enter all studied variables in regression analysis. For these analysis qualitative independent variables more than two levels were categorized as dummy variables. Dummy variables included: marital status, reported in three categories: 1) married (referent), 2) never married,

3) widowed/divorced; BMI categorized as: 1) ≤ 24.9 kg/m² (referent), 2) 25 to 29.9 kg/m² and 3) ≥ 30 kg/m²; socioeconomic status categorized as: 1) low (referent), (2) moderate and 3) high levels. The level of significance is considered to be less than 0.05.

Results

The mean age of women in this study was 60.96 ± 7.57 years old. Of these women 98.86% (949 women) reported natural menopause and 1.14% (11 women) reported induced menopause. The age at which natural menopause occurred ranged from 46–51 years with an overall mean of 48.66 ± 3.79 with a median of 48 years old. The mean time since menopause was 12.27 ± 7.91 years. The distribution of reported age at natural menopause among studied women shows in Fig. 1.

Table 1 shows the association between menopausal age with sociodemographic and reproductive history in 949 women with natural menopause. BMI in nearly 11.49% of women was more than 30 kg/m² which had significantly higher menopausal age than women with lower BMI ($P = 0.022$). At the time of the survey majority of women were married (59.43%) or widowed/divorced (38.57%) and only 2% were single. The mean of menopausal age was not statistically significant in regard to marital status, but age at marriage had significantly adverse association with age

at natural menopause. More than half of women (58.69%) reported weekly physical activity, and 15.38% had history of abortion. The mean of menarche age and first pregnancy were 13.15 and 16.27 years, respectively. The mean of pregnancy numbers was 5.7. Socioeconomic status in 53.64% of women was moderate, in 26.66% was high and only 19.7% had recalled low status of socioeconomic. In this study marital status, physical activity, smoking status, menarche age, age at first pregnancy and history of abortion were not significantly associated with age at natural menopause. A positive association was observed between age at natural menopause with pregnancy numbers and age at last pregnancy. Also, women with better socioeconomic status had significantly higher natural menopause age.

Table 2 summarizes results of multiple linear regression analyses. The findings revealed that of variables included in the analyses, marital status, BMI, smoking status, physical activity, menarche age, age at first pregnancy, age at last pregnancy, and history of abortion were not associated with age at menopause. There was an increased age at menopause with a lower age at marriage. The increased age at menopause was observed in relation to higher number of pregnancy. Also, women who had lower socioeconomic status negatively were likely to have earlier menopause than moderate or high level of socioeconomic status.

Discussion

In the present study age at natural menopause and underlying factors in a representative sample of Iranian women was assessed and findings indicated that mean age at natural menopause was 48.66 years. BMI, age at marriage, pregnancy numbers, age at last pregnancy and socioeconomic status were significantly associated with natural menopause age. Also, multiple linear regression revealed that lower age at marriage, higher number of pregnancy and higher level of socioeconomic status were associated with increase in age at natural menopause.

The mean 48.66 years as natural menopause age in our study was similar to the findings in a systematic review and meta-analysis which performed to determine the overall mean of age at natural menopause. In this meta-analysis,

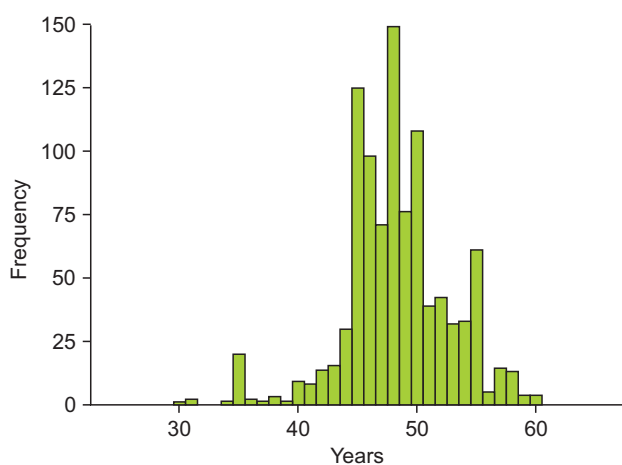


Fig. 1. Distribution of self-reported age at menopause in 960 studied women.

Table 1. The association between menopausal age and demo-socio characteristics among women

	N (%)	Mean ± SD	Pearson Coefficients	P value
Age (years)	960 (100)	60.96 ± 7.57		
Menopausal status				
Natural menopause	949 (98.85)	48.66 ± 3.79		
Induced menopause*	11 (1.15)	35.27 ± 3.26		
Body mass index (kg/m ²)				
≤ 24.9	454 (47.84)	48.34 ± 4.07		
25-29.9	383 (40.36)	48.76 ± 3.64		0.022 [†]
≥ 30	109 (11.49)	49.48 ± 3.72		
Marital status				
Single	19 (2)	43 ± 3.3		
Married	564 (59.43)	48.84 ± 3.71		0.059 [†]
Widowed/ Divorced	366 (38.57)	48.48 ± 3.93		
Marriage age	930 (98)	17.15 ± 4.46	-0.117	< 0.0001 [§]
Smoking status	57 (6.01)	47.81 ± 4.13		0.56 [‡]
Physical activity				
Non-active	392 (41.31)	48.61 ± 3.95		0.66 [‡]
Active ≥ 1 hour/week	557 (58.69)	48.72 ± 3.72	0.045	
Menarche age	893 (94.1)	13.15 ± 1.74	0.132	0.162 [§]
Number of pregnancy	927 (97.68)	5.7 ± 2.96	0.018	< 0.0001 [§]
Age at first pregnancy	927 (97.68)	16.27 ± 5.51	0.093	0.57 [§]
Age at last pregnancy	927 (97.68)	31.2 ± 9.35		0.004 [§]
History of abortion				
Yes	146 (15.38)	48.61 ± 3.79		0.85 [‡]
No	803 (84.62)	48.67 ± 3.8		
Socio-economic status				
Low	187 (19.7)	44.97 ± 2.1		
Moderate	509 (53.64)	48.11 ± 2.66		< 0.0001 [†]
High	253 (26.66)	52.51 ± 3.79		

Missing data: body mass index, 3 subjects; menarche age 56 subjects; number of pregnancy, age at first and last pregnancy, 3 subjects
 *Women whose menopause was induced by hysterectomy and/or bilateral oophorectomy or other medical intervention, such as chemo-therapy
 P values calculated using [†]one-way analysis of variance, [‡]independent sample t-test, [§]Pearson correlation coefficient
 SD: standard deviation

46 studies across 24 countries identified and reported natural menopause age was 48.78 years. African, Latin American, Asian and Middle Eastern countries had lowest mean and highest mean was observed in Europe and Australia,

followed by the United States of America. A median age of 48 years in our study was lower than those reported in the Western world (51 years). Another show that the median age at menopause was 50 years in Russia (Novosibirsk), 51 years

Table 2. Multiple linear regression of age at natural menopause on individual variables

	Unstandardized β (SD)	Standardized β	P value
Body mass index (reference, ≤ 24.9)			
25-29.9	0.234 (0.21)	0.03	0.262
≥ 30	0.478 (0.35)	0.038	0.168
Marital status (reference, married)			
Single	-0.621 (0.78)	-0.023	0.424
Widowed/Divorced	0.171 (0.22)	0.021	0.431
Marriage age	-0.022 (0.03)	-0.028	< 0.0001
Smoking status	-0.563 (0.81)	-0.033	0.524
Physical activity (yes)	0.093 (0.21)	0.012	0.646
Menarche age	0.029 (0.06)	0.013	0.639
Number of pregnancy	0.125 (0.048)	0.096	0.009
Age at first pregnancy	-0.025 (0.032)	-0.036	0.43
Age at last pregnancy	-0.013 (0.019)	-0.031	0.492
History of abortion	-0.459 (0.283)	-0.042	0.105
Socio-economic status (reference, low)			
Moderate	3.21 (0.249)	0.333	< 0.0001
High	4.522 (0.226)	0.515	< 0.0001

SD: standard deviation

in Czech towns and 52 years in Poland (Krakow), which were higher than the median age in the present study (48 years). The differences between our findings with previous result may be explained by the differences in lifestyle and socioeconomic status in studied women, whereas European people have higher socioeconomic status than our studied women. The menopausal age in some provinces in Iran reported as follow; in Shiraz 48.3 years, Yazd 47.39 years, Zahedan 46.9 years, Tehran 47.71 years, Hamadan 49.6 years, and in Gorgan 47.6 years,²⁸⁻³³ these findings are similar to the findings in the present study.

Despite the fact that women with BMI more than 30 kg/m² had higher menopausal age but regression analysis did not show any significant association between BMI and menopausal age. This finding was in contrast to previous studies that show a higher BMI might cause a later menopause.³⁴ The association between menopause age with BMI in our study can be affected by the fact that lifestyle

habits usually changed during menopausal transition and after menopause weight gain often observed.

Between the marital status and the age at menopause in our study was not significant relation. This was dissimilar to other studied that show significant association between marital status and menopause age.^{28,29,35} No significant relation between single with married women in our study may explain by the low number of single women, whereas age at marriage in our study was significantly in relation to menopause age and lower age at marriage cause to late menopausal age in studied women.

Smoking status is reported as a risk factor in relation with menopause age and in a systematic review all of include studies showed that smoking was associated with a greater risk/chance of earlier menopause.³⁶ Another meta-analysis of smoking in 2014 comprised 15 study populations and showed that overall smoking was associated with having an earlier mean age at menopause by almost a

year, and also revealed that the greater effect of smoking in economically more developed regions.³⁴ In the present study smoking status was not significantly associated with age at menopause. This can be explained by the possibility of measurement errors in estimates of smoker number in our samples. Smoking habit in Iran especially for women is known as shameful behavior and it is possible that some women in the present study did not report the exact status of their smoking. So, under estimate number of smoker can obscure its association with age at menopause in our studied sample.

Socioeconomic factors may play an important role in changing the onset of menopause.³⁷ Socioeconomic status of our studied sample which was significantly associated with age of menopause, was determined using variables included female educational level, male educational level, female occupation, male occupation and family income. A meta-analysis shows that age of menopause was associated with some socioeconomic factors. In this meta-analysis to assess the effect of education on menopause age, 11 study populations included and findings showed that menopause occurred one-third and of two-thirds a year later in women with a middle and high education level, respectively, compared with a low education level. Also, this study reported that occupation had an effect comparable to education, and menopause age was higher in women with a middle occupation level compared with a low occupation level.³⁴ In a number of studies the significant association between an earlier age at natural menopause with lower social class is reported.³⁸⁻⁴⁰ Similar to these studies socioeconomic status in our study was significantly associated with age at natural menopause. Women with lower socioeconomic status having an earlier mean age at menopause by almost 3 years compare to women with moderate socioeconomic status, also women with moderate socioeconomic status having an earlier mean age at menopause by almost 4 years compare to women with high socioeconomic status. All of these findings show the strong association between socioeconomic status and age at menopause. This would be more important that these factors are modifiable and using appropriate policy can help to improve women's health.

In conclusion the results of the present study revealed that

the mean age at natural menopause in women who live in Isfahan, Iran was 48.66 years. Also, advance analyses show that higher age at marriage, lower number of pregnancy and lower socioeconomic status were significantly associated with earlier mean age at menopause.

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