Original Article

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Menopause Age and the Associated Factors in Postmenopausal Women in Babol, Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Menopause plays a pivotal role in women's life comprising of approximately one third of it. Nevertheless, few studies have focused on the significance of this period. This study aimed to determine the age of menopause and its associated factors in postmenopausal women in Babol, Iran

METHODS: This cross-sectional study was conducted by cluster sampling on 300 postmenopausal women identified by doorstep questioning of the homes in selected areas. The questionnaires consisted of information on the menopause age, body mass index (BMI), age at menarche, first pregnancy age, duration of hormonal contraceptive use, left-handedness, occupation, menstrual regularity, exercise, smoking habits, couple's education degree, marital status, family size and the number of births and abortions. The collected data were registered into checklists and The Holmes & Rahe Stress Scale was used for the assessment of the variables.

FINDINGS: In total, the average age of menopause was 50.02±0.21 years, the average length of marriage was 42.10±0.63 years, age at last pregnancy was 35.15±0.35 years and the lactation duration was 106.02±3.5 months. A significant correlation was found between the length of marriage, age at last pregnancy, stress scores, lactation duration and the menopause age ($p<0.001$), while some factors such as BMI, regulation and age at menarche, duration of hormonal contraceptive use and exercise were found to have no significant correlations with the onset of menopause.

CONCLUSION: According to the results of this study, the mean age of menopause in Babol is within the normal range and it is associated with the length of marriage, age at last pregnancy, stress scores and lactation duration.

KEY WORDS: Menopause Age, Pregnancy, Menstruation.

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Introduction

Reproduction periodslike the reproductive age at menarche, first pregnancy and the menopause play a pivotalrole in a woman's life (1). Natural menopause, as defined by the World Health Organization (WHO), is the cessation of menstruation in women due to the ovarian follicular activity for at least 12 consecutive cycles which is not associated with pregnancy, lactation or other hormonal disorders (2-8). However, amenorrhea along with decreased levels of estrogen and follicle stimulating growth hormone (FSH) greater than 40 milliunits per liter also represent the onset of menopause in laboratory terms (5, 7).

Since the life expectancy of women has risen to 70-80 years according to various sources, everywoman spends about a third of her life (20-30 years) in the postmenopausal stages(1, 2, 4, 7, 9,10). The average age of menopause in industrial societies is50-51 years and approximately40% of women reach natural menopause before the age of 40 (premature menopause) (11, 14). However, the scope of the changes in menopause in Iran accounts fora relatively large age rangeof 46-52 years (1-3, 6, 8, 12, 14, 24, 25). Approximately 25 million women in the world reach menopause every year. Thus,with an annual increase of 47 million new cases per year, it is expected that this rate will reach one billion and 200 million people by2030 which is a dramatic growth in the world's elderly population (1, 14). The average age of menopause in America and Ankara, Turkeyis estimated as 51.4 (18-20) and 47±4.2 years, respectively (1) and it is 49±3.6 and 49.6 years in Lahore, Pakistan (1) and Iran (17), respectively. In a number of studies, the average age of menopause in Tehran, Iranwas estimated as 48.51±4.45 and 49.6±4.5 years in 2003 and 2012, respectively (4, 25). In addition, the average menopause age was 48.2±3.7 years in Mashhad (13), 53.2±5.7 years in Shahrood (3), 47.97±4.17 years in Ahwaz (5), 46.34±3.69 years in Gonabad (24) and 47.93±4.37 years in the region of Mazandaran (9).For many women in different societies, menopause is followed by a particularfeeling of anxiety and confusion. In the view of the fact that women constitute a significant part of a community and half the population of the world, having adequate knowledge ofthe age of menopause onsetcould set the foundations for regulating more efficienthealth policiesas to improvewomen'squality of life (2, 4, 6).

Identifying the mean age of menopause is regardedas a health indicator of the nutritional and socioeconomic status of a society (5). In fact, the importance of considering menopause in family and community health is due to thecomplications it causes in women and the problems which might bethreatening to their health, whilethese complications are believed to be easily preventable (1).

According to severalstudies, many factors are associated with menopause including age at menarche and menopause, nutritional and socioeconomic status, number of childbirths and abortions, use of hormonal contraceptives, race, religion, breastfeeding, education degree, physical characteristics such as left-handedness, consumption of alcohol and tobacco, addiction of any kind, age at first and last pregnancy, physical exercise and sexual behavior. However, conflicting results have been reported on the precise effects of these factors (1-5, 20-22).

For instance, in a research conducted in Tehran in 2006, usingbirth control pills was found to reducetheage of menopause.However, the same agent was associated with the late onset of menopause in another study performed in Ahwaz in 2001-2002 (1, 5). On the other hand, menopause, as amarkerof the end of the reproductive period, has not been adequately studied compared toother periods of women's life (1, 5, 6, 14). Since the city of Babol was not included in asurvey conducted on this subject in the region of Mazandaran (2003) (9), the presentstudy aimed to determine the age of menopause and its related factors in postmenopausal women of 46 and older in Babol so that the results would help providethehealth care services requiredby these womenwhile laying thegrounds for future research

Methods

This cross-sectional study was conducted in Babol in 2012 bycluster random sampling. After obtaining approval from the Health Department of Babol University of Medical Sciences, 300 postmenopausal women were surveyedat the selected houses covered byhealth care centers. Those who were willingto participate in the study were enrolled. The selected subjects had gone through at least one year of their natural menopause, were ageing 46 years orolder and were sober, speakers ofPersian or Mazandarani and finally, they were partially aware of their menstrual and reproductive history.The exclusion criteria of this study were the history of Hysterectomy, ovariectomy, underlying diseases such as diabetes and thyroid.

Regarding the fact that the average age of menopause in Mazandaran in 2003 was estimated as

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47.93 years (9), the sample size consisted of 300 individualsby a 95% confidence leveland an absolute error of 0.05. According to the information obtained from the Central Health Departmentof Babol, thiscity has 14 major health care centers6 of which were selected randomly for this study. Since the majority of these health care centers are located in the Southern and Eastern part of the city, 2 centers were selected from each part, one center was selected from the Northern and Westernpart each and 50 samples were chosenfrom each center. In the most recent map of Babol, the city is divided into the geographical regions of North, South, East and West in each of whichrandom cluster sampling was performed. Following that,households in these parts were surveyed in orderto identify postmenopausal women. The average lengthof the interview was 15 minutes during which the weight, height and blood pressure of thepostmenopausal women weremeasured and recorded by the researchers. Informed consents were provided from the subjects and the interviews were conducted anonymously. The in dividuals' information remained confidential and the obtained results were only reported to the associated organization.

The collected data were registeredin checklists consisting of three sections.The first section contained the demographic characteristics of the samples, the second part included their age at menopause and the third part included the related factors related to the menopause age.

The variables associated with menopause in thesechecklistsincluded the age at menopause, length of marriage, age at menarche, age at first and last pregnancy, blood pressure, body mass index (BMI), length of using hormonal methods of birth control, left-handedness, occupation, spouse's job, menstrual regularity, exercise, smoking habits, couples' education degree, marital status, family size, number of births and abortions and the stress level. The level of stress was measuredby the standard questionnaire of Holmes & Rahe whose reliability and validity was evaluated in a studyby Ardakani et al (A study of the Relationship between Preterm Delivery and the Stress caused by Life events during Pregnancy) (23). Furthermore, the Holmes and Rahe Stress Scale (1967) was principally used as a criterion for interpreting the changes and vulnerability to stress-related illnesses. In this questionnaire, scoresof 150 or lower represent small changes in life in which the possibility of fallingsick is also lower, the scores of 150-300 imply that health problems may occur by a probability of 50% within the next two years and scoresabove 300 are indicative of an increased chance of diseases by 80%. The subjects were surveyed with emphasis on the events before the onset of menopause. In order for that, the participants were asked to recall the two years before the onset of theirmenopause while answering the questions. The collected data were analyzed by SPSS software V.18, Logistic regression tests, Linear regression and Chi-square. A P value of <0.05 was considered as significant.

Findings

In this study, 300 postmenopausal women were studied whose average age of menopause was 50.02±0.21 years. The mean lengthof marriage, age at menarche and age at first and last pregnancy were 42.10±0.63, 13.29±0.71, 19.55±0.24, and 35.15±0.35 years, respectively. No statistically significant differences were observed between age at menopause, BMI, age at menarche, age at first pregnancy, lengthof hormonal contraceptive useandthe mother's age at menopause. Furthermore, no statistically significant correlation was found between the menopause age and other investigated factors such as left-handedness, occupation, spouse'soccupation, menstrual regularity, exercise, smoking habits, the couple's education degree, marital status, family size and the number of births and abortions. In addition, 1% of the subjects were single, 87.3% were married, 10.3% were widowed and 1.3% were divorced or separated. The mean age at menopause in left-handed and right-handed subjects did not differ significantly. The average age in these subjects was reported to be 49.27±4.52 and 50.08±3.57 years in the right-handed and left-handed women, respectively.

The meanage of menopause in employed women was 50.1±3.68 years, it was49.60±3.42 in housewives, 49.89±3.78 in women whose spouse was a clerk, and 50.11±3.6 in women with self-employed spouses. This findingsuggested that the couple's occupation had no significant association with the onset of menopause. Approximately 95.3% of the surveyed women had regular menstrual cycles before menopause with an average menopause age of 50.09±3.63 years while this average in the women without menstrual regularity was reported to be 48.50±3.8 years which indicatedno statistically significant association.

The average menopause age in athletic and non-athletic postmenopausal women was reported to be 49.49±3.52 and 50.12±3.66, respectively which

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indicated no statistically significant association. The average age of menopause in the subjects' mothers was 49.07±4.37 years and although the average age of menopause in their sisters was associated with the subjects' menopause age (p=0.012), it hadno significant associations with the average age of menopause in their mothers (table 1).

Table 1. Association of the average menopause age with the variables examined in the study population

Variable	Menopause average age(year) Mean±SD	P-value
Exercise		
athletic	49.49±3.52	0.269
non athletic	50.12±3.66	
Mother's age menopaue	49.07±4.37	
Habits smoking		
Smoker	47±20	0.15
smoker-non	50.05±3.64	
Handed-right	50.08±3.57	0.321
Handed-left	49.27±4.52	
Average sisters' age menopause	49.84±4.37	
Occupation		
Employed	50.1±3.68	0.393
Unemployed	49.60±3.42	
Spouse's		
Occupation clerk	89.49±3.78	0.636
Employed-self	50.11±3.6	
Mensrual regularity		
Regular	50.09±3.63	0.139
Irregular	48.50±3.8	

Moreover, such factors as high blood pressure, lengthof marriage, age at last pregnancy, lactation period and stress scores were found to be associated with menopause (p<0.001). According to further statistical findings, menopause age increased by 1.178 years (p<0.01) per aone-unit increase in the blood pressure, 0.8 year (p<0.001) pera one-year increase in the length of marriage and 0.1 year (p<0.001) pera one-year increase in the age at the last pregnancy. The average age of menopause in the threecategories of Holmes et al stress questionnaire was reported to be 50.74±3.48 years (low stress), 49.73±3.40 (average stress) and 48.69±4.22 (high stress), respectively. There was a significant difference in theage ofmenopause between at leasttwo of these groups. Additionally, the results of the statistical tests indicated that there was a significant difference between Group 1 (low stress) and 3 (high stress) (table 2).

Table 2. Frequency and menopause age based on the variables of the postmenopausal women's stress scores

Variable	N(%)	Menopause age Mean±SD	pvalue
Stress	300(100)		
Low	131(44)	50.74±3.48	0.001
Average	121(40)	49.73±3.40	
high	48(16)	48.69±48(16)	

Discussion

Acording to the results of this study, the overall meanage of menopause in Babol was50.02±0.21 years which is equal to the average age of menopause in other industrialized countries in the world (5). The average age of menopause in the capital cities of Iran (Tehran, Arak, Mashhad and Ahwaz)was estimated as 48.48, 48.2, 48.2 and 47.97 years, respectively (1, 5, 6, 13). The inconsistencies found invarious studies are possibly due to the differences in the climate, social and racial status as well asthe subjects' lifestyle. Recently, genetic factors have also been proposed as the most important determiners of the age at natural menopause (11).

According to the present study, the lengthof marriage was positively correlated with menopausal age, such that for every increase byone year, age at menopause went up by0.8 year. However, astudy conducted in Tehran did not confirm these findings (1, 14) due to the differences in the samples' time range of marriage. The findings of this study also indicated that perevery 1 unit increase in the blood pressure, menopause age would go up by1.178 years. Similarly, Abdollahi et al observed a relationship between systolic blood pressure and menopause in a study performed in Mazandaran, as women with a latemenopause experienced ahigher systolic blood pressure (9). This relationship may also suggest the influence of sex hormones on blood pressure, or vice versa. According to the findings ofour study, there wasno association between BMI and age at menopause, and this finding is corroborated in similar studies in Arak (6), Tehran (1) and Shiraz (11), while a study in Ahwaz by Nouh Jah et al (5) indicated that BMI above 20 is associated with a delayedage ofmenopause. On the other hand, we found that age at menarche and at menopause werenot

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significantly correlated which corresponds to the results of Nouh Jah et al in Ahwaz (5). In a review by Tavassoli et al in Mashhad, such a relationship was not reported either (12). Since the age atmenarche and menopause mark the beginning and the end of productivityin women and they are both formed byhypothalamic-pituitary-ovarian axis, lack of correlation between these two factors is unlikely. For more definite statements about the relationship between these two, furthers pecialized studies are required. According to the results of the current study, there wereno correlations between age at first pregnancy and menopause age, while the relationship with age at last pregnancy was so highly significant that for every increase in age by one year at the last pregnancy, the menopause age would go upby 0.5 year. A study in Mazandaran by Abdollahi et al (9) reported that women of elder age at their last pregnancy may alsoreach menopause later in life. This association is confirmed byanother study conducted in Arak as well (6). In this regard, there can be two possibilities: first, that an elder age at menopause is the main cause oflate pregnancy, and secondly,itis likely that the hormonal effects on the ovarian activity stimulation after pregnancy could be followed by a delayed menopause. However, in their research performed in Tehran, Nahidi et al suggested that the associationbetween age at first pregnancy and menopause wasnot statistically significant (14).

For another thing, the total lengthof lactation and menopause were found to be significantly associated in the current study while the studies ofAhwaz (5), Kashan (10) and Mashhad (13) did not report any such statistically significant association in this regard. This significant correlationis most probably due to the impact of breastfeeding on the number of menstrual cycles. Perhaps this inconsistencyin results comes from the differences between the samples' duration of lactation in various studies. In the study of Mazandaran, a significant correlation was also found between the length of lactation for the last child and the age of menopause (9). This factor has not been widely examined in other studies, soit requires further investigation. In ourstudy, the duration of hormonal contraceptive usewas found to haveno correlations with the menopause age and similar studies ofAhwaz (5), Arak (6), Mazandaran (9) and Kashan (10) did not report of such a relationship either. However, Tavassoli et al observeda significant correlation between the menopause age and the use of oral contraceptives. This inconsistency appears to be due to the differences in the mean duration of hormonal contraceptives compared with other methods of contraception.Our findings indicated that women's age at menopause had no significant relationships with that of their mothers' which was not compatible with the findings of a study by Ashrafi et al in Tehran (1).

On the other hand,ourstudy suggests that there is a correlation between the sisters' average age of menopause and that of the studied subjects. According to the resultsof Mazandaran (9) and Kashan (10) studies, a significant relationship was observed between the mother's and the sister's menopause age and that of the subjects' which is probably because our samples were more aware of their sisters' age at menopause than that of their mothers'.

The findings of the currentstudy confirmedno significant differences between the mean age of menopause in either theleft-handedor theright-handed subjects,which is similar to the studies ofArak (6), Mazandaran (9) and Shiraz (11). Apparently, the absence of any correlations in our study in this regard could be due to the limited number of left-handed subjects (7.3%) compared tothe right-handed ones (89.7%). Moreover, the postmenopausal women' soccupation and education degreeas well asthose of their husbands'were found to have no significant association with menopause in the current study. Similarly, Abdollahi et al in Mazandaran (9), Kafaee et al in Kashan (10) and Tavassoli et al in Mashhad (13) reported no such correlation while thestudy of Arakdescribed thehousehold income as asignificant variable involved in theaverage age of menopause by a5% error level (6).

In their research, Nahidi et al statedthat such factors as primary levels of education or lower, husband's low education degree (elementary education orilliterate) and the state of being a tenant had a significant statistical correlationwith the age of menopause (14). A study by Ayatollahi et al in Shiraz (11) indicated that the average age of menopause in women withlow incomesor coming fromthe underclass of the society was lower compared toother subjects. Such factors appear to lack in the present study due to the limitednumber of educated samples (postmenopausal women above diploma accounted for 8.3% and husbands with education higher than diploma accounted for 16.7%). Another study in Arak (6) considers the level of income as a major factorwhile disregarding the education degree to be associated with the menopause age.In ourstudy, 95.3% of the postmenopausal women had

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regular menstrual cycles. The mean age of menopause in women with regular and irregular menstrual cycles was not significantly different. The studies of Arak (6), Mazandaran (9) and Mashhad (12) also support this finding while Nouh Jah et al from Ahwaz (5) link monthly regular periods during thereproductive age to theearly onset of menopause. Ashrafi et al from Tehran (1) also found that women with a regular menstrual pattern reach menopause significantly later. The follicular atresia in irregular cycles might behigher and this inconsistencywas most likely due to the limited number of samples with irregular cycles in the present study. Of the 300 samples in ourstudy, only 49 women practiced continuous professional sports or had regularphysical exercise. Therefore, we concluded that exercise and menopause age had no significant association. The study of Ayatollahi et al in Shiraz (11) corroborated these findings, while physical exercisewas a significant factor in women's menopause age in the study of Rafee et al in Arak(6). This inconsistency in the results isprobably due to thelarger number of the athletes in other studies compared to our study. Smoking habits wereanother non-related factor to menopause in this study where only 1% of our cases had a history of smoking. Ayatollahi et al (11) also confirmed this finding in their research, while the results of two similar studies (5, 14) considered a history of smoking cigarettes and hookah to be significantly associated with the early onset of menopause.

This significant association could be due to the effect of the nicotine content of cigarettes on the eggs and their estrogen secretion. The inconsistencies in these findings mightbe due to the differences in the consumption of tobacco in different cities. One of the main reasons of the absence of such significant relationship in this regard is probably the unpopularity of smoking habits amongIranian women compared toother countries. For another thing, the marital status of postmenopausal women in the currentstudy was found to haveno statistically significant association with the menopause age.

Although the majority of other studies do not support thisfinding (6), the findings of Nouh Jah et al (5) and Ayatollahi et al (11) confirm this result. The household size and the number of pregnancies were also among the factors with no association with the mean age of menopause in our study. In another study (13), it was observedthat menopause hadno significant correlations with the number of thechildren. Moreover, Kafaee et al (10) did not confirm such association between the number of births and menopause, while similar studies (1, 5, 6, 9) all focused on the relationship between the number of births and the age of menopause. Our findingsalso indicated that having a blood relation with the spouse had no statistically significant association with the onset of menopause. Ayatollahi et al (11) claimedthat the average age of menopause in women who had blood relations with their husbands was comparatively lower. However, this association was not considered to be statistically significant. Among the subjects of the present study, 41 women had a blood relation with their spouse while256 women did not. This particular variable has not been examined in other studies and realizing its precise impact requires further investigation.

The stress scoreswere among the studied factors known to influencethe menopause age in the present study whilethe study of Mazandaran (9) does not supportthis finding. This variable has also been inadequately investigated and requires further research. In summary, the results of the current study indicated that the mean age of menopause in Babol washigher compared to other partsof the country while beingwithin the normal range.

With referenceto the inconsistencies in different studies, further investigation is to be made for a more accurate assessment of the associated factors with the age of menopause. It is also noteworthy that in the currentstudy, more than 20 factors were closely investigatedwhich could lay the grounds for future studies on the menopause age and its correlated factors.

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