

# Age at Menopause and its Determinants in Women Participating in Hoveyzeh Cohort Study, South West Iran

Nader Saki (MD)<sup>1,2</sup>, Bahman Cherghian (PhD)<sup>3,4</sup>, Sara Sarvandian (MSc)<sup>4,5</sup>, Sedigheh Nouhjah (PhD)<sup>6\*</sup>

<sup>1</sup> Professor of Otolaryngology, Hearing Research Center, Clinical Sciences Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>2</sup> Department of Otolaryngology, Head and Neck Surgery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>3</sup> Professor of Epidemiology, Hearing Research Center, Clinical Sciences Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>4</sup> Department of Biostatistics and Epidemiology, School of Public Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>5</sup> Lecturer of Epidemiology, Hearing Research Center, Clinical Sciences Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>6</sup> Associate Professor of Reproductive Health, Social Determinants of Health Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

ARTICLE INFO	ABSTRACT
<b>Article type:</b> Short Communications	Menopausal age as an indicator of healthy aging is a complex phenomenon. However, there is no consensus on the contributing factors. This study aimed to determine age at menopause and its determinants in 1930 menopausal women participating in the Hoveyzeh Cohort Study (HCS), South west Iran. HCS was conducted in Hoveyzeh County from May 2016 to August 2018.
<b>Article History:</b> Received: 14-Mar-2023 Accepted: 28-Jan-2024	By door-to-door census, eligible people were identified. In this population-based cross-sectional study, interviewer-administered questionnaires were used for data collection. Principle component analysis (PCA) was used for wealth index quintiles estimation. SPSS 23 software was used to analyze the data. The chi-square test, independent, and one-way analysis of variance were used. The odds ratio was calculated using univariate and multivariate regression. The mean age of natural menopause was 49.46 (SD=4.48), with a median of 50 years. Premature menopause was reported in 6.6% (155) of women. The wealth index and its components had no significant association with the natural age at menopause ( $P>0.05$ ). The mean and median age of natural menopause was within the range reported in previous studies. Further studies are recommended to determine the definite effect of social factors on menopausal age.
<b>Key words:</b> Menopause Social Determinants of Health Economic Status Cohort Studies Iran	

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## Introduction

Menopause is the permanent cessation of menstruation for at least 12 months due to loss of ovarian and follicular activity (unrelated to pregnancy, lactation, and hormonal disorders) (1). Each year about twenty-five million women worldwide and 1.3 million in the United States experience menopause (2). By 2030, it is expected that 1.2 billion women will have passed through menopause (3). Based on the World Health Organization report, by 2050 the

Iranian population aged >60 years will increase to 33% (4). The number of Iranian women at menopausal age was reported to be 2215000 in 2012. Also, about 5 million Iranian women experienced menopause in 2021 (5).

The age of menopause may indicate healthy aging and significantly impacts women's health and their quality of life (6). Every one-year increase in the age of menopause is associated with a two percent reduction in the risk of

\* Corresponding author; Sedigheh Nouhjah, Associate Professor of Reproductive Health, Social Determinants of Health Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. Tel: 00989166058004; Email: S\_Nouhjah@yahoo.com



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mortality, and two years longer life expectancy has been reported in women who experienced menopause at the age of 55 or higher compared to women <40 years (7). The difference in life expectancy for women with early menopause is -3.5 (95% CI, -6.6 to -0.8) years, compared with women who experienced late menopause (8).

Some positive consequences of delayed menopause include reduced risk of cardiovascular disease, mortality from cardiovascular disease and ischemic heart disease, myocardial infarction, and atherosclerosis. Delayed menopause is also associated with a reduced risk of osteoporosis and fractures. In contrast, menopause at older ages is associated with an increased risk of breast, ovarian, and endometrial cancer (9, 10).

Previous studies have addressed the effect of some social factors on the age of menopause, and reports have been presented with contradictory results. In some reports, low literacy levels and low income have been associated with menopause at a younger age (11-12). A significantly higher menopausal age was reported in more educated Indian women (11). In contrast, no significant association was found between the education level and age at menopause in an Iranian population (11). These factors may be stressful, affecting ovarian function (13). Menopausal age also seems to differ by race and ethnicity (14). Demographics and health-related lifestyle factors, especially smoking, may also affect menopausal age. Some of these discrepancies are due to the different study designs and analysis of their results regardless of the interfering factors. Some of these reports have not taken into account physical activity, literacy level, history of infertility, and the number of deliveries (15). Further research with a large sample size which considers interfering factors may clarify the effect of different factors on menopausal age. In addition to the effect of genetics and other reproduction factors, the role of socioeconomic factors in menopausal age is hardly disputable.

The mean age at menopause in Iranian women ranged between 46.9 and 49.6 years in different geographical regions of Iran (16). Even the use of different estimation methods led to a higher

mean of menopausal age in the Iranian Population (17).

Most of the studies conducted in Iran have focused on classical factors related to menopausal age (including obstetric history, use of oral contraceptive pills, and family history). Few studies, however, have focused on socio-economic and environmental factors due to the difficulty of conducting this type of research. Therefore, given the importance of menopausal age and its determinants the present study was designed to fulfill this aim by using Hoveyze Cohort Study (HCS) data.

## Materials and Methods

This cross-sectional population-based study was performed on baseline data of women who participated in the Hoveyze Cohort Study (HCS). HCS is a part of the PERSIAN Cohort Study, which stands for Prospective Epidemiological Research Studies in Iran (18). The first phase of HCS was conducted in Hoveyze County from May 2016 to August 2018. The aim of this survey was annual follow up of the population continued for 15 years in order to determine the prevalence and incidence of chronic diseases. The studied population includes 35-70-year-old people living in Hoveyze County. Hoveyze, with an area of about 5330 square kilometers, is located in the west of Khuzestan province, southwest of Iran. Most of its inhabitants are of Arab ethnicity.

By door-to-door census, eligible people were identified, and 12103 people were invited to participate in the study, of whom 10009 were included in the study after giving written consent. The general eligibility criteria for entering HCS were: age of 35-70 years, living in Hoveyze County, not having a severe illness, and ability to answer the questions. The exclusion criterion was unwillingness to participate in each study stage.

Data collection at the cohort center included registration procedures, laboratory sample collection, physical measurements, and questionnaire completion. One week before the referral day, the invitation to the cohort center was sent by a trained person. Interviewer-administered questionnaires were used for collection of data. Questionnaires with 482 items eliciting medical, general, and nutrition

information were completed for all participants. The main questionnaire used to collect data was derived from an already nativized standard web-based electronic questionnaire of the Persian cohort. These questionnaires have been reported to have acceptable levels of validity and reliability. Cronbach's alpha (0.83) was used for reliability and content validity was used for validity. Each part was completed by an interviewer who was specially trained to complete it. All stages of the study and data collection were monitored by a quality control team consisting of a clinician, a laboratory specialist, two statisticians, and an epidemiologist under the supervision of the principal investigator.

The cohort data used in the present study were demographic factors which included current socioeconomic status, occupational status, reproductive history, cessation of a menstrual period for at least 12 months, age at menopause, cause of menopause (natural, surgery, radiation), type of surgery (hysterectomy and/or oophorectomy), time of surgery (before or after menopause), and hormone replacement therapy. These pieces of information were obtained from the general questionnaires. Information about menopause and its details was obtained through self-report by face to face interview. Women who reported cessation of their menstrual period for at least 12 months were defined as menopausal women. Premature menopause as an important menopause-associated issue was described as menopause occurring before the age of 40 (19).

The wealth index was calculated based on the property status of 11 household items, including television, motorcycle, mobile phone, personal car, vacuum cleaner, internet access, washing machine, computer, freezer, private house, and the number of rooms per person.

Using principal component analysis (PCA), the factor score of each of these assets was determined. In this analysis, the first component explains the variables' greatest variance. Accordingly, the weight of each household asset item was determined through calculating the total asset score, which was obtained from the sum of the weighted scores. Higher scores indicated better wealth status and vice versa. Based on quintiles, five categories were defined,

namely from poorest (1st quintile) to richest (5th quintile) (20).

Data analysis was done using SPSS software (version 23). First, descriptive statistics, including frequency distribution tables, graphs, and central tendency indices, were used. The Kolmogorov-Smirnov test checked the normal distribution of quantitative variables. The chi-square test was used to analyze the relationship between qualitative variables, independent t-test was used to compare the means of two groups, and one-way analysis of variance was used to compare the means of more than two groups. The odds ratio was calculated using univariate and multivariate regression. Also, a correlation test was used. The significance level was less than 0.05.

## Results

The total number of women participating in this cohort study was 5983, of whom 39.4% (2358) were post-menopausal. Of these menopausal women, 1930 (81.8%) experienced menopause naturally. The average age of the postmenopausal women was 57.48 ( $\pm 6.68$ , range; 36-70) years. The mean and median of natural menopause were 49.46 (SD, 4.48) and 50 years, respectively.

Table 1 presents the socioeconomic characteristics of women who experienced menopause.

More than one-third of the women selected tubectomy as a contraception method before menopause (Table 2).

Premature menopause was reported in 6.6% (155) women. As far as weight was concerned, 35% of the studied women were overweight, and 41.9% were obese. Table 3 presents the correlation coefficients of some quantitative variables. The prevalence of premature menopause in housewives and employed women was 6.4% and 13%, respectively ( $P=0.028$ ). The univariate logistic regression test showed that women's job was significantly related to premature menopause OR=2.20 (1.07-4.52). Using multivariate logistic regression test showed women job of socioeconomic factors ( $P=0.048$ ), and having a hysterectomy ( $P<0.001$ ) were significantly related to premature menopause.

## Discussion

The present study aimed to determine the social determinants of age at menopause in women participating in the HCS. According to the results, the mean and median of natural menopause was 49.46 (SD, 4.48) and 50 years. These results are within the range reported in previous studies in Iran and other countries. Schoenaker et al. (2014) conducted a meta-analysis of 46 studies in 24 countries, which showed that the average age of menopause is 48.8 years and that the range varies by geographical area. The youngest age is reported in Latin America, Asia, and the Middle East, while the oldest was related to Europe, Australia, and the United States (15). Based on an Iranian systematic review and meta-analysis including 40,042 subjects during 1998-2017, the mean age of menopause was reported to be 48.57 years (21). Furthermore, the mean age of natural menopause in Tabari Cohort (2020, north of Iran), including 2,753 post-menopausal women, was  $49.2 \pm 4.7$  years (22). Menopause is a complex phenomenon influenced by various genetic factors, fertility history, lifestyle, and socioeconomic factors (23).

According to the findings of the study, there was no significant relationship between the wealth index and age at menopause in the present study. Also, no significant association was found between components of socio-demographic status and age at menopause in the present study, which is inconsistent with the results of some studies (11, 24). Results of a survey on five Indian regions, conducted by Ahuja (2016) showed that women with upper socioeconomic status experience menopause at an older age ( $P=0.01$ ) (11). Also, Costanian et al. (2018) reported that low household income and education levels were associated with an earlier age at menopause in Canadian women (24). The relationship between social class and age at menopause can be explained by access to better medical care, better nutritional status, and the ability to make better health choices in the population at a higher social class (11).

Some social factors, such as literacy level, occupation, marital status, socioeconomic status, and smoking have been studied more than other social factors (22, 25). In a systematic review and meta-analysis of studies across six continents, lower education and occupation

levels, and smoking have been associated with earlier age at natural menopause. Furthermore, the association between physical activity, body mass index, and age at natural menopause was insignificant (15).

In line with the results of the present study, Abdollahi et al. (2013), in a cross-sectional study conducted in Gorgan City (in the north of Iran), determined socioeconomic status using Principal Component Analysis (PCA). Five factors, including female and male educational level, female and male occupation, and family income, were used for determining socioeconomic status categories (i.e., low, middle, and high). They found no significant difference between the age of menopause and socioeconomic categories and family income separately.

Unlike our study where the impact of the current socioeconomic status of women was investigated, Otero et al. (2011) studied earlier life socioeconomic position and found that worse earlier socioeconomic position is associated with early menopause (26). Results of two British population-based birth cohort studies conducted by Peycheva and colleagues showed that smoking is associated with early menopause and that earlier initiation of smoking is linked to earlier menopause (27). Besides, a Canadian longitudinal study by Castanian et al. (2018), which included more than 7,000 women, found that unmarried women and female smokers experienced menopause at a younger age (24).

Some of these inconsistencies are due to various methodological differences between the studies, different ages of women during evaluation, and the analysis of their results regardless of the interfering factors (15, 22). Moreover, in this study, menopausal age and components of socioeconomic status were obtained through self-report method. Also, financial status and income in Iran are sensitive topics, and this may have affected the study results. Therefore, further studies considering all related confounding variables and causal relationships using appropriate methods are required.

Another objective of this study was to determine the prevalence of premature menopause and to see whether hysterectomy

and woman's employment have any relationship with a higher prevalence of premature menopause. According to the results, premature menopause was reported in 6.6% of the studied women, which was higher than what was reported in previous studies in Iran and other countries. The incidence of premature menopause is estimated to be 1 in every 100 women. The global prevalence of premature menopause ranges from 0.9 to 2% (28). In Iran, this rate was reported as 3.5% by Rostami Dovom et al (2021) (29). In a prospective cohort study, Jambarsang and colleagues studied 1276 women with menopause and found that 3% of Yazdi women had premature menopause (28).

One of the highest rates of premature menopause (14%) was reported in rural areas of India by Jungari et al. (2017)(30). Poor access to healthcare and lifestyle differences in areas like Hoveyzeh County may be the cause of the higher prevalence of premature menopause in these populations.

In the present study, employment of women was associated with an increased risk of premature menopause. The few studies focusing on this relationship have reported contradictory results. Jambarsang et al. (2021)(28), for example, found no association between women's employment and premature menopause while Jungari et al. (2017) reported that housewives had a greater risk for premature menopause (30). The low rate of employment in the studied women and details about the type of employment may explain these discrepancies.

The present study is worthwhile in that it has a significantly large sample size and highly validated cohort study data. Another strength of this study is the use of a combined wealth index, which is less common in previous studies. Most of the data in this report were collected based on the participants' self-reports. Due to the high percentage of illiterate and low-educated women and their current age, there is a risk of forgetting events, which may have interfered with the results. However, most studies in the world in this field have been collected in the same method. Considering that the age of menopause and identifying the factors affecting it are of particular importance in programs to improve women's quality of life and health,

therefore, we strongly recommend large prospective cohort studies using similar methods on different populations.

## Conclusion

Although the mean age of menopause was consistent with previous studies, the factors related to it, especially socio-economic factors, need further investigation. The components of socio-economic status used in the present study were those used in previous research. Also, the complex nature of the mechanism of action of socio-economic factors makes it difficult to draw solid conclusions.

## Declarations

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## Conflicts of interest

The authors declared no conflicts of interest.

## Ethical considerations

Informed consent was taken from all participants, also voluntary participation of women was ensured.

## Code of Ethics

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## Use of Artificial Intelligence (AI)

We have not used any AI tools or technologies to prepare this manuscript.

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## Authors' contribution

NS supervised the study. BC participated in data analysis. SS assisted with data collection and analysis. SN conceived of the presented idea and provided the first draft of the manuscript. All authors read and approved the final manuscript.

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