

# The Age at Menopause and Related Factors in Korean Women

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This cross-sectional design was to identify the age at menopause of Korean women using a national sample, and to examine relationships between age at menopause and the anthropometric, sociodemographic, biological and life style behavioral factors. Two thousand eight hundred seven naturally postmenopausal women aged between 41 - 65 years were recruited by self-selection from 7 metropolitans and 6 provinces in Korea from Dec. 20, 1998 to April 30, 1999.

The age at menopause of Korean women was 49.2 years (mean) and 50.0 years (median). The range of age at menopause was 33.0 to 61.0 years. The significant influencing factors on age at menopause were body mass index, mother's and sister's age at menopause, alcohol use, physical activity, coffee preference, and residential area. The menopausal age of Korean women has slightly increased compared to a previous study.

**Key Words:** Menopausal Age; Life Style Behavior Factors; Body Mass Index  
Biological factors, sociodemographic Factors; Middle Aged Women

## INTRODUCTION

The relation of menopausal age to risk factors for breast cancer (Kelsey, Gammon, & John, 1993), and to postmenopausal osteoporosis (Kritz-Silverstein & Barrett-Connor, 1993) and cardiovascular disease (Hu et al., 1999; Matthews et al., 1989; Palmer, Rosenberg, & Shapiro, 1992) makes age at menopause an important research issue.

The Korea National Statistical Office (1996) has predicted that the average life expectancy for Korean women will be 77.4 years in the year 2000. According to the recent population census, about 26 percent (5.88 million) of the total population (20.86 million) of Korean women were older than 45 years of age (Korea National Statistical Office, 1997). This data indicates that the lifespan after menopause in Korean women occupies

one third of the total life expectancy and the distribution ratio of Korean women who are more than 45 years old occupies one fourth of the total population of Korean women. Despite this major demographic shift, current knowledge about middle-aged women in Korea regarding menopause remains incomplete. To our knowledge, only one large selected clinic population-based study (Min & Ku, 1986) has been done in Korea. Health and risk factors such as life style behaviors were not considered in the study. In addition, more than ten years have elapsed since this study was done. The absence of reliable data makes it difficult to address the relevant health and social issues related to menopause. Also, extrapolating from information mainly made in Western societies to those of Asian societies may be hazardous. As Diczfalussy (1987) indicated, there exists a critical need to establish specific data based on the age distribution and sociocultural significance of menopause. The pur-

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pose of this study is to identify the age at menopause of Korean women, and to examine relationships between age at menopause and the sociodemographic, biological, anthropometric, and life style behavioral factors.

## REVIEW OF THE LITERATURE

Large population-based studies have estimated the mean or median age of natural menopause in Western women as 50 - 52 years (Brambilla & McKinlay, 1989; Luoto, Kaprio, & Uutela, 1994; McKinlay, Bifano, & McKinlay, 1985; McKinlay, Brambilla, & Posner, 1992; Noord, Boersma, Dubas, Velde, & Dorland, 1997; Stanford, Hartge, Brinton, Hoover, & Brookmeyer, 1987). Whereas, the mean or median age at menopause of Eastern and African women has been estimated to be 48 - 50 years (Chompootweep, Tankeyoon, Yamarat, Poomsuwan, & Dusitsin, 1993; Kwawukume, Ghosh, & Wilson, 1993; Min et al., 1986; Okonofua, Lawal, & Bamgbose, 1990).

Numerous studies tried to explain which factors were related with age at menopause. In genetic factors, Torgerson, Thomas, Campbell, & Reid (1997) reported that the mother's age at menopause had a significant positive association with age at menopause. Cramer, Xu, & Harlow (1995) and Tibiletti et al. (1999) found the presence of a familial pattern of early menopause.

Reports of the influencing effect of sociodemographic factors such as geographic area, income, education, marital status and occupational status on age at menopause have not been consistent. Some studies reported a later age at menopause in women with a higher socioeconomic status (Luoto et al., 1994; Nilsson, Moller, Koster, & Hollnagel, 1997; Noord et al., 1997; Stanford et al., 1987; Torgerson et al., 1997), and a higher educational level (Luoto et al., 1994; McKinlay et al., 1985), and earlier age at menopause in single women (Stanford et al., 1987). However, others indicated no relationship between menopausal age and marital status (McKinlay et al., 1985; Nagata, Takatsuka, Inaba, Kawakami, & Shimizu, 1998) or geographic area (McKinlay et al., 1985).

With respect to the relationship between age at menopause and reproductive factors, some studies reported that irregular menstrual cycles before the age of 25 had a significant association with later age at menopause (Bromberger et al., 1997; Stanford et al., 1987). However, Tonkelaar, Velde, and Looman (1998)

reported that irregular menstrual cycles were not significantly related with later age at menopause. The relation between menstrual cycle length and age at menopause was also controversial (Whelan, Sandler, McConnaughey, & Weinberg, 1990; Tonkelaar et al., 1998). Nulliparity had a significant association with an earlier age at menopause (Nagata et al., 1998; Noord et al., 1997; Stanford et al., 1987; Whelan et al., 1990). In addition, some studies found that an earlier age at menarche was significantly associated with later age at menopause (Frisch, 1987), whereas other studies did not find a significant relationship between them (Whelan et al., 1990; Berg, 1999). Luoto et al. (1994) found that the first full-term pregnancy before the age of 25 years was associated with a later age at menopause. But Nagata et al. (1998) differed from the previous study.

With respect to the anthropometric factors such as relative body weight, Leidy (1996) reported that age at menopause was earlier among women who reported weight losses of 50 or more pounds across adulthood or weight gains of 100 or more pounds. Otherwise, Sherman, Wallace, Bean, and Schlabaugh (1981) found higher body weight and adiposity at age 18 were related to early age at menarche and later age at menopause.

There have been some studies investigating the relationship between menopausal age and life style behavior factors such as general physical activity, smoking, alcohol use, and diet. A consistent finding has been a positive association of smoking and earlier age at menopause (Bromberger et al., 1997; Chiechi et al., 1997; Kaufman, Slone, Rosenberg, Miettinen, & Shapiro, 1980; Luoto et al., 1994; McKinlay et al., 1985, 1992; Nilsson et al., 1997; Noord et al., 1997; Willet et al., 1983). However, the relationship between the amount of smoking or smoking duration and age at menopause has been inconsistent (McKinlay et al., 1985; Nilsson et al., 1997; Torgerson et al., 1983; Willet et al., 1983). Fewer studies investigated the relationship of alcohol use and age at menopause. Torgerson et al. (1997) reported that moderate alcohol use was related with later age at menopause. Fewer studies examined physical activity in relation to age at menopause. But, the association of physical activity and age at menopause was not evident in the studies by Nagata et al. (1998) and Bromberger et al. (1997). Fewer studies have investigated the association of diet and age at menopause. Nagata et al. (1998) reported that lower fat and cholesterol intake, higher calcium intake, higher coffee intake and higher soy prod-

ucts intake were related with earlier age at menopause, although the potential preventive effects of phytoestrogens, which are abundant in soy, against osteoporosis or menopausal symptoms are expected. Bromberger et al. (1997) reported that weight reduction diets were associated with an earlier age at menopause. Baird, Tylavsky, and Anderson (1988) inferred that an earlier age at menopause of Seventh-day Adventists might be explained by their vegetarian diet.

## METHODS

### *Design and sample*

This cross-sectional survey was conducted using a convenient sampling method from 7 metropolitan areas (Seoul, Incheon, Pusan, Daegu, Woolsan, Daejeon, and Kwangju) and 6 provinces (Kyunggi, Kyungsang, Chunla, Chungcheong, Kangwon and Cheju) in Korea. The subjects were recruited by self-selection at community-based social groups such as community centers for women in town or city hall auxiliaries.

In this study naturally postmenopausal women were defined as women who had experienced their last bleeding more than 12 months earlier. A total sample of 4,087 naturally postmenopausal women aged 41 to 65 years was obtained for the study, of which 2,807 women completed the questionnaires used for the analysis, giving the response rate of 68.7%. In order to study natural menopause, 50 women were eliminated because they had hysterectomies or medical intervention on the ovaries such as surgery or radiation therapy. Additional women were excluded because either they reported out-of-range values on age (defined as either before age 40 or later than age 66:  $n=897$ ) or were missing data on age at menopause ( $n=333$ ). This study was approved by the Human Subject Review Board and each participant gave a written informed consent.

### *Instrument*

A semi-structured questionnaire was used to obtain information on the demographic characteristics, biological factors, general medical histories, and life style behaviors including physical activity, smoking, alcohol use, and diet. The demographic data included the items such as current age, socioeconomic status, marital status, religion, occupation, and education. For measuring life style behaviors, women who had smoked regularly were defined as smokers. Alcohol users were divided according to ask-

ing a self-report of frequent alcohol use or non-frequent. Physical activity was assessed by asking whether they do or do not exercise regularly. Diet was assessed by asking whether or not they favor specific foods such as wheat, meat, fish, beans, vegetables, fruits, milk products, oils and fats, or coffee. In addition, women were asked to report on the biological, reproductive, and menopause-related characteristics such as age at menopause, age at menarche, mother's age at menopause, sister's age at menopause, and weight and height at menopause by recall. General medical histories included dichotomous "yes" or "no" responses to hysterectomy, radiation therapy on the ovaries, or hormone replacement therapy (HRT).

### *Procedure*

Data was collected by thirty-nine research assistants using a self-report questionnaire from Dec. 20, 1998 to Apr. 30, 1999. The research assistants were undergraduate nursing students in 'K' university. They were educated for data collection by the data collection protocol. Thirty-nine research assistants residing in different regions of the country contacted potential women subjects, and the consents to participate in the study were obtained from 4,087 women. The research assistants met the subjects on a one-to-one basis and explained the purpose of this study. A research assistant distributed a questionnaire in person to each consenting woman for completion, and the research assistant collected the completed questionnaire on site.

### *Data analysis*

Data was analyzed using the SAS program. The demographic, biological, reproductive and menopause-related characteristics were analyzed using descriptive statistics. The difference in age at menopause according to life style behavioral factors, biological factors and demographic factors were analyzed by t-test, ANOVA and Duncan's multiple comparison tests. The linear relationship between age at menopause and these related factors were examined using multiple regression analysis.

## FINDINGS AND DISCUSSION

### *Sample characteristics*

A sample of 2,807 women whose data was used for analysis represents 45.1% from seven metropolitan areas and 54.9% drawn from the six provinces. The mean

age of the sample was 55.6 years, with 25% over the age of 60. Nearly half of the sample (48.0%) had a middle/high school level of education, and about 10% had a college education. The sample represents mostly (76%) the middle level of socioeconomic status. The majority of this sample was married (80%), and forty percent of the sample had an occupation. The mean body mass index (BMI) was 22.9. The range was from 11.5 to 44.0. The mean menarcheal age was 16.3 years. The hormone replacement therapy (HRT) users were only 289 (11.1%).

#### *Age at menopause*

The age at menopause in Korean women was 49.2 years (mean), 50.0 years (median) and 50.0 years (mode). The range of age at menopause was from 33.0 to 61.0 years, with 88.2 percent between the ages of 45 and 55, 9.4% under the age of 44, and 2.4% over the age of 56. The mean age at menopause was 48.3 years in only one previous large-scale study including general and clinical populations in Korea (Min et al., 1986). Therefore, this new result may mean that the age at menopause may have a slightly increased age at menopause trend in the general population. It is consistent with the secular trend finding of age at menopause in Finnish women (Noord et al., 1997). This finding shows that the mean and median age at menopause of Korean women is earlier than that of European and American women (Luoto et al., 1994; Noord et al., 1997; Brambilla et al., 1989; McKinlay et al., 1985).

#### *Relationships between life style behavioral factors and age at menopause*

Table 1 shows the difference of age at menopause according to life style behavioral factors such as smoking, alcohol use, physical activity and diet. Only 3 percent (n=86) of women reported that they were current smokers. The mean age at menopause in smokers (M=49.0) was lower than that in nonsmokers (M=49.2). However, their difference was not statistically significant. Twenty three percent of women reported frequent alcohol use. The mean age at menopause was 48.8 years for alcohol users and 49.3 years for non- alcohol users, this being significantly different,  $t(972.3) = -3.09, p=.002$ . Thirty two percent of women engaged in regular exercise. The mean age at menopause was 49.7 years in women taking regular exercise, and 49.0 years in women not taking exercise, indicating a significant difference between the

groups,  $t(2779) = 4.16, p=.000$ . On the other hand, looking at the difference of age at menopause according to the types of favorite foods revealed that only the case where coffee is a favorite food or not was statistically significant,  $t(2805) = -2.67, p=.008$ .

The lack of an association between smoking and age at menopause in this study is inconsistent with findings from most other studies. It has been reported that smoking is associated with earlier age at menopause (Bromberger et al., 1997; Chiechi et al., 1997; Kaufman et al., 1980; Luoto et al., 1994; McKinlay et al., 1985; Nilsson et al., 1997; Noord et al., 1997; Willet et al., 1983). One possible explanation for the result of this study in this regard may be due to the small number of women who smoked. The current smoking rate among Korean women, 20 to 59 years of age increased gradually from 4% in the year 1989 to 5% in the year 1995

**Table 1.** The difference of age at menopause according to the life-style behavior factors

Life Style Factors		N	%	M	SD	t
Physical Activity						
	Yes	882	31.7	49.65	3.54	4.16***
	No	1899	68.3	49.03	3.64	
	Missing	26				
Smoking						
	Yes	86	3.2	49.02	3.80	-0.41
	No	2588	96.8	49.18	3.62	
	Missing	133				
Alcohol Use						
	Yes	630	23.0	48.79	3.83	-3.09**
	No	2106	77.0	49.32	3.54	
	Missing	71				
Diet						
Wheat	Yes	2132	76.0	49.18	3.65	-0.83
	No	675	24.0	49.32	3.54	
Meat	Yes	1355	48.3	49.25	3.67	0.55
	No	1452	51.7	49.17	3.58	
Fish	Yes	1661	59.2	49.25	3.62	0.55
	No	1146	40.8	49.17	3.63	
Beans	Yes	1254	44.7	49.24	3.63	0.40
	No	1553	55.3	49.19	3.62	
Vegetables	Yes	2087	74.3	49.20	3.71	-0.38
	No	720	25.7	49.26	3.38	
Fruits	Yes	1787	63.7	49.24	3.62	0.48
	No	1020	36.3	49.17	3.63	
Milk Products	Yes	875	31.2	49.26	3.62	0.48
	No	1932	68.8	49.19	3.63	
Oils and Fats	Yes	265	9.4	49.35	3.86	0.64
	No	2542	90.6	49.20	3.60	
Coffee	Yes	849	30.2	48.94	3.57	-2.67**
	No	1950	69.8	49.33	3.64	

\*\*  $p < .01$ , \*\*\*  $p < .001$

(Nam, 1997). Although the difference in age at menopause in relation to smoking was not statistically significant, the mean age at menopause of smoking women was lower than that of non-smoking women. Therefore, the relationship between smoking and age at menopause in Korean women needs to be clarified.

Age at menopause of alcohol users was earlier than non-alcohol users. This finding was inconsistent with some previous studies that showed significant positive correlation between moderate social alcohol consumption and a later age at menopause (Torgerson et al., 1997), higher bone mineral density (Holbrook & Barret-Connor, 1993) and a reduced mortality rate (Fuchs et al., 1995). However, chronic alcohol misuse could potentially have adverse effects on bone mineral density through nutritional deficiencies, abnormal production of parathyroid hormone, or high-risk behaviors such as cigarette smoking (Clark & Sowers, 1996). In this study we have some limitations. We measured only alcohol use, not the amount of alcohol consumption. Therefore, further research as to whether the amount of alcohol consumption is associated with menopausal development needs to be clarified.

In this study, we found that regular physical activity had a strong association with a later age at menopause. However, in other studies, the association between physical activity and age at menopause was found to be inconclusive (Bromberger et al., 1997; Willett et al., 1983). Nonetheless, the possibility that physical activity may affect reproductive functions of women has been raised (Warren, 1980). Some researchers have suggested physical activity and relaxation as alternatives to hormone replacement therapy (Shaw, 1997; Wijma, Melin, Nedstrand, & Hammer, 1997; Wilbur, Holm, & Dan, 1992). However, women exercising regularly in this study were only a fourth of the total subjects. Therefore, the importance of physical activity on health benefits, especially menopause development, needs to be emphasized.

The age at menopause of women who favor coffee usually is earlier than that of women who dislike it. This result is consistent with a previous study (Nagata et al., 1998). Shaw (1997) suggested that a high-vegetable diet, a low-meat diet, a low-saturated fat diet, and a diet high in phytoestrogens might contribute to the decreased incidence of menopausal symptoms such as hot flashes. Murkies et al. (1995) and Messina (1995) also suggested that dietary flour supplementation including soy and

wheat products might relieve hot flashes. In addition, some studies reported the relation between the risk of coronary heart disease and whole-grain consumption (Liu et al., 1999) or coffee consumption (Willett et al., 1996), or between milk consumption and bone mineral density (Soroko, Holbrook, Edelstein, & Barret-Connor, 1994). We expected to find a relationship between other foods such as wheat products, vegetables, milk products, beans, oils and fats and age at menopause, however this was not so. One concern with the approach in this study involves the assumption that the favored foods may be eaten more often. We did not measure objectively the amount of these foods ingested. Further research needs to determine the relationship between accurate dietary intake in different types of foods and its effect on age at menopause.

#### *The relationship between sociodemographic, anthropometric, and biological factors and age at menopause*

Table 2 shows the distribution of age at menopause by subgroups according to anthropometric, biological, and sociodemographic factors. The mean menopausal age was the lowest in women whose BMI was less than 19 ( $M=48.9$ ), and the highest in those whose BMI was more than 25 ( $M=49.7$ ). The difference of age at menopause according to BMI was statistically significant,  $F(2, 2804)=6.32$ ,  $p=.002$ . The linear relationship of BMI and age at menopause in this study was consistent with other studies (Carda et al., 1998; Nagata et al., 1998; Willett et al., 1983). In addition, some studies found a relationship between age at menopause and a change in body weight (Leidy, 1996; Sherman et al., 1981). In this study, the BMI was calculated from body weight and height at the menopausal age of subjects, based on a self-report at menopausal age of subjects. Therefore, future studies need to include the objective measure of body weight and its change.

The linear relationship of age at menarche and age at menopause by simple regression was not statistically significant,  $t=.78$ ,  $p=.43$ . The lack of an association between age at menarche and age at menopause observed in this study was consistent with other studies (Berg, 1999; Whelan et al., 1990).

Age at menopause was positively associated with the mother's age at menopause. The difference of age at menopause according to the mother's menopausal age was statistically significant,  $F(4, 594)=15.53$ ,  $p=.0001$ . Age at menopause was also positively related to the sis-



ter's age at menopause. The difference of age at menopause according to the sister's menopausal age was statistically significant,  $F(4, 560)=25.67, p=.0001$ . These findings showed a strong positive association between the mother's age at menopause, the sister's age at menopause and age at menopause. Torgerson et al. (1997) reported the significant relationship between menopausal age and mother's age at menopause. In addition, Cramer et al. (1995) and Tibiletti et al. (1999) found the presence of a familial pattern of early menopause in early menopausal women. Future studies need to examine the relationship between the mother's age at menopause and menopausal age.

On the other hand, the mean age at menopause of women in a residential area was older in women living in metropolitan areas ( $M=49.4$ ) than women living in rural areas ( $M=48.5$ ), this being statistically significant,  $F(2, 2738)=10.47, p=.0001$ . The mean age at menopause according to educational level was the highest in highly educated women, however there was no significant difference in menopausal age according to education,  $F=2.14, ns$ . Previous studies reported that women with a higher socioeconomic status tended to have an older age at menopause (Luoto et al., 1993; McKinlay et al., 1985; Nilsson et al., 1997; Noord et al., 1997; Stanford et al., 1987; Torgerson et al., 1997). One possible explanation is the socioeconomic status in women that live in rural areas tends to be lower than women in cities and metropolitan areas in Korea.

The regression model included all factors found to affect age at menopause in univariate analysis: Mother's age at menopause, sister's age at menopause, physical activity, alcohol use, residential area, and coffee preference. Following a multiple regression analysis, the predictive variables with statistical significance were mother's age at menopause,  $t=2.54, p=.01$ , and sister's age at menopause,  $t=2.70, p=.008$  (Table 3).

### Conclusions

In a national sample of Korean women aged from 41 years to 65 years, the mean and median age at menopause were 49.2 and 50.0 years. The age reveals the possibility of slightly increasing ages of menopause in Korean women. In this study, age at menopause was associated with the mother's age at menopause, sister's age at menopause among biological factors, BMI among anthropometric factors, residential area among sociodemographic factors, and physical activity, alcohol use, and

coffee preference among life style factors. This is the first study that has investigated the impact of many other factors such as life style behavior factors unrelated to hormonal change on age at menopause of Korean women. In considering of the connection of menopausal age to

**Table 2.** The difference of age at menopause by subgroups according to each of anthropometric, sociodemographic, and biological factors

Factors	n	M	SD	F
Anthropometric Factor				
BMI				
Less than 19	843	48.94 <sub>a</sub>	3.79	6.32**
20 - 24	1579	49.24 <sub>a</sub>	3.53	
More than 25	385	49.72 <sub>b</sub>	3.58	
Biologic Factors				
Mother's menopausal age				
Less than 39	17	45.59 <sub>a</sub>	5.15	15.53***
40 - 44	52	46.87 <sub>a</sub>	4.44	
45 - 49	205	48.71 <sub>b</sub>	3.32	
50 - 54	263	49.82 <sub>bc</sub>	3.26	
More than 55	62	50.47 <sub>c</sub>	3.44	
Missing	2208			
Sister's menopausal age				
Less than 39	11	48.50 <sub>ab</sub>	4.90	25.67***
40 - 44	15	46.07 <sub>c</sub>	3.41	
45 - 49	185	48.11 <sub>b</sub>	2.61	
50 - 54	329	50.00 <sub>a</sub>	2.72	
More than 55	25	52.28 <sub>d</sub>	3.84	
Missing	2242			
Sociodemographic Factors				
Residential area				
Metropolitan areas	1237	49.42 <sub>a</sub>	3.36	10.47**
Small cities	1131	49.26 <sub>a</sub>	3.66	
Rural areas	373	48.45 <sub>b</sub>	4.14	
Missing	66			
Education				
None	245	49.00	4.51	2.14
Elementary School	958	49.40	3.64	
Middle School	1334	49.10	3.48	
High School & Beyond	244	49.52	3.14	
Missing	26			

Means with different subscripts differ significantly at  $p < .05$  by the Duncan's multiple comparison test.

\*\*  $p < .01$ , \*\*\*  $p < .001$

**Table 3.** The linear relationship of age at menopause and related factors

Variables	Parameter estimate	t-value	p-value
Mother's menopausal age	.15	2.54	.01
Sister's menopausal age	.14	2.70	.008
Physical activity	-.66	-1.43	.15
Alcohol use	.53	1.02	.31
Residential area	-.58	-.75	.45
Coffee preference	.14	.27	.79

risk factors for cancer of the breast and endometrium and to postmenopausal osteoporosis, nurses can use these results to plan and implement nursing interventions for health promotion and subsequent quality of life of Korean menopausal women. Further studies need to use prospective and longitudinal measures that follow women from premenopausal to postmenopausal time periods with reliable and valid instruments to fully address phenomena related to menopause.

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