EPIDEMIOLOGY

Age at Natural Menopause in a Sample of Puerto Rican Women

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Objectives. **To characterize the distribution of age at menopause in a sample of Puerto Rican women and to evaluate the differences in demographic, health and lifestyle factors associated with menopausal state.**

Background. Age at natural menopause may be an important marker of a woman's long-term risk of chronic disease. Understanding which factors influence the timing of menopause remains limited and while ethnic differences in age at menopause have been reported, little data are available for Puerto Rican women.

Methods. **In 2000, a self-administered questionnaire was completed by a sample of 300 women aged 30-59 attending health fairs in the cities of Carolina, Aguadilla and Yauco, Puerto Rico (PR). Data from this interview was used to determine age at menopause which was described with probit analysis. Women from different menopausal status groups were compared with respect to demographic, lifestyle and health characteristics by using contingency table analysis and chi-square statistics.**

Results. **In a sample where 53% of women were menopausal, the median age of natural menopause was 51.4 years (95% confidence intervals 50.3-52.5). Compared to premenopausal women, naturally and surgically postmenopausal women had lower educational attainment, increased parity and were more likely to be obese ($p<0.05$).**

Conclusion. **This analysis provides the first estimate of age at natural menopause among women living in PR and the age is similar to that reported in other populations. Determining whether this population tends to have an early or late menopause will facilitate a better understanding of the potential chronic disease profile of Puerto Rican women as they age.**

Key words: Menopause, Women, Age at menopause, Chronic diseases

In the developed world where most women are not dying prematurely, researchers have estimated that women will live 30 years in the menopausal state (1). World-wide, it is estimated that approximately 40 million women will experience menopause during the next decade (2).

Average age at menopause in United States (US) and European populations ranges from 48 to 52 years (3-5). Most estimates of age at natural menopause in the US are based on samples of Caucasian women, although a recent study based in a multiethnic sample of women in the US estimated the median age at menopause to be 51.4 years (6). Some data suggests that age at menopause may vary in different ethnic groups. In general, studies have shown that African- Americans, (3, 7) Filipino-Americans, (8) and Mexicans (9) have an earlier age at menopause than Caucasians; data on age at menopause among Hispanic women is limited. Studies in Mexico and Peru have estimated a median age at menopause of 47.8 years (10) and 46-47 years (11) respectively, although estimates for Mayan women in Mexico, reflect a much younger age at menopause of 44.3 (12). To date, no studies of age at menopause have been conducted among Hispanic women living in Puerto Rico (PR).

Age at menopause has been identified as a risk factor for several chronic diseases. Early age at menopause has been linked to an increased risk of heart disease (13-15) and osteoporosis (16) while a later age at menopause has been linked to an increased risk of breast cancer (17). One possible explanation for the relationships between menopause and chronic disease incidence is that menopause marks the culmination of exposure to higher circulating levels of estrogen. Depending on the relation between estrogen and a particular disease, lower or higher levels of estrogen could either be protective of or a risk factor for a specific chronic disease (18).

Early age at menopause has also been associated with substantial excess mortality from chronic disease (14). A

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Dutch study of women aged 50-65 found that risk of cardiovascular mortality was higher for women with early menopause than for those with late menopause (19).

There are a number of lifestyle characteristics that appear to affect age at menopause including smoking, educational attainment and contraceptive use. Smoking is a well-documented risk factor for early menopause; women who smoke reach menopause 1-2 years earlier on average than non smokers (7,20,21). Some data also suggest that smokers may have a shorter perimenopause (22). In some studies, an earlier age at menopause is independently associated with less educational attainment, being unemployed, being separated/widowed/divorced, having lower socio economical status, or reporting a history of heart disease and diabetes (18,23-25). A recent study in Mexican women found that women with Type II diabetes (non-insulin dependent diabetes mellitus) have an earlier age at menopause (45.7 compared to 48.0 for non-diabetics) (24). While a study in US women showed a similar effect for Type I diabetic women (41.6 as compared with 49.9 for non-diabetic sisters) (25). In contrast, increased parity (6,26-28), oral contraceptive use (18, 27) and longer menstrual cycles (29) have been associated with a later age at menopause in some studies. Results for the association between body mass index (BMI) and age at menopause are inconclusive. A recent study reported no effect of BMI on age at menopause (18), while increased BMI has been associated with both later (30) and earlier menopause (31) by other studies.

Although age at natural menopause is an important marker of a woman's long-term disease risk and all-cause mortality, our understanding of those factors that influence the timing of this transition remains limited. Furthermore, while ethnic differences in age at menopause have been found to exist, little data on the experience of menopause among Puerto Rican women has been published.

The present cross-sectional study characterizes the distribution of age at menopause in a sample of Puerto Rican women aged 30-59 who participated in a pilot health screening project for midlife and aging women. It also evaluates the differences in demographic, health and lifestyle factors associated with menopausal status.

Materials and Methods

A sample of 300 women attending health fairs in the cities of Carolina, Aguadilla and Yauco, PR were recruited to participate in this study. The health fairs were hosted by the *Centro Mujer y Salud* of the School of Medicine of the University of Puerto Rico, and took place during the months of October, November and December of the year 2000. Women were offered a calcaneous ultrasound bone assessment to determine risk of osteoporosis, information on menopause and hormonal replacement therapy (HRT), and asked to complete a health history questionnaire.

Inclusion criteria for the study included that women self-identified as Puerto Ricans, spoke Spanish and were able to give written consent. Exclusion criteria included not having a Puerto Rican ethnic background (n=4), being outside the eligible age group of 30-59 (n=62) and missing information on their menstrual status (n=5). In addition, premenopausal women using HRT were excluded from all statistical analyses due to the small number of participants who were currently using HRT (n=10) and since it is uncertain if their observed menstrual bleeding was due to HRT use rather than to true premenopausal status. The final study sample included 219 women; 123 from Aguadilla, 56 from Yauco and 40 women from Carolina.

A self administered questionnaire requiring about 20 minutes was completed by each participant. The questionnaire addressed demographic characteristics, gynecologic and obstetric history, chronic illness, lifestyle practices and current and past use of oral contraceptives and HRT.

Outcome variable. Natural menopause was defined according to the World Health Organization (32) as at least 12 consecutive months of amenorrhea not due to surgery or alternative obvious cause, such as lactation. Those women who reported having a hysterectomy or an oophorectomy reported the year of surgery and, in the case of oophorectomy, if it was unilateral or bilateral. Women who did not report such surgery were asked whether they had menstruated in the previous 12 months. Among those with 12 or more months of amenorrhea, women whose periods had not stopped because of surgery or other obvious cause were defined as naturally post menopausal (32).

Probit analyses were used to estimate median age at menopause by classifying a woman's menopausal status as a dichotomous variable of either yes/no menopausal at the time of data collection. To evaluate differences of demographic, health and lifestyle factors by menopausal state, menopausal status was defined as 1) surgical amenorrhea 2) naturally postmenopausal and 3) premenopause. For those with a surgical menopause, age at surgery was computed by subtracting year of birth from the year of surgery. For naturally postmenopausal women, age at menopause was determined by subtracting their year of birth from the year in which their last menstrual period had occurred.

Demographic factors. Age was defined as both a continuous and an ordinal (30-39, 40-49 and 50-59 years) variable. Education level attained was defined as an ordinal variable (None/Primary/Junior High-School, High School,

Technical/Associate and Bachellors/Masters). Other demographic variables included: marital status (married/living together and single/widowed/divorced/separated), employment status (currently employed or unemployed), and number of live births (0, 1-2, 3 or ≥4 children). Women were designated as having low socioeconomic status classification if they received social aid from the government.

Lifestyle factors and hormone use. Women were asked if they exercised at least twice a week, [which were considered physically active (yes or no)], smoked cigarettes (never or ever) or used any alcohol (yes or no). Women self-reported of ever use and current use of hormonal contraception/hormone replacement therapy (yes or no).

Health-related factors. Women with a history of hypertension, diabetes or heart disease were classified as having chronic disease (yes or no). BMI which is determined by the weight in kg/height in meters^2 was based on women's self reported height and weight. They were classified into five groups with the following cut points (normal weight: BMI ≤25, moderately overweight: 25.1≤ BMI ≤27.9, highly overweight: 28≤ BMI ≤29.9, obese: 30≤ BMI ≤31.9 and highly obese: BMI ≥32). Obesity was defined as a BMI ≥30.

Frequency distributions and descriptive statistics were used to describe the study population. The demographic, lifestyle and health characteristics of the menopausal status groups were compared using contingency table analysis and the chi-square statistics. The predicted probabilities of women being naturally menopausal in each age group were calculated using probit probability analysis (33) with women who reported having had a surgical menopause excluded. Median age at natural menopause was determined from the probability curve.

Results

Age a natural menopause. Median age of natural menopause was 51.4 years (95% confidence intervals 50.3-52.5). The expected probability curve (Figure 1) provided by the probit analyses is a good fit of the observed data (Pearson chi-square goodness of fit = 22.83, p=0.69).

Unadjusted demographic, lifestyle and health characteristics. About 47.6% of women in the study were still menstruating. Compared to naturally and surgically postmenopausal women, premenopausal women were younger, had greater educational attainment (p=.003),

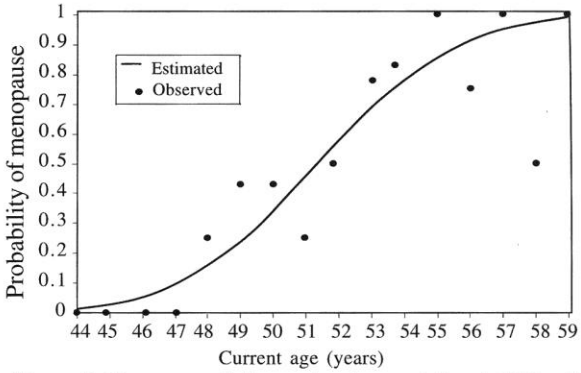

Figure 1. Frequency of observed and expected probability of natural menopause, by age at time of response, among women aged 30 and 59 years of age

Table 1. Demographic characteristics of the study population, by menstrual status.

Demographic variables	Pre-Menopause (n=99)		Natural Menopause (n=52)		Surgical Menopause (n=68)		X^2	P value	Fishers exact test* (p-value)
	No.	%	No.	%	No.	%			
Age groups (n=219)							67.84	<0.001	<0.001
30-39	27	27.3	0	0	5	7.4			
40-49	52	52.5	7	13.5	26	38.2			
50-59	20	20.2	45	86.5	37	54.4			
Parity (n=219)							14.2	0.03	
0 children	11	11.1	6	11.5	8	11.8			
1-2 children	46	46.5	12	23.1	17	25.0			
3 children	29	29.3	19	36.5	25	36.8			
≥ 4 children	13	13.1	15	28.9	18	26.5			
School (n=219)							13.28	0.03	
Non/elementary Junior-high	14	14.1	17	32.7	17	25.0			
High-school	23	23.2	13	25.0	22	32.4			
Technical/associate	27	27.3	9	17.3	17	25.0			
Bachelors/master	35	35.4	13	25.0	12	17.7			
Employed (n=207)							15.56	.0004	
Yes	48	51.1	11	22.0	17	27.0			
No	46	48.9	39	78.0	46	73.0			
Marital status (n=204)							2.1	0.35	
Married/living together	74	77.9	38	79.2	42	68.9			
Divorced/Widowed/ Separated/Single	21	22.1	10	20.8	19	31.2			
Receives social services (n=208)							4.86	0.09	
Yes	12	12.4	12	24.0	15	24.6			
No	85	87.6	38	76.0	46	75.4			

*Fishers exact test was done for variables with cell counts < 5 .

Table 2. Lifestyle characteristics of the study population, by menstrual status.

Lifestyle variables	Pre-Menopause (n=99)		Natural Menopause (n=52)		Surgical Menopause (n=68)		X^2	P value
	No.	%	No.	%	No.	%		
Cigarette smoking (n=215)							1.2	0.54
never	82	83.7	45	90.0	56	83.6		
ever	16	16.3	5	10.0	11	16.4		
Physical activity (n=211)							1.3	0.54
Yes	33	65.3	16	32.7	28	41.8		
No	62	34.7	33	67.4	39	58.2		
Alcohol (n=213)							2.7	0.26
Yes	21	21.4	5	10.6	11	16.2		
No	77	78.6	42	89.4	57	83.8		

were more likely to be employed (p=.0004) and have fewer children (p=0.03) (Table 1). Smoking, physical activity and alcohol consumption did not differ by menopausal status (Table 2). Women with surgical menopause reported more HRT use than naturally menopausal women (p<0.001). BMI, which was high in the study population, differed by menopausal status. Postmenopausal women were more likely to be obese (BMI ≥30) (p=0.03) (Table 3) and to report a history of high blood pressure as compared to premenopausal women (p<0.001).

Discussion

This study is the first to estimate age at menopause in Puerto Rican women and found the median age at menopause to be 51.4 years. This age is similar to that estimated for US women (51.4 years) in the Study of Women's Health across the Nation (SWAN). As shown by confidence intervals, this estimate is also similar to the 51.0 years determined for the Hispanic portion within SWAN's study sample (18). In contrast, our estimate is higher than that reported for Hispanic women in other studies (47.8 in Mexicans (10) and 46-47 in Peruvians (11)).

Probit analysis was used to estimate median age at menopause, taking into consideration women who had already had a natural menopause and women who are pre-menopausal at the time of the study. This methodological approach is very important because calculating age at menopause from reports of only post-menopausal women has several problems. First, many women do not remember their age at menopause, creating the opportunity for recall bias (3, 4). Secondly, using the mean age at menopause of post menopausal women tends to underestimate age at menopause in samples of mid-life women, because women with earlier menopause contribute disproportionately to the calculation. Actual mean age at menopause is underestimated for any given age, because women who are postmenopausal will be included in the analysis although women who are still menstruating will be excluded, since their date of menopause is still unknown (3). If we had calculated the mean age at menopause among

Table 3. Health characteristics of the study population, by menstrual status.

Health variables	Pre-menopause (n=99)		Natural menopause (n=52)		Surgical menopause (n=68)		X^2	P value	Fishers exact test* (p-value)
	No	%	No.	%	No.	%			
Use of oral contraceptives (n=205)							3.1	0.21	
Never	30	31.3	23	46.0	22	37.3			
Ever	66	68.8	27	54.0	37	62.7			
Current HRT use (n=198)							85.5	<.0001	<.0001
Yes	0	0	28	58.3	41	66.1			
No	88	100	20	41.7	21	33.9			
BMI (n= 219)							20.1	0.01	
≤25	25	25.3	6	11.5	13	19.1			
25.1 to 27.9	24	24.2	10	19.2	12	17.7			
28 to 29.9	18	18.2	16	30.8	7	10.3			
30 to 31.9	9	9.1	11	21.2	10	14.7			
≥32	23	23.2	9	17.3	26	38.2			
Obesity (n= 219)							7.21	0.03	
Non-obese (BMI< 30)	67	67.7	32	61.5	32	47.1			
Obese (BMI ≥ 30)	32	32.3	20	38.5	36	52.9			
History of diabetes (n=206)							3.0	0.22	
Yes	6	6.5	7	14.3	9	13.9			
No	86	93.5	42	85.7	56	86.2			
History of heart disease (n=206)							0.78	0.68	0.69
Yes	2	2.2	2	4.1	3	4.6			
No	90	97.8	47	95.9	62	95.4			
History of HBP † (n=206)							20.9	<.0001	
Yes	10	10.9	17	34.7	27	41.5			
No	82	89.1	32	65.3	38	58.5			

*Fishers exact test was done for variables with cell counts < 5.
† High blood pressure (HBP).

post menopausal women in our study, the calculated age at menopause would have been 46.7 years. Unfortunately, the small number of women with natural menopause (n=52) in this preliminary study limits the analysis and our ability to adjust for covariates. Further, since health fairs were the source of participants, selection bias might have occurred if the health profile of women who attended the fairs differed from that of the general population.

This analysis provides the first estimate of age at menopause among women living in Puerto Rico. Determining age at menopause, that is whether the population tends to have an early or late menopause, will facilitate a better understanding of the potential chronic disease profile of Puerto Rican women as they age.

Resumen

El objetivo de este estudio fue determinar la edad de la menopausia en una muestra de mujeres puertorriqueñas y evaluar las diferencias de factores demográficos, de salud y estilos de vida asociados con el estado de la menopausia. Un cuestionario fue completado por 300 mujeres entre las edades de 30-59 años que participaron en ferias de salud en las ciudades de Carolina, Aguadilla y Yauco, Puerto Rico en el año 2000. La data de esta entrevista se utilizó para determinar la edad de la menopausia con el método de análisis probits. Las mujeres con distintos estados de la menopausia fueron comparadas con respecto a sus características demográficas, de salud y estilos de vida con análisis de tablas de contingencia y con la prueba de chi-cuadrada. En una muestra donde alrededor del 53% eran menopaúsicas, la mediana de la edad de la menopausia natural fue 51.4 años (95% CI 50.3-52.5). Comparadas a las mujeres en la pre-menopausia, las mujeres con menopausia natural y quirúrgica tenían menor escolaridad, mayor número de hijos y eran mas obesas ($p < .05$). Este análisis provee el primer estimado de la edad de la menopausia natural entre las mujeres que viven en Puerto Rico y la edad estimada es similar a las que se reportan para otras poblaciones. Determinar la edad de instalación de la menopausia de esta población facilitará un mejor entendimiento del posible perfil de enfermedades crónicas de la mujer puertorriqueña al envejecer.

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