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Ethnic Differences in the Clusters of Menopausal Symptoms

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Abstract

Our purpose for this study was to identify the clusters of midlife women by menopausal symptoms in a multi-ethnic sample, and to determine ethnic differences in the clusters. This was a secondary analysis of the data from 501 women in a larger Internet study on menopausal symptom experience. The data were analyzed using factor analysis, hierarchical cluster analysis, and multinomial logistic analysis. A three cluster solution was adopted ($F=575.71$, $p<.01$). The clusters differed significantly in the country of birth and ethnicity ($p<.05$). Only in the low symptomatic cluster, there were significant ethnic differences in menopausal symptoms.

Keywords

Menopausal Symptoms; Clusters; Midlife Women; Ethnicity

The existence of a universal “menopausal syndrome” across ethnic groups has been discussed over the past decade (Andrist & MacPherson, 2001; Avis, Brockwell & Clovin, 2005; Melby, Lock, & Kaufert, 2005). Some researchers recommend a list of menopausal symptoms experienced by midlife women in menopausal transition across ethnic groups while others assert that there is no universal syndrome across ethnic groups (Avis et al., 2005; Melby et al., 2005). This inconsistency could come from multiple sources, including differences in the specific menopausal symptoms studied, the number of menopausal symptoms considered in the studies, the time frame of the symptom reports, the instruments used to measure menopausal status and menopausal symptoms, characteristics and composition of the samples (e.g., age range, acculturation, BMI), and the recruitment settings (Anderson, Melby, Sievert, & Obermeyer, 2011; Anderson, Sievert, Melby, & Obermeyer, 2011; Avis et al., 2001; Hardy & Kuh, 2002; Melby, Sivert, Anderson, & Obermeyer, 2011; Melby, Anderson, Sievert, & Obermeyer, 2011; Shea, 2006; Sievert, Anderson, Melby, & Obermeyer, 2011; Wilbur, Shaver, Kogan, Buntin, & Wang, 2006). However, no clear reason for the inconsistency is known, and the association of ethnicity with menopausal symptoms is still in question. Further clarification on the association of ethnicity with menopausal symptom experience is necessary for interdisciplinary

international health care providers to provide adequate and appropriate care for multi-ethnic groups of midlife women in menopausal transition.

A cluster analysis is usually used to systematically organize observations (usually people) into groups whose members share common properties (Massart & Kaufman, 1983). Subsequently, grouping through a cluster analysis makes it easy for researchers to predict behavior or properties of people or objects based on group membership, all of whom share common properties (Formann, 1984; Massart & Kaufman, 1983). Thus, we could expect that a cluster analysis would be helpful in clarifying the association of ethnicity with menopausal symptoms by grouping women with similar menopausal symptom experience. However, few symptom cluster studies specifically related to menopausal symptom experience have been conducted (Abe, Suzuki, Moritsuka, & Botan, 1984; Cray, Woods, & Mitchell, 2010; Frohlich, Kuh, Hardy, & Wadsworth, 2000; Greenblum, Rowe, Neff, & Greenblum, 2012; Sievert, Obermeyer, & Aliba, 2007; Sievert & Obermeyer, 2012; Woods, Mariella, & Mitchell, 2006).

The earliest study on menopausal symptoms using a cluster analysis is the analysis by Abe et al. (1984) who found seven clusters through hierarchical cluster analysis. Frohlich et al. (2000) also determined three clusters based on menstrual changes experienced by multiple ethnic groups of women in the U.K. Cray et al. (2010) identified four clusters of menopausal symptoms experienced by midlife women in late menopausal transition. Recently, Greenblum et al. (2012) reported that sleep disturbances and vaginal dryness were the only symptom clusters that had the highest impact on quality of life. More importantly, Sievert and Obermeyer (2012) found that symptoms were differently clustered by country of residence. However, researchers still have rarely identified ethnic differences in the clusters of menopausal symptoms, and nothing is clearly known about the association of ethnicity with menopausal symptoms.

Our purpose for this study was to identify the clusters of midlife women by menopausal symptoms in a multi-ethnic sample, and to determine ethnic differences in the clusters. This is a secondary analysis of the quantitative data from a larger study on menopausal symptoms of four major ethnic groups of midlife women in the U.S. (Whites, Hispanics, African Americans, and Asians). In this paper, we used the definition of symptom experience by Blacklow (1983). Thus, symptom experience means subjective experiences representing changes in a person's bio-psycho-social function, sensation, and cognition (Blacklow, 1983). In this study, menopausal symptoms refer to the symptoms experienced during the menopausal transition. Also, based on the definitions by the Stages of Reproductive Aging Workshop (STRAW)(Soules et al., 2001, p. 405), menopause is defined as "the anchor point that is defined after 12 months of amenorrhea following the final menstrual period, which reflects a near complete but natural decrease in ovarian hormone secretion." Also, based on the definitions by the STRAW (Soules et al., 2001, p. 405), the menopausal transition is defined as "the period that begins with variation in menstrual cycle length in a woman who has a monotropic FSH rise and ends with the final menstrual period". In this paper, the stages of the menopausal transition are based on those in the SWAN study: pre-, early peri-, late peri-, and post-menopausal (Avis et al., 2001). Since our focus of this study was ethnic

differences in menopausal symptoms like the focus of the SWAN study was, we used the same stages of the menopausal transition used in the SWAN study.

To theoretically guide this analysis, a feminist perspective was taken. Details on the feminist approach taken for the study can be found elsewhere (Authors, 2007). The feminist approach was chosen for the study because it provides a contextual understanding of menopausal symptoms in ethnically diverse situations. For this analysis, a feminist assumption was also made: inadequate management of menopausal symptoms reported by ethnic minority midlife women could result from their interactions with their environments rather than just biological differences. For example, the clusters of women with menopausal symptoms were reported to be significantly correlated with menopausal status, the number of children, BMI, and the use of hormone (Frohlich et al., 2000; Vollmer-Conna, Aslakson, & White, 2006; Woods et al. 2006). Thus, in determining ethnic differences in the clusters of women with menopausal symptoms, these four variables (menopausal status, the number of children, BMI, and hormone use) were considered. Feminists also respect research participants' own views, perspectives, opinions, and experiences as well as researchers' (Andrist & MacPherson, 2001; Hall & Stevens, 1991; Hesse-Biber & Piatelli, 2007). Thus, in this study, rather than the instruments measuring menopausal symptoms that have been developed among Western women, we used the Midlife Women's Symptom Index (MSI) that allows for reporting of a wide range of symptoms. Finally, based on the feminist perspective considering gender as a significant characteristic that interacts with race, ethnicity, and class (Ford-Gilboe & Campbell, 1996; Hesse-Biber & Piatelli, 2007), we focused on ethnicity as one of the significant characteristics that limits women's menopausal symptom experience, and we tried to see how other contextual factors, including socioeconomic status, influenced the women's menopausal symptoms.

Methods

Again, this study was a secondary analysis of the data from a larger Internet study consisting of both a quantitative Internet survey and four ethnic-specific online forums on menopausal symptom experience of four major ethnic groups of midlife women in the U.S. Only the data from the Internet survey were used for this analysis. The Institutional Review Board of the institution where the researchers were affiliated approved the study. More detailed information on the larger study can be found elsewhere (Authors, 2010a; 2010b).

Settings and Participants

The participants of the larger study were recruited through Internet communities/groups among middle-aged women (ICMWs) and Internet communities/groups for ethnic minorities (ICEMs)(e.g., churches, organizations, forums, health care centers, and professional groups, all of which were ethnic specific). The participants were recruited using a quota sampling method, and a total of 512 midlife women (160 N-H Whites, 120 Hispanics, 121 N-H African Americans, and 111 N-H Asians) were recruited. The quota sampling was based on menopausal status and socioeconomic status in order to recruit an adequate number of women from each socioeconomic level and stage of menopause. All the participants were middle-aged women between 40 and 60 years old who could read and write English, who

were online, and whose self-reported ethnic identity was Hispanic, N-H White, N-H African American, or N-H Asian. Here, “middle-aged” refers to the period of life from age 40 to age 60, and “being online” meant that the women were familiar with the Internet as a medium of communication and had access to it. The age range was determined because most women experience menopause around the age of 50, ranging from 40 to 60 years old (U.S. Department of Health and Human Services [USDHHS], 2012). Only those who could read and write English were recruited for the study because of feasibility issues in incorporating all diverse languages that are being used by the four major ethnic groups of midlife women. The four ethnic groups were chosen because these four are the most common (largest) ethnic groups in the U.S. (US Census Bureau [USCB], 2012).

Sample size was pre-determined because this was a secondary analysis in nature. The initial dataset included the data of 512 participants, but only 501 participants were included for this secondary analysis after eliminating 11 participants that had missing data on menopause symptoms. The sample size was calculated using the guideline for cluster analyses (Formann, 1984): the minimum number of cases for a cluster analysis is no less than $2k$ cases (k =the total number of variables), preferably $5*2^k$. Thus, the sample size was adequate for a cluster analysis.

Instruments

Background Characteristics—Background characteristics of the participants were measured using questions on age, education, religion, marital status, employment, financial status, body weight, height, smoking status, perceived social support, number of close friends/relatives, number of children, level of physical activity, and soy consumption. Socioeconomic status was determined based on the women’s self report on their degree of difficulty in paying for basics, and categorized into: (a) low (very hard to pay for basics), (b) middle (somewhat hard to pay for basics), and (c) high (not hard to pay for basics). In this analysis, body mass index (BMI) was calculated in kg/m^2 from the self-reported height and weight at the time of the Internet survey and added as a variable.

Ethnicity-related Factors—Ethnicity-related factors were measured using questions on self-reported ethnic identity (the NIH standard question), country of birth, and degree of acculturation (when the country of birth is other than the U.S.). The questions on degree of acculturation were composed of six questions about length of stay in the U.S. and preferences for foods, music, customs, language, and close friends. Length of stay in the U.S. was measured in months or years, and preferences for foods, music, customs, language, and close friends were measured using a Likert scale (1=exclusively own ethnic group, 5=exclusively American). The questions on preferences to measure the level of acculturation were adopted and modified from the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA) (Suinn, Ahuna, & Khoom, 1992). Then, for the data analysis, the level of acculturation was determined by summing all the items (ranged from 5 to 25). The reliability and content validity of the questions on level of acculturation were established in previous studies (Authors, 2005; 2008). The reliability of the questions in this study was also high: Cronbach’s $\alpha=0.98$.

Health and Menopausal Status—To measure health and menopausal status, questions on self-reported health status (one Likert scale item rating general health), diagnosed diseases and medicine (two open-ended questions), and self-reported menopausal status (seven items asking about last menstrual cycle, menstrual regularity, and menstrual flow) were used. As mentioned above, menopausal status was categorized into pre-menopause, early peri-menopause, late peri-menopause, and post-menopause based on the data collected through these seven items.

Menopausal Symptom Experience—The Midlife Women's Symptom Index (MSI) (Im, 2006) was used to measure menopausal symptoms. The MSI consists of 73 items that are categorized into physical, psychological, and psychosomatic symptoms as well as one open-ended question about other symptoms (that participants might be experiencing, but not included in the MSI). The MSI also includes questions on severity measures (5-point Likert scales), and open-ended questions on the perceived causes, meanings of, and management strategies for menopausal symptoms. The reliability of the MSI was established among multi-ethnic groups of midlife women (test-retest correlation, $r = 0.94 - 0.98$). The content validity of the MSI was supported by expert reviews (Im, Meleis, & Lee, 1999; Im, 2006). The reliability of the MSI in this study was also high: Cronbach's $\alpha = 0.95$. For this study, only the data on total number of total symptoms and total number of symptoms in each subcategory were used.

Data Collection Procedures

For the larger study, a project website was established first while conforming to the Health Insurance Portability and Accountability Act (HIPAA) and the SANS/FBI recommendations. The project website was published on an independent, dedicated website server (five Pentium-based computers). The project website included an informed consent sheet, Internet survey questions, and four different ethnic-specific online forum sites. When a woman visited the project website, she was asked to review the general purpose of the study on the opening page, and to click to enter the "informed consent sheet." Informed consents from the women were obtained by asking them to click the "I agree to participate" button on the project website. When they agreed by clicking the button, they were asked to go through screening questions in order to verify that they met the inclusion criteria (age, literacy, Internet access, and ethnic identity). Then, when they met the inclusion criteria, they were asked about menopausal status and socioeconomic status (SES). Only when the women had the ethnicity, MS, and SES characteristics of the strata that still needed participants, they were automatically linked to the Internet survey page. Then, through the Internet, the women were asked to answer the questions on background characteristics, ethnicity-related factors, health and menopausal status, and the MSI. To ensure authenticity of their participation, the women were repeatedly asked several random questions that participants had already answered.

Data Management and Analysis

The data that the women entered through the Internet were automatically saved in the database and were analyzed using the Statistical Package for Social Science and the Mplus software. If the women did not enter their answers for the missing fields even after a

reminder, and the missing fields were less than 10%, the women's data were included in the data analysis, using mean substitution to determine the value of missing data for continuous variables and allowing missing data for categorical variables (missing data was categorized as "999"). Women for whom 10% or more data were missing were not included in the data analysis.

The data were analyzed using descriptive statistics, factor analysis, hierarchical cluster analysis and multinomial logistic analysis. First, to explore the grouping of menopausal symptoms, a factor analysis was performed with the generalized least square as extraction method and varimax rotation. We determined the number of factors to be extracted using the Eigen value and scree plot. From the results of the factor analysis, 11 items (frequent urination, discomfort during sexual intercourse, burning pain during intercourse, night urination, nose bleeding, weight gain, losing control of the bladder, weight loss, vaginal dryness, poor appetite, and difficulty hearing) were eliminated because their loading was under 0.30. Sixty-two menopausal symptoms were classified to three factors (psychological symptoms, physical and psychosomatic symptoms, and menstrual symptoms). These factors accounted for 31.81% of the total variance of the measured variables.

To determine the clusters of women with menopausal symptoms, hierarchical clustering methods were used with an agglomerative approach and the average linkage between clusters. Five hundred and one participants who provided complete data on menopausal symptoms were included in the cluster analysis. The sum of each factor was used to measure the squared Euclidean distance. We computed the Z score of the sum of each factor to standardize continuous variables. The research team used the Dendrogram and the ANOVA test to determine which clusters were combined. To examine ethnic differences in each cluster, descriptive statistics, chi-square tests, t-tests and multinomial logistic regression analyses were used.

Findings

Clusters by the Menopausal Symptom Scores

In Table 1, the menopause symptom scores of the clusters in each cluster solution are summarized. After comparing the menopause symptoms scores, the three cluster solution was finally adopted for this study ($F=575.71$, $p<.01$). Fifty-four percent of the participants ($n=274$) were grouped in Cluster 1 (the low symptomatic group) who reported an average of $8.84 (\pm 5.50)$ number of menopausal symptoms. Twenty-nine percent of participants ($n=148$) were grouped in Cluster 2 (moderate physical and psychosomatic, high psychological, and low menstrual symptoms) who had an average of $28.49 (\pm 8.07)$ number of menopausal symptoms. Fifteen percent of the participants ($n=79$) were grouped in Cluster 3 (the high symptomatic group) who reported an average of $35.11 (\pm 10.66)$ number of menopausal symptoms. There were significant differences in the scores of total symptoms, physical and psychosomatic symptoms, psychological symptoms, and menstrual symptoms among the clusters ($p<.01$)(Table 2).

Differences in Characteristics of the Participants by Clusters

In Table 3, the background characteristics and health and menopausal status of the participants are summarized by cluster. The three clusters differed significantly in age, education level, income, number of children, country of birth, ethnicity, BMI, self-reported health, diagnosed disease, smoking, and physical activity ($p<.05$).

In Table 4, the background characteristics and health and menopausal status of the clusters are compared. Compared with Cluster 1, Cluster 2 tended not to know about their health (adj. ORs=3.55); their family income tended to be somewhat hard to pay for basics (adj. ORs=2.97); they tended to be in early/late peri menopause (adj. ORs=2.79); and they tended to be past smokers (adj. ORs=2.38). Compared with Cluster 1, Cluster 3 tended to be post menopausal (adj. ORs=9.19) or early/late peri-menopausal (adj. ORs=4.35); they tended to have more than three children (adj. ORs=3.45) or 1–2 children (adj. ORs=2.86); and it tended to be very hard or somewhat hard for them to pay for basics with their current family income (adj. ORs=2.23)(adj. ORs=1.75). Compared with White women, Asian (adj. ORs=0.33) and Hispanic women (adj. ORs=0.51) were less likely to be included in Cluster 3.

Ethnic Differences in Menopausal Symptoms in Each Cluster

In Table 5, ethnic differences in menopausal symptoms in each cluster are summarized. Only in Cluster 1, the low symptomatic group, there were significant ethnic differences in the scores of total symptoms and physical and psychosomatic symptoms. In Cluster 1, White and African American women reported larger numbers of total symptoms and physical and psychosomatic symptoms than Asian women ($p<.01$). Also, in Cluster 1, White and African American women reported a larger number of physical and psychosomatic symptoms than Hispanic ($p<.01$). Compared with Asian and Hispanic women, White and African American women in Cluster 1 were more likely to experience ‘night sweat’, ‘hot flush’, ‘feeling hot or cold’, ‘swelling ankles’, ‘breast pain’ and ‘feeling clumsy.’ In Cluster 1, Hispanic women were more likely to experience ‘crying often’ than any other ethnic groups.

Although there were no ethnic differences in the scores of total symptoms and subcategories of symptoms in Cluster 2, there were significant ethnic differences in some individual symptoms, including ‘aches in the back of neck and skull’, ‘muscle and joints stiffness and soreness’, ‘palpitation’, ‘frequent loose stools’, ‘night sweat’, ‘hot flush’, ‘severe headaches’, ‘feeling clumsy’, ‘worrying’, ‘feeling anxious, tense or nervous frequently’, and ‘feeling panic frequently.’

In Cluster 2, compared with any other ethnic groups, White women were more likely to report ‘palpitation’ and ‘frequent loose stools.’ Compared with any other ethnic groups, White and Hispanic were more likely to report ‘severe headache’, ‘feel clumsy’ and ‘aches in the back of neck and skull.’ White and Asian women were more likely to report ‘muscle and joint stiffness and soreness’ than any other ethnic groups. Also, White and African American women were more likely to report ‘night sweat’ than other ethnic groups, while Asian women were less likely to report ‘hot flush’ than other ethnic groups. White and Asian American women were more likely to experience ‘feeling anxious, tense or nervous

frequently', 'worrying', and 'feeling panic frequently' than other ethnic groups. Yet, ethnic differences in menopausal symptoms in Cluster 3 could not be examined in this study because of the small sample size in Cluster 3.

Discussion

Through this secondary analysis, three clusters of midlife women by menopausal symptoms were identified, which is consistent with some previous studies. Although the characteristics of menopausal symptoms were different from those reported in this paper, Abe et al. (1984) identified three clusters of menopausal symptom groups by hormone levels. Frohlich et al. (2000) also identified three clusters based on menstrual changes: (a) those who experienced more menstrual changes, (b) those who experienced less, and (c) those who experienced few changes. The clusters that were identified in this study may be closer to the three clusters identified by Frohlich et al. (2000). However, the finding that the cluster of midlife women with menopausal symptoms differed in psychological symptoms and menstrual symptoms needs to be carefully interpreted. A plausible reason for this finding could be: psychological and menstrual symptoms tend to be closely linked to cultural attitudes toward menstruation and menopause. Indeed, researchers have suggested that any understanding of menopause should be placed within the context of a woman's life and should include a consideration of her psychological state, psychological influences, cultural and social background, social contexts, the microenvironment of the household, and the aging process (Avis, et al., 2005; Deeks, 2003; Hewner, 2001; Obermeyer, Reher, & Saliba, 2007; Sievert, Obermeyer, & Saliba, 2007).

The significant differences among the clusters in the background characteristics and health and menopausal status are also consistent with the findings in previous studies on specific characteristics of the midlife women who tended to report larger numbers of menopausal symptoms. The characteristics of the women who were more likely to experience menopausal symptoms included: (a) being older than 50 years of age, (b) being peri- or post-menopausal, (c) having low educational attainment, (d) working as housewives, or being a land owner, (e) having more children, (f) reporting their health as not so good, (g) having difficulty paying for basics, (h) smoking, (i) less physically active, (j) hormone users, and (k) having surgical menopause (Browall, Ahlberg, Persson, Karlsson, Danielson, 2008; Freeman, Sammel, Rinaudo, & Sheng, 2004; Duffy, Iversen, & Hannaford, 2012; Lerner-Geva, Boyko, Blumstein, & Benyamini, 2010; Mishra & Dobson, 2012; Pimenta, Leal, Maroco, & Ramos, 2012; Schwarz et al., 2007).

The findings on ethnic differences in menopausal symptoms are also consistent with the previous studies although the ethnic differences in specific symptoms were a little bit different from the previous studies. Researchers have highlighted differences in hot flush and sweating between Whites and Asian women; about 30% of White women experience hot flashes and sweating while 18 to 21% of Asian women experience them (Bair et al., 2008; Chim et al., 2002; Gold et al., 2006; Im, 1997; Lock, 2001; Pan, Wu, Hsu, Yao, & Huang, 2002; Richard-Davis, 2011). In this study, in Cluster 2, White and African American women were more likely to report 'night sweat' than other ethnic groups and Asian American women were less likely to experience 'hot flush' compared with any other ethnic

groups, which is consistent with the previous studies. Yet, in this study, White and Asian women in Cluster 2 were more likely to report ‘muscle and joint stiffness and soreness’ than any other ethnic groups. This finding is not consistent with that of Dugan et al. (2006) who reported that African Americans had a higher level of arthritic pain than White women. Finally, in this study, White and Asian American women were more likely to experience psychological symptoms compared with any other ethnic groups, which is not consistent with previous studies. Lock (2001) reported that Japanese women had less depressive symptoms than those in Western cultures, and Bromberger, Harlow, Avis, Kravitz, & Cordal (2004) reported that there were no significant ethnic differences in depressive symptoms.

There were several limitations in this secondary analysis. First, because the sample size was predetermined by the larger study, there was no control of the sample size. Although the sample size was large enough for the general analyses conducted in this study, Cluster 3 had a small sample size, which did not allow for ethnic comparisons. Second, because the larger study was an Internet survey study, the participants of this study tended to be a selected group of midlife women. Finally, because the prevalence rate of the symptoms in general tended to be low, the interpretation of the findings needs to be carefully made.

Conclusions

Based on these findings, we want to conclude this paper with the following implications for future research. First of all, the linkage of menopausal symptoms (especially psychological and menstrual symptoms) to cultural attitudes toward menopause and menstruation needs to be further examined. Second, further studies with a larger number of samples are needed to identify patterns of menopausal symptoms in multi-ethnic groups of midlife women. As mentioned above, basically, very few studies have been conducted to identify clusters of women with menopausal symptoms among multi-ethnic groups. Third, ethnic differences in menopausal symptoms need to be further examined while identifying symptom cluster groups. The finding of this study on hot flush among African American midlife women in the moderate symptomatic group (Cluster 2) was somewhat different from those of the previous studies, which needs further investigations. Finally, further studies with diverse groups of midlife women are needed to confirm the findings reported in this paper. As discussed above, this study had several limitations because of its inherent nature of a secondary analysis. With diverse groups of midlife women, the picture of ethnic-specific clusters of menopausal symptoms could be further completed.

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Table 1

Clusters of midlife women by menopausal symptoms in two, three and four cluster solutions

Cluster solutions	Clusters	N(%)	Menopause symptoms Mean±SD	t or F	p-value
Two subgroups	Cluster 1	422(84.2)	15.73±11.44	-13.96**	0.00
	Cluster 2	79(15.8)	35.11±10.66		
Three subgroups [§]	Cluster 1	274(54.7)	8.84±5.50 ^a	575.71**	0.00
	Cluster 2	148(29.5)	28.49±8.08 ^b		
	Cluster 3	79(15.8)	35.11±10.66 ^c		
Four subgroups [§]	Cluster 1	274(54.7)	8.84±5.55 ^a	546.41**	0.00
	Cluster 2	148(29.5)	28.49±8.07 ^b		
	Cluster 3	52(10.4)	28.75±5.33 ^b		
	Cluster 4	27(6.95)	47.37±6.95 ^c		

[§] Post hoc tests: Duncan tests (the different letters indicate statistically significant differences at an alpha level of .05).

* p<.05,

** p<.01

Table 2

Menopausal symptoms by clusters.

Variables	Cluster 1 m±SD	Cluster 2 m±SD	Cluster 3 m±SD	Total m±SD	F	p-value
Total symptoms (0–62) §	8.84±5.55 ^a	28.49±8.07 ^b	35.03±10.60 ^c	18.78±13.31	576.12	0.00
Physical and psychosomatic (0–37) §	5.03±3.32 ^a	15.95±6.45 ^b	18.10±7.61 ^c	10.31±7.85	313.19	0.00
Psychotic (0–18) §	3.08±2.55 ^a	11.74±4.10 ^b	11.96±4.26 ^b	7.04±5.50	416.97	0.00
Symptoms related menstruation(0–7) §	0.74±1.16 ^a	0.81±1.19 ^a	4.96±1.19 ^b	1.43±1.93	425.63	0.00

§ Post hoc tests: Duncan tests (the different letters indicate statistically significant differences at an alpha level of .05).

Table 3

Differences in characteristics by clusters

Variables	Cluster1 n(%)	Cluster2 n(%)	Cluster3 n(%)	Total n(%)	X ² or F	p-value
Age(Mean ± SD) §	49.18±5.19 ^a	49.75±5.53 ^a	46.13±4.10 ^b	48.87±5.27	13.91	0.00
Education level						
high school	38(13.9)	29(19.6)	20(25.3)	87(17.4)	6.33	0.04
>high school	236(86.1)	119(80.4)	59(74.7)	414(82.6)		
Employment						
Yes	207(75.5)	102(68.9)	53(67.1)	362(72.3)	3.36	0.19
No	67(24.5)	46(31.1)	26(32.9)	139(27.7)		
Family income [¶]						
Very Hard	31(11.3)	39(26.4)	24(30.4)	94(18.8)	35.92	0.00
Somewhat hard	91(33.2)	61(41.2)	31(39.2)	183(36.5)		
Not Hard	152(55.5)	48(32.4)	24(30.4)	224(44.7)		
Marital Status						
Married/partnered	195(71.2)	91(61.5)	55(69.6)	341(68.1)	4.25	0.12
Non- married/separated	79(28.8)	57(38.5)	24(30.4)	160(31.9)		
Total	274(100.0)	148(100.0)	79(100.0)	501(100.0)		

Variables	Cluster1 n(%)	Cluster2 n(%)	Cluster3 n(%)	Total n(%)	X ² or F	p-value
Number of children						
None	57(20.8)	13(8.8)	14(17.7)	84(16.8)	13.73	0.01
1–2	141(51.5)	76(51.4)	44(55.7)	261(52.1)		
More than 3	76(27.7)	59(39.9)	21(26.6)	156(31.1)		
Country of birth						
U.S	200(73.0)	123(83.1)	71(89.9)	394(78.6)	12.90	0.00
Outside U.S	74(27.0)	25(16.9)	8(10.1)	107(21.4)		
Level of acculturation [‡] (Mean ± SD)	2.59±0.65	2.44±0.60	2.38±0.64	2.54±0.63	0.78	0.46
Ethnicity						
Hispanic	63(23.0)	35(23.6)	25(31.6)	123(24.6)	29.85	0.00
N-H Asian	82(29.9)	20(13.5)	7(8.9)	109(21.8)		

Variables	Cluster1 n(%)	Cluster2 n(%)	Cluster3 n(%)	Total n(%)	X ² or F	p-value
N-H African	61(22.3)	34(23.0)	16(20.3)	111(22.2)		
N-H White	68(24.8)	59(39.9)	31(39.2)	158(31.5)		
Total	274(100.0)	148(100.0)	79(100.0)	501(100.0)		

Variables	Cluster1 n(%)	Cluster2 n(%)	Cluster3 n(%)	Total n(%)	X ² or F	p-value
BMI (kg/m ²) §	27.02±6.63 ^a	30.11±8.77 ^b	31.48±9.44 ^b	28.63±7.99	13.81	0.00
Normal (<25)	131(47.8)	51(34.5)	23(29.1)	205(40.9)	17.22	0.00
Overweight	72(26.3)	36(24.3)	22(27.8)	130(25.9)		
(25 to <30)						
Obese (≥ 30)	71(25.9)	61(41.2)	34(43.0)	166(33.1)		
General health						
Unhealthy	38(13.9)	37(25.0)	22(27.8)	97(19.4)	28.98	0.00
Don't know	16(5.8)	15(10.1)	15(19.0)	46(9.2)		
Healthy	220(80.3)	96(64.9)	42(53.2)	358(71.5)		
Having diagnosed disease						
Yes	91(33.2)	79(53.4)	38(48.1)	208(41.5)	17.77	0.00
No	183(66.8)	69(46.6)	41(51.9)	293(58.5)		
Total	274(100.0)	148(100.0)	79(100.0)	501(100.0)		

Variables	Cluster1 n(%)	Cluster2 n(%)	Cluster3 n(%)	Total n(%)	X ²	p-value
Health behavior						
Never smoker	205(74.8)	77(52.0)	38(48.1)	320(63.9)	36.50	0.00
Past smoker	45(16.4)	37(25.0)	28(35.4)	110(22.0)		
Current smoker	24(8.8)	34(23.0)	13(16.5)	71(14.2)		
Activity level						
Less than other women	73(26.6)	64(43.2)	30(38.0)	167(33.3)	13.25	0.01
Same with other women	97(35.4)	44(29.7)	25(31.6)	166(33.2)		
More than other women	104(38.0)	40(27.0)	24(30.4)	168(33.5)		
Menopausal Status						
Pre menopause	80(28.2)	11(7.4)	18(22.8)	109(21.8)	82.24	0.00
Early/late peri menopause	109(39.8)	59(39.9)	60(75.9)	228(45.5)		
Post menopause	85(31.0)	78(52.7)	1(1.3)	164(32.7)		

Variables	Cluster1 n(%)	Cluster2 n(%)	Cluster3 n(%)	Total n(%)	X ²	p-value
Total	274(100.0)	148(100.0)	79(100.0)	501(100.0)		

§ Post hoc tests: Duncan tests (the different letters indicate statistically significant differences at an alpha level of .05).

¶ The difficulties in paying basics with family income.

§ Post hoc tests: Duncan tests (the different letters indicate statistically significant differences at an alpha level of .05).

£ l=exclusively own ethnic group, S = exclusively American

§ Post hoc tests: Duncan tests (the different letters indicate statistically significant differences at an alpha level of .05).

§ Post hoc tests: Duncan tests (the different letters indicate statistically significant differences at an alpha level of .05).

Table 4

Comparisons of characteristics among clusters

Variables		Cluster 2 vs Cluster 1 Adjusted OR(95% CI)	Cluster 3 vs Cluster 1 Adjusted OR (95% CI)
<i>Age</i> [§]		0.88 [*] (0.82–0.95)	
<i>Income</i>			
Very Hard	Not hard to pay	1.73(0.84–3.57)	2.23 [*] (1.08–4.59)
Somewhat hard	Not hard to pay	2.97 [*] (1.19–7.44)	1.75 [*] (1.01–3.01)
<i>Children</i>			
1–2	None		2.86 ^{**} (1.34–6.13)
More than 3	None		3.45 ^{**} (1.55–7.67)
<i>Ethnicity</i>			
Hispanic	N-H White		0.51 [*] (0.27–0.99)
N-H Asian	N-H White		0.33 [*] (0.13–0.86)
N-H African	N-H White		0.60(0.31–1.16)
<i>Self-reported health</i>			
Unhealthy	Healthy	2.32(0.94–5.71)	
Don't know	Healthy	3.55 ^{**} (1.39–9.06)	
<i>Diagnosed disease</i>			
Yes	No	1.88(0.98–3.63)	2.07 ^{**} (1.25–3.42)
<i>Smoking</i>			
Past smoker	Never smoker	2.38 [*] (1.17–4.83)	
Current smoker	Never smoker	1.28(0.49–3.36)	
<i>Menopausal Status</i>			
Early/late peri	Pre menopause	2.79 ^{**} (1.39–5.63)	4.35 ^{**} (2.01–9.42)
Post menopause	Pre menopause	0.09 [*] (0.01–0.72)	9.16 ^{**} (3.95–21.26)

Fourteen independent variables (age, education level, employment, income, maternal status, number of children, country of birth, ethnicity, body mass index, self-reported health, having diagnosed disease, smoking, activity level, and menopausal status) were adjusted and only significant variables are presented in this table

[§] Age was treated as a continuous variable,

^{*} p<.05,

^{**} p<.01

Table 5

Ethnic differences in menopausal symptoms in each cluster

	Cluster	White n(%)	Hispanic n(%)	Asian American n(%)	African American n(%)	Total	F	p-value
Total symptoms (0–62)	1 [§]	10.15±5.67 ^c	8.57±5.70 ^{ab}	7.27±5.11 ^a	9.79±5.40 ^c	8.84±5.55	4.24	0.01
	2	30.59±8.68	26.89±7.63	27.25±6.25	27.24±7.90	28.49±8.07	2.28	0.08
	3	34.26±11.27	34.20±10.58	36.29±13.54	37.25±8.27	35.03±10.60	0.36	0.78
	Total [§]	22.51±13.56 ^a	18.99±13.27 ^b	12.80±11.59 ^c	19.09±12.67 ^b	18.78±13.31	12.29	0.00
Physical and psychosomatic (0–37)	1 [§]	6.00±3.55 ^a	4.65±3.31 ^b	3.96±2.97 ^b	5.75±3.07 ^a	5.03±3.32	6.35	0.00
	2	17.46±7.07	15.57±6.58	13.05±4.26	15.41±5.72	15.95±6.45	2.63	0.05
	3	18.06±8.08	17.12±7.22	17.86±9.48	19.81±6.79	18.10±7.61	0.40	0.75
	Total [§]	12.65±8.36 ^a	10.29±7.87 ^b	6.52±6.00 ^c	10.74±7.33 ^b	10.31±7.85	14.30	0.00
Psychological (0–18)	1	3.32±2.37	3.32±2.78	2.73±2.54	3.03±2.37	3.08±2.55	0.91	0.44
	2	12.31±4.07	10.60±4.00	12.90±3.52	11.24±4.39	11.74±4.10	2.02	0.11
	3	11.23±4.82	12.00±3.62	13.14±5.27	12.81±3.64	11.96±4.26	0.69	0.56
	Total [§]	8.23±5.60 ^a	7.15±5.17 ^a	5.27±5.32 ^b	6.96±5.49 ^a	7.04±5.50	6.47	0.00
Menstrual (0–7)	1	0.82±1.11	0.60±1.19	0.57±1.02	1.00±1.33	0.74±1.16	2.02	0.11
	2	0.83±1.23	0.71±1.13	1.30±1.26	0.59±1.10	0.81±1.19	1.62	0.19
	3	4.97±1.14	5.08±1.04	5.29±1.38	4.63±1.45	4.96±1.19	0.67	0.57
	Total	1.64±2.01	1.54±2.12	1.01±1.58	1.40±1.85	1.43±1.93	2.53	0.06

[§]Post hoc tests: Duncan test (same letters indicate statistically significant difference at 5% significant level)