Midlife Women's Cardiovascular Symptoms: A Cluster Analysis

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Abstract

Menopausal transition, in which biological and psychosocial changes are caused due to estrogen fluctuations, has been reported to increase cardiovascular risk among midlife women. Our purpose of this study was to identify the clusters of midlife women by cardiovascular symptoms and to examine racial/ethnic differences in the clusters. This was a secondary analysis, in which hierarchical cluster and multinomial logistic analyses were conducted with the data (N=966) collected in two previous studies. Three-clusters were adopted: Cluster 1 (high vasomotor and low cardiorespiratory), Cluster 2 (low vasomotor and high cardiorespiratory and high discomfort/pain), and Cluster 3 (high discomfort/pain and high indigestion).

Keywords

menopause; cardiovascular symptoms; race; ethnicity; midlife women

Menopausal transition, in which biological and psychosocial changes are caused due to estrogen fluctuations, has been reported to increase cardiovascular risk (Pérez, Garcia, Palacios, & Pérez, 2009). Indeed, a number of studies have been conducted across countries, and the researchers have indicated female midlife changes in biomarkers such as aortic pulse-wave velocity, distinct lipid/lipoprotein profiles, hormone levels, and blood pressure that could increase the risks of cardiovascular diseases (CVDs)(Birru et al., 2011; Sherwood et al., 2001; Taechakraichana et al., 2007). In recent studies, including the Study of Women Across the Nation (SWAN), it was found that midlife women in their menopausal transition

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could experience cardiovascular symptoms that they did not experience previously (Sutton-Tyrrell et al., 2005; Thurston, Sutton-Tyrrell, Everson-Rose, Hess, & Matthews, 2008).

Racial/ethnic differences in hormone levels during the menopausal transition could influence the development of racial/ethnic differences in hormonally influenced diseases, such as CVDs (Richard-Davis & Wellons, 2013). This has important international implications for cardiovascular health of racially/ethnically diverse groups of midlife women across the globe. In the literature, racial/ethnic differences in midlife women's cardiovascular symptoms are clearly reported (McSweeney et al., 2010; Im et al., 2015). For example, African American women reported more vasomotor and indigestion symptoms than White and Hispanic women, and Hispanic women reported more discomfort/pain than White and African American women (McSweeney et al., 2010). Asian American women reported lower cardiovascular symptoms than White, African American and Hispanic women (Im et al, 2015). However, there is a great need to further clarify the association of race/ethnicity to cardiovascular symptom experience during the menopausal transition through adopting various statistical analyses such as structural equation modeling, multiple regression analyses, multiple logistic analyses, etc. (Richard-Davis & Wellons, 2013). For instance, Im et al. (2015) reported that, after adjusting for other contextual variables (age, BMI, menopausal status, and the diagnosis of CVDs), the racial/ethnic differences in the prevalence and severity scores of total and individual cardiovascular symptoms were no longer significant although the effect of menopausal status was still significant.

A cluster analysis can be used to categorize midlife women who report similar cardiovascular symptom experience, and the findings on racial/ethnic differences in the clusters could be used to provide an answer for the association of race/ethnicity to cardiovascular symptom experience of midlife women during their menopausal transition (Massart & Kaufman, 1983). However, few cluster studies specifically related to cardiovascular symptoms of midlife women have been conducted across the globe. Rather, studies have been conducted on general symptoms reported by midlife women during their menopausal transition. Sievert and Obermeyer (2012) analyzed the responses of midlife women in four countries to symptom checklists and to open-ended questions using factor analysis and textual analysis, and found differences in symptom clusters by the country of residence. Also, Mishra and Kuh (2012) analyzed the data of 695 women in England, Scotland, and Wales who were annually followed-up since their birth in 1946 using factor analysis and latent class analysis. They found four clusters including psychological, somatic, vasomotor, and sexual discomfort symptoms. Cray, Woods, and Mitchell (2013) also targeted to determine various symptom clusters experienced by midlife women during the menopausal transition and examine if the symptom factor structure of the former stage could help identify the symptom factor structure of the next stage. They found similar factor structures across different menopausal stages, including a mood component, a vasomotor component, and a pain component, although there were differences in individual symptoms by the stages.

Our purpose of this study was to identify the clusters of midlife women in the U.S. by their cardiovascular symptoms (Aim #1) and to examine racial/ethnic differences in the clusters (Aim #2). Here, cardiovascular symptoms are broadly defined as subjective experience

reflecting changes in bio-psycho-social function, sensation, and cognition of a woman that are due to changes in cardiovascular systems. Subsequently, we included a broad scope of symptoms related to CVDs as cardiovascular symptoms. Also, by including only midlife women as research participants, menopausal transition is considered to be inclusive in the study design.

Methods

This secondary analysis was done using the data from two national Internet survey studies on midlife women's health issues that were conducted in the U.S. from 2005 to 2013. The first study was to identify racial/ethnic difference in menopausal symptoms experienced among four major ethnic groups (Authors, 2010). The latter was to identify racial/ethnic difference in midlife women's attitudes toward physical activity among four major ethnic groups (Authors, 2012). In both studies, the participants were recruited using a quota sampling by race/ethnicity and socioeconomic status through the Internet. More detailed information on the original studies is reported elsewhere (Authors, 2012; Authors, 2010), and a related publication on multiple regression analyses on cardiovascular symptoms of a smaller dataset is also available (Authors, 2015). The Institutional Review Boards (IRB) of the institutions where researchers were affiliated approved the original studies.

Sample and Settings

In this study, the data from a total of 966 samples (234 Hispanics, 196 Non-Hispanic (N-H) Asian Americans, 238 N-H African Americans and 298 N-H Whites) were included. The inclusion criteria of the original studies were midlife women aged 40 to 60 years who could read and write English and reported their ethnic identity as Hispanic, N-H Asian, N-H African American, or N-H White. For this secondary analysis, we included two additional exclusion criteria. First, the participants without any symptoms among 25 cardiovascular symptoms were excluded because the focus of this study was given to cardiovascular symptoms. Also, if the missing fields were more than 10%, the women's data were excluded in the data analysis. Subsequently, only 966 out of 1,054 participants in the original studies were included in this study. The sample size for this study was pre-determined because of the secondary nature of this study. The minimum number of cases for a cluster analysis is no less than 2^k cases (k=the total number of variables), preferably $5*2^k$ (Formann, 1984). Thus, the pre-determined sample size of this study was adequate to conduct cluster analyses.

Instruments

In the original studies, multiple instruments were used, but only the data from the following instruments were used for this secondary analysis.

Questions on background characteristics, perceived health, and menopausal status—Various questions on background characteristics including age, education, marital status, employment, family income, number of children, self-reported ethnic identity, race, country of birth, level of acculturation and length of stay in the U.S. (in years) were used to measure the women's background characteristics. The level of acculturation was measured only for the women who were born outside the U.S., utilizing five questions on preferences

for foods, music, customs, language, and close friends (1 = *exclusively own ethnic group* to 5 = *exclusively American*). The acculturation questions were adopted from the Suinn-Lew Asian Self-Identity Acculturation Scale (Suinn, Ahuna, & Khoo, 1992; Suinn, Richard-Figueroa, Lew, & Vigil, 1987). The mean score of the five questions was used as the level of acculturation. In this study, Cronbach's alpha of these questions was .96.

Two questions on body weight and height and one Likert scale question on perceived general health (1 = *very unhealthy* to 5 = *very healthy*) were used to measure the women's perceived health. Two additional questions on having a diagnosed disease and taking medicine were used to measure perceived general health. Seven questions on the last menstrual cycle, menstrual regularity, and menstrual flow were asked to measure the women's menopausal status. Based on the women's answers on the seven questions, they were categorized into pre-, peri-, and postmenopausal. When the women had menstruation in the previous 3 months, with no change in irregularity, they were regarded as pre-menopausal. When the women had menstruation in the previous 12 months, but had elevated irregularity in cycle length, they were regarded as peri-menopausal. Finally, when the women had no menstruation in the past year (not due to other conditions such as medication, pregnancy, or severe weight loss), they were regarded as post-menopausal.

The Cardiovascular Symptom Index for Midlife Women (CSIMW)—The Cardiovascular Symptom Index for Midlife Women (CSIMW) was adopted from the Midlife Women's Symptom Index (MSI) (Im, 2006). The CSIMW includes only 25 questions that were chosen based on an extensive literature review on midlife women's symptoms associated with CVDs (Khan et al., 2013; Kikidis, Tsioufis, Papanikolaou, Zerva, & Hantzakos, 2014; National Heart, Lung, and Blood Institute, 2014; Polunina et al., 2011). Each item consists of: (a) the symptom frequency sub-scale with dichotomous items (1 = yes; 0 = no) and (b) the symptom severity sub-scale with 6-point Likert scale items (0 = no symptom; 5 = extremely). The total numbers and the total severity scores of cardiovascular symptoms were calculated by adding the frequency of all items (ranged 0~25) and by adding the severity of the 25 items (ranged 0~125). In this study, Cronbach's alpha was .87 for the frequency subscale, and .89 for the severity subscale.

Data Collection Procedures

Because the original studies were Internet survey studies, project websites were developed for each study while conforming to the Health Insurance Portability and Accountability Act (HIPAA) and the SysAdmin, Audit, Network, Security (SANS)/Federal Bureau of Investigation (FBI) recommendations. For recruitment, e-mail requests were sent to the Web masters of each Internet communities/groups for racial/ethnic minorities and/or for midlife women to ask them to announce our study and share the survey link with their members. When the women stopped by the project websites, they were required to review *informed consent sheets* and provide their consent to participate through the Internet. Then, they were queried against the inclusion criteria and the quota requirement, linked to the Internet survey site, and asked to answer the questions through the Internet.

Data Analysis

The de-identified data were analyzed using the Statistical Package for Social Science. First, to explore the grouping of cardiovascular symptoms, a factor analysis was performed with a principle component analysis as the extraction method and varimax rotation. Five factors of cardiovascular symptoms were suggested by factor analysis, accounting for 49.37% of the variance. Factor loadings >0.30 are displayed. Factors included: cardio-respiratory symptoms (7 items: heart racing, palpitation, suffocating, difficulty in breathing, pain in heart or chest, dizziness), discomfort/pain (7 items: aches in neck and skull, exhaustion or fatigue, anxious or nervous, back pain, headache, cold hands or feet trouble, breast pain), indigestion symptoms (3 items: pain in stomach, upset stomach or nausea, bloating after eating), musculoskeletal symptoms (5 items: pain in arms or legs, swollen ankles, numbness or tingling sense, muscle and joint stiffness), and vasomotor symptoms (3 items: hot flushes, sweat at night, feeling hot or cold). To determine the clusters of women with cardiovascular symptoms (Aim #1), hierarchical clustering methods were used with an agglomerative approach and average linkages between clusters. To validate the cluster solution, we used analysis of variance (with cluster as independent variable and cardiovascular symptoms as dependent variable). To examine racial/ethnic differences in each cluster (Aim #2), chi-square tests, t-tests and multinomial logistic regression analyses were used.

Results

Clusters of mild-life women by cardiovascular symptoms (Aim #1)

Background characteristics of the participants can be found in Tables 1. The average number of cardiovascular symptoms that the participants experienced was 7.71 (SD=5.44). The prevalence of cardiovascular symptom grouping is reported in the following order: discomfort/pain (84.4%), vasomotor symptoms (74.3%), musculoskeletal symptoms (68.8%), cardio-respiratory symptoms (50.9%), and indigestion symptoms (46.9%). The average severity of cardiovascular symptom grouping is reported in the following order: vasomotor symptoms (1.46±1.37), discomfort/pain (1.10±0.97), musculoskeletal symptoms (0.91±0.96), indigestion symptoms (0.68±0.96), and cardio-respiratory symptoms (0.47±0.73). Through cluster analyses, three solutions were identified based on the ANOVA and Dendrogram. After comparing the scores of cardiovascular symptoms and the percentages of participants in each cluster on each solution, the three cluster solution was adopted for this study. Total and subgroup scores of cardiovascular symptoms were significantly different among the selected three cluster solution at the significance level .05.

Forty five percent of the participants were categorized into Cluster 1 (high vasomotor symptoms and low cardiorespiratory symptoms); 39% were categorized into Cluster 2 (low vasomotor symptoms, high cardiorespiratory symptoms, and high discomfort/pain), and 16% were categorized into Cluster 3 (high discomfort/pain and high indigestion symptoms). There were significant differences in age, family income, ethnicity, self-reported health, and menopausal status among the clusters ($p<.05$)(see Table 1).

In Table 2, the results of multinominal logistic regression analyses are summarized to show the predictors of being in Clusters 2 and 3. Comparing with Cluster 1, being Hispanic

(adjusted OR, 1.72; 95% CI, 1.14-2.62), being Asian American (adjusted OR, 1.79; 95% CI, 1.03-3.11), being African American (adjusted OR, 0.61; 95% CI, 0.40-0.93), having insufficient family income (adjusted OR, 2.05; 95% CI, 1.26-3.32), being premenopausal (adjusted OR, 2.30; 95% CI, 1.53-3.47) and having a diagnosed disease (adjusted OR, 1.59; 95% CI, 1.16-2.19) were strongly associated with Cluster 2. Compared with Cluster 1, being African American (adjusted OR, 0.51; 95% CI, 0.30-0.88), having insufficient family income (adjusted OR, 1.91; 95% CI, 1.03-3.51), having a diagnosed disease (adjusted OR, 1.58; 95% CI, 1.05-2.38) and having no access to health care (adjusted OR, 1.78; 95% CI, 1.05-3.11) were strongly associated with being in Cluster 3.

Racial/Ethnic Differences in Cardiovascular Symptoms in Each Cluster (Aim #2)

There were significant racial/ethnic differences in cardiovascular symptoms in all three Clusters (see Table 3). In all clusters, Asian Americans tended to report significantly lower numbers of symptoms compared with other racial/ethnic groups in the U.S. (p<.01).

Discussion

The findings of this study tend to be new to the literature on cardiovascular symptoms experienced during menopausal transition. As mentioned above, very few symptom cluster studies have been conducted specifically on the cardiovascular symptoms. Subsequently, the clusters of midlife women by cardiovascular symptoms that were identified in this study have rarely been reported in the literature. Rather, midlife women have been clustered by general symptoms experienced during the menopausal transition. As mentioned above, Mishra and Kuh (2012) reported four symptom clusters including psychological, somatic, vasomotor, and sexual discomfort symptoms. Cray et al. (2013) reported a mood component, a vasomotor component, and a pain component among midlife women during the menopausal transition. These clusters are somewhat different from those that were identified in this study.

When considering significant associations of being premenopausal and having a diagnosed disease to Cluster 2 (low vasomotor symptoms, high cardiorespiratory symptoms, and high discomfort/pain), being in Cluster 2 may not be directly linked to menopausal transition. Rather, it may be linked to existing cardiovascular diseases, which may need treatment modalities rather than preventive interventions. Considering the factors significantly correlated with being Cluster 3 (high discomfort/pain and high indigestion symptoms), being Cluster 3 may not be directly linked to menopausal transition as well. Rather, it would be related to existing diagnosed diseases and family income. However, Cluster 1 (high vasomotor symptoms and low cardiorespiratory symptoms) was the unique group at risk of CVDs due to their menopausal transition because post-menopausal status was a significant predictor of being in Cluster 1. Indeed, it has been reported that women reporting high vasomotor symptoms are at an increased risk of CVDs even if they have few typical symptoms of CVDs (e.g., chest pain or discomfort). For example, vasomotor symptoms (e.g., hot flushes) are reportedly associated with high CVD risks (e.g., low flow-mediated dilation, greater coronary artery and aortic calcification)(Thurston et al., 2008). High vasomotor symptoms are associated with overactive of the sympathetic nervous system, and

sympathetic overdrive in turn is associated with metabolic symptoms, which is a known risk factor of CVDs (Tuomiloski, & Savolainen-Peltonen, 2017). In addition, in a longitudinal study, it was confirmed that women having hot flushes or night sweats often had an increased risk of developing coronary heart diseases (Herber-Gast, Brown, & Mishar, 2015). Furthermore, it is known that women with CVDs report atypical symptoms such as unusal fatigue, sleep disturbance, nausea, vomiting, dyspena, and weakness rather than typical cardiovascular symptoms (McSweeney et al, 2010).

In this study, we found significant associations of race/ethnicity to cardiovascular symptoms experienced by midlife women in their menopausal transition. The findings that there were significant racial/ethnic differences in cardiovascular symptoms in all three clusters and that Asian Americans reported lower numbers and severity scores of cardiovascular symptoms than other racial/ethnic groups are similar to those reported in the literature (Richard-Davis & Wellons, 2013; Frank et al., 2014; Im, 2003; Im et al., 2015; Gold et al., 2006). For instance, in the studies by Im (2003), Im et al. (2015) and by Gold et al. (2006), Asian Americans had lower total numbers and severity scores of menopausal symptoms, including cardiovascular symptoms, than other racial/ethnic groups. Therefore, Asian American midlife women may not be the group that needs to be specifically targeted in preventive and/or treatment interventions for CVDs.

A plausible reason for this finding would be racial/ethnic differences in hormonal changes during menopausal transition as discussed above. Randolph et al. (Randolph et al., 2003) indicated that Asian American women, specifically Chinese women, reported lower unadjusted levels of serum estradiol and sex hormone-binding globulin than other racial/ethnic groups. Sutton-Tyrrell et al. (2005) also supported racial/ethnic variations in sex hormone-binding globulin (SHBG) and free androgen index (FAI), and reported that Asian Americans (Chinese) had lower levels of SHBG and higher levels of FAI compared with White women.

The finding on significant differences in age, family income, ethnicity, self-reported health, and menopausal status among the clusters is similar to those in the literataure. Cardiovascular symptoms have been reported to be influenced by multiple factors, and age and socioeconomic status are significant factors associated with CVDs, CVD risk factors, and cardiovascular symptoms (Jani & Rajkumar, 2006; Shaw et al., 2008; Wang, Tai, Hung, & Chen, 2013). Also, self-reported health and menopausal status are other significant factors that have been reported to influence cardiovascular symptoms (Collins et al., 2007; Rutledge et al., 2010). However, the factors associated with different clusters of cardiovascular symptoms experienced during menopausal transition have rarely been reported in the literature.

There are several limitations in the study. First of all, cardiovascular symptoms are broadly defined to cover a wide range of symptoms that could be experienced by diverse groups of midlife women. Second, because the original studies were Internet-based, the participants tended to be a selected group of midlife women. Third, because self-reports were used to collect the data, there would be no objective validation of the self-reports on characteristics and symptoms. Fourth, because the original study was a cross-sectional study, the

interpretations on temporal and subsequent causal relations of the considered factors to the women's cardiovascular symptoms need to be carefully done. Finally, clinical meanings of the findings on symptom clusters reported in this study are not clear at this point.

Conclusions

In this study, we identified three clusters of midlife women in the U.S. by their cardiovascular symptoms, and found significant racial/ethnic differences in the clusters. Subsequently, we confirmed the association of race/ethnicity to cardiovascular symptom experience during the menopausal transition through a cluser analysis. Based on the findings, we want to conclude this paper with the following suggestions for future research and practice. First of all, this study would be one of the first cluster analyses on midlife women's cardiovascular symptoms, and it has several limitations that require careful interpretation as discussed above. Thus, further international studies with various groups of midlife women are essential to confirm the findings of this study. Also, future studies are needed to confirm the racial/ethnic differences in hormonal levels that may be the reason for the racial/ethnic differences in cardiovascular symptoms experienced during the menopausal transition. In addition, the findings on racial/ethnic differences in the midlife women's experience of cardiovascular symptoms could be used as the basis for clinicians to provide more risk-based screening to promote better cardiovascular outcomes across the globe. Finally, the findings on certain characteristics of midlife women (age, family income, race/ethnicity, self-reported health, and menopausal status) that are linked to the clusters could be used to provide directions for future development of preventive and/or treatment interventions for CVDs.

Acknowledgments

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Table 1

Differences in characteristics of the three clusters (N=966).

Characteristics		Cluster 1	Cluster 2	Cluster 3	Total	X² or F	p
Age, M±SD		49.80±5.45[a]	48.35±5.84[b]	48.52±5.56[b]	49.03±5.66	7.469	.001
Education, n(%)	High school	57(13.0)	51(13.7)	23(14.6)	131(13.6)	8.242	.083
	Partial college	96(22.0)	96(25.8)	51(32.5)	243(25.2)		
	More than college	284(65.0)	225(60.5)	83(52.9)	592(61.3)		
Marital status, n(%)	Married/partnered	293(67.0)	249(66.9)	103(65.6)	645(66.8)	.116	.944
	Non married/separated	144(33.0)	123(33.1)	54(34.4)	321(33.2)		
Employment, n(%)	Yes	336(76.9)	270(72.6)	115(73.2)	721(74.6)	2.160	.340
	No	101(23.1)	102(27.4)	42(26.8)	245(25.4)		
Family income, n(%)	Very hard	56(12.8)	77(20.7)	35(22.3)	168(17.4)	19.236	.001
(difficulty in paying basics)	Somewhat hard	163(37.3)	150(40.3)	67(42.7)	380(39.3)		
	Not hard	218(49.9)	145(39.0)	55(35.0)	418(43.3)		
Acces to health care, n(%)	Yes	391(89.5)	321(86.3)	128(81.5)	840(87.0)	6.665	.952
	No	46(10.5)	51(13.7)	29(18.5)	126(13.0)		
Ethnicity, n(%)	Hispanic	81(18.5)	106(28.5)	47(29.9)	234(24.2)	41.034	.000
	N-H Asian american	80(18.3)	91(24.5)	25(15.9)	196(20.3)		
	N-H African american	144(33.0)	67(18.0)	27(17.2)	238(24.6)		
	N-H White	132(30.2)	108(29.0)	58(36.9)	298(30.8)		
Birthplace, n(%)	The U.S.	352(80.5)	275(73.9)	125(79.6)	752(77.8)	5.454	.065
	Outside the U.S.	85(19.5)	97(26.1)	32(20.4)	214(22.2)		
Acculturation, M±SD	(1-5)	4.64±0.78	4.52±0.88	4.62±0.78	4.59±0.82	2.696	.068
Self reported health	Unhealthy	67(15.3)	95(25.5)	34(21.7)	196(20.3)	20.846	.000
	Don't know	24(5.5)	31(8.3)	17(10.8)	72(7.5)		
	Healthy	346(79.2)	246(66.1)	106(67.5)	698(72.3)		
BMI, n(%)	Normal (<24.9kg/m²)	171(39.1)	138(37.1)	62(39.5)	371(38.4)	2.029	.730
	Overweight (25-29.9 kg/m²)	115(26.3)	89(23.9)	41(26.1)	245(25.4)		
	Obsess (≥30 kg/m²)	151(34.6)	145(39.0)	54(34.4)	350(36.2)		
Diagnosed disease, n(%)	No	250(57.2)	183(49.2)	78(49.7)	511(52.9)	5.959	.051
	Yes	187(42.8)	189(50.8)	79(50.3)	455(47.1)		

Characteristics		Cluster 1	Cluster 2	Cluster 3	Total	$X^{2 \text{ or }} F$	p
Menopause status, n(%)	Pre-menopausal	91(20.8)	124(33.3)	34(21.7)	249(25.8)	23.401	.000
	Peri-menopausal	145(33.2)	128(34.4)	56(35.7)	329(34.1)		
	Post-menopausal	201(46.0)	120(32.3)	67(42.7)	388(40.2)		
Total		437(100.0)	372(100.0)	157(100.0)	966(100.0)		

Table 2

The results of the multinomial logistic regression analyses (N=966).

Variables		Cluster 2 (ref. Cluster1) Adjusted OR(95% CI)	Cluster 3 (ref. Cluster1) Adjusted OR(95% CI)
Ethnicity			
Hispanic	White	1.72[**](1.14-2.62)	1.48(0.89-2.47)
N-H Asian american	White	1.79[*](1.03-3.11)	0.81(0.38-1.72)
N-H African american	White	0.61[*](0.40-0.93)	0.51[**](0.30-0.88)
Menopause status			
Pre-menopausal	Post-menopausal	2.30[**](1.53-3.47)	
Peri-menopausal	Post-menopausal	1.41 (0.99-2.03)	
Family income			
Very hard to pay basics	Not hard	2.05[**](1.26-3.32)	1.91[*](1.03-3.51)
Somewhat hard to pay basics	Not hard	1.30 (0.93-1.83)	1.40 (0.90-2.19)
Disease			
No	Yes	1.59[**](1.16-2.19)	1.58[*](1.05-2.38)
Access to health care			
No	Yes		1.78[*](1.05-3.11)

Twelve independent variables (age, education, marriage status, employment, family income, number of children, birth place, acculturation, disease diagnosed, have a health adviser, self reported health, and BMI) were adjusted and only significant variables were presented in this table.

[§]Age and acculturation were treated as continuous variables.

[*]p<.05,

[**]p<.01

Table 3

Racial/ethnic differences in cardiovascular symptoms in each cluster (N=966).

Clusters	Hispanic	N-H Asian American	N-H African American	N-H White	Total	F	P
1 Total symptoms (0-25)	7.38±5.29[a]	4.45±3.79[b]	6.31±4.80[ab]	7.30±4.91[b]	6.47±4.86	7.194	.000
Cardiorespiratory symptoms (0-7)	1.09±1.51	0.64±1.70	0.90±1.37	1.04±1.42	0.93±1.37	1.913	.126
Discomfort/pain (0-7)	2.37±1.96[a]	1.19±1.58[b]	1.64±1.65[bc]	2.17±1.79[ab]	1.85±1.78	8.512	.000
Musculoskeletal symptoms (0-5)	1.32±1.47[ab]	0.94±1.02[a]	1.31±1.37[ab]	1.47±1.33[b]	1.29±1.33	2.739	.043
Indigestion symptoms (0-3)	0.48±1.78	0.28±0.59	0.44±0.74	0.46±0.70	0.42±0.71	1.494	.215
Vasomotor symptoms (0-3)	2.12±0.95[a]	1.41±0.94[b]	2.01±0.98[a]	2.15±0.91[a]	1.97±0.98	11.644	.000
2 Total symptoms (0-25)	8.21±6.12[ab]	6.55±5.23[a]	8.52±6.08[ab]	9.33±6.42[b]	8.19±6.07	3.642	.013
Cardiorespiratory symptoms (0-7)	1.72±2.01[ab]	1.23±1.63[a]	1.82±1.92[ab]	2.04±2.10[b]	1.71±1.95	2.968	.032
Discomfort/pain (0-7)	3.36±1.93	2.88±1.82	3.10±2.02	3.56±1.97	3.26±1.94	2.251	.082
Musculoskeletal symptoms (0-5)	1.58±1.63	1.37±1.38	1.78±1.53	1.81±1.48	1.63±1.51	1.653	.177
Indigestion symptoms (0-3)	0.75±0.99	0.55±0.85	0.82±0.97	0.86±1.07	0.75±0.98	1.853	.137
Vasomotor symptoms (0-3)	0.79±0.96[ab]	0.52±0.74[a]	1.00±1.04[b]	1.06±1.03[b]	0.84±0.97	6.245	.000
3 Total symptoms (0-25)	8.57±4.72[ab]	5.40±3.32[a]	9.59±4.10[b]	10.07±5.32[b]	8.80±4.90	6.135	.001
Cardiorespiratory symptoms (0-7)	0.81±1.30[ab]	0.20±0.50[a]	1.00±1.04[ab]	1.17±1.56[b]	0.88±1.31	3.505	.017
Discomfort/pain (0-7)	3.13±1.65[ab]	2.12±1.36[a]	3.67±1.64[b]	3.60±1.93[b]	3.24±1.78	5.027	.002
Musculoskeletal symptoms (0-5)	1.51±1.46	1.00±1.19	1.33±1.30	1.66±1.32	1.45±1.35	1.493	.219
Indigestion symptoms (0-3)	1.70±0.91	1.56±0.71	1.74±0.86	1.83±0.86	1.73±0.85	.601	.615
Vasomotor symptoms (0-3)	1.43±1.02[a]	0.52±0.77[b]	1.85±0.82[a]	1.81±0.98[a]	1.50±1.04	12.630	.000

§Post hoc tests: Duncan tests (different letters indicate statistically significant differences at 5% significant level)