Published in final edited form as:

West J Nurs Res. 2019 February ; 41(2): 217–237. doi:10.1177/0193945918767660.

Racial/Ethnic Differences in Cognitive Symptoms during the Menopausal Transition

Eun-Ok Im, PhD, MPH, RN, CNS, FAAN* [Professor], Yun Hu, PhD, RN*,** [Visiting Scholar & Lecturer], Ching-Yu Cheng, PhD, RN*,*** [Visiting Scholar & Professor], Young Ko, PhD, RN+ [Associate Professor], Eunice Chee, BSE++ [Research Assistant], and Wonshik Chee, PhD* [Associate Professor]

*Duke University, School of Nursing, Durham, NC

**Shanghai Jiao Tong University, China

***Chang Gung University of Science and Technology, Taiwan

+Gachon University, Incheon, South Korea

++North Caroline State University, Raleigh, NC

Abstract

The purpose of this study was to explore racial/ethnic differences in midlife women's cognitive symptoms among four major racial/ethnic groups in the U.S. and to determine multiple factors that influenced the women's cognitive symptoms. This was a secondary analysis of the data from two larger studies among 1,054 midlife women. The instruments included multiple questions on background characteristics and health and menopausal status, and the Cognitive Symptom Index for Midlife Women. The data were analyzed using multiple logistic and Poisson regression analyses. There existed significant racial/ethnic differences in the total numbers and total severity scores of cognitive symptoms ($p < .01$); Non-Hispanic Asians had significantly lower total numbers and total severity scores compared with other racial/ethnic groups. Socioeconomic status and health and menopausal status were significant factors that influenced cognitive symptoms across racial/ethnic groups ($p < 0.05$). Further studies on racial/ethnic differences in cognitive symptoms are needed with diverse groups of midlife women.

Keywords

cognitive symptoms; midlife women; race; ethnicity; menopause; factors; predictors

Mainly due to aging process, self-reported memory problems are common in midlife women (Gold et al., 2000; Mitchell & Woods, 2001). Mitchell and Woods (2001) reported that 60% of their research participants noticed memory changes over the last few years. In their study, the participants indicated their problems in remembering words and numbers, interruptions

in everyday behavior due to loss of memory, problems in concentrating, and necessity of memory aids. In the Study of Women's Health Across the Nation (SWAN), a significant association of self-reported forgetfulness to peri-menopausal status was also found (Gold et al., 2000). In the SWAN, 31% of pre-menopausal, 44% of early or late peri-menopausal, and 42% of naturally menopausal women reported forgetfulness. Also, peri-menopausal women were 1.4 times more likely to have forgetfulness than pre-menopausal women after controlling for background characteristics. However, racial/ethnic differences in cognitive symptoms that are experienced during the menopausal transition are not well known in the current literature (Greendale, Derby, & Maki, 2011).

Racial/ethnic Differences in Cognitive Symptoms and their Associated Factors

Estrogens are reported to have salutary neurophysiologic effects; a decrease in estrogens during menopausal transition would be detrimental to women's cognition (McEwen, 2002; 2001). According to McEwen (2001), the hippocampus and prefrontal cortex that is in charge of episodic and working memory is rich in estrogen receptors, and estrogens subsequently play an important role in memory. For example, estrogens increase the level of neurotransmitters (e.g., serotonin, acetylcholine), promote the growth and formation of neural synapses, play a role of antioxidants, and regulate calcium homeostasis and second messenger systems (McEwen, 2002). Therefore, the decrease in estrogens during the menopausal transition could definitely influence cognitive symptoms of the women. In this study, "cognitive symptom" is defined as subjective experience of changes in cognitive functions of a midlife woman and its accompanying bio-psycho-social symptoms (e.g. fatigue, sleep difficulties, mood changes, hot flashes). A broad definition of cognitive symptoms was taken to reflect racial/ethnic variances in symptoms related to cognitive functions that were experienced during the menopausal transition. Subsequently, in this paper, three domains of cognitive symptoms (primary, secondary, and tertiary symptoms) were included as cognitive symptoms. Primary symptoms were those that directly indicated changes in cognitive functions, such as forgetfulness and concentration problems. Secondary symptoms included those that were highly related to changes in cognitive functions, such as depression and anxiousness. Tertiary symptoms included those that could possibly affect cognitive functions, such as hot flush and night sweats. The inclusion of these three domains was essential because different racial/ethnic groups could differently experience and/or report their symptoms due to various reasons (e.g., stigma attached to cognitive symptoms).

Recent studies have supported racial/ethnic differences in hormonal changes (including the decrease in estrogens) during the menopausal transition and subsequent racial/ethnic differences in women's cognitive symptom experience during the menopausal transition. For example, Sutton-Tyrrell and colleagues (2005) reported significant racial/ethnic differences in sex hormone-binding globulin (SHBG) and free androgen index (FAI) among a multi-racial/ethnic cohort of pre-menopausal and peri-menopausal women. Although some researchers claim that racial/ethnic differences in hormone levels during the menopausal transition could be subtle (Richard-Davis & Wellons, 2013), these differences could still

influence cognitive symptoms during the menopausal transition differently in different racial/ethnic groups.

In addition to the hormonal changes, multiple factors have been reported to be associated with cognitive symptoms that are experienced during the menopausal transition, which include employment status, job stress and multiple life roles (Greendale et al., 2011). Socioeconomic status is one of the most frequently reported factors that are significantly associated with cognitive symptoms (Wee et al., 2012). General health and menopausal status are other factors that are significantly correlated to cognitive symptoms et al., 2011). However, the associations of multiple factors to cognitive symptoms in different racial/ethnic groups have rarely been determined, and little is known about the racial/ethnic-specific factors that differently influence cognitive symptoms in different racial/ethnic groups of midlife women (Greendale et al., 2011).

The UCSF symptom management model (Dodd et al., 2001) guided this secondary analysis. This model has been broadly used in research on symptom experience related to various health/disease conditions (Dodd et al., 2001; Linder, 2010; Skelly, Leeman, Carlson, Soward, & Burns, 2008). Three major domains of person, health and illness, and environments are included in the model. The domains interact with three major concepts of the model including symptom experience, symptom management strategies, and outcomes. The major concepts have sub-concepts under them as well. For instance, the concept of symptom experience has three sub-concepts (perception of symptoms, evaluation of symptoms, and response to symptoms). All these domains, concepts, and sub-concepts have been established with empirical evidence from research and practice (Dodd et al., 2001). Among these domains, concepts, and sub-concepts, this secondary analysis specifically targeted to determine the influences of race/ethnicity—a demographic characteristic of a person (under the major domain of person)—on symptom experience (the sub-concept of perception of symptoms under the major concept of symptom experience) (see the below for Aim #1). Here, only perception of symptoms was considered symptom experience, which was a conceptual limitation of this secondary analysis due to limited variables from the original studies. Among the concepts, domains, and sub-concepts, this secondary analysis also targeted two factors related to the major domain of person (background characteristics and health and illness) (see the below for Aim #2).

Purpose

The purpose of this study was to explore racial/ethnic differences in midlife women's cognitive symptoms among four major racial/ethnic groups in the U.S. and to determine multiple factors that influenced the women's cognitive symptoms. This secondary analysis was conducted with the data from two larger Internet survey studies that included four major racial/ethnic groups of midlife women in the U.S. (Non-Hispanic [NH] Whites, Hispanic, NH African Americans, and NH Asians). The specific aims of this secondary analysis were to determine racial/ethnic differences in the total numbers and total severity scores of cognitive symptoms among four major racial/ethnic groups of midlife women in the U.S. (Aim #1), and to determine multiple factors that influenced the total numbers and total severity scores of cognitive symptoms in each racial/ethnic group (Aim #2).

Methods

The data from two cross-sectional national Internet surveys among multi-ethnic groups of midlife women were used for this study (Im et al., 2012; Im, Lee, Chee, Brown, & Dormire, 2010). The original studies got the approvals from the institutional review boards of the institutions where the researchers were affiliated.

Samples and Settings

The data of 1,054 midlife women (316 Non-Hispanic [NH] Whites 255 Hispanics, 250 NH African Americans, and 233 NH Asians) were analyzed in this study. Included were midlife women aged 40 to 60 years who were able to read and write English and who self-identified their racial/ethnic identity as NH White, Hispanic, NH African American or NH Asian. The response rate was calculated based on the total number of visitors at the project websites, which was 95% across the two studies. The pre-determined sample size (N=1,054) from the two studies was adequate for multivariate regression analyses with more than 99.9% power to detect an effect size of 0.4 with 8–10 predictors and a 0.05 alpha level (two-sided).

Instruments

The original studies utilized various instruments, and this study included only the data from the following instruments.

Background characteristic and health status and menopausal status—Multiple questions on age, education, employment, family income, marital status, self-reported racial/ethnic identity, country of birth and level of acculturation were used to measure the women's background characteristics. Socioeconomic status was measured using a question on family income level (the capability to pay for basic necessities such as food, clothing, and shelter). For those who were born outside the U.S., five questions about their preferences on foods, music, customs, language, and close friends (1 = *exclusively own ethnic group* to 5 = *exclusively American*) were asked to measure the level of acculturation. These questions came from the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA)(Suinn, Ahuna, & Khoom, 1992). The mean of these questions was used as the level of acculturation.

Items on body weight and height and a 5-point Likert scale on perceived health (1 = *very unhealthy* to 5 = *very healthy*) were used to measure the women's health status. Also, diagnosed disease(s) and access to health care were measured using two questions. The women's menopausal status was decided based on the data from seven questions on the last menstrual cycle, menstrual regularity, and menstrual flow. When a woman menstruated in the past 3 months without changes in regularity, she was categorized as pre-menopausal. When a woman had menstruation in the past 3 months with increasing irregularity in cycle length over the last year, she was categorized as early peri-menopausal. When a woman had menstruation in the past 12 months but not in the past 3 months, she was categorized as late peri-menopausal. Finally, when a woman did not have menstruation in the past one year, she was categorized as post-menopausal. These categories came from the criteria by the SWAN (Avis et al., 2001).

The Cognitive Symptom Index for Midlife Women (CMW)—The Cognitive Symptom Index for Midlife Women (CMW) was derived from the Midlife Women's Symptom Index (MSI)(Im, 2006). The MSI includes 71 items on physical, psychological, and psychosomatic symptoms that midlife women could experience in their menopausal transition, and the CMW includes only 20 items on cognitive symptoms from the MSI. These items were selected from an extensive literature review on symptoms related to cognitive functions that could be experienced during the menopausal transition (Bender et al., 2006; Centers for Disease Control and Prevention [CDC], 2015; Greendale et al., 2011; Lee, Diwan, & Yeo, 2010). As mentioned above, the items included three domains of cognitive symptoms (primary, secondary, and tertiary symptoms). Each item includes two sub-items: (a) a prevalence item (1 = yes; 0 = no) and (b) a severity item (0 = no symptom~5 = extremely). The total numbers of all the symptoms included in the CMW were summed as the total numbers of total symptoms (0~20). The total severity scores were also calculated by summing the severity scores of all the items in the CMW (0~100). Higher numbers and scores indicate more prevalent and severe symptoms. The reliability of the CMW was supported in this study (KR-20=.89 [for the prevalence items] and Cronbach's alpha=.92 [for the severity items]).

Data Collection Procedures

For the original studies, project websites were developed based on the Health Insurance Portability and Accountability Act (HIPAA) and the SysAdmin, Audit, Network, Security (SANS)/Federal Bureau of Investigation (FBI) recommendations. When a woman came to the project websites after viewing the study announcement, she was required to review the informed consent sheets and give her consent by clicking "I agree to participate in the study." Then, she was checked against the screening questions related to inclusion criteria and quota requirement. When she passed the screening questions, she was asked to answer the Internet survey questions.

Data Analysis

The de-identified data from the parent studies were analyzed using the SPSS (version 24.0) software. Included were only the data with less than 10% missing fields. The data were analyzed using both descriptive and inferential statistics. All statistical analyses were 2-tailed, and an alpha level of 0.05 was used. Two-way ANOVA with post hoc tests using Bonferroni's methods were conducted to identify (a) the main effects of racial/ethnic group and menopausal status on the total numbers and total severity scores of cognitive symptoms, and (b) the effects of interactions between race/ethnicity and menopause on the total numbers and total severity scores of cognitive symptoms.

To determine racial/ethnic differences in the cognitive symptoms (Aim#1), Chi-square tests and analysis of variance (ANOVA) were performed with post hoc tests using the Duncan's method. The one way ANCOVA was performed to find out racial/ethnic differences in the individual severity scores of cognitive symptoms. Then, multinomial logistic regression analyses were performed to compare the frequencies and severity scores of individual cognitive symptoms among racial/ethnic groups.

Poisson regression analyses were performed to identify significant variables associated with the total numbers of cognitive symptoms (Aim #2). Because the assumption of normal distribution (tested with Kolmogorov-Smirnov test) was violated ($p < 0.001$), Poisson regression analyses were chosen (Osgood, 2000). The likelihood ratio χ^2 test was performed to examine the goodness of fit. Finally, logistic regression analyses were also performed to determine the factors that were associated with the total severity scores of cognitive symptoms in each racial/ethnic group (with the Hosmer & Lemeshow goodness of fit test; Aim #2) (Cohen, Cohen, West, & Aiken, 2002).

In the analyses, the confounding variables that were reported to influence the cognitive symptoms (CDC, 2015; age, educational level, and menopausal status) were identified and included as covariates. Previous studies indicated aging as a strong risk factor for cognitive decline (Deary et al., 2009; Salthouse, 2009). Also, educational achievement and menopausal status have been reported to affect cognitive symptoms (Alley, Suthers, & Crimmins, 2007; Scarmeas, Albert, Manly, & Stern, 2006). In the analyses, NH Whites were used as the reference group.

Results

Characteristics of the Participants

In Table 1, background characteristics and health and menopausal status of the participants are summarized. The participants' average age was 48.97 years ($SD=5.69$) in total participants, 49.08 years ($SD=5.62$) among NH Whites, 48.85 years ($SD=5.40$) among Hispanics, 49.34 year ($SD=5.74$) among NH African Americans, and 48.56 years ($SD=6.05$) among NH Asians. About 86% of the participants were college graduates or with graduate degrees. About 68% were married or partnered. About 44% reported that it was not hard to pay for basics (e.g., foods, housing, etc.) with their family income. About 30% were NH Whites, 24% were Hispanics, 23% were NH African Americans, and 22% were NH Asians. About 40% had a normal BMI, and over 52% had newly diagnosed diseases. Over 32% were early or late peri-menopausal. The average level of acculturation was 4.58 (on a 1~5 scale; $SD=0.83$) in total participants, 4.95 ($SD=0.35$) among NH Whites, 4.58 ($SD=0.81$) among Hispanics, 4.95 ($SD=0.30$) among NH African Americans, and 3.66 ($SD=0.98$) among NH Asians. Compared with other racial/ethnic groups, NH Asian women were less likely to be acculturated and peri-menopausal.

Racial/Ethnic Differences in Cognitive Symptoms (Aim #1)

The mean total number of cognitive symptoms was 7.13 ($SD=5.53$, range 1–20). Significant differences were observed in the total numbers of cognitive symptoms among different racial/ethnic groups; Asian women had the lowest total number of cognitive symptoms among all racial/ethnic groups ($p < .01$; see Table 2). The most frequently reported symptoms across the racial/ethnic groups were worrying (54.1%), sleep problems (52.6), and hot flush (44.8%). Statistically significant racial/ethnic differences were observed in the unadjusted frequencies of 14 symptoms ($p < 0.05$; see Table 2). Compared with other racial/ethnic groups, NH Whites were more likely to report all symptoms. NH Asians had the lowest

symptom prevalence rates across all symptoms, except feeling grouchy in which NH African Americans showed the lowest prevalence rate.

In the multinomial logistic regression analyses, Hispanics were less likely to report night sweats (OR=0.49, 95% Confidence Interval [CI]=0.33–0.75), hot flush (OR=0.60, 95% CI=0.42–0.85), sleep problems (OR=0.60, 95% CI=0.42–0.85), mental exhaustion (OR=0.51, 95% CI=0.35–0.75), concentration problems (OR=0.48, 95% CI=0.32–0.71), feeling clumsy (OR=0.36, 95% CI=0.25–0.54), feeling depressed (OR=0.53, 95% CI=0.36–0.79), feeling unhappy (OR=0.56, 95% CI=0.38–0.82), feeling anxious (OR=0.63, 95% CI=0.43–0.93), feeling easily hurt (OR=0.65, 95% CI=0.45–0.94), and feeling grouchy (OR=0.57, 95% CI=0.39–0.83) than NH Whites. NH Asians were less likely to report all symptoms than NH Whites. Compared with NH Whites, NH African Americans were more likely to report hot flush (OR=1.50, 95% CI=1.05–2.15), but less likely to report feeling clumsy (OR=0.52, 95% CI=0.35–0.78), feeling easily hurt (OR=0.64, 95% CI=0.44–0.93), and feeling grouchy (OR=0.61, 95% CI=0.41–0.90).

The mean total severity score was 22.28 (SD=20.38, range 1–100) across all racial/ethnic groups. Significant racial/ethnic differences were observed in the unadjusted mean total severity scores; NH Asians had significantly lower total severity scores compared with other racial/ethnic groups ($p<.01$; Table 3). The severity scores of all individual symptoms were significantly different by racial/ethnic group ($p<.05$). Across the symptoms, NH Asians had lower severity scores of individual symptoms than other racial ethnic groups.

In the multinomial logistic regression analyses, the participants were divided into two groups by the severity scores: (a) one group with the severity scores of “not at all” and “a little bit,” and (b) the other group with the severity scores of “moderately,” “quite a bit,” and “extremely.” The multinomial logistic regression analyses indicated that Hispanics were less likely to report feeling unhappy (OR=0.51, 95% CI=0.27–0.94) compared with NH Whites. Compared with NH Whites, NH Asians were less likely to report hot flush (OR=0.42, 95% CI=0.21–0.83), sleep problems (OR=0.41, 95% CI=0.21–0.82), mental exhaustion (OR=0.37, 95% CI=0.18–0.77), feeling depressed (OR=0.36, 95% CI=0.17–0.77), feeling unhappy (OR=0.38, CI=0.19–0.77), feeling getting down (OR=0.38, 95% CI=0.19–0.78), and feeling irritated (OR=0.49, CI=0.26–0.89). Compared with NH Whites, NH African Americans were more likely to report hot flush (OR=1.19, 95% CI=0.72–1.96), but less likely to report feeling anxious (OR=0.55, 95% CI=0.31–0.98).

Racial/Ethnic Differences in Cognitive Symptoms by Menopausal Status (Aim #1)

Post-menopausal women had higher total numbers and total severity scores than pre- and peri-menopausal women among all racial/ethnic groups except NH Asians. Among NH Asians, peri-menopausal women had significantly higher total numbers and total severity scores of cognitive symptoms than pre- or post-menopausal women. The main effects of race/ethnicity and menopausal status were significant for both total numbers and total severity scores of cognitive symptoms ($p<.05$) (Table 4). Interactions between race/ethnicity and menopausal status were also significant for the total numbers and severity scores of cognitive symptoms ($p<.05$) (Table 4).

Subsequent ANOVA and post hoc tests by Duncan were performed to identify the differences in the total numbers and severity scores of cognitive symptoms by menopausal status. The results showed that, among Hispanics, NH African Americans, and NH Whites, the total numbers and severity scores of peri-menopausal women were lower than those of the post-menopausal women ($p<0.05$) (see Figures 1 and 2). Among Asians, the total numbers and severity scores of peri-menopausal women were higher than those of post-menopausal women ($p<0.05$) (Figures 1 & 2).

Factors Associated with Cognitive Symptoms (Aim #2)

Across the racial/ethnic groups, family income (very hard to pay for basics, $\beta=0.17$, $p<0.01$ & somewhat hard to pay for basics, $\beta=0.08$, $p=0.01$), the country of birth (the U.S., $\beta=0.78$, $p<0.01$), BMI (overweight, $\beta=0.08$, $p<0.01$), perceived health (unhealthy, $\beta=0.10$, $p<0.01$ & don't know, $\beta=0.14$, $p<0.01$), and menopausal status (pre-, $\beta=-1.78$, $p<0.01$ & peri, $\beta=-0.47$, $p<0.01$) were significantly associated with the total numbers of cognitive symptoms. Among NH Whites, age ($\beta=-0.01$, $p=0.04$), family income (very hard to pay for basics, $\beta=0.13$, $p=0.03$), the country of birth (the U.S., $\beta=1.32$, $p<0.01$), diagnosed disease(s) (yes, $\beta=-0.10$, $p=0.02$), perceived health (unhealthy, $\beta=0.15$, $p<0.01$ & don't know, $\beta=0.21$, $p<0.01$), and menopausal status (pre-, $\beta=-1.82$, $p<0.01$ & peri, $\beta=-0.42$, $p<0.01$) were significantly associated with the total numbers of cognitive symptoms. Among Hispanics, the level of acculturation ($\beta=0.24$, $p<0.01$), employment (employed, $\beta=-0.19$, $p<0.01$), and menopausal status (pre-, $\beta=-1.65$, $p<0.01$ & peri-, $\beta=-0.45$, $p<0.01$) were significantly associated with the total numbers of cognitive symptoms. Among NH African Americans, menopausal status (pre-, $\beta=-1.82$, $p<0.01$ & peri, $\beta=-0.57$, $p<0.01$) was significantly associated with the total numbers of cognitive symptoms. Among NH Asians, age ($\beta=0.02$, $p<0.01$), education (less than high school, $\beta=-0.22$, $p=0.02$), family income (very hard to pay for basics, $\beta=0.40$, $p<0.01$ & somewhat hard to pay for basics, $\beta=0.24$, $p<0.01$), employment (employed, $\beta=-0.11$, $p=0.09$), the country of birth (the U.S., $\beta=0.41$, $p=0.02$), perceived health (don't know, $\beta=0.30$, $p<0.01$), diagnosed disease(s)(yes, $\beta=0.29$, $p<0.01$), and menopausal status (pre-, $\beta=-1.40$, $p<0.01$) were significantly associated with the total numbers of cognitive symptoms.

For binomial logistic regression analyses on the total severity scores, the participants in the total group and each racial/ethnic group were divided into two groups based on the mean severity scores (low versus high cognitive symptom severity groups). For example, the mean severity score of cognitive symptoms was 26.35 among NH Whites. Thus, NH White women with mean severity scores over 26.35 were categorized into the high cognitive symptom severity group, and those with mean severity scores of less than or equal to 26.35 were categorized into the low cognitive symptom severity group. In total participants (across all the racial/ethnic groups), very low (OR=2.80, 95% CI=1.66–4.75) and somewhat low family income (OR=1.57, 95% CI=1.07–2.31), overweight (25 to <30)(OR=1.66, 95% CI=1.04–2.64), perceived health as unhealthy (OR=2.08, 95% CI=1.31–3.31) and don't know (OR=1.98, 95% CI=1.09–3.62), and pre- (OR=0.00, 95% CI= 0.00–0.01) and peri-menopausal status (OR=0.10, 95% CI= 0.06–0.17) were significantly associated with the total severity scores of cognitive symptoms. Among NH Whites, age (OR=0.91, 95% CI= 0.85–0.97), very low family income (OR=5.05, 95% CI=1.76–14.51), overweight (OR=2.83,

95% CI=1.08–7.43), perceived health as unhealthy (OR=2.86, 95% CI=1.12–7.30), and pre-menopausal status (OR=0.12, 95% CI=0.05–0.31) were significantly associated with the total severity scores. Among Hispanics, pre- (OR=0.00, 95% CI=0.00–0.01) and peri-menopausal statuses (OR=0.14, 95% CI=0.05–0.37) were significantly associated with the total severity scores. Among NH Asians, very low (OR=3.32, 95% CI=1.04–10.64) and somewhat low family income (OR=2.12, 95% CI=1.02–4.43), and pre-menopausal status (OR=0.01, 95% CI=0.00–0.23) were significantly positively associated with the total severity scores for cognitive symptoms. Among NH African Americans, pre- (OR=0.00, 95% CI=0.00–0.01) and peri-menopausal statuses (OR=0.05, 95% CI=0.01–0.20) were significantly associated with the total severity scores of cognitive symptoms. The Hosmer and Lemeshow goodness of fit tests indicated that all the logistic regression models had acceptable fit indices ($p>0.05$).

Discussion

The findings of this study supported that there were significant racial/ethnic differences in the total numbers and total severity scores of cognitive symptoms that were experienced during the menopausal transition, and the main effects of race/ethnicity and menopausal status were significant for both the total numbers and total severity scores of cognitive symptoms (Aim #1). Interactions between race/ethnicity and menopausal status were also significant for both the total numbers and severity scores of cognitive symptoms. In general, these findings are consistent with the existing literature that has supported significant associations of race/ethnicity to cognitive symptoms (Greendale et al., 2011). As discussed above, researchers have reported racial/ethnic differences in hormone trajectories during the menopausal transition (Weiss, Skurnick, Goldsmith, Santoro, & Park, 2004), which could partially explain the significant associations of race/ethnicity to cognitive symptoms that are experienced during the menopausal transition (McEwen, 2002).

The directions of racial/ethnic differences that were found in this study are also consistent with those in the literature. As in most studies (Gold et al., 2000; Randolph et al., 2003; Richard-Davis & Wellons, 2013), White women had larger total numbers and higher total severity scores of cognitive symptoms than other racial/ethnic groups during their peri-menopausal status while Asian women had smaller total numbers and lower severity scores of cognitive symptoms than other racial/ethnic groups during their peri-menopausal status. Richard-Davis and Wellons (2013) suspected that NH Asian women's lower estradiol levels than NH White women would be a possible reason for these racial/ethnic differences. Randolph et al. (2003) also confirmed that Chinese women had lower levels of unadjusted serum estradiol and sex hormone-binding globulin than other racial/ethnic groups after controlling for their body size.

In this secondary analysis, yet, the racial/ethnic differences in individual symptoms totally depended on the types of symptoms. In some individual symptoms, NH Whites had higher frequencies and higher severity scores than other racial/ethnic groups, while other racial/ethnic groups had higher frequencies and higher severity scores in other symptoms than NH Whites. However, these differences in individual symptoms have rarely been reported in the literature, which needs further investigations.

The findings in total participants that post-menopausal women had larger total numbers and higher severity scores of cognitive symptoms than those in the peri-menopausal period are consistent with those of existing studies (Pérez, Garcia, Palacios, & Pérez, 2009). As discussed above, women's menopausal transition results in various physical and psychosocial changes that are often linked to cognitive impairment, which subsequently make midlife women experience cognitive symptoms that they did not experience before (Gold et al., 2000; Mitchell & Woods, 2001). Thus, it is natural that post-menopausal women would be the group who has larger numbers and higher severity scores of cognitive symptoms compared with peri-menopausal women who have not gone through all these changes yet.

The findings among Asian women (the total numbers and severity scores were higher in the peri-menopausal period compared with those in the post-menopausal period), yet, do not agree with the findings in the literature, which needs further investigations to confirm. A possible reason for this finding would be: Asian women were the group with the smallest numbers and lowest severity scores of cognitive symptoms, which subsequently made it difficult to determine the differences due to small variances in their symptom scores. Or, as reported in the literature (Frank et al., 2013; Gold et al., 2000; Richard-Davis & Wellons, 2013), their symptom experience during the menopausal transition could be simply different from other racial/ethnic groups' due to the hormonal differences that were discussed above.

Although the factors that influenced the women's cognitive symptoms were different in each racial/ethnic group, family income, the country of birth, BMI, perceived general health, and menopausal status were significantly associated with cognitive symptoms across the racial/ethnic groups (Aim #2). These findings are consistent with those reported in the literature, which support that socioeconomic status is an important factor that significantly influences cognitive symptoms (Bender et al., 2006; CDC, 2015; Greendale et al., 2011; Lee et al., 2010). Although there still exists a question on the association of socioeconomic status to cognitive symptoms in the literature, researchers in general agree that proxy measures of socioeconomic status (e.g., education, manual occupation) are significantly related to cognitive impairments (Marengoni, Fratiglioni, Bandinelli, & Ferrucci, 2011). Furthermore, self-reported health and menopausal status are other significant factors that have been reported to influence cognitive symptoms (Greendale et al., 2011). Yet, the significant association between the country of birth and cognitive symptoms has rarely been reported in the literature. A possible reason for this association would be the healthy immigrant effect (Organista, Organista, & Kurasaki, 2003); immigrants are a selected group of healthy people who subsequently experience less cognitive symptoms.

This analysis has several limitations mainly due to the shortcomings of the original studies. First of all, the findings need to be carefully interpreted because the participants tended to be highly educated, married, and employed women. Subsequently, there could exist some potential bias from the selected characteristics of the participants. Also, again, a broad scope of symptoms was included as cognitive symptoms in this analysis to adequately measure potential racial/ethnic variances in midlife women's cognitive symptom experience. Furthermore, the data were based on self-reports and there were no objective measurements and/or validation of the self-reported data, which might be another source of potential bias.

In addition, clinical meanings of the racial/ethnic differences in cognitive symptoms that are reported in this paper are not clear at this point. Finally, because the original studies were cross-sectional studies using Internet surveys, there was no way to determine temporal and/or causal relations between race/ethnicity and multiple factors and cognitive symptoms.

Based on the findings, the following implications are proposed for future research. First, further studies with diverse groups of midlife women are needed on racial/ethnic differences in cognitive symptoms that are experienced during the menopausal transition. As mentioned above, the participants of the original study tended to be a selected group of midlife women, which limits the generalizability of the findings reported in this paper. As discussed above, we also considered a broad scope of symptoms related to cognitive functions in this analysis to adequately reflect racial/ethnic variances in cognitive symptom experience. Thus, more investigations on racial/ethnic differences in individual symptoms and subsequent racial/ethnic specific symptom clusters are essential to identify racial/ethnic differences in cognitive symptoms. Finally, more studies on the factors that are differently associated with cognitive symptoms in different racial/ethnic groups are needed to confirm the findings reported in this paper.

Acknowledgments

This is a secondary analysis of the quantitative data from two larger studies that were funded by the National Institutes of Health (NIH/NINR/NIA, 1R01NR008926 and NIH/NINR/ NHLBI, R01NR010568). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

- Alley D, Suthers K, Crimmins E. 2007; Education and cognitive decline in older Americans: Results from the AHEAD sample. *Research on Aging*. 29(1):73–94. DOI: 10.1177/0164027506294245 [PubMed: 19830260]
- Avis NE, Stellato R, Crawford S, Bromberger J, Ganz P, Cain V, Kagawa-Singer M. 2001; Is there a menopausal syndrome? Menopausal status and symptoms across racial/ethnic groups. *Social Science & Medicine* (1982). 52(3):345–356. [PubMed: 11330770]
- Bender CM, Sereika SM, Berga SL, Vogel VG, Brufsky AM, Paraska KK, Ryan CM. 2006; Cognitive impairment associated with adjuvant therapy in breast cancer. *Psycho-Oncology*. 15(5):422–430. DOI: 10.1002/pon.964 [PubMed: 16097037]
- Centers for Disease Control and Prevention. Cognitive impairment: A call for action now!. 2015. Retrieved from http://www.cdc.gov/aging/pdf/cognitive_impairment/cogimp_poilicy_final.pdf
- Cohen, J, Cohen, P, West, SG, Aiken, LS. *Applied multiple regression/correlation analysis for the behavioral sciences*. 3. Mahwah, N.J: Routledge; 2002.
- Deary IJ, Corley J, Gow AJ, Harris SE, Houlihan LM, Marioni RE, ... Starr JM. 2009; Age-associated cognitive decline. *British Medical Bulletin*. 92:135–152. DOI: 10.1093/bmb/ldp033 [PubMed: 19776035]
- Dodd M, Janson S, Facione N, Faucett J, Froelicher ES, Humphreys J, ... Taylor D. 2001; Advancing the science of symptom management. *Journal of Advanced Nursing*. 33(5):668–676. [PubMed: 11298204]
- Frank ATH, Zhao B, Jose PO, Azar KMJ, Fortmann SP, Palaniappan LP. 2013; Racial/ethnic differences in dyslipidemia patterns. *Circulation*. 129(5):570–579. DOI: 10.1161/CIRCULATIONAHA.113.005757 [PubMed: 24192801]

- Gold EB, Sternfeld B, Kelsey JL, Brown C, Mouton C, Reame N, ... Stellato R. 2000; Relation of demographic and lifestyle factors to symptoms in a multi-racial/ethnic population of women 40–55 years of age. *American Journal of Epidemiology*. 152(5):463–473. [PubMed: 10981461]
- Greendale GA, Derby CA, Maki PM. 2011; Perimenopause and cognition. *Obstetrics and Gynecology Clinics of North America*. 38(3):519–535. DOI: 10.1016/j.ogc.2011.05.007 [PubMed: 21961718]
- Im EO. 2006; The Midlife Women's Symptom Index (MSI). *Health Care for Women International*. 27:268–287. [PubMed: 16524856]
- Im EO, Lee B, Chee W, Brown A, Dormire S. 2010; Menopausal symptoms among four major ethnic groups in the United States. *Western Journal of Nursing Research*. 32(4):540–565. [PubMed: 20685910]
- Im EO, Chang SJ, Ko Y, Chee W, Stuifbergen A, Walker L. 2012; A national internet survey on midlife women's attitudes toward physical activity. *Nursing Research*. 61(5):342–352. [PubMed: 22699941]
- Lee SE, Diwan S, Yeo G. 2010; Causal attributions of dementia among Korean American immigrants. *Journal of Gerontological Social Work*. 53(8):743–759. DOI: 10.1080/01634372.2010.515290 [PubMed: 20972929]
- Linder L. 2010; Analysis of the UCSF Symptom Management Theory: Implications for pediatric oncology nursing. *Journal of Pediatric Oncology Nursing*. 27(6):316–324. DOI: 10.1177/1043454210368532 [PubMed: 20639345]
- Marengoni A, Fratiglioni L, Bandinelli S, Ferrucci L. 2011; Socioeconomic status during lifetime and cognitive impairment no-dementia in late life: The population-based aging in the Chianti Area (InCHIANTI) Study. *Journal of Alzheimer's Disease*. 24(3):559–568. DOI: 10.3233/JAD-2011-101863
- McEwen B. 2001; Invited review: Estrogens effects on the brain: Multiple sites and molecular mechanisms. *Journal of Applied Physiology*. 91(6):2785–2801. [PubMed: 11717247]
- McEwen B. 2002; Estrogen actions throughout the brain. *Recent Progress in Hormone Research*. 57:357–384. [PubMed: 12017552]
- Mitchell SE, Woods NF. 2001; Midlife women's attributions about perceived memory changes: observations from the Seattle Midlife Women's Health Study. *Journal of Women's Health & Gender-Based Medicine*. 10(4):351–362. DOI: 10.1089/152460901750269670
- Organista, PB, Organista, KC, Kurasaki, K. The relationship between acculturation and ethnic minority health. In: Chun, NKM, Organista, PB, Marin, G, editors. *Acculturation: Advances in theory, measurement, and applied research*. Washington, DC: American Psychological Association; 2003. 139–162.
- Osgood DW. 2000; Poisson-based regression analysis of aggregate crime rates. *Journal of Quantitative Criminology*. 16(1):21–43. DOI: 10.1023/A:1007521427059
- Pérez JAM, Garcia FC, Palacios S, Pérez M. 2009; Epidemiology of risk factors and symptoms associated with menopause in Spanish women. *Maturitas*. 62(1):30–36. DOI: 10.1016/j.maturitas.2008.10.003 [PubMed: 19010615]
- Randolph JF Jr, Sowers M, Gold EB, Mohr BA, Luborsky J, Santoro N, ... Lasley BL. 2003; Reproductive hormones in the early menopausal transition: relationship to ethnicity, body size, and menopausal status. *The Journal of Clinical Endocrinology and Metabolism*. 88(4):1516–1522. DOI: 10.1210/jc.2002-020777 [PubMed: 12679432]
- Richard-Davis G, Wellons M. 2013; Racial and ethnic differences in the physiology and clinical symptoms of menopause. *Seminars in Reproductive Medicine*. 31(5):380–386. DOI: 10.1055/s-0033-1348897 [PubMed: 23934699]
- Salthouse TA. 2009; When does age-related cognitive decline begin? *Neurobiology of Aging*. 30(4): 507–514. DOI: 10.1016/j.neurobiolaging.2008.09.023 [PubMed: 19231028]
- Scarmeas N, Albert SM, Manly JJ, Stern Y. 2006; Education and rates of cognitive decline in incident Alzheimer's disease. *Journal of Neurology, Neurosurgery, and Psychiatry*. 77(3):308–316. DOI: 10.1136/jnnp.2005.072306
- Skelly AH, Leeman J, Carlson J, Soward ACM, Burns D. 2008; Conceptual model of symptom-focused diabetes care for African Americans. *Journal of Nursing Scholarship*. 40(3):261–267. DOI: 10.1111/j.1547-5069.2008.00236.x [PubMed: 18840210]

- Suinn RM, Ahuna C, Khoom G. 1992; The Suinn-Lew Asian Self-Identity Acculturation Scale: Concurrent and factorial validation. *Educational and Psychological Measurement*. 52(4):1041–1046.
- Sutton-Tyrrell K, Wildman RP, Matthews KA, Chae C, Lasley BL, Brockwell S. ... SWAN Investigators. 2005; Sex-hormone-binding globulin and the free androgen index are related to cardiovascular risk factors in multiethnic premenopausal and perimenopausal women enrolled in the Study of Women Across the Nation (SWAN). *Circulation*. 111(10):1242–1249. DOI: 10.1161/01.CIR.0000157697.54255.CE [PubMed: 15769764]
- Wee LE, Yeo WX, Yang GR, Hannan N, Lim K, Chua C, ... Shen HM. 2012; Individual and area level socioeconomic status and its association with cognitive function and cognitive impairment (Low MMSE) among community-dwelling elderly in Singapore. *Dementia and Geriatric Cognitive Disorders EXTRA*. 2(1):529–542. DOI: 10.1159/000345036 [PubMed: 23277785]
- Weiss G, Skurnick JH, Goldsmith LT, Santoro NF, Park SJ. 2004; Menopause and hypothalamic-pituitary sensitivity to estrogen. *JAMA*. 292(24):2991–2996. DOI: 10.1001/jama.292.24.2991 [PubMed: 15613667]

Figure 1.
Total numbers of cognitive symptoms by menopausal status and race/ethnicity.

Figure 2.
Total severity scores of cognitive symptoms by menopausal status and race/ethnicity.

Table 1
Background characteristics and health and menopausal status of the participants (N=1,054).

Characteristics	Racial/Ethnic Groups				
	Total N (%)	Hispanic n (%)	NH* Asian n (%)	NH AA** n (%)	NH White n (%)
Education					
High school	141(13.38)	43(30.5)	30(21.3)	17(12.1)	51(36.2)
>High school	913(86.62)	212(23.2)	203(22.2)	233(25.5)	265(29.0)
Employment					
Employed	790(75.0)	208(26.3)	145(18.4)	209(26.5)	228(28.9)
Unemployed	264(25.0)	47(17.8)	88(33.3)	41(15.5)	88(33.3)
Family income***					
Very hard	185(17.6)	41(22.2)	20(10.8)	32(17.3)	92(49.7)
Somewhat hard	406(38.5)	104(25.6)	88(21.7)	102(25.1)	112(27.6)
Not hard	463(43.9)	110(23.8)	125(27.0)	116(25.1)	112(24.2)
Marital status					
Married/partnered	714(67.7)	172(24.1)	196(27.5)	134(18.8)	212(29.7)
Single/separated	340(32.3)	83(24.4)	37(10.9)	116(34.1)	104(30.6)
Country of birth					
US	811(76.9)	195(24.0)	63(7.8)	244(30.1)	309(38.1)
Outside of US	243(23.1)	60(24.7)	170(70)	6(2.5)	7(2.9)
Diagnosed disease(s)					
Yes	288(52.2)	118(25.0)	63(13.3)	124(26.3)	167(35.4)
No	264(47.8)	137(23.5)	170(29.2)	126(21.6)	149(25.6)
BMI					
Normal (<25)	423(40.1)	72(17.0)	165(39.0)	59(13.9)	127(30.0)
Overweight (<30)	265(25.1)	83(31.3)	54(20.4)	61(23.0)	67(25.3)
Obese (≥ 30)	366(34.7)	100(27.3)	14(3.8)	130(35.5)	122(33.3)
Perceived health					
Unhealthy	202(19.17)	60(29.7)	32(15.8)	33(16.3)	77(38.1)
Don't know	77(7.31)	17(22.1)	23(29.9)	16(20.8)	21(27.3)

Characteristics	Racial/Ethnic Groups				
	Total N (%)	Hispanic n (%)	NH* Asian n (%)	NH AA** n (%)	NH White n (%)
Healthy	775(73.53)	178(23.0)	178(23.0)	201(25.9)	218(28.1)
Diagnosed disease(s)					
Yes	472(44.8)	118(25.0)	63(13.3)	126(21.6)	149(25.6)
No	582(55.2)	137(23.5)	170(29.2)	124(26.3)	167(35.4)
Access to health care					
Yes	227(24.9)	177(19.4)	234(25.6)	275(30.1)	913(86.6)
No	28(19.9)	56(39.7)	16(11.3)	41(29.1)	141(13.4)
Menopausal status					
Pre-	296(28.1)	58(19.6)	44(14.9)	95(32.1)	99(933.4)
Peri	340(32.3)	90(26.5)	14(4.1)	105(30.9)	131(38.5)
Post	418(39.7)	107(25.6)	175(41.9)	50(12.0)	86(20.6)
Total	1,054(100)	255(100)	233(100)	250(100)	316(100)

* NH=Non-Hispanic,

** AA=African Americans/

*** The capability to pay for basic necessities.

Table 2

Racial/ethnic differences in the frequencies of cognitive symptoms (N=1,054).

Symptoms	Racial/Ethnic Groups					X ² (p)
	Total N (%)	Hispanic n (%)	NH [*] Asian n (%)	NH AA ^{**} n (%)	NH White n (%)	
Night sweats	287(27.2)	61(21.3)	28(9.8)	91(31.7)	107(37.3)	46.24(0.00)
Hot flush	472(44.8)	112(23.7)	51(10.8)	145(30.7)	164(34.7)	73.60(0.00)
Sleep problems	554(52.6)	136(24.5)	90(16.2)	140(25.3)	188(33.9)	25.48(0.00)
Mental exhaustion	482(45.7)	125(25.9)	71(14.7)	113(23.4)	173(35.9)	33.35(0.00)
Concentration problems	310(29.4)	76(24.5)	43(13.9)	73(23.5)	118(38.1)	23.07(0.00)
Feeling clumsy	282(26.8)	64(22.7)	33(11.7)	61(21.6)	124(44.0)	45.05(0.00)
Worrying about	570(54.1)	164(28.8)	88(15.4)	138(24.2)	180(31.6)	36.90(0.00)
Feeling depressed	346(32.8)	86(24.9)	59(17.1)	80(23.1)	121(35.0)	10.40(0.02)
Feeling unhappy	358(34.0)	88(24.6)	66(18.4)	79(22.1)	125(34.9)	8.37(0.04)
Feeling getting down	366(34.7)	105(28.7)	65(17.8)	73(19.9)	123(33.6)	15.3(0.00)
Often crying	239(22.7)	70(29.3)	32(13.4)	48(20.1)	89(37.2)	21.09(0.00)
Feeling anxious	398(37.8)	106(26.6)	72(18.1)	82(20.6)	138(34.7)	13.55(0.00)
Feeling easily hurt	402(38.1)	106(26.4)	73(18.2)	81(20.1)	142(35.3)	15.53(0.00)
Feeling grouchy	363(34.4)	95(26.2)	60(23.3)	74(20.4)	134(36.9)	20.16(0.00)
Mood swing	432(41.0)	110(25.5)	77(17.8)	106(24.5)	139(32.2)	7.94(0.04)
Total numbers of symptoms	M±SD 7.13±5.53	M±SD 7.63±5.33 ^{bc}	M±SD 5.28±5.10 ^a	M±SD 6.97±5.36 ^b	M±SD 8.23±5.79 ^c	F(p) 14.10(0.00)

* NH=Non-Hispanic,

** AA=African Americans/

Notes: Post Hoc Tests by Duncan (a b bc c)/ Only significant findings are reported in Table 2.

Table 3

Racial/ethnic differences in the severity scores of individual symptoms (ANCOVA, N=1,054).

Severity of symptoms	Total	Hispanic ^a		NH Asian ^b		NH AA ^c		NH White ^d		F(p)
	M ±SD	M ±SD	M ±SD	M ±SD	M ±SD	M ±SD	M ±SD	M ±SD		
Night sweats	0.89±1.54	0.75±1.42	0.36±1.03	1.16±1.64	1.16±1.75	32.27(0.00)	$b_{<a<c,d}$			
Hot flush	1.40±1.70	1.37±1.68	0.59±1.18	1.84±1.75	1.67±1.81	47.79(0.00)	$a_{<c,d}$			
Mental exhaustion	1.54±1.80	1.70±1.86	0.95±1.52	1.46±1.72	1.91±1.90	42.87(0.00)	$a_{<c,d}$			
Sleep problems	1.85±1.90	1.90±1.95	1.29±1.74	1.94±1.86	2.16±1.94	26.75(0.00)	$b_{<a<d}, b_{<c}$			
Feeling tense	0.68±1.32	0.82±1.44	0.48±1.10	0.64±1.30	0.74±1.38	8.95(0.00)	$b_{<b,c,d}$			
Feeling keyed up	0.60±1.29	0.66±1.35	0.47±1.11	0.53±1.27	0.70±1.39	8.93(0.00)	$b_{<a,c,d}$			
Easily excitable	0.64±1.29	0.71±1.40	0.56±1.21	0.61±1.26	0.66±1.27	5.22(0.00)	$b_{<a,c,d}$			
Concentration problems	0.91±1.50	0.95±1.53	0.54±1.20	0.88±1.48	1.18±1.63	28.59(0.00)	$b_{<a<d,c}$			
Feeling clumsy	0.78±1.38	0.77±1.44	0.40±1.05	0.66±1.27	1.15±1.55	31.86(0.00)	$b_{<a,c<d}$			
Worrying	1.77±1.79	2.16±1.82	1.15±1.59	1.80±1.78	1.87±1.80	28.51(0.00)	$b_{<a,c,d}$			
Easily forgettable	1.59±1.68	1.71 ±1.68	1.38±1.61	1.48±1.64	1.75±1.73	13.07(0.00)	$b_{<a,c,d}$			
Feeling unhappy	1.07±1.60	1.07±1.60	0.84±1.42	0.99±1.56	1.30±1.73	19.57(0.00)	$b_{<a<d}, b_{<c}$			
Feeling depressed	1.05±1.60	1.11±1.66	0.76±1.37	1.00±1.55	1.25±1.73	24.29(0.00)	$b_{<a,d}, b_{<c}$			
Feeling getting down	1.10±1.62	1.36±1.74	0.82±1.41	0.90±1.50	1.27±1.71	18.34(0.00)	$b_{<a,c,d}$			
Often crying	0.68±1.34	0.81±1.43	0.39±1.07	0.58±1.27	0.85±1.47	19.13(0.00)	$b_{<a,c,d}$			
Feeling irritated	1.22±1.60	1.36±1.66	1.08±1.48	1.02±1.51	1.36±1.70	14.58(0.00)	$b_{<a,c,d}$			
Feeling anxious	1.15±1.60	1.30±1.67	0.93±1.48	0.94±1.45	1.36±1.69	19.46(0.00)	$b_{<a,c,d}$			
Feeling easily hurt	1.12±1.55	1.21±1.57	0.90±1.41	0.91±1.43	1.38±1.68	17.41(0.00)	$b_{<a,c<d}$			
Feeling grouchy	1.02 ±1.50	1.10±1.55	0.76±1.35	0.86±1.42	1.26±1.59	20.95(0.00)	$b_{<a<d}, a_{<c}$			
Mood swing	1.25±1.61	1.33±1.64	0.97±1.47	1.26±1.58	1.38±1.69	20.99(0.00)	$b_{<a,c,d}$			
Total severity scores of symptoms	M±SD 22.28±20.38	M±SD 24.13±20.33	M±SD 15.64±17.43	M±SD 21.46±19.26	M±SD 26.35±22.03	M±SD				
						60.08(0.00)	$b_{<a<d}, b_{<c}$			

Notes:

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

^aHispanic,
^bNon-Hispanic (NH) Asian,
^cNH African Americans,
^dNH White/
AA=African Americans/ Post hoc tests by Bonferroni/ Covariates: age, education, menopause status

Table 4

Total numbers and total severity scores of cognitive symptoms by menopausal status and racial/ethnic groups (N=1,054).

Total numbers	Menopausal Status			F (p)
	Pre ^a M ±SD	Peri ^b M ±SD	Post ^c M ±SD	
Hispanic ^{y,z}	2.41±2.24	8.22±3.32	9.94±5.96	Race/ethnicity 13.67(0.00)
NH [*] Asian ^x	1.84±1.48	9.78±4.72	5.78±5.26	Menopausal status 360.59(0.00)
NH AA ^{**y}	2.31±1.95	8.04±3.62	13.56±4.70	Race/ethnicity [*] 22.46(0.00)
NH White ^z	2.17±1.90	8.86±3.61	14.24±4.50	menopausal status
Total severity scores	Menopausal Status			F(P)
	Pre ^b M ±SD	Peri ^b M ±SD	Post ^a M ±SD	
Hispanic ^z	6.76±6.77	23.94±11.25	33.71±24.54	Race/ethnicity 12.36(0.00)
NH Asian ^x	4.95±4.81	30.93±17.49	17.10±18.08	Menopausal status 296.50(0.00)
NH AA ^y	6.20±5.74	23.77±12.15	45.60±21.22	Race/ethnicity [*] 21.76(0.00)
NH White ^z	5.73±5.48	26.95±13.57	49.16±21.43	menopausal status

* NH=Non-Hispanic,

** AA = African American/

Notes: Differences by menopausal status (post hoc tests by Bonferroni): a<b<c / Differences by racial/ethnic groups with post hoc tests by Duncan: x<y<yz<z