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Role of ethnicity in the expression of features of hot flashes

James W. Simpkins^{a,*}, Kimberly Brown^a, Sejong Bae^b, Anna Ratka^c

^aDepartment of Pharmacology & Neuroscience and the Institute for Aging and Alzheimer's Disease Research, University of North Texas Health Science Center, Fort Worth, TX 76107, United States

^bDepartment of Biostatistics, School of Public Health, University of North Texas Health Science Center, Fort Worth, TX 76107, United States

^cDepartment of Pharmaceutical Sciences, Rangel College of Pharmacy, Texas A&M Health Science Center Kingsville, TX 78363, United States

Abstract

The overall goal of this study was to determine the role of ethnicity on features of hot flashes (HFs) in a population of menopausal women in North Central Texas. A total of 397 ethnically diverse menopausal women from North Central Texas were administered our Menopausal Vasomotor Symptoms (MVS) survey to ascertain accurate information about number, length, intensity and behaviorally disruptive effects of hot flash episodes for subsequent analysis for the role of ethnicity in the occurrence of hot flashes. The mean (SD) age for participants was 50.2 (5.3) years; 40% were Caucasian, 38% were African-American and 22% were Hispanic. To evaluate and identify potential associations of hot flash (HF) features, ethnicity, and other independent variables, ordinal/multinomial/binary logistic regression models were used to calculate crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs). The analysis demonstrates strong associations with ethnicity and the number of HF's/day, the length of each HF episode, the intensity of HFs, and the interruption of daily activities and sleep. Ethnicity was important in the crude and adjusted model describing the association between the number of HFs per day and ethnicity. African-American women were 2.22 (95% CI, 1.38–3.56) times and Hispanic women were 1.85 (95% CI, 1.08–3.18) times more likely to experience more frequent HFs per day than Caucasian women. In contrast, Hispanic women were less likely than Caucasian women to experience sweating and disruption of both daily activities and sleep. Collectively, our results show more frequent and more bothersome HFs in African-American women and more frequent, but less intense and bothersome HFs in Hispanic women in comparison to Caucasian women.

*Corresponding author. Tel.: +1 8177350498; fax: +1 8177352091, jsimpkin@hsc.unt.edu (J.W. Simpkins).

Conflict of interest statement

None of the investigators are employed by or hold a financial interest in private entities that would create a conflict of interest in the design or conduct of the study or in the interpretation of the data obtained. Also, none of the authors have patents on any products or techniques used in the study.

Keywords

Hot Flashes; Menopause; Ethnicity; Caucasians; African-Americans; Hispanics

1. Background

The U.S. Census Bureau reported that the population of women between 45 and 64 years old was 32 million in 2000, and it is estimated that by 2010 it will reach approximately 42 million, and by 2050 it will increase to about 47 million [1]. It is estimated that during the natural course of menopause, approximately 65–80% of women experience hot flashes [2] and 10–20% find them nearly intolerable [3]. Thus, during the next five decades, 27–37 million American women may experience menopausal hot flashes, and in about 7 million menopausal women these symptoms may be severe and difficult to tolerate. Hot flashes are the most frequent complaint among middle-aged women and should be regarded as a public health problem because they affect the health and quality of life of millions of women [4].

Hot flashes can begin during the late premenopausal or early perimenopausal years, but they become more frequent and severe during the late perimenopausal and early postmenopausal years [5]. Hot flashes can last from a few seconds to more than an hour and persist for one year in 95% of affected women and up to 5 years in 65% of affected women [6–8]. Hot flashes are not only confined to the age-related decline of estrogen and progesterone at the menopause. Surgical removal of ovaries results in hot flashes in 95–100% of oophorectomized women [9]. Hot flashes can be experienced by either women or men treated for breast or prostate cancer with chemotherapy, radiation, selective estrogen receptor modulators (SERM) or gonadotropin releasing hormone agonists or antagonists [10]. The prevalence of hot flashes has been reported to be influenced by culture, diet, body weight, ethnicity, environmental stressors, and socioeconomic status [8,11,12].

Ethnicity is recognized as an important factor contributing to women's experience with menopausal transition but only a few studies described race differences in Menopausal Vasomotor Symptoms. African-American women are reported to have significantly more vasomotor symptoms than other ethnic groups of women [13–15]. The results may be sometimes conflicting and seem to depend on the multiple variables represented among the studied population of women.

Menopausal Vasomotor Symptoms can be measured with subjective and objective methods. Currently available subjective instruments, such as the Blatt-Kupperman index [16], the Women's Health Questionnaire [17], the Greene Climacteric Scale [18], the Menopause-specific Quality of Life questionnaire [19], and the Menopause Rating Scale [20], address a variety of climacteric domains, but they provide only minimal assessment of HFs, the most common and discomforting vasomotor symptoms of menopause. Assessment methods for HFs that use self-reported daily diaries or electronic event markers depend heavily on women's adherence. The use of HF diaries and electronic event markers was reported to have low sensitivity and to seriously underestimate hot flash frequency, intensity and bothersomeness [21].

We have developed and validated a questionnaire designed specifically for subjective assessment of hot flashes – the Menopausal Vasomotor Symptoms (MVS) survey [2]. The MVS survey was designed to be short, simple, clear, easy to respond to, and easy to administer. It addresses multiple characteristics of hot flashes as well as issues such as use of hormonal and herbal therapy for hot flashes.

The prevalence and severity of vasomotor menopausal symptoms, and specifically of HFs, is reported to be influenced by culture, race, and ethnicity [8,11,12]. However, in these studies, presence or absence of HFs but not number, intensity or other features of hot flashes were assessed. The overall goal of the present study was to determine the role of ethnicity on multiple features of HFs in a population of menopausal women in North Central Texas.

2. Materials and methods

2.1. Study population

North Central Texas women were assessed between February 16, 2006 and August 22, 2008. To qualify for this study, women must have been 40–60 years old, have current hot flashes and be Caucasian, African-American or Hispanic. Women younger than 40 years and older than 60 years, and women who have previously responded to the MVS survey (through participation in our earlier clinical study) were excluded.

2.2. Study approval and informed consent

All participants in the study gave written informed consent according to procedures approved by the University of North Texas Health Science Center Institutional Review Board. An informed consent document was written, approved by the University of North Texas Health Science Center Institutional Review Board and was provided to each subject prior to their agreement to participate.

The procedures employed in this research study underwent full review and received approval from the Institutional Review Board (IRB) at the University of North Texas Health Science Center in Fort Worth, Texas.

2.3. Recruitment of participants

A total of 698 women responded to the various recruiting methods and were screened. Subsequently 458 qualified women were contacted and a final population of 397 women participated in the study. Recruitment of an ethnically diverse sample of menopausal women in the local community proved to be challenging and was achieved through a variety of different methods (Table 1). We used the following recruitment methods: (i) flyers posted on the University of North Texas Health Science Center (UNTHSC) campus, in our clinics, and in local Fort Worth, TX community centers, (ii) networking in the community by the study coordinator, (iii) targeted mailing to women of the appropriate ages in specified zip codes using lists obtained from Accudata (Acculeads.com), (iv) referrals from participants of their friends and relatives, (v) ads in the local newspaper that were also sent to their membership on-line, (vi) postings on miscellaneous menopause-related websites, (vii)

menopause-related newsletters, and (viii) an interview on a local television news program (Table 1).

Each participant was compensated \$10.00 for travel and time associated with participation in the study.

2.4. Procedures

During the research study, each woman participated in one session held at our UNTHSC clinic and responded to questions about vasomotor (hot flashes) menopausal symptoms by answering questions on the MVS survey [2]. The survey is designed to be simple, clear, and easy to administer. A trained surveyor read the 30 questions to the participant and recorded responses. Women answered “Yes” or “No” to most of the questions or provide either the age or year when specific events occurred, or the name of the hormonal preparation used to treat hot flashes. Completion of the survey took no more than 10 min. For each participant, a separate survey questionnaire form coded only with identification number was used. All survey forms were kept in a locked file cabinet. The database obtained during this study did not contain any identifying information. Also, during the session, body weight and height were measured to calculate body mass index (BMI). Finally, women were questioned about present diagnosis of diabetes mellitus (DM), hypertension, thyroid disease, and hypercholesterolemia, as well as exercise frequency, possible confounding factors that may independently be associated with hot flash features.

2.5. Statistical analyses

All data analysis was performed with the Statistical Analysis System 9.13 and the statistical significance was set at 0.05. Means and proportions for demographic and possible risk factors for the hot flash features in women were calculated for each race/ethnic category, and the significance of any differences in means or proportions across race/ethnic groups was assessed by one-way analysis of variance or chi-square statistics. To evaluate and identify potential association and predictors of the hot flash (HF) features and ethnicity, and other independent variables, ordinal/multinomial/binary logistic regression models were used to calculate crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs). For the number of HF's/day (<5/day, 5–10/day, >10/day) ordinal logistic regression was used, while multinomial logistic was used for the intensity of HFs (No Sweat, Mildly or Drenched in sweat, Mildly Sweaty, Drenched in Sweat) and the interruption of activities (No Interruption, Daily or Sleep, Both Daily and Sleep) for not meeting the proportional odds assumption, and binary logistic regression used for length of each HF episode (≤ 5 min, >5 min) and duration of HF experience (≤ 2 years, >2 years).

Covariates were removed from the final model if their race adjusted *p*-value was not significant in any one of the outcomes at the *p*< 0.05 level.

3. Results

3.1. Effectiveness of recruitment methods

Four recruitment methods accounted for 91% of the participants enrolled in this study (Table 1). These were (i) flyers posted on our campus, in our clinics and in local community centers, (ii) networking in the community by the study coordinator, (iii) targeted mailing to women of the appropriate ages in specified zip codes using lists obtained from Accudata, and (iv) referrals from participants of their friends and relatives. Flyers and networking worked best for Caucasians, targeted recruitment letters worked best for Hispanics, and each of these methods contributed about equally for recruitment of African-American women. Since no one method was effective in delivering large number of subjects from all ethnic groups, various recruitment methods were used to attract women from each of these ethnic groups into studies of hot flashes.

3.2. Demographic and health characteristics of participants

Demographic and other characteristics of study participants are shown in Table 2. A total of 397 women 40–60 years of age participated in the study. The mean ($\pm$ SD) age for participants was 50.2 ± 5.3 years. The ethnic distribution was 40% Caucasians, 38% African-Americans and 22% Hispanics. The ethnic groups did not differ significantly in age or in the age of hysterectomy. The Hispanic population had a highest percentage of married women, fewer smokers, and less formal education than Caucasian or African-American women. African-American women had significantly higher BMI and were more likely to have annual incomes less than \$20,000.

3.3. Features of hot flashes

Table 3 shows the features of HFs, smoking, hypertension, diabetes, cholesterol and hypothyroidism among the ethnic groups that participated in this study. A significant effect of ethnicity was observed for number of HFs per day ($p < 0.05$), length of each HF episode ($p < 0.05$), the intensity of HFs ($p < 0.01$), and interruption of daily activities by HFs ($p < 0.05$), but not the duration of the HF experience. Also, smoking, hypertension and diabetes were significantly associated with ethnicity. Elevated cholesterol and hypothyroidism were not associated with ethnicity.

Tables 4–6 present the crude and adjusted ORs and 95% CIs for the association between HFs and ethnicity. The analysis demonstrates strong associations between number of HFs per day, length of each HF episode, intensity of HFs, and interruption of activities and ethnicity. Duration of the HF experience was not effected by ethnicity. Ethnicity was important in the crude and adjusted model describing the association between the number of HFs per day. African-American women were 2.22 (95% CI, 1.38–3.56) times more likely to experience more HFs per day than Caucasian women. Similarly, Hispanic women were 1.85 (95% CI, 1.08–3.18) time more likely to experience a higher frequency of HFs per day than Caucasian women. For length of each HF episode, African-American women had longer HF episodes ($p < 0.05$), and this effect was still significant when adjusted for age alone ($p < 0.05$) but not when age, DM, BMI and smoking were controlled in the analysis (Table 4). For intensity of HF, Hispanics were less likely to experience more intensive HF than Caucasians,

and this effect was still significant when adjusted for age alone, but not when age, DM, BMI and smoking were controlled in the analysis (Table 5). Similarly, Hispanics were less likely to experience interruption of activities due to HF than Caucasians, and this effect was still significant when adjusted for age alone, but not when age, DM, BMI and smoking were controlled in the analysis (Table 6).

4. Discussion

To our knowledge, this is the first study to measure detailed features of HFs in an ethnically diverse population of menopausal women. While other studies have compared the presence/absence of HFs in African-American vs. Caucasian women, specific features of the HF experience have not been previously described in an ethnically diverse population. We showed that in comparison to Caucasians, African-American and Hispanic women have more frequent HFs and that African-American women have more disruptive HFs and Hispanic women have less intense and bothersome HFs.

The Study of Women's Health Across the Nation (SWAN) reported a higher percentage of African-American (46%) than Caucasian women (31 %) with HFs and night sweats [22]. Similarly, three other studies reported a higher percentage of African-American population with HFs than Caucasian women [11,12,23] and one study reports a trend for more HFs in African-American women [24]. Our study was restricted to women with current HFs and therefore did not assess the presence/absence of HFs. Rather, we determined several features of HFs, including number, intensity, duration of the HF experience and bothersomeness of HFs. Only one study has attempted to assess features of hot flashes from questions about recall of number of hot flashes per day, and their categorical self-classification of moderate to severe [22]. More frequent and more severe HFs were reported in African-American than Caucasian women.

We have shown that the Menopausal Vasomotor Symptoms (MVS) survey is a comprehensive, simple, highly valid, reliable, sensitive, and convenient instrument for the assessment of many of the characteristics of hot flashes. The analysis of the MVS survey for its validity, reliability and sensitivity demonstrated that this instrument has many advantages over other tools for assessing hot flashes. The MVS survey encompasses various specific measures of hot flashes, and the response categories were mutually exclusive. The administration of the survey in person guaranteed that 100% of the responses would be completed, providing more confidence in the results. The face-to-face interaction during the MVS survey assured authenticity of the self-reported information. We have shown that women's subjective answers were reliable and showed very high test-retest correlations [2]. After 24–48 h, the test-retest correlation coefficients varied between 1.000 and 0.837 and were highly significant for all survey questions ($p < 0.001$). After 14 days, the test-retest correlations for the majority of the questions varied between 1.000 ($p < 0.001$) and 0.798 ($p < 0.001$); only two questions had a lower correlation of 0.577 ($p < 0.01$).

Our assessment of specific features of HFs revealed some of the factors which contribute in addition to the effects of ethnicity on their expression. For frequency of HFs, both crude and adjusted ORs demonstrated a strong association of ethnicity on number of HFs even when

adjusted for age, DM, BMI and smoking. In contrast, the length of each HF episode, ethnicity remained significant when adjusted for age, but not when adjusted for age, DM, BMI and smoking. This suggested that for length frequency of each HF episode, age, DM, BMI and smoking confounded observed ethnicity effects, but not in the frequency of HFs.

A number of factors limit the interpretation of these data. First, the recruited menopausal women were highly motivated to participate in this study and our study population was over represented by African-American women. In Tarrant County, TX, in 2006, the population distribution among ethnic groups was 56% Caucasian, 14% African-American and 25% Hispanic women [25]. As such, the population enrolled in our study may not represent the typical female population of North Central Texas.

An additional limitation of this study is that most data were obtained from self-reporting, raising the possibility that some information is inaccurate. Additionally, African-American women may differ in reporting symptoms of the menopause [26–28]. This concern is somewhat allayed for our HF data, since the VMS survey has been shown to be highly reliable using repeated measures of each question in the survey [2]. Also, we recruited women with current HFs, a strategy that should have improved their reporting of features of these events, since the MVS survey asks women about their current HF experience, a characteristic that is less dependent on recollection of events. Additionally, since the same person administered all surveys, the chance of encountering inter-rate differences was eliminated from our study.

The inclusion of Hispanic women in the study presented a number of challenges. First, we encountered difficulties in recruiting large numbers of Hispanic participants, an observation reported by other investigators [29–34]. We observed that targeted recruitment letters work best among the methods that we used. Also, we had limited success in obtaining access to Spanish speaking clinics, in part because our staff did not speak Spanish. The surprising failure of the local television interview to generate more substantial contacts may have been due to the airing in the early morning and very close to the Christmas holiday.

We assessed exercise in all our study participants, using self-reporting of hours of exercise per week. We observed that Caucasian women exercised more than Hispanic women (statistically significant at 0.05 level, data not shown). In addition, the “exercise hours per week” variable was inversely statistically significantly associated with length of HF (5min, >5min). However, this exercise effect was not statistically significant ($p = 0.0618$) after adjusting for age, diabetes, BMI, and smoking variables.

The role that genetics, diet, culture, environmental stressors or socioeconomic status plays in the ethnic differences in the expression of features of HFs was not addressed in the present study. We did observe that African-American women had significantly higher BMI and were significantly more likely to be in the lowest annual income category. We assume that this is correlated with substantial dietary and socioeconomic challenges. However, the extent to which this contributed to the observed expression of features of HFs is not known and will require additional studies.

Finally, the role that the observed features of HFs play in the overall health of minority women is only now being described. Several studies have shown an association between HFs and hypertension in the general population [35–37]. In the present study, we too observed an association between HF number and hypertension and DM in African-American women. Given the now well-recognized relationship between both hypertension and DM and cardiovascular and cerebrovascular diseases, the role that HFs may play in both hypertension and DM needs to be addressed.

5. Conclusions

Collectively, our results show more frequent and more bothersome hot flashes in African-American women in comparison to Caucasian women. Hispanic women experienced higher number of HFs per day than Caucasian women. These observations contribute to our understanding of health disparities in middle-aged women and foster additional studies to determine the contributing factors to this increased severity of the menopausal experience in non-Caucasian women. Furthermore, given the association between HFs and hypertension and DM in African-American women, the contribution of HFs to development of these conditions needs to be elucidated. A better understanding of the role of genetics, diet, culture, body weight, environmental factors and socioeconomic status is needed to eliminate this health disparity among women undergoing menopausal transition.

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Table 1

Role of ethnicity in response to various recruitment methods.

Recruitment source	Ethnic group			Total
	Caucasian	African-American	Hispanic	
Flyers (campus, clinics, community)	35.6% (57)	29.3% (44)	17.2% (15)	29.2% (116)
Networking by study coordinator	26.3% (42)	26.0% (39)	17.2% (15)	24.2% (96)
Mailed recruiting letters	8.8% (14)	18.7% (28)	47.1% (41)	20.9% (83)
Referred by other participants	13.8% (22)	23.3% (35)	9.2% (8)	16.4% (65)
Ads in the Fort Worth <i>Star-Telegram</i>	5.6% (9)	1.3% (2)	8.0% (7)	4.5% (18)
Ads in the <i>UNTHSC Daily News</i>	6.9% (11)	1.3% (2)	1.1% (1)	3.5% (14)
Ads on websites and newsletters	1.3% (2)	0	0	0.5% (2)
Local television interview	1.3% (2)	0	0	0.5% (2)
Participants from our previous studies	0.6% (1)	0	0	0.3% (1)
Number of recruited participants (N)	40.3% (160)	37.8% (150)	21.9% (87)	100% (397)

Table 2Demographic characteristics of study participants ($N=397$).

Characteristics	Ethnic group			<i>p</i> -Value
	Caucasian ($N=160$)	African-American ($N=150$)	Hispanic ($N=87$)	
Age: mean (SD)	50.8 (5.13)	49.7 (5.49)	49.7 (5.04)	0.115
BMI: mean (SD)	30.1 (7.34)	34.3 (8.74)	32.2 (6.92)	<0.001
Married	48% (77)	34% (51)	59% (52)	0.002
Single	21% (34)	35% (53)	17% (15)	
Divorced	27% (44)	25% (38)	23% (21)	
Widowed	4% (7)	5% (8)	1% (1)	
Non-smokers	69% (111)	61% (92)	91% (80)	<0.001
Smoker	31% (50)	39% (59)	9% (8)	
Income < \$20,000	23% (37)	41% (62)	24% (21)	<0.001
\$20,000-\$39,999	20% (32)	29% (44)	28% (25)	
\$40,000-\$59,999	22% (36)	17% (26)	25% (22)	
\$60,000-\$79,999	14% (23)	6% (9)	9% (8)	
\$80,000-\$100,000	7% (12)	4% (6)	9% (8)	
>\$100,000	13% (21)	1% (2)	5% (5)	
Years of formal education: mean (SD)	14.5 (3.44)	13.0 (2.56)	12.3 (3.14)	<0.001
Hysterectomy (with or without oophorectomy)	34% (55)	41% (62)	33% (29)	0.349
Exercise (hours per week)	1.91 (2.09)	1.44 (1.95)	1.14 (1.53)	0.007
Mean age at time of hysterectomy (SD)	35.8 (8.32)	38.0 (8.51)	37.6 (8.81)	0.812

Chi-square analyses or one-way analysis of variance are used for the statistical comparison.

SD: standard deviation.

Table 3

Characteristics of hot flash (HF) features, smoking, and diseases in three ethnic groups of women ($N=397$).

Characteristic	Ethnic group		<i>p</i> -Value
	Caucasian ($N=160$)	African-American ($N=150$)	Hispanic ($N=87$)
Number of HF's per day			
5/day	64% (103)	54% (81)	60% (52)
5–10/day	21% (33)	37% (55)	31% (27)
>10/day	15% (24)	9% (14)	9% (8)
Length of each HF Episode			
5 min	68% (109)	56% (84)	70% (61)
>5 min	32% (51)	44% (66)	30% (26)
Intensity of HF's			
No Sweat	6% (9)	5% (8)	17% (15)
Mildly or Drenched in sweat	49% (78)	37% (55)	36% (31)
Mildly Sweaty	32% (51)	42% (63)	34% (30)
Drenched in sweat	14% (22)	16% (24)	13% (11)
Interruption of activities			
No Interruption	15% (24)	11% (16)	24% (21)
Daily or Sleep	54% (87)	49% (74)	40% (35)
Both Daily and Sleep	31% (49)	40% (60)	36% (31)
Duration of HF experience			
2 years	33% (53)	32% (48)	39% (34)
>2 years	67% (107)	68% (102)	61% (53)
Smoking	31% (49)	39% (59)	9% (8)
Hypertension	23% (36)	45% (68)	24% (21)
Diabetes	4% (6)	13% (19)	9% (8)
High Cholesterol	14% (22)	9% (13)	10% (9)
Hypothyroidism	8% (13)	7% (10)	11% (10)

Chi-square analyses are used for the overall statistical comparison.

Crude and adjusted odds ratio (OR)s for the association between hot flash (HF) Features and other independent variables in three ethnic populations of women.

Table 4

HF feature	Ethnic group			p-Value
	Caucasian (N= 160)	African-American (N= 150)	Hispanic (N=87)	
Number of HFs per day				
5/day (reference) crude	1.0	2.08 (1.32,3.26)	1.71 (1.01,2.88)	0.005
Age adjusted	1.0	2.12 (1.35,3.33)	1.74 (1.03, 2.94)	0.004
Age, DM, BMI, smoking	1.0	2.22 (1.38,3.56)	1.85(1.08,3.18)	0.003
Length of each HF episode				
5 min (reference)	1.0	1.68 (1.06,2.67)	0.91 (0.52,1.61)	0.035
Age adjusted ^a	1.0	1.60 (1.01, 2.55)	0.86 (0.49,1.53)	0.048
Age, DM, BMI, smoking, PA ^{a,b,c}	1.0	1.10 (0.66,1.83)	0.71 (0.38,1.32)	0.362
Duration of HF experience				
2 years (reference)	1.0	1.05 (0.65,1.69)	0.77 (0.45,1.33)	0.517
Age adjusted ^a	1.0	1.25 (0.76,2.07)	0.87 (0.49,1.54)	0.446
Age, DM, BMI, smoking ^{a,c}	1.0	1.17 (0.69,1.96)	0.95(0.53,1.71)	0.768

^a Age significant at 0.05 level.

^b BMI significant at 0.05 level.

^c Smoking significant at 0.05 level.

DM – diabetes; BMI – body mass index; PA – physical activity.

Table 5

Multinomial crude and adjusted odds ratio (OR) for the association between intensity of hot flashes (HFs) and other independent variables in three ethnic study populations of women.

Ethnic group and adjustments	Intensity of HFs			p-Value
	Mildly or Drenched in sweat vs. No Sweat	Mildly Sweaty vs. No Sweat	Drenched in sweat vs. No Sweat	
African-American vs. Caucasian	1.39 (0.50,3.86)	0.79 (0.29,2.18)	1.23 (0.40,3.74)	0.010
Crude Hispanic vs. Caucasian, crude	0.35 (0.14,0.90)	0.24 (0.09, 0.60)	0.30 (0.10,0.90)	
African-American vs. Caucasian, age adjusted	1.32 (0.47,3.68)	0.77 (0.28, 2.14)	1.22 (0.40,3.71)	0.010
Hispanic vs. Caucasian, age adjusted	0.33 (0.13, 0.86)	0.23 (0.09,0.59)	0.30 (0.10, 0.89)	
African-American vs. Caucasian, age, DM, BMI, smoking adjusted ^{a,b}	0.94 (0.32, 2.76)	0.63 (0.22,1.82)	0.70 (0.21, 2.29)	0.077
Hispanic vs. Caucasian, age, DM, BMI, smoking adjusted	0.38 (0.14,1.01)	0.23(0.09,0.61)	0.33 (0.10,1.05)	

^aDM significant at 0.05 level.

^bSmoking significant at 0.05 level.

Table 6

Multinomial crude and adjusted odds ratio (OR) for association between disruption of daily activity and sleep and other independent variables in three ethnic populations of women.

Ethnic group and adjustments	Disruption of activities		p-Value
	Both Daily and Sleep vs. No Interruption	Daily or Sleep vs. No Interruption	
African-American vs. Caucasians, crude	1.84(0.88,3.84)	1.28 (0.63,2.58)	0.034
Hispanic vs. Caucasians, crude	0.46 (0.23, 0.93)	0.72 (0.35,1.51)	
African-American vs. Caucasians, age adjusted	1.31 (0.65,2.66)	1.89 (0.90,3.96)	0.035
Hispanic vs. Caucasians, age adjusted	0.47 (0.23,0.96)	0.74 (0.35,1.55)	
African-American vs. Caucasians, age, DM ^a , BMI ^a smoking ^b adjusted	1.17 (0.56,2.44)	1.35 (0.62, 2.93)	0.119
Hispanic vs. Caucasians, age, DM, BMI, smoking adjusted	0.45 (0.22, 0.93)	0.74(0.34,1.62)	

^aSignificant at 0.05 level.

^bSignificant at 0.05 level.