Published in final edited form as:

Health Care Women Int. 2011 December ; 32(12): 1079–1087. doi:10.1080/07399332.2011.562998.

Body Mass Index in Multiethnic Midlife Women: Influence of Demographic Characteristics and Physical Activity

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Abstract

We examined the influence of demographic characteristics and physical activity on body mass index (BMI) in multiethnic midlife women. A sample of 236 African, European, and Mexican/Central Americans aged 40–50 completed the initial, 1-year, and 2-year assessments. The effects of demographic characteristics and physical activity on BMI at the 2-year assessment were evaluated using hierarchical multiple regression analysis. After controlling for other demographic factors, ethnicity, annual household income, and physical activity at the initial assessments were significant predictors of BMI. BMI may be influenced by socioeconomic status as well as ethnicity. Regular physical activity should be encouraged to maintain a healthy BMI in midlife women.

Obesity is a public health concern in the United States as well as a global epidemic. Obese people are at risk of developing a serious medical condition, which can cause poor health and premature death. Women in particular tend to gain weight during the years surrounding menopause. Several longitudinal studies have found midlife women to be at risk for weight gain (Owens, Matthews, Wing, & Kuller, 1992; Sternfeld et al., 2004). Although midlife women experience this trend regardless of their race or ethnic group, obesity is more common in African American than European Americans in the United States. In longitudinal studies, African American midlife women consistently gained more weight than Whites (Kahn & Williamson, 1991; Sternfeld et al., 2004).

Lower socioeconomic status has also been associated with obesity (Sobal & Stunkard, 1989). Because lower education and income is more prevalent in women of color than in Caucasian, racial/ethnic differences in body weight might be due to socioeconomic disadvantages or higher prevalence of other behavioral risk factors for obesity such as physical inactivity.

Understanding the influence of race or ethnicity and socioeconomic status as well as physical activity on body mass index (BMI) in midlife women is important because of the

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A part of this paper was presented at the American Heart Association Scientific Conference, San Francisco, California, March 2010.

potential impact on health status in this population. In addition, international health care providers who serve ethnic minority women may apply this information to understand adverse health status (i.e., higher prevalence of obesity) of ethnic minority women in their own countries. Thus, our purpose in this study is to investigate the influence of demographic characteristics (ethnicity, annual household income, education) and physical activity on BMI in multiethnic midlife women.

Methods

Design and Sample

Data were collected from midlife women as part of a longitudinal study to describe changes in biological and psychosocial health before and during the menopausal transition. The sample and recruitment strategies were described in detail earlier (Gilliss et al., 2001). Briefly, the eligibility criteria included being self-identified as African American, European American, or Mexican/Central American, being healthy, English- or bilingual Spanish-speaking, between 40 and 50 years of age, living in the United States for at least 20 years, and still experiencing regular menstrual cycles. Women were excluded if they were taking hormonal therapy or if they self-reported any major health problem such as stroke, myocardial infarction, cancer, type I diabetes or psychiatric condition. Women were invited to participate through English and Spanish public advertisements in newsletters and newspapers, public announcements on English and Spanish radio and television stations, fliers in community libraries and other public places, ethnic-specific churches and street fairs, and personal contacts with age, gender and culturally/racially matched recruiters.

From the 1011 women responding to the recruitment strategies, 722 women were screened for eligibility and 347 were eligible. Of the 375 women not recruited, 275 women were designated ineligible because of age, ethnicity, or chronic health problems and 100 eligible women refused prior to enrollment after learning that this was not an intervention study. Data for the present paper are from 236 women with BMI values at the initial assessment as well as at 1-year and 2-year assessments.

The study was approved by the Committee on Human Research at a major Western university. After obtaining informed consent, the participant received the self-administered questionnaire packet. A trained bicultural and bilingual research assistant was available to answer questions. Each data collection took approximately 90 minutes and participants received \$10 cash for each session.

Measures

Physical activity was assessed with the Paffenbarger Physical Activity Questionnaire (PPAQ), a self-administered measure of typical weekly physical activity level from lifestyle physical activity in three domains: walking, climbing stairs, and recreational sports/exercise. Women were asked to estimate the number of blocks they walked and flights of stairs they climbed daily and to list all sports or exercise in which they had actively participated during the past year as well as their frequency and duration (Lee, Paffenbarger, & Hsieh, 1992). Each sport or exercise was assigned a multiple of resting metabolic rate (MET score) and physical activity level (MET-hour/wk) was estimated from the three domains of walking, climbing stairs, and sports/exercise (Lee et al., 1992; Ainsworth et al., 2000). Test-retest coefficients of the PPAQ were acceptable, ranging between .34 (8-month) to .72 (1-month) in men and women between 21 and 59 years of age (Ainsworth, Leon, Richardson, Jacobs, & Paffenbarger, 1993). The physical activity level was significantly correlated with blocks walked, sports/exercise activities, total and vigorous intensity leisure-time physical activity from physical activity records and maximal oxygen capacity (Ainsworth et al., 1993).

Demographic items in the questionnaire packet included age, ethnicity, education, annual household income, and marital status. Highest grade in school was assessed for educational attainment. Annual household income was categorized into nine levels from less than \$10,999 to \$81,000 and above. Higher values indicate higher educational and income level. Marital status was identified and then dichotomized as either married/partnered relationship or living alone (single, divorced or widowed).

Ethnically matched research assistants assessed participants' weight and height every six months. Body mass index (BMI) was calculated dividing the weight in kilogram (kg) by the height in meters squared (m^2). Weight was measured using an electronic scale (Precision Health Scale®, UC-300). Height was measured from floor to top of head, without shoes, using an Accustat® stadiometer.

Analytic strategy

Descriptive statistics were estimated for all study variables. Chi-Square tests were conducted to examine the differences in education, annual household income, and marital status among ethnic groups. Because BMI as well as physical activity levels were not normally distributed, log transformation was done for BMI and square-root transformation was done for physical activity level. The transformed BMI scores and physical activity levels were normally distributed. ANOVA tests were conducted to examine the differences in physical activity level and BMI among the ethnic groups. Dummy coding was used to represent three ethnic groups. European American was used as the baseline/referent group; African American and Mexican/Central American were separately compared to European American. Spearman's correlation coefficients were used to examine relationships between BMI and potential correlates of BMI including demographic variables (ethnicity, education, and annual household income) and physical activity levels measured at the initial assessment, 1-year assessment, and 2-year assessment. The effects of demographic characteristics and physical activity on BMI at the 2-year assessment were evaluated using hierarchical multiple regression analyses.

Findings

The demographic characteristics are shown in Table 1. About half of the sample was European American, with the other participants almost evenly divided between African and Mexican/Central Americans. The women ranged in age from 40 to 50 years ($M = 43.4$, $SD = 2.2$). Approximately 58% of the women were married or partnered, but a significantly greater proportion of the African American women (56%) were neither married nor partnered compared to the European (35.4%) and Mexican/Central American (41.2%) women, ($\chi^2 = 6.95$, $p = .03$). The majority of women in this sample had a college education or higher (62.8%), but the educational level of the women differed by ethnic group, with a significantly larger proportion of European Americans having graduated from college (74%) than African American (55.4%), or Mexican/Central American women (43%). The annual household income also varied by ethnic group, with a significantly smaller proportion of European American than African American and Mexican/Central American women reporting \$30,999 or less.

The BMI scores indicated that about 40% were either overweight (BMI: 27.3 – 32.3) or obese (BMI: > 32.3), but BMI significantly varied by ethnic group. African American and Mexican/Central American women had higher BMI than European American women at the initial ($F(2,233) = 8.25$, $p < .001$), 1-year ($F(2,233) = 8.92$, $p < .001$), and 2-year assessments ($F(2,233) = 7.90$, $p < .001$). There was no physical activity level difference among the ethnic groups at the initial, 1-year, and 2-year assessments.

Relationships Between BMI, Demographic Characteristics and Physical Activity

Spearman correlations were computed to examine relationships between demographic characteristics, physical activity level at each time point, and BMI at the 2-year assessment (see Table 2). Being African American (vs. European American) was associated with having lower household income and higher BMI.

Hierarchical multiple regression

Hierarchical multiple regression was performed to predict BMI at the 2-year assessment (see Table 3). The demographic characteristics were first entered into the model. Being African American (vs. European American) was a significant positive predictor of BMI: African American women were more likely to show higher BMI than European American women. On the other hand, annual household income was a significant negative predictor of BMI: those who had higher income showed lower BMI. Physical activity level at the initial assessment, 1-year assessment, and 2-year assessment were then added and explained a significant additional 8% of the variance in BMI at their 2-year assessment. In this second model, being African American (vs. European American) was a significant positive predictor whereas annual household income and physical activity at the initial assessment were significant negative predictors of BMI. The final model explained 17% of variance in BMI at the 2-year assessment.

Discussion

The results of this study revealed that African and Mexican/Central American women tended to have higher BMI than European American women throughout two-year period. The significant racial differences in BMI are consistent with cross-sectional and follow-up studies (Kahn & Williamson, 1991; Matthews et al., 2001; Sternfeld et al., 2004) and would suggest that African American women may be at the greatest weight-related health risk, because ethnic differences in obesity are pronounced, especially for the African American population.

The hierarchical multiple regression analysis indicated that ethnicity, especially, being African American, was a significant predictor of BMI. This finding is consistent with the Study of Women Across the Nation (SWAN) study, which supports the independent role of race (here, African American midlife women) in racial differences in body weight. (Matthews et al., 2001). In addition, we found that annual household income as well as physical activity were significant predictors of BMI. This finding would indicate that socioeconomic disadvantages and lack of health promoting behaviors (here, regular physical activity) all independently predict BMI along with ethnicity.

Physical activity was a consistently significant predictor of BMI after adjusting for other variables in this study. This finding suggests that interventions designed to increase physical activity are likely to be beneficial to maintain healthy BMI in midlife women. In the NHANES I Epidemiologic Follow-up Study, African American women gained more weight than White women but showed the same likelihood of major weight gain over 10 years as White women (Kahn & Williamson, 1991). African American women in the NHANES study showed less likelihood of major weight loss than White women, after adjustments for demographic, socioeconomic (family income, education, marital change), behavioral (smoking, physical activity), and geographical factors. It is essential to explore factors that may have made African American women less able or less motivated than White women to lose weight. In addition, cultural differences in desired ideal weight and body image may explain differences in BMI (Mabry et al., 2003). These factors should be integrated in developing an intervention to promote physical activity in African American women.

Study limitations include the nonrandom nature of participant recruitment and enrollment. This sample was recruited from a variety of community settings and it is similar in sociodemographics to the published demographic profile of California's population (1997). Because the population-based Study of Women Across the Nation (SWAN) study was recruiting Asian American midlife women in the same geographic area during the same period time, this study purposely excluded Asian American women. Another limitation includes the use of a self-report physical activity measure, which cannot exclude the possibility of memory recall and responder bias. However, the Paffenbarger Physical Activity Questionnaire has shown satisfactory reliability and validity (Ainsworth et al., 1993) and sensitivity to detect changes in biological risk factor levels (Owens et al., 1992) resulting from changes in physical activity levels (Simkin-Silverman, Wing, Boraz, & Kuller, 2003). Future studies are needed to examine dietary behaviors that may influence midlife women's BMI and physical activity. The use of mixed-method will be likely to improve our understanding how and why race (here, being African American) is associated with higher BMI. We also suggest that BMI data be reported internationally so that international researchers can learn whether African women have similar patterns of BMI measurements to African American counterparts. Because our interests were how African American and Mexican American midlife women differed from European American midlife women in their BMI, European Americans were chosen as the base-line referent group for the entire sample. Incidentally, when African Americans are chosen as the base-line referent group, being European American is negatively associated with higher BMI.

In summary, we found that BMI was associated with ethnicity as well as socioeconomic status (e.g., annual household income). Another significant predictor of BMI was physical activity, suggesting that regular physical activity should be encouraged to maintain a more healthy BMI in midlife women as they transition from pre-menopause to post-menopause. Low-income sedentary midlife women, especially African American, should be a priority population for health-promotion endeavors from health care providers in the United States. In addition, international health care providers should consider ethnic minority women's socioeconomic status in their own society as well as their care recipients' unique belief on body weight while promoting regular physical activity.

Acknowledgments

This study was financially supported by the National Institutes of Health, National Institute of Nursing Research (R01NR0459, Kathryn A. Lee, RN, PhD, Principal Investigator). Manuscript preparation was supported by the National Institutes of Health, National Institute of Nursing Research (T32 NR07088).

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TABLE 1

Descriptive Statistics for Demographic Characteristics by Ethnic Group

	Total (n = 236)	African (n = 58)	European (n = 127)	Mexican/ Central (n = 51)	F	P
Demographic Characteristics						
Age (year $\pm$ S.D.)	43.4 $\pm$ 2.2	42.9 $\pm$ 2.3	43.3 $\pm$ 2.1	43.9 $\pm$ 2.3	2.42	NS
Marital status^a						
Married or partnered	137 (58.3%)	25 (43.9%)	82 (64.6%)	30 (58.8%)		.03
Other	98 (41.7%)	32 (56.1%)	45 (35.4%)	21 (41.2%)		
Education^a						
High school or less	21 (9.0%)	3 (5.4%)	4 (3.1%)	14 (27.5%)		<0.001
Partial college	66 (28.2%)	22 (39.3%)	29 (22.8%)	15 (29.4%)		
College graduate	70 (29.9%)	17 (30.4%)	43 (33.9%)	10 (19.6%)		
Graduate degree	77 (32.9%)	14 (25.0%)	51 (40.2%)	12 (23.5%)		
Annual household income^a						
≤\$30,999	47 (20.3%)	15 (27.3%)	17 (13.4%)	15 (30.0%)		0.001
\$31,000 – \$60,999	80 (34.5%)	24 (43.6%)	37 (29.1%)	19 (38.0%)		
≥\$61,000	105 (45.3%)	16 (29.1%)	73 (57.5%)	16 (32.0%)		

Note.

^aDiscrepancies between subsample size and total sample size are due to missing values.

Spearman Correlations Among Demographic Characteristics, Physical Activity, and Body Mass Index

TABLE 2

Variables	1	2	3	4	5	6	7
1. European vs. African American							
2. European vs. Mexican/Central American	-.30**						
3. Education level	-.08	-.24**					
4. Annual household income	-.20**	-.18**	.32**				
5. PA at initial assessment	-.05	-.06	.03	.17*			
6. PA at 1-year assessment	-.08	-.03	-.03	.12	.53**		
7. PA at 2-year assessment	-.09	-.14*	.06	.13	.46**	.49**	
8. BMI at 2-year assessment	.21**	.10	-.09	-.23**	-.30**	-.31**	-.22**

Notes: Original physical activity levels and body mass index were used. PA = Physical activity; BMI = body mass index.

*
p < .05.,
**
p < .01

TABLE 3

Multiple Regression of Body Mass Index at the 2-Year Assessment on Demographic Characteristics and Physical Activity (N = 234)

	<i>B</i>	<i>SE B</i>	β
Step 1			
Constant	1.45	.04	
European vs. African American	.04	.02	.19*
European vs. & Mexican/Central American	.03	.02	.11
Education level	.00	.01	.01
Annual household income	.00	.00	-.19*
Step 2			
Constant	1.52	.04	
European vs. African American	.05	.02	.19*
European vs. & Mexican/Central American	.02	.02	.09
Education level	.00	.01	-.01
Annual household income	.00	.00	-.15*
Physical Activity at initial assessment	-.00	.00	-.19*
Physical Activity at 1-year assessment	.00	.00	-.14
Physical Activity at 2-year assessment	.00	.00	-.01

Notes: $R^2 = .09$ for Step 1; $\Delta R^2 = .08$ for Step 2 ($ps < .001$).

* $p < .05$.