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Menopause and metabolic syndrome in obese individuals with binge eating disorder

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ABSTRACT

Menopausal transition has been associated with the emergence of metabolic abnormalities, which may increase risk for chronic medical conditions in women. This study compared metabolic function between premenopausal women ($n = 152$), postmenopausal women ($n = 88$), and men ($n = 98$) recruited for treatment studies for obesity co-occurring with binge eating disorder (BED), a high-risk population for developing metabolic syndrome (MetS). Postmenopausal women were more likely than premenopausal women to show elevated total cholesterol (OR = 2.75; 95% CI = 1.56–4.80) and poor glycemic control (OR = 2.92; 95% CI = 1.32–6.33) but were more likely to have lower HDL levels (OR = 0.36; 95% CI = 0.19–0.68). These became non-significant after adjusting for age. Both pre- and postmenopausal women were less likely than age-matched men to show elevated levels of triglycerides (OR = 0.27; 95% CI = 0.13–0.53 [postmenopausal], OR = 0.29; 95% CI = 0.16–0.53 [premenopausal]), blood pressure (OR = 0.48; 95% CI = 0.25–0.91 [postmenopausal], OR = 0.40; 95% CI = 0.23–0.69 [premenopausal]), and less likely to have MetS (OR = 0.41; 95% CI = 0.21–0.78 [postmenopausal], OR = 0.46; 95% CI = 0.27–0.79 [premenopausal]). Premenopausal women were also less likely to have elevated fasting glucose level (OR = 0.50; 95% CI = 0.26–0.97) than age-matched men. Among obese women with BED, aging may have a more profound impact on metabolic abnormalities than menopause, suggesting the importance of early intervention of obesity and symptoms of BED. The active monitoring of metabolic function in obese men with BED may also be critical.

1. Introduction

Metabolic syndrome (MetS) is a clustering of metabolic risk factors linked with cardiovascular disease, type II diabetes, and other causes of mortality (Isomaa et al., 2001; Trevisan, Liu, Bahsas, & Menotti, 1998; Wilson, D'Agostino, Parise, Sullivan, & Meigs, 2005). Maladaptive eating patterns similar to those reported in binge eating disorder (BED; e.g., gorging eating pattern, meal skipping, and irregular meal consumption) have been associated with metabolic abnormalities and MetS (Kral, Buckley, Kissileff, & Schaffner, 2001; Roehrig, Masheb, White, & Grilo, 2009; Sierra-Johnson et al., 2008). BED is characterized by recurrent binge eating (i.e., consumption of unusually large amount of food and feeling of loss of control) without inappropriate compensatory weight-control behaviors (American Psychiatric Association, 1994). BED occurs in a subset of obese individuals and has been associated with the severity of obesity (Hudson, Hiripi, Pope, & Kessler, 2007). BED may also increase the risk for metabolic abnormalities and MetS beyond the risk attributable to obesity (Hudson et al., 2010).

The prevalence of MetS is higher in women than men, although sex differences in abnormalities in each metabolic component appear to be complex (Razzouk & Muntner, 2009). In women, menopausal transition may be particularly vulnerable time to develop features of MetS, including increases in accumulation of central fat, worsening lipid profile, and insulin resistance (Carr, 2003; Lobo, 2008). Age-adjusted prevalence of MetS among women in the United States is 23.4% (Ford, Giles, & Dietz, 2002), but the rate increases with age, particularly after 50 years old in women (Ford et al., 2002; Park et al., 2003). Even after adjusting for age, postmenopausal women are also estimated to be 1.6 times more likely to have MetS than premenopausal women (Kim, Park, Ryu, & Kim, 2007). Menopause thus appears to make a unique contribution to development of MetS in women. Because MetS at postmenopausal has been strongly associated with various chronic medical conditions, such as cardiovascular disease (Carr, 2003; Ren & Kelley, 2009) and breast cancer (Agnoli et al., 2010; Esposito et al., 2013; Rosato et al., 2011), the emergence of metabolic abnormalities during the menopausal transition has been suggested as an important target of intervention for cardiac and other causes of mortality in women (Carr, 2003).

The impact of menopause on the risk for MetS has not been studied among obese individuals with BED. Interestingly, in obese individuals with BED, the rate of MetS has been found higher in men than women (Barnes et al., 2011; Roehrig et al., 2009). Yet age-matched sex comparison of the risk for MetS has not been investigated in this population. An important question is whether menopause is an additional risk factor for MetS in women who are obese and have BED. It may also help inform development of targeted intervention strategies in relation

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to menopause in women who are already at risk for MetS. The present study compared the risk for metabolic abnormalities and MetS among postmenopausal women, premenopausal women, and age-matched men who were obese and sought treatment for BED.

2. Methods

2.1. Participants

Participants were 338 treatment-seeking obese adults (240 women, 98 men; mean age = 46.4 ± 10.7 years) with BED. Eighty-eight of the 240 women were categorized as being postmenopausal based on interview. All participants were obese (BMI ≥ 30 kg/m^2) and had BED based on *DSM-5*. Exclusion criteria were as follows: current anti-depressant therapy, severe psychiatric problems (lifetime bipolar disorders and schizophrenia, and current substance dependence), severe medical problems (cardiac and liver diseases), and uncontrolled hypertension, thyroid conditions, or diabetes. Ethnic/racial composition was as follows: 62.3% Caucasian, 23.3% African American, 8.7% Hispanic, and 5.8% other. 94.8% of participants reported at least high-school education. All participants provided written informed consent and the research was approved by the Yale IRB.

2.2. Assessment and measures

2.2.1. Features of eating disorders

The Eating Disorder Examination (EDE) (Fairburn & Cooper, 1993) interview was used to assess the frequency of objective bulimic episodes in the past 28 days (OBE; i.e., binge eating defined as unusually large quantities of food with a subjective sense of loss of control). This EDE also includes four subscales (Restraint, Eating Concern, Shape Concern, and Weight Concern) and a global total score. All items are rated on a 7-point scale (0–6 range) with higher scores reflecting greater severity/frequency.

2.2.2. Metabolic measures

Participants' weight was measured using a high-capacity digital scale. Height, waist circumference, heart rate, and blood pressure were measured by trained staff. Fasting lipid profile (total cholesterol, high-density lipoprotein [HDL] cholesterol, low-density lipoprotein [LDL] cholesterol, and triglycerides), glucose levels, and glycated hemoglobin 1Ac (HbA1c) were obtained through serum sample, and analyzed by Quest Diagnostics.

Clinically elevated total cholesterol level was defined as ≥200 mg/dL (%). Poor glycemic control was defined an HbA1c value ≥5.45 (%), which is demonstrated to predict MetS in non-diabetic samples (Sung & Rhee, 2007). For components of MetS, we followed clinical criteria outlined by the National Cholesterol Education Program's Adult Treatment Panel-III guidelines (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001): (a) central or abdominal obesity (>40 inches for men and >35 inches for women); (b) triglycerides ≥150 mg/dL; (c) HDL cholesterol (<40 mg/dL for men and <50 mg/dL for women); (d) systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥85 mmHg; and (e) fasting glucose ≥110 mg/dL. Individuals were categorized as having MetS if they had three or more of the five criteria.

2.3. Analysis

Means and standard deviations or proportions were calculated for demographic, eating/weight-related, and metabolic characteristics for four groups: premenopausal women, postmenopausal women, and two groups of age-matched men (20–58 years for premenopausal women and 42–65 years for postmenopausal women).

Odds ratios (ORs) for meeting clinical criteria for metabolic abnormalities were calculated by logistic regression with the following paired group comparison: post- vs. premenopausal (reference group), premenopausal vs. age-matched men (reference group), and postmenopausal women vs. age-matched men (reference group). Race (Caucasian [reference group], African American, other) was included as covariates in all analyses. For the comparison between pre- and postmenopausal women, we also completed age-adjusted analyses (age as a continuous variable) to examine whether the effect of menopause was beyond the effect of aging.

3. Results

3.1. Participant characteristics

Table 1 summarizes participants' characteristics by four groups. Postmenopausal women were significantly older than respective age-matched men and premenopausal women. Majority of men and postmenopausal women were Caucasian, whereas only 50% of premenopausal women were Caucasian.

Premenopausal women reported significantly younger age onset of binge eating than age-matched men and postmenopausal women. Pre- and postmenopausal women both reported significantly earlier age onset of dieting compared with their respective age-matched men. Postmenopausal women reported a significantly greater number of times on a diet than age-matched men and premenopausal women. Regardless of menopausal status, women reported higher scores on EDE subscales than their respective age-matched men, except for restraint eating. Postmenopausal women reported significantly higher scores on restraint eating than age-matched men and premenopausal women.

Waist circumferences, systolic and diastolic blood pressure, fasting glucose level, and triglycerides were significantly elevated in age-matched men, regardless of menopausal status. HbA1c was significantly lower in premenopausal women compared with age-matched men and postmenopausal women. Postmenopausal women showed significantly higher HDL cholesterol level than age-matched men or premenopausal women; HLD cholesterol was also significantly lower in premenopausal women than age-matched men. Total and LDL cholesterol levels were significantly higher in postmenopausal women compared with age-matched men and premenopausal women. Regardless of menopausal status, a smaller proportion of women had MetS than their respective age-matched men.

3.2. Odds ratios for meeting clinical criteria for metabolic abnormalities

Adjusting for race, compared with premenopausal women, postmenopausal women were significantly more likely to show clinically elevated total cholesterol and poor glycemic control but less likely to have a clinically low level of HDL cholesterol (Table 2). After adjusting for age, however, all significant odds ratios became non-significant. Compared with age-matched men, postmenopausal women were significantly more likely to show clinically elevated total cholesterol level but significantly less likely to show clinically elevated triglycerides and blood pressure. Compared with age-matched men, premenopausal women were significantly less likely to have clinically low level of HDL cholesterol, elevated blood pressure, and elevated fasting glucose level. Men were more likely have MetS than both pre- and postmenopausal women.

4. Discussion

We found that among obese individuals with BED, postmenopausal women were more likely than premenopausal women to have a clinically elevated level of total cholesterol and poor glycemic control. However, these significant differences disappeared after adjusting for age, suggesting that aging rather than menopause may add risk for metabolic abnormalities in obese women with BED. While controversial, an independent effect of menopause on metabolic abnormalities above and beyond the effect of aging has been demonstrated (Dasgupta et al.,