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Smoking cessation and associated risk of metabolic syndrome in women

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Evaluation of: Kwasniewska M, Pikala M, Kaczmarczyk-Chalas K et al. Smoking status, the menopausal transition, and metabolic syndrome in women. *Menopause* 19, 194–201 (2012).

This study was a cross-sectional analysis of 7462 randomly selected Polish women, aged 20–74 years, who had completed the WOBASZ, a Polish National Multicenter Health Survey. Components of metabolic syndrome, including waist circumference, fasting plasma glucose, triglycerides, blood pressure and high-density lipoprotein cholesterol were measured in addition to BMI. The authors assessed the prevalence of metabolic syndrome in pre- and postmenopausal women with respect to smoking status (current smoking, past smoking or never smoked). They determined that the prevalence of metabolic syndrome was 3.3-fold higher in postmenopausal women compared with premenopausal women and that past smoking was associated with higher odds of metabolic syndrome, regardless of menopausal status. Previous studies that have examined the risk of developing metabolic syndrome after smoking cessation did not assess menopausal status in women, and also used reported rather than measured anthropomorphic data. This study provides an additional perspective on the metabolic changes that may occur in women after smoking cessation.

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Methods

For this analysis, the prevalence of metabolic syndrome was assessed in 7462 women aged 20–74 years with respect to smoking and menopausal status [1]. Anthropomorphic data, including BMI, waist circumference and blood pressure, were measured in each subject. Smoking status was determined by self-report, and subjects were classified into three categories: current, past and never smokers. Menopausal status was determined by self report, and women were classified as premenopausal or postmenopausal. Levels of fasting plasma glucose (FPG), triglycerides and high-density lipoprotein (HDL) were measured at a central laboratory, and diagnosis of metabolic syndrome was defined by International Diabetes Federation (IDF) criteria, namely a waist circumference of ≥ 80 cm (32 in) and the presence of two or more of the following: FPG ≥ 5.6 mmol/l (101 mg/dl), a triglyceride level ≥ 1.7 mmol/l (151 mg/dl), HDL ≤ 1.03 mmol/l (40 mg/dl), a systolic blood pressure of ≥ 130 mmHg and/or diastolic blood pressure of ≥ 85 mmHg or taking medications for hyperlipidemia or hypertension. Data on physical activity and alcohol intake were collected for all subjects. However, nutritional intake was collected in only 50% of the subjects and was assessed by a food frequency questionnaire. Daily caloric intake was calculated from a 24-h dietary recall.

Results

A total of 27% of the study participants were current smokers, 15% were past smokers and 58%

were never smokers. Overall, the prevalence of metabolic syndrome increased with age, regardless of smoking or menopausal status. Past smokers had significantly higher odds of metabolic syndrome, regardless of menopausal status. In never smokers, only postmenopausal women demonstrated increased odds of metabolic syndrome. This was not observed among premenopausal never smokers. Furthermore, past and never smokers had increased odds of central obesity compared with current smokers, regardless of menopausal status. Premenopausal women who were past and never smokers had decreased odds of low HDL, but this relationship was not observed in postmenopausal women. Adjustment for daily caloric intake in the subset of women for whom this data were available did not significantly influence the overall results.

Among never smokers, having a secondary education, exercising 4–7 days per week for at least 30 min per day or active commuting to work was associated with decreased odds of metabolic syndrome, regardless of menopausal status. However, these associations were not found in past smokers who were premenopausal. In postmenopausal past smokers, only physical activity 4–7 days per week (>30 min per day) or active commuting were associated with decreased odds of metabolic syndrome compared with postmenopausal current smokers.

Significance of results

The study provides evidence that smoking cessation may increase the odds of developing

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Keywords

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metabolic syndrome, regardless of menopausal status. Strengths of the study include the size and age range of the subject population, direct measurement of anthropomorphic data in all subjects, collection of nutritional intake in a subset of patients and collection of data regarding menopausal status. Of note, the authors defined the presence of metabolic syndrome by the IDF criteria [2], which uses a smaller cut-off waist circumference (≥ 80 cm or 32 in) than other definitions that use either waist-to-hip ratio or waist circumference (≥ 88 cm or 35 in) in women [3]. There is considerable debate about the superiority of the IDF versus Adult Treatment Panel (ATP) III definitions for metabolic syndrome. Metabolic syndrome is important in its predictive value for cardiovascular disease and diabetes mellitus, and ATP III has been shown to have higher predictive value for coronary events than IDF in some populations [4]. It would be of interest to determine the impact of smoking status on metabolic syndrome using ATP III criteria in this study population.

Waist circumference was noted to be significantly higher in past and never smokers, compared with current smokers, regardless of menopausal status. In premenopausal women, past and never smokers were not at significantly increased odds for other components of metabolic syndrome. Similarly, postmenopausal women who were past and never smokers were also not at significantly increased odds of many other components of metabolic syndrome, including elevated triglycerides, low HDL or elevated FPG. Since waist circumference was a major factor leading to women making the criteria for metabolic syndrome, the use of a higher waist circumference cut-off, as supported by ATP III criteria, may have led to no significant increase in metabolic syndrome in past smokers.

Since this is a cross-sectional study, it is possible that there were other exposures associated with both smoking status and risk factors for metabolic syndrome that could explain the presence of metabolic syndrome in specific groups.

While this study focused on metabolic syndrome as a risk factor for cardiovascular mortality, the authors acknowledge that cigarette smoking remains the leading preventable cause of morbidity and mortality worldwide [5]. The authors, however, do not discuss that the association of cigarette smoking with increased morbidity and mortality is not likely to be mediated primarily through metabolic factors, but rather

through the direct effect of nicotine on coronary vasoconstriction, hypercoagulability and endothelial dysfunction [6,10]. Furthermore, nicotine may increase insulin resistance, and increased number of cigarettes smoked daily is directly associated with the risk of developing Type 2 diabetes [7]. With respect to women, cigarette smoking accelerates bone loss and increases the risk of hip fracture, a risk that can be reversed with smoking cessation [8]. Other conditions for which cigarette smoking significantly increases risk include pulmonary disease, lung cancer or other malignancies [9] and infections [10,11].

Smoking cessation has been associated with weight gain in several studies [12–14]. Despite weight gain, a large cohort study demonstrated that smoking cessation resulted in longevity benefits in both men and women [15]. Quitting smoking at a younger age resulted in greater life extension; however, even men and women who quit after the age of 65 years also experienced life extension of 1–4 years. This study did not report BMI or the prevalence of metabolic syndrome prior to and after smoking cessation. However, it has been well established in many studies that smoking cessation results in weight gain [12–14]. As a result, it appears that despite weight gain and associated metabolic changes after smoking cessation, smoking cessation still offers significant benefit with respect to mortality.

Future perspective

Kwasniewska *et al.* demonstrated that there is an increased prevalence of metabolic syndrome among postmenopausal women who were past and never smokers as compared with current smokers [1]. While smoking cessation is considered a leading approach to decrease morbidity and mortality worldwide, it may be associated with weight gain and increased risk of metabolic syndrome [5]. Kwasniewska *et al.* have demonstrated that both regular physical activity and active commuting were associated with decreased odds of developing metabolic syndrome in past smokers. This study supports that smoking cessation counseling should be coupled with broader lifestyle counseling focused on limiting weight gain by limiting nutritional intake and increasing physical activity, both of which may prevent the development of metabolic syndrome [1]. Future studies should focus on these lifestyle interventions to determine their direct effect on the development of metabolic changes after smoking cessation.

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Executive summary

- Cigarette smoking remains the leading preventable cause of morbidity and mortality worldwide.
- In both premenopausal and postmenopausal women, smoking cessation is associated with weight gain and increased odds of developing metabolic syndrome.
- Factors that are associated with decreased odds of metabolic syndrome among past and never smokers include physical activity of at least 30 min per day, 4–7 days per week and active commuting to work.
- For women who are planning to quit smoking, the lifestyle strategies listed above may prevent the development of weight gain and metabolic syndrome.

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