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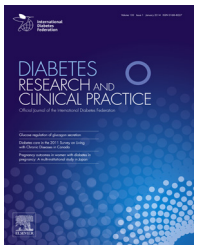

Instant coffee consumption may be associated with higher risk of metabolic syndrome in Korean adults

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ABSTRACT

Aims: Cumulative evidence suggests that coffee consumption may have beneficial effects on metabolic diseases; however, few previous studies have considered the types of coffee consumed and the additives used. We investigated the relationship between coffee consumption and metabolic syndrome (MetSyn) and its components.

Methods: We analyzed 17,953 Korean adults, aged 19–65 years, using cross-sectional data from the Korean National Health and Nutrition Examination Survey (KNHANES, 2007–2011). Coffee consumption level, types of coffee consumed, and the additives used were assessed based on a food frequency questionnaire and 24-h recall. Demographic and lifestyle factors were assessed using self-administered questionnaires. Data on metabolic biomarkers were obtained from a health examination. Multivariable logistic regression was used to determine the odds ratios of prevalent metabolic syndrome and its components according to frequency and type of coffee consumption.

Results: We found that 76% of the subjects were habitual coffee drinkers, most of whom consumed instant coffee mix containing sugar and powder creamer. After multivariable adjustment, the odds ratios (95% CI) comparing those who consumed coffee ≥3 times/day with those who consumed coffee <1 time/week were 1.37 (1.15–1.63) for obesity, 1.33 (1.11–1.59) for abdominal obesity, 1.28 (1.09–1.51) for hypo-HDL cholesterolemia, and 1.37 (1.10–1.72) for metabolic syndrome. Instant-coffee drinkers were observed to have elevated risks of these metabolic conditions.

Conclusions: Consumption of coffee, particularly instant coffee mix, may have harmful effects on MetSyn, perhaps partly deriving from excessive intake of sugar and powder creamer.

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1. Introduction

Coffee is one of the most frequently consumed beverages worldwide [1]. In 2010, the average annual coffee consumption in Korea was 2.06 kg per capita, and the consumption of coffee in Korea continues to increase [2]. Recent data showed that Koreans drink coffee approximately 10 times per week, making coffee the third most frequently consumed food or beverage item after rice (17 times/week) and cabbage (14 times/week) [3].

Previous studies reported that coffee consumption may be inversely associated with metabolic risk factors such as blood pressure (BP) [4,5] and fasting blood glucose (FG) [6,7]. In addition, cumulative evidence suggests that frequent coffee consumption may be linked to a lower risk of incident diabetes [8–12]. However, few studies have investigated the effects of the types of coffee consumed and the use of coffee additives on the risk of metabolic syndrome (MetSyn) or type 2 diabetes mellitus [8,10,13–16]. In addition, data on the Korean population are extremely limited [17–19], and the prevalences of MetSyn and type 2 diabetes have recently been increasing in Asian populations, including Koreans, reaching similar levels as Western countries [20,21]. Studies from other nations cannot be directly generalized to the Korean population because Koreans have unique coffee drinking habits. For example, filtered coffee is the most common type of coffee consumed in Europe and the United States, where the majority of the previous studies were conducted [8–11]. In contrast, coffee prepared using instant coffee mix (usually including powder creamer and sugar) is the most common type of coffee consumed in Korea, constituting over 90% of the domestic coffee market [22].

Therefore, we designed the present cross-sectional study to analyze coffee consumption patterns among Korean adults using nationally representative data from the Korean National Health and Nutrition Examination Survey (KNHANES). We specifically sought to investigate possible associations of the risk of MetSyn with the frequency of coffee intake and the type of coffee consumed.

2. Materials and methods

2.1. Study population

The KNHANES used a complex, stratified, multistage, probability-cluster sampling method, which enabled the collection of extensive and representative data concerning health and nutritional status in the non-institutionalized civilian Korean population. Data were collected through health interviews, health examinations, and dietary interviews administered by trained personnel.

We analyzed data from KNHANES 2007–2011, which included a total of 42,347 participants. Subjects were excluded from this study if they were aged <19 or >65 years (n = 17,326); self-reported a diagnosis of diabetes, stroke, myocardial infarction, angina pectoris, or were taking medications to control diabetes, myocardial infarction, or angina pectoris (n = 1910); had missing information on sampling weights (n = 1512); had missing frequency information on the coffee item of the food frequency questionnaire (FFQ) (n = 236); did not report 24-h recall dietary information (n = 3258); or had a daily energy intake <25% or >300% of estimated energy requirements (n = 152). In total, 17,953 subjects were included in the analysis of this study. We also conducted a sub-sample analysis of a total of 13,313 subjects, after excluding KNHANES respondents who provided insufficient information on coffee types or additive intakes. The Institutional Review Board (IRB) of Korea Centers for Disease Control and Prevention (KCDC) provided formal ethics approval for the KNHANES data sets (IRB number: 2007-02-CON-04-P, 2008-04EXP-01-C, 2009-01CON-03-2C).

2.2. Measurements

Education level was classified into 3 groups: middle school graduation or less, high school graduation, and at least college graduation. Smoking status was classified as never, former, or current smoker. Alcohol consumption was categorized based on the frequency of consumption per week. Level of physical activity was estimated using answers to 3 survey questions, and was categorized as vigorous-intensity physical activity, moderate-intensity physical activity, or walking. Metabolic equivalents (METs) h/week were calculated based on the subjects' responses to the physical activity questionnaires [23].

Food intake was assessed with a 63-item FFQ that included coffee. For each food item, there were 10 categories for the frequency of consumption, with responses that ranged from "rarely" to "3 times a day"; however, the amount consumed was not assessed. The frequency of coffee consumption was classified into 5 groups (<1 time/week, 1–6 times/week, 1 time/day, 2 times/day, ≥3 times/day). Dietary intake was also assessed using a single 24-h dietary recall. In this data, a total of 87 food codes were classified as "drink and tea." Among them, we selected 14 food codes that contained "coffee." To minimize the misclassification of coffee consumption status, and to identify the types of coffee and coffee additives consumed, we classified coffee drinkers using data from both the 24-h recall and the FFQ as follows: (1) non-drinkers were defined as individuals who drank less than once per week; (2) filtered-coffee drinkers were defined as individuals who consumed only filtered coffee with a frequency of coffee consumption greater than or equal to once per week; and (3) instant-coffee drinkers were defined as individuals who consumed only instant coffee or coffee prepared using instant coffee mix with a frequency of coffee consumption greater than or equal to once per week. Decaffeinated or boiled coffee is rarely consumed in South Korea, so it was not considered in our analysis. Because intake levels of sugar/syrup, coffee creamer, and milk were not included in the FFQ, we analyzed and categorized these using data from the 24-h recall.

Participants were asked to fast overnight before the health examination. Body weight and height were measured in light clothing with no shoes, and body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). "Overweight/obesity" was defined based on 2000 statement from the World Health Organization for Asian population [24].

Waist circumference (WC) was measured as the abdominal girth midway between the costal margin and the iliac crest at