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The effect of coffee consumption on food group intake, nutrition intake, and metabolic syndrome of Korean adults—2010 KNHANES (V-1)

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ABSTRACT

Background: Coffee is a popular beverage in Korea recent years. The purpose of this study was to investigate the relationship between coffee consumption and the risk of metabolic syndrome in Korean adults based on the 2010 Korean National Health and Nutrition Examination Survey (KNHANES V-1).

Methods: Dietary intake status and the factors of metabolic syndrome were assessed. Three groups (no coffee consumption, moderate intake, and high intake) were divided into tertile according to black coffee cream (include brewed coffee) consumption per day.

Results: Our results showed that the Tertile 3 group consumed more calories from fat, and niacin was higher than in the Tertile 1 and Tertile 2 group. INQ for protein and vitamin B_1 was significantly higher in no coffee consumption group than the other groups and in Tertile 3 exhibited significantly higher niacin intake. The subjects in Tertile 3 showed significantly higher consumption in grain and oil intake, and Tertile 1 group showed higher consumption in milk and dairy products. In the logistic regression analysis, adjusting for sex, age, energy intake, smoking, and drinking, being in the high coffee consumption group (Tertile 3) was significantly and inversely associated with abdominal obesity (OR = 0.76, CI = 0.71–0.82), hypertension (OR = 0.70, CI = 0.54–0.87), high glucose(OR = 0.71, CI = 0.61–0.86). However, no significant association was found between coffee consumption and metabolic syndrome.

Conclusion: Coffee consumption has not a considerably relationship with nutrient intake. Appropriate consumption of coffee may have potentially helpful effects on certain metabolic risk factors, such as abdominal obesity, hypertension, and high glucose.

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1. Introduction

In Korea, the culture of coffee consumption has become more common through the adoption of the Westernized diet, and it has continuously and rapidly increased in recent years [1]. In research based on the 2007–2009 (KNHANES V-1), 8056 subjects (52.3%) of the 15,389 subjects included in the analysis reported consuming coffee more than once a day, and 50.7% of the coffee consumers reported that their average coffee consumption was more than twice a day [2]. Recently, coffee was reported to be the most frequently consumed foods among Korean adults after rice (17 times per week), cabbage (14 times per week), and alcoholic beverages (10 times per week) [3]. According to the 2007 KNHANES of the Korea Centers for Disease Control and Prevention, the average daily energy intake among Koreans from coffee/instant coffee mix was 15.3 kcal per day, which ranked 24th for its contribution to

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energy intake among Koreans. It was shown that coffee was the only item categorized as a beverage within the top 30 foods ranked in order of their contribution to energy intake [4].

Coffee contains diverse ingredients, such as Café Royal, caffeol, chlorogenic acid, potassium, niacin, and magnesium. Such ingredients as caffeine are known to affect diverse physiological functions in our bodies [5]. Previous research conducted in many countries on the relationship between coffee and health has shown a potential effect on health by frequency of coffee consumption. There was one finding which showed a significantly lower level of metabolic syndrome present in Japanese people who drink coffee frequently [6–8]. However, no significant association between coffee and metabolic syndrome was found in cohort studies in the U.S. and Europe [9,10]. Additionally, the majority of the precedent studies suggested that higher or more frequent consumption of coffee reduces the morbidity rate of diabetes [11–13]. The relationship between coffee consumption and diabetes has been relatively consistent in studies. In comparison to overseas studies, domestic studies on coffee and health are insufficient. Specifically, a general consensus on the risk of metabolic syndrome has not been established to date.

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As the consumption of coffee beverages has rapidly grown and the frequency of coffee consumption by adults has become especially high, a majority of studies have been conducted on the physicochemical characteristics of coffee or the product quality and organoleptic properties [14]. However, there have been an inadequate number of studies on food and nutrient intake regarding coffee consumption [15]. There is normally a quantitative correlation between nutrient intake and energy intake. Therefore, an evaluation on the level of nutrient intake should be accompanied by considerations of energy intake [16]. A study by Lutsey et al. [17] on coffee consumption and food intake did not find any significant relationships between the risk of metabolic syndrome and the intake of food groups, including grains, fruits, vegetables, nuts, fish, poultry, and dairy products. While previous studies have focused more on eating patterns followed by coffee consumption or the construction of nutrients and calorie intake among the food groups, there is a gradual trend currently toward the study of the food itself ingested during a meal [18]. However, there is not yet an understanding of the relationship between coffee consumption and chronic diseases. Therefore, nothing much is known about the influence of coffee consumption on the diet of Korean adults, and there is no sufficient nutrient education underway in this field.

The 2010 KNHANES was a nationally funded, cross-sectional, nationwide survey that used a multistage sampling design to collect data regarding the health behaviors, nutrition, and socio-demographics of the general Korean population [19,20]. Currently, the nutrition survey has adopted 3 methods, such as health behavior investigation and health examination investigation, food frequency questionnaire and dietary intakes (24 h recall method), and dietary habits research (research on items related to dietary life and eating habits). Additionally, the health behavior survey and checkup survey are underway [21].

Therefore, this study aimed to understand the level of coffee consumption in Korean adults and to compare and analyze the true state of food group and nutrient intake, followed by coffee consumption (Tertile), INQ, and index related to metabolic disease, by utilizing the 2010 KNHANES. We hypothesized that higher coffee consumption affects dietary intake and increase risk of metabolic syndrome.

2. Materials and methods

2.1. Study population

The analysis in this study was conducted using 2010 KNHANES, V-1 data. Overall, 8958 subjects participated in this research. The following subjects were excluded from the analysis: (1) subjects who were younger than 19 years of age (2171 subjects), (2) subjects whose energy intakes were less than 500 kcal/day or exceeded 5000 kcal/day (1065 subjects), (3) pregnant women (771 subjects), and (4) subjects who had missing values (145 subjects). In total, 4806 individuals were included in the analysis after excluding the subjects who met those criteria.

2.2. Data collection and definitions

This study utilized data on sex, age, alcohol consumption, smoking status, body mass index(BMI), and coffee consumption, which were collected through the health inquiry survey of the KNHANE Survey. BMI was divide the subjects into a low weight group (<18.5 kg/m²), normal weight group (18.5 kg/m² \leq BMI < 23 kg/m²), overweight group (23 kg/m² \leq BMI < 25 kg/m²), and obese group (25 kg/m² \geq) [22]. To classify the groups according to coffee consumption, this study used variables from the second round of food code to examine the data on food intake of the subjects by using 24-h recall method-used-study in KNHANES. The second round of food code is a classification value to find foods that can be considered the same because their commercial names are identical and their water contents are similar. The coffee intake was analyzed by the black coffee include brewed

coffee, calculated by adding up the weight (g) variables. The subjects were classified into 3 groups (Tertile 1, Tertile 2, and Tertile 3) based on their daily coffee consumption by utilizing tertile and by calculating the average coffee intake of each group.

2.3. Dietary assessment

This study analyzed and displayed intake per 1000 kcal of each nutrient based on the food intake survey conducted through the 24-h recall method in the nutrient survey part of the data from the 2010 KNHANES (V-1). Nutrient intake was calculated from intake per nutrient of the subjects for analysis using data from the 24-h recall method [2,18]. Nutrients utilized in the analysis were total energy, protein, carbohydrate, fat, fiber, calcium, phosphorus, iron, sodium, vitamin A, vitamin B₁, vitamin B₂, niacin, and vitamin C. The energy ratio acquired from carbohydrates, fats, and proteins was calculated using the intake of those 3 nutrients.

This study calculated daily intake of different food groups by classifying them into the following 6 food groups: grains; meat, fish, egg, and beans; vegetables; fruits; milk and dairy products; and fat, oils, and sugars. These were grouped based on recommendations in the revised edition (2010) of the Nutrition Intake Criteria of Koreans from the Korea Nutrition Society, after examining the food code data which focused on the nutrition code data provided by KNHANES [23].

This study used the Index of Nutritional Quality (INQ) to evaluate the quality of a meal. This index can evaluate the degree of satisfaction in energy intake from each nutrient based on nutrient density. The INQ was used to compare nutrient intake per 1000 kcal of each nutrient and the recommended dietary intake per 1000 kcal. In this study, evaluation of the INQ was conducted on the following 12 nutrients: protein, fiber, calcium, phosphorus, iron, sodium, potassium, vitamin A, vitamin B₁, vitamin B₂, niacin, and vitamin C. In cases where the INQ exceeds 1, a specific nutrient was sufficiently consumed. In cases where INQ is less than 1, more of that nutrient should be consumed to satisfy the recommended dietary intake [23,24].

 $*INQ = \frac{nutrient intake per 1,000 kcal of calorie intake}{nutrient intake per 1,000 kcal of recommended calorie intake}$

2.4. Risk factors of metabolic syndrome

This study closely examined the following 8 factors of metabolic risks: BMI, waist circumference, diastolic blood pressure, systolic blood pressure, concentration of blood triglycerides, blood cholesterol concentration, HDL cholesterol concentration, and fasting blood glucose. These factors were used to study the association between coffee consumption and metabolic syndrome. Metabolic syndrome was defined as any Asian, according to the WHO, meeting any 3 out of the following 5 criteria recommended by the 2001 National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III): (1) abdominal obesity: waist circumference for males \geq 90 cm and females \geq 85 cm; (2) high blood pressure: systolic blood pressure \geq 133 mmHg or diastolic blood pressure \geq 85 mmHg, or medication status in the case of a patient who has past medical history of high blood pressure; (3) hypertriglyceridemia: blood triglycerides \geq 150 mg/dL or taking medication; (4) low HDL cholesterol: in males <40 mg/dL, in females <50 mg/dL, or taking medication; and (5) fasting blood glucose \geq 100 mg/dL or taking medication. Obesity is defined as BMI \geq 25.0 kg/m² according to the criteria of the Asia-Pacific region of the WHO [24,25].

2.5. Statistical analyses

Data analysis was conducted in SAS (Statistical Analysis System, version 9.3, SAS Institute, Cary, NC, USA). Composite sampling based on the outcome data of KNHANES was applied to the data treatment and the Download English Version:

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