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The association of increased uric acid levels according to the intake and frequency of sugar-sweetened carbonated beverages(SSB) in the Korean population

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Background : High uric acid levels are associated with various conditions such as obesity, metabolic syndrome, and diabetes. According to several Western studies, the consumption of sugar-sweetened carbohydrate beverages (SSB) has been found to increase serum uric acid levels. However, there is limited research on the association between SSB and uric acid levels in Korea. This study aimed to investigate the relationship between the consumption of SSB and serum uric acid levels in the Korean population, which can provide valuable insights into the potential health implications of SSB consumption in our study population.

Methods: We analyzed data from 2,881 participants aged 19 to 64 years (1066 males and 1,815 females), excluding those diagnosed with cancer and chronic kidney disease, from the 2016 Korean National Health and Nutrition Examination Survey. Serum uric acid levels were categorized into quartiles for each gender, with the highest quartile defined as high uric acid levels(serum uric acid level ≥6.7mg/dL for males and ≥4.8mg/dL for females)). These thresholds indicate that serum uric acid levels surpass the upper 25% range within their respective gender groups and may be associated with conditions such as obesity, metabolic syndrome, and diabetes. Daily consumption of SSB was classified into quartiles (almost never, <1 cup, 1~3 cups, ≥3 cups), and consumption frequency was divided into tertiles (almost never, ≤1/week ,≥2/week). We used multivariate logistic regression to assess the association and we conducted separate analyses for males and females.

Results: Mean uric acid levels differed significantly between males (5.9±0.0 mg/dL) and females (4.3±0.0 mg/dL) ($p < 0.001$). Mean age showed no significant difference between males (40.6±0.5 years) and females (41.5±0.4 years) ($p = 0.095$). Various other factors, including BMI, waist circumference, blood pressure, triglyceride levels, HDL cholesterol, and fasting blood glucose were all higher in males ($p < 0.001$). Males exhibited higher rates of alcohol consumption, smoking, and aerobic physical activity ($p < 0.001$, $p < 0.001$, $p = 0.003$, respectively). Dietary variables, including energy intake, protein, saturated fat, and carbohydrates, were all higher in males ($p < 0.001$). Education level, marital status, and personal income also varied significantly between genders ($p < 0.001$, $p < 0.001$, $p = 0.047$, respectively).

An increased daily consumption and frequency of SSB intake were associated with high uric acid levels in males but not in females. These associations remained significant even after adjusting for sociodemographic and health-related characteristics. After adjusting all sociodemographic and health-related characteristics, individuals who consumed more than 3 cup of SSB per day had a significant association with high serum uric acid levels (OR, 95% CI = 1.921, 1.159-3.184), with a linear trend (p for trend < 0.001). Additionally, those who consumed SSB ≥twice a week also had a significant

association with high serum uric acid levels (OR, 95% CI = 1.742, 1.199-2.532), with a linear trend (p for trend < 0.001).

Conclusion: In this study, both increased consumption and frequency of SSB intake were significantly associated with elevated serum uric acid levels in Korean males, while no such association was observed in females. This can be affected by gender-specific factors, such as the impact of female hormones. And lower consumption and frequency of SSB in females may also play a role. Hyperuricemia can contribute to the onset of various diseases, including hypertension, obesity, diabetes, metabolic syndrome, gout, and ischemic heart diseases, ultimately leading to an increase in mortality rates. Therefore, excessive consumption and increased frequency of SSB should be avoided, particularly in males.

Keywords: uric acid, sugar-sweetened carbonated beverages, metabolic syndrome, Korea