Regular intake of sugary beverages, but not diet soda, is associated with prediabetes

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Adult Americans who regularly consumed sugar-sweetened beverages

(roughly one can of soda per day) had a 46 percent higher risk of developing prediabetes compared to low- or non-consumers over a 14-year period, according to a new epidemiological analysis led by scientists at the Jean Mayer USDA Human Nutrition Research Center on Aging (HNRCA) at Tufts University. Higher sugar-sweetened beverage intake was also associated with increased insulin resistance, a risk factor for type 2 diabetes.

No associations between diet soda consumption and risk of prediabetes or increased insulin resistance were found. However, the research team notes that previous studies on associations between diet soda and risk of type 2 diabetes have produced mixed results, and further studies are needed to reveal the long-term health impact of artificially sweetened drinks. The findings were published in the *Journal of Nutrition* on Nov. 9.

"Although our study cannot establish causality, our results suggest that high sugar-sweetened beverage intake increases the chances of developing early warning signs for type 2 diabetes. If lifestyle changes are not made, individuals with prediabetes are on the trajectory to developing diabetes," said senior study author Nicola McKeown, Ph.D., scientist in the Nutritional Epidemiology Program at the USDA HNRCA.

"Our findings support recommendations to limit sugar-sweetened beverage intake, which can be achieved by replacing sugary beverages with healthier alternatives such as water or unsweetened coffee or tea," added McKeown, who is also an associate professor at the Friedman School of Nutrition Science and Policy at Tufts. "This is a simple dietary modification that could be of substantial health benefit to people who consume sugary drinks daily and who are at increased risk of diabetes."

In the current study, McKeown and her colleagues analyzed longitudinal

data on 1,685 middle-aged adults over a period of 14 years, obtained from the Framingham Heart Study's Offspring cohort—a National Heart, Lung, and Blood Institute-funded program that has monitored multiple generations for lifestyle and clinical characteristics that contribute to cardiovascular disease. Selected participants did not have diabetes or prediabetes during an initial baseline examination and self-reported their long-term sugar-sweetened beverage and diet soda consumption habits through food frequency questionnaires. Sugar-sweetened beverages were defined as colas and other carbonated beverages, and non-carbonated fruit drinks such as lemonade and fruit punch. Fruit juice was not included in the sugar-sweetened beverage category.

The team found those who drank the highest amounts of sugar-sweetened beverages—a median of six 12 fluid ounce servings a week—had a significantly greater risk of developing prediabetes compared to low- or non-consumers, after adjusting for factors such as age, sex and body mass index. The highest consumers of sugar-sweetened beverages had roughly 8 percent higher insulin resistance scores, compared to low- or non-consumers after follow-up at seven years. Even after accounting for change in weight and other aspects of diet, the relationships between sugar-sweetened beverages and these metabolic risk factors for diabetes persisted.

Diet soda intake—defined as low-calorie cola or other carbonated low-calorie beverages—had no statistical associations with risk for either prediabetes or insulin resistance. However, previous research on the relationship between diet soda and type 2 diabetes has been mixed, and it is still unclear whether any observed associations are due to direct or indirect factors. More research is needed to determine whether there are real health risks with long-term diet soda consumption, say the study authors. In addition, the authors caution that despite adjusting for multiple factors, residual confounding cannot be ruled out due to the

observational nature of the study. Participants who were analyzed in the study were mostly middle-aged and Caucasian, more likely to be women, and had lower body mass index and waist circumference, which may limit the generalizability of the findings.

A significant body of research has found associations between regular consumption of sugar-sweetened beverages and increased risk of type 2 diabetes. The new findings now provide evidence of an association with the major predictor of type 2 diabetes. If diagnosed early, prediabetes is reversible through lifestyle changes such as diet and exercise.

"Based on our observational study alone, we cannot be certain why we saw the relationships we did. Additional studies are needed to fully understand the health impact of sugar-sweetened beverages and diet sodas," said lead study author Jiantao Ma, Ph.D., who conducted the analysis as part of his doctoral thesis as a student in the Nutrition Epidemiology Program at the USDA HNRCA and the Friedman School.

"Nevertheless, our data are consistent with many other studies and clinical trials that support the health benefits of reducing sugar intake, and we encourage the public to look for healthier options," added Ma, who is currently a postdoctoral fellow at the National Heart, Lung, and Blood Institute of the National Institutes of Health.

  More information: Ma et al. "Sugar-Sweetened Beverage but Not Diet Soda Consumption Is Positively Associated with Progression of Insulin Resistance and Prediabetes." *J. Nutrition* 2016; 146:1-7. DOI: 10.3945/jn.116.234047

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