

EDITORIAL



Calories from Soft Drinks — Do They Matter?

Sonia Caprio, M.D.

Obesity has emerged as one of the greatest global health challenges of the 21st century.¹ Its increase among children and adolescents is particularly frightening, given the associated metabolic and cardiovascular complications.^{2,3} Studies from developing countries with populations that are undergoing rapid changes in nutrition are showing increases in the prevalence of childhood obesity.⁴

The increase in consumption of sugar-sweetened beverages among both adults and children in the United States and other countries is considered a potential contributor to the obesity pandemic.^{5,6} Sugar intake from sugar-sweetened beverages alone, which are the largest single caloric food source in the United States, approaches 15% of the daily caloric intake in several population groups.^{7,8} Adolescent boys in the United States consume an average of 357 kcal of the beverages per day.⁸ Sugar-sweetened beverages are marketed extensively to children and adolescents, and large increases in consumption of sugar-sweetened beverages have occurred among black and Mexican-American youth,^{8,9} who are known to be at higher risk for obesity and the development of type 2 diabetes than their white counterparts.¹⁰

Unlike carbohydrates with high fiber content, sugar-sweetened beverages are nutrient-poor and are often associated with consumption of salty foods and fast foods. An emerging association between the increased consumption of sugar-sweetened beverages and chronic diseases such as type 2 diabetes, hypertension, and coronary heart disease is a major concern.⁶ A widely proposed explanation for this association is that caloric beverages elicit weak satiety and compensatory dietary responses.⁶ However, the evidence supporting this hypothesis remains inconclusive. Another potential explanation is the use of high-fructose corn syrup, a key ingredient in most

sugar-sweetened beverages. Many studies have shown that dietary fructose promotes hepatic lipogenesis and the development of insulin resistance,¹¹ thereby fueling the development of fatty liver disease and type 2 diabetes.

Three studies now published in the *Journal*, by de Ruyter et al.,¹² Ebbeling et al.,¹³ and Qi et al.,¹⁴ provide new data showing that consumption of sugar-sweetened beverages may influence the development of obesity among children, adolescents, and adults. The study by Qi and colleagues examined the interaction between the intake of sugar-sweetened beverages and a genetic-predisposition score that was calculated on the basis of 32 body-mass index (BMI) loci associated with obesity in women and men from two large prospective cohorts and in an independent replication cohort. This study provides strong evidence that there is a significant interaction between an important dietary factor — intake of sugar-sweetened beverages — and a genetic-predisposition score, obesity, and the risk of obesity. Hence, participants with a greater genetic predisposition may be more susceptible to the adverse effects of sugar-sweetened beverages on obesity; this is a clear example of gene–environment interaction. It is important to note, however, that this interaction is apparent only when a score is calculated from multiple genetic variants. The mechanisms accounting for the observed interaction are, unfortunately, not provided by the study. Nevertheless, the study by Qi et al. provides support for the need to test whether interventions aimed at reducing the intake of sugary drinks to reduce the risk of obesity might be more effective in persons with a high genetic-predisposition score.

In their articles on their rigorously designed randomized, controlled trials, de Ruyter et al. and

Ebbeling et al. describe the effects of interventions to reduce consumption of sugar-sweetened beverages on weight gain in normal-weight children and overweight and obese adolescents, respectively. The study by de Ruyter and colleagues is laudable for its double-blind design, large sample of normal-weight schoolchildren from 4 years 10 months to 11 years 11 months of age, and measurement of sucralose in urine as an additional compliance marker. An important limitation is that 26% of the participants did not complete the study, for unspecified reasons. Nevertheless, the results clearly suggest that masked replacement of a sugar-containing beverage (104 kcal) with a sugar-free beverage significantly reduced weight gain and fat accumulation in normal-weight children.

Ebbeling and colleagues randomly assigned 224 overweight and obese adolescents who regularly consumed sugar-sweetened beverages to experimental and control groups. The experimental group received a 1-year intervention consisting of home delivery of noncaloric beverages. This intervention was designed to decrease consumption of sugar-sweetened beverages, with a follow-up for an additional year. A particular merit of the study is its choice of the home as the place for the intervention, since the greatest consumption of sugar-sweetened beverages in both children and adolescents occurs at home.⁵ Another strength of the study is its excellent participant-retention rates. The difference in the primary outcome, the change in BMI at 2 years between the experimental and control groups, was not significant. However, at 1 year, significant changes in BMI were observed, particularly among Hispanic participants. These changes were modest, occurring mainly in a very small number of obese Hispanic adolescents, and they were not sustained at 2 years.

These randomized, controlled studies — in particular, the study by de Ruyter et al. — provide a strong impetus to develop recommendations and policy decisions to limit consumption of sugar-sweetened beverages, especially those served at low cost and in excessive portions, to attempt to reverse the increase in childhood obesity. Such interventions, if successful, may also help prevent the development of type 2 diabetes and its complications in youth.

Taken together, these three studies suggest that calories from sugar-sweetened beverages

do matter. Furthermore, policy decisions about sugar-sweetened beverages should not be considered in isolation. Other strategies to achieve and maintain normal weight, including increasing physical activity, will be important to stem the obesity epidemic and its effects. The time has come to take action and strongly support and implement the recommendations from the Institute of Medicine, the American Heart Association, the Obesity Society, and many other organizations to reduce consumption of sugar-sweetened beverages in both children and adults.

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From the Department of Pediatrics, Yale School of Medicine, and the Yale Center for Clinical Investigation at Yale University, New Haven, CT.

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