Sugar-Sweetened Soft Drinks, Obesity, and Type 2 Diabetes

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SUGAR-SWEETENED SOFT DRINKS CONTRIBUTE 7.1% OF total energy intake and represent the largest single food source of calories in the US diet.[1] Coincidentally or not, the rise of obesity and type 2 diabetes in the United States parallels the increase in sugar-sweetened soft drink consumption.[2] Several studies have found an association between sugar-sweetened beverages and incidence of obesity in children.[3,4] In one study, the odds ratio of becoming obese increased 1.6 times for each additional sugar-sweetened drink consumed every day.[3] Increased diet soda consumption was negatively associated with childhood obesity.

The article by Schulze and colleagues[5] in this issue of *JAMA* represents another link in the chain of evidence. This study provides additional evidence that excess calories from sugar-sweetened soft drinks are responsible for the increasing prevalence of obesity among adults and also implicates sugar-sweetened soft drinks as a cause of type 2 diabetes.

One of the significant features of the study by Schulze et al[5] is that its results are based on longitudinal data. Studies based on cross-sectional data may be biased because many overweight or obese persons will switch to drinking diet soda as a way of combating their increasing weight. Thus, cross-sectional studies may underestimate the link between sugar-sweetened beverages and overweight, since obese persons may switch to diet soft drinks to lose weight. Longitudinal data allow researchers to follow up with participants and account for any switch to diet drinks.

Second, the study reports that women who increased their sugar-sweetened soft drink consumption also increased their reported total calorie consumption, by 358 kcal/d on average, with most of the excess calories accounted for by the soft drinks. This finding holds for fruit punches and fruit juices as well as sugar-sweetened soft drinks. This result supports the finding that when individuals increase liquid carbohydrate consumption, they do not reduce their solid food consumption in response.[6-8] An increase in liquid carbohydrates leads, perversely, to even greater caloric consumption.

One 12-oz can of sugar-sweetened soda contains 150 kcal and 40 to 50 g of sugar. If these calories are added to a typical US diet with no offsetting reduction in other caloric sources, 1 can of soda per day could lead to a 15-lb (6.75-kg) weight gain in 1 year. A better mechanism for weight gain could not have developed than introducing a liquid carbohydrate with calories that are not fully compensated for by increasing satiety. Liquid calories are a relatively new addition to the human diet—perhaps the human satiety circuit has not yet adapted to register these calories for what they are.

A notable finding of Schulze et al[5] was that weight gain was more dramatic for soft drinks compared with fruit punches and fruit juices. In addition, unlike intake of sugar-sweetened soft drinks, intake of fruit juices was not associated with an increased risk of type 2 diabetes. This could be because of the lower glycemic index of fruit juice or the phytochemicals, soluble fiber, or other constituents of fruit juice that could be beneficial, as the authors suggest.

The data in the study by Schulze et al[5] reveal that women with a higher intake of sugar-sweetened soft drinks tended to be less physically active, to smoke more, and to have higher intakes of total calories and lower intakes of protein, alcohol, magnesium, and cereal fiber. In addition, intake of total carbohydrates, sucrose, and fructose, as well as overall glycemic index, was higher in these women. In essence, these women have dietary patterns and lifestyle habits that lead to increased risk of several disease states, including obesity, type 2 diabetes, and. cardiovascular disease.

Perhaps the take-home message is that a simple question about sugar-sweetened beverage consumption can alert the primary care clinician to patients' unhealthy eating and lifestyle habits. Sugar-sweetened beverage consumption as a marker of an unhealthy lifestyle has the potential of being a quick screening test for increased risk of obesity and type 2 diabetes, but it requires validation. The data from Schulze et al[5] also suggest that fruit juices can be recommended over fruit punch or sugar-sweetened soda as the least of 3 evils. Fruit juices are not completely safe if the extra energy associated with consumption of fruit juices is not displaced. Clinicians should also advise their patients to cut down on overall sugar-sweetened beverage consumption.

See also p 927.

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Hill et al[9] estimated that a deficit of 100 kcal/d could prevent weight gain in most of the US population. This would amount to decreasing sugar-sweetened beverage intake by less than 1 can of soda per day per person.

From a public policy perspective, this study should help to convince the US Department of Agriculture to redefine guidelines for sugar consumption, especially in soft drinks. In addition, the government should support local efforts to banish soda machines from schools or replace soft drinks with healthier options (eg, *not* sugar-sweetened fruit drinks). School-based programs can play an important role in preventing obesity. A recent randomized clinical trial has shown that a targeted, school-based intervention resulting in a modest reduction in the number of carbonated drinks consumed reduced overweight and obesity among children.[10] The food industry should cooperate by decreasing the sugar load of their marketed beverages and by offering other, healthier beverages.

Because of the large amount of calories in sugar-sweetened soft drinks and the relationship between consumption of these drinks and weight gain, reducing sugar-sweetened beverage consumption may be the best single opportunity to curb the obesity epidemic. However, convincing individuals to alter their behavior will require major educational and public health efforts that have not been forthcoming.

Obesity is now a complex worldwide problem, resulting from a combination of genetic, behavioral, cultural, and environmental influences, that calls *for* not only behavioral changes at individual levels but also changes in public policy, social environment, and cultural norms. To begin the process of change, the World Health Organization (WHO) and the Food and Agriculture Organization submitted a report in April 2003 concluding that many deaths attributed to chronic diseases are due to obesity and outlined how millions of persons around the world can avoid chronic disease through diet and exercise.[ll] The report criticized the food industry for "heavy marketing practices of energy-dense, micronutrient poor food" and recommended restricting intake of sugar-sweetened soft drinks with total sugar intake comprising no more than 10% of a healthy diet. The food industry, as expected, challenged and denounced the report as being "in conflict with a wealth of scientific evidence on obesity, diet quality, and nutrient intake."[12] Unfortunately, the US Department of Health and Human Services also rejected the report early in 2004, citing that the report was not evidence-based and failed to meet the standards of the US Data Quality Act.[13] Experts in the field of obesity reported feeling a sense of deja vu with the tobacco industry's tactics to thwart the rising public health campaign against smoking.[14]The *WHO's* global strategy on diet, physical activity, and health was finally adopted in May 2004, after a compromise eliminating the specific limits on the consumption of salt, sugar, saturated fats, and trans-fatty acids.[15,l6] The study by Schulze et al[5] provides strong, scientifically sound evidence that excess calories from soft drinks are directly contributing to the epidemics of obesity and type 2 diabetes, at least in the United States, and should help convince the US government that further changes in health policy are needed.

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