

Soft Drinks, Obesity, and Risk for Development of Type 2 Diabetes

Schulze MB, Manson JE, Ludwig DS, et al. Sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. JAMA 2004;292:927-34.

Study Overview

Objective. To examine the association between consumption of sugar-sweetened drinks and weight gain and the risk for developing type 2 diabetes in women.

Design. Prospective cohort analysis conducted from 1991 through 1999 among women enrolled in the Nurses Health Study II.

Setting and participants. The Nurses Health Study II consists of 116,671 U.S. women nurses aged 24 to 44 years at initiation in 1989. The diabetes analysis included 91,249 women who were free of diabetes at baseline in 1991. All participants were followed up with biennial mailed questionnaires. Incident diabetes was determined through self-report. Those reporting diabetes were mailed a supplemental diabetes questionnaire asking about the diagnosis and treatment. There were 741 confirmed cases of incident type 2 diabetes during the 716,300 person-years of follow-up. The weight change analysis included 51,603 women whose complete dietary history was available by semiquantitative food frequency questionnaire. They were also included if their body weight was available in 1991, 1995, and 1999.

Main outcome measures. The mean weight changes and incidence of type 2 diabetes according to frequency of sugar-sweetened soft drink consumption.

Main results. Those with stable consumption patterns had no difference in weight gain. Those women who increased their sugar-sweetened soft drink consumption from ≤ 1 /week to ≥ 1 /day had the highest weight gain over a 4-year period (4.69 kg, 1991-1995; 4.2 kg, 1995-1999), after adjusting for lifestyle and dietary confounders. The multivariate adjusted relative risk of developing diabetes among women in the highest consumption category (≥ 1 drink/day) was 1.87 (95% confidence interval, 1.43-2.45; $P < 0.001$).

Conclusion. Higher consumption of sugar-sweetened drinks is associated with greater weight gain and an increased risk for developing type 2 diabetes in women.

Commentary

Type 2 diabetes and obesity are among the top public health crises in the world today. The prevalence of type 2 diabetes in the United States was more than 18 million people aged 20 years and older in 2002 [1]. According to Schulze et al, soft drinks are the leading source of added sugars in the U.S. diet. Moreover, the increase in the prevalence of diabetes and obesity has coincided with a 61% increase in the consumption of soft drinks by adults and a doubling in consumption by children and adolescents between the late 1970s and the mid-1990s [2].

In this study, women who increased their sugar-sweetened soft drink consumption also increased their reported total calorie consumption by an average of 358 kcal/day with most of the excess calories coming from soft drinks. This result supports the finding that persons who consume sugar-sweetened soft drinks do not reduce their solid food consumption, leading to more calories consumed and, ultimately, weight gain. The women in the study reported an average weight gain of 4.5 kg over a 4-year period.

Cohort studies, in general, are an acceptable way to follow a population for a long period of time to assess for the development of common outcomes, such as diabetes. This study's longitudinal design is superior for following a population that may change their intake of sugar-sweetened drinks as they get older or as a consequence of weight gain. A limitation of the study is the imprecise measurements that are obtained from food frequency questionnaires, which may lead to a decrease in the observed frequency of sugar-sweetened beverage consumption. However, this would have biased the results toward null, leading to little or no association between sugar-sweetened beverages and weight gain or diabetes. Another limitation is the imprecision of self-reported weights. Women may have underreported their weight, and this also would have underestimated the amount of weight gained over time. The authors note that because of the observational nature of the study, they cannot prove that the observed associations are causal. There may be unidentified confounders that could have affected the associations between sugar-sweetened soft drinks and weight gain and diabetes. The authors controlled for potential confounding by identifying most known risk factors

associated with sugar-sweetened soft drinks and the changes that are known to occur in these variables over time.

Applications for Clinical Practice

The study by Schulze et al provides evidence that excess calories from sugar-sweetened soft drinks are contributing to the U.S. epidemics of obesity and type 2 diabetes. Primary care physicians should inquire about sugar-sweetened beverage consumption and counsel patients that this may increase their risk of obesity and type 2 diabetes.

—Review by Christianne L. Roumie, MD

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References

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2. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet* 2001; 357:505–8.