Consumption of sugar-sweetened beverages (SSBs), particularly carbonated soft drinks, may be a key contributor to the epidemic of being overweight and obese, by virtue of these beverages' high added sugar content, low satiety, and incomplete compensation for total energy.

We searched English-language MEDLINE publications from 1966 through May 2005 for cross-sectional, prospective cohort, and experimental studies of the relation between SSBs and the risk of weight gain (ie, overweight, obesity, or both).

Findings from large cross-sectional studies, in conjunction with those from well-powered prospective cohort studies with long periods of follow-up, show a positive association between greater intakes of SSBs and weight gain and obesity in both children and adults.

The weight of epidemiologic and experimental evidence indicates that a greater consumption of SSBs is associated with weight gain and obesity.

These authors also note:

“Over the past 2 decades, obesity has escalated to epidemic proportions in the United States and many countries around the world.”

According to the World Health Organization (WHO), more than 1 billion adults throughout the world are overweight, and of these, at least 300 million are considered obese.

“In the United States alone, an estimated 129.6 million persons, or 64% of the population aged 20–74 y, are overweight, and 30% of those 129.6 million are considered obese.”

“Similar trends are being seen among children and adolescents, which could lead to serious health complications in adulthood.”

Being overweight and obese is associated with hypertension, cardiovascular disease, diabetes, depression, and breast, endometrial, colon, and prostate cancers.
In the United States there is a concomitant increase in rates of being overweight and obese with consumption of carbohydrates, largely in the form of added sugars.

The WHO has suggested that added sugars should provide no more than 10% of dietary energy, yet in the US it is 16%.

The largest source of these added sugars is soft drinks, which account for 47% of total added sugars in the diet.

The term soft drink includes sodas and other sugar-sweetened beverages such as fruit drinks, lemonade, and iced tea. Consumption of these beverages has increased by 135% between 1977 and 2001.

In the United States, a 12-oz can of soda provides 40–50 g of sugar in the form of high-fructose corn syrup ((HFCS) 45% glucose and 55% fructose), which is equivalent to 10 teaspoons of table sugar.

One soda/d could lead to a weight gain of 15 lb or 6.75 kg in 1 year.

“Paralleling the pattern of soda consumption is that of the consumption of fruit drinks and fruitades (drinks made by adding water to powder or crystals), which are similarly sweetened and are often consumed in large amounts by toddlers and young children.”

“Consumption of these fruit drinks and soda represents nearly 81% of the increase in caloric sweetener intake across 2 recent decades in the United States.”

“The increased consumption of HFCS, the prevailing sweetener used to flavor calorically sweetened beverages in the United States, has been found to mirror the growth of the obesity epidemic.”

The intake of sugar-sweetened beverages may promote weight gain and obesity by increasing overall energy intake.

DISCUSSION

Thirty studies were identified and included in this systematic review.

“Most of the cross-sectional studies, especially the large ones, found a positive association between the consumption of sugar-sweetened beverages and body weight.”

Three prospective studies “found that an increase in the consumption of sugary soft drinks was significantly associated with greater weight gain and greater risk of obesity over time in both children and adults.”
BIOLOGIC MECHANISMS

Soda consumption weight gain arises because of the low satiety of liquid foods.

“When persons increase liquid carbohydrate consumption, they do not concomitantly reduce their solid food consumption.” (13 references)

“Some evidence suggests that the palatability of both sugar-sweetened and artificially sweetened drinks increases subjective hunger and hence energy intake and weight gain.” [Important]

The consumption of fructose-sweetened beverages increases adiposity more than does the consumption of either sucrose-sweetened or artificially sweetened beverages. [Important] “This finding is of particular interest because soft drinks are sweetened with HFCS in the United States.”

“In addition to its potential role in weight gain, the intake of sugar-sweetened soda may increase the risk of type 2 diabetes,” probably because of the HFCS which is rapidly absorbable.

The consumption of sucrose-sweetened items significantly increased inflammatory biomarkers. [Important] The proinflammatory process increases the risk of diabetes, and “may be exacerbated by a high intake of rapidly digested and absorbed carbohydrates.”

“Soft drinks that contain caramel coloring are rich in advanced glycation end-products [AGEs], which may increase insulin resistance and inflammation.”

The intake of sweetened soft drinks may be associated with a greater risk of pancreatic cancer.

The consumption of cola-type beverages is associated with bone mineral density loss and with bone fractures because of their high phosphate content.

The intake of soft drinks has been linked to increased risk of dental caries because of the sodas' high sugar content and acidity, which results in enamel erosion over time.

Fruit juices, “such as apple juice, which are consumed in great quantities by young children,” are also been linked to being overweight and obese.

CONCLUSIONS

“The consumption of sugar-sweetened beverages has increased dramatically in the past decades, in parallel with increasing prevalences” of being overweight and obese in the United States.
This study has “provided strong evidence for the independent role of the intake of sugar-sweetened beverages, particularly soda, in the promotion of weight gain and obesity in children and adolescents.”

The “likely mechanism by which sugar-sweetened beverages may lead to weight gain is the low satiety of liquid carbohydrates and the resulting incomplete compensation of energy at subsequent meals.”

“The HFCS content of soda may have a particular role in adiposity and diabetes risk.”

“Sugar-sweetened beverages, particularly soda, provide little nutritional benefit, increase weight gain and probably the risk of diabetes, fractures, and dental caries.” [Important]

“Consumption of sugar-sweetened beverages such as soda and fruit drinks should be discouraged, and small quantities of fruit juice should be made a priority.”

KEY POINTS FROM DAN MURPHY

1) Consumption of sugar-sweetened beverages, particularly carbonated soft drinks, is a key contributor to the epidemic of being overweight and obese because of their high sugar content.

2) “Over the past 2 decades, obesity has escalated to epidemic proportions in the United States and many countries around the world.”

3) More than 1 billion adults throughout the world are overweight.

4) In the U S, 129.6 million persons (64% of the population) aged 20–74 years, are overweight, and 30% of those 129.6 million (38.9 million) are obese.

5) The obesity epidemic seen in adults is also seen in children and adolescents.

6) Being overweight and obese are associated with hypertension, cardiovascular disease, diabetes, depression, and breast, endometrial, colon and prostate cancers.

7) In the U S there is a concomitant increase in rates of obesity with consumption of carbohydrates, especially in the form of added sugars.

8) The term soft drink includes sodas and other sugar-sweetened beverages such as fruit drinks and lemonade.

9) A 12-oz can of soda provides 40–50 g of sugar in the form of high-fructose corn syrup ((HFCS) 45% glucose and 55% fructose), which is equivalent to 10 teaspoons of table sugar.
10) One soda/day could lead to a weight gain of 15 lb. or 6.75 kg in 1 year.

11) “The increased consumption of high-fructose corn syrup, the prevailing sweetener used to flavor calorically sweetened beverages in the United States, has been found to mirror the growth of the obesity epidemic.”

12) Soda consumption weight gain arises because of the low satiety of liquid foods. “When persons increase liquid carbohydrate consumption, they do not concomitantly reduce their solid food consumption.” Therefore, weight gain is inevitable.

13) Both sugar-sweetened and artificially sweetened drinks increase hunger and hence energy intake and weight gain. [Important]

14) The consumption of fructose-sweetened beverages increases adiposity more than does the consumption of either sucrose-sweetened or artificially sweetened beverages. [Important] “This finding is of particular interest because soft drinks are sweetened with HFCS in the United States.”

15) High-fructose corn syrup is rapidly absorbable, and therefore is particularly apt to cause weight gain and type-2 diabetes.

16) Sugary sodas increase incidences of pancreatic cancer and dental caries.

18) The consumption of sugary items significantly increased inflammatory biomarkers.

19) “Soft drinks that contain caramel coloring are rich in advanced glycation end-products, which may increase insulin resistance and inflammation.” [Advanced glycosylation end-products (AGEs) are damaged proteins caused by poor insulin control; they promote inflammation. This process is accelerated by aluminum (soda can) and therefore leads to Alzheimer’s. AGEs also damage the blood-brain barrier, the mitochondria, increase the production of free radicals, and accelerate biological aging.]


21) Fruit juices, which are consumed in great quantities by young children, are linked to them being overweight and obese; the worse fruit juice is apple juice.

22) “Sugar-sweetened beverages, particularly soda, provide little nutritional benefit and increase weight gain and probably the risk of diabetes, fractures, and dental caries.” [Important]

23) “Consumption of sugar-sweetened beverages such as soda and fruit drinks should be discouraged.”