

Sugar-sweetened beverages and their contribution to obesity and metabolic disorders

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Sugar-sweetened beverages (SSBs) are widely consumed globally, representing one of the largest sources of added sugars in the modern diet. These include soft drinks, fruit drinks, sweetened teas, energy drinks, and flavored waters. Their high sugar content, mainly in the form of sucrose or high-fructose corn syrup, contributes significantly to total energy intake while providing minimal nutritional value. The increasing prevalence of obesity and metabolic disorders such as type 2 diabetes mellitus (T2DM), cardiovascular disease, and non-alcoholic fatty liver disease (NAFLD) has raised concerns about the role of SSBs in global health. This review discusses the nutritional composition of SSBs, the biological mechanisms linking their intake to obesity and metabolic diseases, and public health strategies aimed at reducing their consumption.

Nutritional Profile of Sugar-Sweetened Beverages

SSBs contain large amounts of added sugars but lack essential nutrients. A standard 355 ml (12-ounce) soda contains about 35–40 grams of sugar, equating to roughly 140–160 kcal. The World Health Organization (WHO) recommends limiting free sugar intake to less than 10% of total daily energy, ideally below 5% for additional health benefits. Regular consumption of SSBs often exceeds these limits, promoting weight gain and poor metabolic health.

Mechanisms Linking SSBs to Obesity and Metabolic Disorders

1. **Excess Caloric Intake:** Liquid calories do not promote satiety as effectively as solid foods, leading to increased overall calorie consumption.
2. **Insulin Resistance:** Frequent intake of high-glycemic SSBs triggers rapid glucose absorption and insulin release, eventually leading to insulin resistance.
3. **Fructose Metabolism:** Fructose in SSBs is metabolized in the liver, driving de novo lipogenesis, increasing triglycerides, and contributing to NAFLD.
4. **Cardiovascular Risk:** Long-term intake is associated with hypertension, dyslipidemia, and systemic inflammation, raising cardiovascular disease risk.

Epidemiological Evidence

Cohort studies and meta-analyses consistently show a strong link between SSB consumption and obesity, T2DM, and metabolic syndrome. For example, individuals consuming one to two servings per day have up to a 26% higher risk of developing T2DM compared with non-consumers. Randomized controlled trials further

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demonstrate that replacing SSBs with water or low-calorie alternatives results in weight reduction and improved metabolic markers.

Public Health Interventions

- Fiscal Policies: Taxes on sugary drinks (e.g., in Mexico, the UK, and several US states) have successfully reduced purchases of SSBs.
- Awareness Campaigns: Educational programs emphasize the health risks of high sugar intake.
- Marketing Restrictions: Limiting SSB advertising to children helps prevent early adoption of consumption habits.
- Healthier Alternatives: Encouraging water, unsweetened beverages, and fresh fruit consumption.

Conclusion: There is substantial evidence that sugar-sweetened beverages play a major role in the global rise of obesity and metabolic disorders. Their high sugar content contributes to excessive caloric intake, insulin resistance, fat accumulation, and cardiometabolic risk. Reducing SSB consumption should be a priority in global public health strategies. Combining fiscal, educational, and policy interventions can effectively reduce intake and improve long-term health outcomes.

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