
بسم الله الرحمن الرحیم

Association between intake of non-sugar sweeteners and health outcomes

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High intake of free sugars has been linked to overweight and obesity, which affects nearly 40% of the global adult population and millions of children, and, in turn, diet-related noncommunicable diseases (NCDs), which are the leading causes of death worldwide

Various measures are being taken to reduce consumption of free sugars as part of global efforts to address the epidemic of obesity and associated diseases.

Non-sugar sweeteners (NSS) are low- or no-calorie alternatives to free sugars that are generally marketed as aiding weight loss or maintenance of healthy weight, and are frequently recommended as a means of controlling blood glucose in individuals with diabetes.

Individual sweeteners undergo toxicological assessment to establish safe levels of intake (i.e. acceptable daily intake, or ADI). However, there is no clear consensus on whether NSS are effective for long-term weight control or if they are linked to other long-term health effects at habitual intakes within the ADI.

Evidence linking the excessive consumption of nutritive sweeteners (NS) to adverse metabolic health outcomes has led to an increase in consumption of non-nutritive sweeteners (NNS), particularly among the obese and individuals with diabetes.

- NNS are characterized by having zero-to-negligible caloric load, while also having a sweet taste.
- They are utilized as a replacement for traditional NS to reduce energy intake and to limit carbohydrate-related negative health outcomes.
- A non-glucose sweetener is a type of sweetener that does not contain glucose.
- These are often used as sugar substitutes and can be either natural or artificial.

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Here are some common examples:

Natural Non-Glucose Sweeteners:

Stevia – Extracted from the Stevia plant; zero-calorie.

Monk Fruit (Luo Han Guo) – Natural, much sweeter than sugar, zero-calorie.

Erythritol – A sugar alcohol with almost no calories and no glucose.

Xylitol – Another sugar alcohol; doesn't raise blood glucose as much as sugar.

Sorbitol and Mannitol – Sugar alcohols found in some fruits and used in sugar-free products.

Artificial Non-Glucose Sweeteners:

Aspartame – Low-calorie, used in diet sodas and other low-calorie foods.

Sucralose (Splenda) – Zero-calorie, heat stable, widely used in baking.

Saccharin – One of the oldest artificial sweeteners.

Acesulfame K – Often combined with other sweeteners for better taste.

- Non-caloric artificial sweeteners (NAS) are common food supplements consumed by millions worldwide as means of combating weight gain and diabetes, by retaining sweet taste without increasing caloric intake.

- While they are considered safe, there is increasing controversy regarding their potential ability to promote metabolic derangements in some humans.

evidence from preclinical studies shows that sweetener consumption may induce glucose intolerance through changes in the gut microbiota, which raises public health concerns

While thought to be inert, the impact of sucralose on metabolic control has shown to be the opposite.

The gut microbiome has emerged as a factor shaping metabolic responses after sweetener consumption

For adults and children with overweight or obesity, sugar substitutes also might help manage weight in the short term.

That's because sugar substitutes often are low in calories or have no calories.

But it's not clear whether sugar substitutes can help people manage their weight over the long term.

Over time, it's most important to eat a healthy diet and get exercise

Some studies suggest that non-caloric sweeteners stimulate appetite, possibly owing to the delivery of a sweet taste without the post-ingestive metabolic signals that normally communicate with the hypothalamus to suppress hunger.

Replacing free sugars with NSS does not help with weight control in the long term.

People need to consider other ways to reduce free sugars intake, such as consuming food with naturally occurring sugars, like fruit, or unsweetened food and beverages.

NSS are not essential dietary factors and have no nutritional value.

People should reduce the sweetness of the diet altogether, starting early in life, to improve their health."

Ingestion of the Non-Nutritive Sweetener Erythritol, but Not Glucose, Enhances Platelet Reactivity and Thrombosis

Recent studies report that fasting plasma levels of erythritol, a commonly used sweetener, are clinically associated with heightened incident cardiovascular disease risks and enhance thrombosis potential in vitro and in animal models. Effects of dietary erythritol on thrombosis phenotypes in humans have not been examined.

Twenty-four-hour glucose profiles did not differ between beverages sweetened with non-nutritive (artificial vs natural) and nutritive sweeteners.

- While sucrose does not directly cause diabetes, it has been linked to negative impacts on glucose tolerance in healthy individuals.
- Diets high in sucrose have also been shown to cause weight gain and obesity, which can lead to the development of diabetes.
- Large visceral fat stores cause fat cells to release proinflammatory cytokines.
- This puts the body into an inflammatory state, which can make insulin responsive cells insensitive to the presence of insulin.
- Compounding the insensitivity brought on by inflammation, adipose tissue may release fat molecules into the blood, which may in turn lead to additional reduced insulin sensitivity

limit or cut out sugar substitutes:

- genetic disease called phenylketonuria. Foods and drinks with aspartame can lead to serious health problems.
- bowel disease. Using sugar substitutes might make symptoms flare up.

Health concerns linked to sugar substitutes

Sugar substitutes also are not linked to a higher risk of cancer in people. Studies dating back to the 1970s linked the artificial sweetener saccharin to bladder cancer in rats. Since then, research has shown that those findings don't apply to people

Some research on long-term, daily use of artificial sweeteners suggests a link to a higher risk of stroke, heart disease and death overall

Sugar alcohols, stevia and luo han guo can cause bloating, gas and diarrhea. The amount of sugar alcohol that causes these symptoms varies from person to person

In general, it is safest to take in small amounts of sugar substitutes. And it's best to use sugar substitutes for a short time,

Evidence from a recent systematic review and meta-analyses of randomized controlled trials (RCTs) and prospective observational studies found that higher NSS consumption by adults led to lower body weight and body mass index (BMI), compared with not consuming NSS or consuming lower amounts of NSS, when assessed in short-term RCTs, but was associated with increased BMI and risk of incident obesity in long-term prospective observational studies.

Long-term NSS use was associated with increased risk of type 2 diabetes, cardiovascular diseases (CVDs) and mortality in prospective cohort studies conducted in adults.

However, significant effects were not observed on intermediate markers of disease such as fasting glucose, fasting insulin or blood lipids when assessed in short-term RCTs.

Meta-analysis of three prospective observational studies found an

- increased risk of preterm birth with higher NSS use during pregnancy
- Single prospective observational studies reported associations between NSS use during pregnancy and outcomes in offspring, including increased risk of asthma and allergies, and poorer cognitive function.

WHO recommendation

WHO suggests that non-sugar sweeteners not be used as a means of achieving weight control or reducing the risk of noncommunicable diseases (conditional recommendation).

The recommendation is based on the findings of a systematic review of the available evidence which suggests that use of NSS does not confer any long-term benefit in reducing body fat in adults or children.

Results of the review also suggest that there may be potential undesirable effects from long-term use of NSS, such as an increased risk of type 2 diabetes, cardiovascular diseases, and mortality in adults.

