



Low/no calorie sweeteners and cardiometabolic health

HIGHLIGHTS

As food ingredients, low/no calorie sweeteners do not affect cardiometabolic risk factors such as blood pressure, glycaemic control and blood lipids.

Using low/no calorie sweeteners in place of sugars in the diet may be beneficial for cardiometabolic health due to a lower rise in blood glucose levels compared with sugars and a decrease in overall energy intake which can help in weight control over time.



The term cardiometabolic health refers to a group of conditions and related risk factors including cardiovascular diseases (CVDs) such as heart attack and stroke, type 2 diabetes, and non-alcoholic fatty liver disease (NAFLD).

Facts & figures about cardiometabolic diseases:



More than half a billion people worldwide are affected by CVDs, which have been the leading cause of death for decades.¹



Globally, 1 in 10 people are living with diabetes.²



The global prevalence of NAFLD is forecasted to exceed 50% by 2040.³



Cardiometabolic diseases are largely preventable! Hypertension, high cholesterol levels, hyperglycaemia, obesity, tobacco and harmful use of alcohol, physical inactivity and unhealthy diets are all modifiable cardiometabolic risk factors.

Healthy eating and cardiometabolic health

Eating a healthy diet including a variety of vegetables, fruits, legumes, nuts, and whole grains, while being low in salt, fat and sugars is key in protecting cardiometabolic health. Limiting excess intake of free sugars is globally recommended as part of a healthy diet including for the prevention and management of cardiometabolic diseases such as CVDs and type 2 diabetes.^{4,5}

Low/no calorie sweeteners (LNCS) can help individuals achieve sugar intake reductions while following an overall healthy and tasteful diet, including for people with, or at risk of, cardiometabolic diseases. Clinical research shows that, when used to replace sugars, LNCS have a neutral or modestly beneficial effect on cardiometabolic risk factors such as glycaemic control, blood pressure and lipid levels, liver enzymes, uric acid, body weight and liver fat.⁶

Impact of low/no calorie sweeteners' intake on cardiometabolic risk factors: evidence from randomised controlled trials confirms no harm and indicates potential benefits

Evidence from systematic reviews and meta-analyses of randomised controlled trials (RCTs), including from a review by the World Health Organization (WHO)⁷, consistently indicates a neutral effect of LNCS intake on intermediate cardiometabolic markers such as glycaemia^{6,7,8,9}, blood pressure^{6,7,10}, blood lipids^{6,7,11}, liver enzymes^{6,12}, and uric acid⁶, and a modest benefit on liver fat⁶, fat mass^{6,15} and body weight^{6,7,13,14,15} when LNCS are compared with sugars, especially in the form of beverages.

Systematic reviews and meta-analyses of RCTs show a neutral or modestly beneficial effect of LNCS on intermediate markers of cardiometabolic diseases

LNCS intake has a...	Systematic review and meta-analysis (N=number of RCTs)
Blood pressure: ...neutral effect on systolic and diastolic blood pressure.	- McGlynn et al, 2022 ⁶ (N=3) - Rios-Leyvraz and Montez, 2022 ⁷ (N=14)
Blood lipids: ...neutral effect on triglycerides, total, LDL- and HDL-cholesterol.	- McGlynn et al, 2022 ⁶ (N=7) - Rios-Leyvraz and Montez, 2022 ⁷ (N=14) - Movahedian et al, 2023a ¹¹ (N=14)
Glycaemic control: ...neutral effect on measures of glycaemic control including fasting and postprandial glucose and insulin levels, HbA1c, HOMA-IR, and incretins.	- Greyling et al, 2020 ⁸ (N=34) - McGlynn et al, 2022 ⁶ (N=7) - Rios-Leyvraz and Montez, 2022 ⁷ (N=16) - Zhang et al, 2023 ⁹ (N=36)
Liver enzymes and liver fat: ...neutral effect on liver enzyme levels; beneficial effect on intrahepatocellular lipid when SSBs are substituted with LNCS beverages.	- McGlynn et al, 2022 ⁶ (N=2) - Golzan et al, 2023 ¹² (N=10)
Body weight: ...modest beneficial effect on body weight loss and fat mass with LNCS compared with sugars, as a result of energy (calorie) intake reduction.	- Laviada-Molina et al, 2020 ¹³ (N=20) - Rogers and Appleton, 2021 ¹⁴ (N=29) - McGlynn et al, 2022 ⁶ (N=12) - Rios-Leyvraz and Montez, 2022 ⁷ (N=29) - Movahedian et al 2023b ¹⁵ (N= 20)

Why is epidemiological evidence conflicting?

Contrary to evidence from RCTs, observational research reports inconsistent findings. Meta-analyses of observational studies that rely on baseline intake data report a positive association between higher LNCS intake and risk of diabetes or CVDs, while meta-analyses of prospective cohort studies with more robust, analytical methodologies that overcome some of the limitations of the observational study design show a neutral or protective association.¹⁶ These new methods include repeated assessment of dietary intake to measure change in exposure, and substitution analysis modelling LNCS as a replacement for caloric sugars.

A systematic review and meta-analysis that included 14 prospective cohort studies with repeated measures of LNCS intake that allowed change and substitution analyses found that an increase in LNCS intake was associated with lower weight and waist circumference without any adverse effect on type 2 diabetes, and that substituting SSBs with LNCS beverages was associated with lower risk of obesity, coronary heart disease, and total and CVD mortality, without any adverse effect on any other cardiometabolic outcomes, including type 2 diabetes.¹⁷

By design, observational studies cannot establish a cause-and-effect relationship due to their inability to exclude residual confounding or attenuate the effects of reverse causality.¹⁶

In contrast, RCTs can provide evidence of causal relationships between the intervention and the outcome because randomisation allows confounding factors to be randomly distributed and offer greater protection against bias.

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Speak to your doctor or health practitioner for further information on cardiovascular diseases. Visit our website www.sweeteners.org for further information on low/no calorie sweeteners.