Coffee and Type 2 Diabetes

Key Points

- Type 2 diabetes is the most common type of diabetes, and the number of people living with diabetes continues to increase
- Moderate coffee consumption is associated with a reduced risk of type 2 diabetes
- The association is seen with both caffeinated and decaffeinated coffee
- Naturally occurring compounds in coffee, including polyphenols (chlorogenic acid), trigonelline, diterpenes and melanoidins, are believed to contribute to the association, although the exact mechanisms are not fully understood

Disease burden

Type 2 diabetes (T2D)

- A chronic metabolic disease characterised by high blood sugar levels
- Involves insulin resistance and pancreatic β-cell dysfunction
- Results in relative insulin deficiency, impaired glucose homeostasis and subsequent hyperglycaemia[1].

T2D accounts for 90% of all diabetes cases worldwide[2]. An estimated 589 million people are living with diabetes globally, and this is projected to increase to 853 million by 2050[2].

In Europe, an estimated 66 million adults (9.8 % of those aged 20–79 years) are living with diabetes; this is projected to increase to 72 million by 2050[2].

Major risk factors for T2D include[3].

- Obesity or being overweight
- A family history of T2D
- Low levels of physical activity
- Diagnosis of prediabetes
- Experience of gestational diabetes

Coffee and T2D risk association

Moderate coffee consumption is associated with a statistically significant reduced risk of developing type 2 diabetes.

- This association is seen with both caffeinated and decaffeinated coffee[4,5,6].
- Drinking 3-4 cups of coffee per day is associated with an approximate **25% lower risk** of developing type 2 diabetes, compared to consuming <2 cups per day or no coffee[4,5,6].
- The association between coffee/caffeine consumption and diabetes appears to be specific to T2D only.
- Evidence suggests a dose-response relationship, with higher coffee consumption associated with progressively lower **T2D risk**[6,7].
- A meta-analysis found a **29% lower risk** of T2D among people in the highest category of coffee consumption (median intake approximately 5 cups per day) compared to those who consume no coffee[6].
- Each additional cup of coffee consumed per day was associated with a **4% lower T2D risk**[7].
- **Mortality:** In people with T2D, coffee consumption was associated with a lower risk of all-cause mortality[8,9].

Potential mechanisms

- Coffee consumption has been associated with a decrease in inflammatory, oxidative stress and metabolic markers relevant to T2D risk[10].
- Coffee consumption has been linked to lower insulin resistance and reduced subclinical inflammation, which may partly explain its association with lower T2D risk[7].

The main bioactive components in coffee are caffeine, chlorogenic acid (CGA), trigonelline, diterpenes, and melanoidins[11]. These are thought to improve glucose homeostasis, insulin sensitivity, inflammation, and oxidative stress[12].

- Caffeine – unlikely to be the main driver, as decaffeinated coffee shows a similar association with lower T2D risk[13,14].
- Polyphenols, including chlorogenic acids – may improve glucose metabolism and reduce T2D risk[6,11].
- Specifically, chlorogenic acids may help to lower fasting blood glucose and reduce spikes in plasma glucose by slowing glucose absorption in the intestine[15].
- Antioxidants – coffee adds to the diet's total antioxidant load, which may help to limit oxidative stress linked to T2D[16,17].
- Trigonelline in particular was found to lower oxidative stress by boosting antioxidant enzyme activity and neutralising reactive oxygen species[11].

Scan to explore the research on Type 2 Diabetes in more detail.

Safety considerations

Moderate coffee intake is associated with a reduced risk of type 2 diabetes. The European Food Safety Authority's (EFSA) review on the Safety of Caffeine concluded that moderate caffeine consumption, of around 400 mg of caffeine per day (the equivalent of up to 5 cups of coffee), can be enjoyed as part of a healthy balanced diet and an active lifestyle. EFSA also concludes that in pregnancy, the daily caffeine limit should be 200mg from all sources[18].

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