Cardiovascular disease risk in type 1 versus type 2 diabetes – interactions with age and sex

Men with type 2 diabetes under age 50 years have higher cardiovascular risk and mortality, as well as double the risk of having a myocardial infarction or heart failure, compared to those of the same age with type 1 diabetes, according to this national Swedish cohort study presented at the 2025 EASD Annual Meeting and published in *Lancet Diabetes & Endocrinology*. In contrast, women with type 1 diabetes, at all ages, have worse cardiovascular outcomes, including risk of myocardial infarction and cardiovascular mortality, than those with type 2 diabetes. People with either type of diabetes had higher cardiovascular risk than those without diabetes. In people with diabetes and pre-existing cardiovascular disease, risk was lower in those with type 2 than type 1 diabetes. Even with optimal adoption of lifestyle behaviours and drug therapy to reduce cardiovascular risk factors, residual risk remains.

Pam Brown
GP in Swansea

Cardiovascular disease (CVD) is the leading cause of mortality and morbidity globally, and people with type 1 and type 2 diabetes alike are known to be at significantly greater risk of CVD and cardiovascular mortality than those without diabetes. Although there are effective lifestyle and drug strategies to help reduce the risk of cardiovascular disease, implementation remains challenging and incomplete, and even with optimal management, residual risk persists (Nappala et al, 2024).

The present study

This longitudinal cohort study, led by Dr Vagia Patsoukaki and colleagues from Upsalla University in Sweden, presented at the Annual Meeting of the European Association for the Study of Diabetes (EASD) in Vienna and published in *Lancet Diabetes & Endocrinology*, compared the risk of CVD and cardiovascular and all-cause death in men and women with type 1 and type 2 diabetes, and those without the conditions, including estimating and comparing risks at different ages.

The Swedish National Diabetes Register was used to identify people aged 18–84 years with either type 1 or type 2 diabetes, and to evaluate potential differences in risk factors, disease progression and clinical outcomes. People with type 1 diabetes had lived with their diabetes for an average of 24 years, compared to 9.2 years in those with type 2 diabetes, and each person with diabetes was matched to two controls without diabetes of the same age and sex.

Over a 5-year follow-up, the primary composite outcome was all CVD (first occurrence of fatal or non-fatal cardiovascular events, myocardial infarction, ischaemic or haemorrhagic stroke, heart failure and cardiovascular death), and these outcomes were also studied separately, along with all-cause mortality, as secondary outcomes. Follow-up provided more than 2 million person-years of data.

Results

Data on a total of 404 026 people with type 1 (n=38 351) or type 2 diabetes (n=365 675) were evaluated; 58% of the cohort was male and 42% female. Previous studies had suggested a significant interaction between age and diabetes type for cardiovascular risk, so the cohorts were stratified into those aged <50 years, 50 to <60 years, 60 to <70 years, and ≥70 years.

In people under 50 years, people with type 2 diabetes had a significantly higher risk of the composite primary outcome (hazard ratio [HR] 1.23), as well as heart failure, than those with type 1 diabetes; this risk was greater in men than women. However, in those aged over 60 years, type 2 diabetes was associated with a lower risk

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of CVD (HR 0.87), myocardial infarction and all-cause mortality.

Stroke risk was lower for those with type 2 versus type 1 diabetes at all ages (HR 0.91).

In people with established pre-existing CVD, those with type 2 diabetes had a lower risk of all CVD, myocardial infarction, and cardiovascular and all-cause mortality compared to those with type 1 diabetes.

Sex comparisons

Men aged <50 years with type 2 diabetes had a 51% higher risk of CVD, 2.4-times the risk of myocardial infarction and 2.2-times the risk of heart failure than those in the same age group who had type 1 diabetes. Conversely, in men aged over 60, type 2 diabetes was associated with lower risk of myocardial infarction and cardiovascular mortality than type 1 diabetes.

In women over 50 years, compared to those with type 1 diabetes, those with type 2 diabetes had significantly lower risks of:

- CVD overall (HRs ranging from 0.73 to 0.83 in the various age groups).
- Myocardial infarction (HRs 0.53–0.59).
- Cardiovascular mortality (HRs 0.62–0.70).
- All-cause mortality (HRs 0.82–0.85).

There was a similar, but non-significant, trend in those aged under 50 years.

Multivariate analysis

After adjusting for multiple established risk factors (blood pressure, cholesterol, blood glucose, kidney function, smoking, body weight, physical activity, education and duration of diabetes):

- Those with type 2 diabetes (men and women) had a higher risk of new CVD and cardiovascular mortality compared to those with type 1 diabetes.
- Female sex was protective compared to male sex across the cohort as a whole, including both types of diabetes, reducing risk of:
  - All CVD by 35%.
  - Myocardial infarction by 39%.
  - Cardiovascular mortality by 34%.
  - All-cause mortality by 31%.

However, the protective effect seen in women was less in those with type 1 diabetes compared with type 2 diabetes. This reminds us that we should remain vigilant in managing modifiable cardiovascular risk factors, especially in women with type 1 diabetes and men, and ideally across the whole population with diabetes.

Discussion

Explaining the findings at the EASD meeting, study co-author Jan Eriksson commented that younger women would be expected to have oestrogen protection supporting healthier blood vessels, and that fat distribution in women is more subcutaneous and less visceral, and thus less harmful to the heart, hence their lower risk than men.

Limitations of this study include those inherent in any observational study. Additionally, 10% of the population had to be excluded due to uncertain diagnosis, the cohort with type 2 diabetes was older than those with type 1 diabetes, participants were mainly Swedish so the results cannot be generalised to other populations, and care delivery is different for the two conditions, with type 2 diabetes seen mainly in primary care.

The authors conclude that the burden of CVD remains high in people with diabetes, particularly in older people with type 1 diabetes with long-term high glucose exposure, and in younger people with type 2 diabetes, likely reflecting the clustering of associated cardiovascular risk factors.

Implications for practice

This study highlights that the risk of CVD and cardiovascular mortality differ between people with type 1 and type 2 diabetes, and that these differences also vary across age groups. As expected, compared with the matched cohort without diabetes, both types of diabetes had greater cardiovascular risk, and this was greater in those with type 1 than type 2 diabetes over the age of 60 years.

CVD is the commonest cause of mortality in people with diabetes, and residual cardiovascular risk remains even with optimal lifestyle changes and drug therapy. This study helps clarify the groups that are at highest cardiovascular risk, including older people with type 1 diabetes, who we may or may not see and whose diabetes care is delivered by specialist teams, who may see them

only once or twice yearly. Opportunistically reviewing cardiovascular risk factors when coding hospital letters of adults with type 1 diabetes and offering a review if there is potential to reduce risk could be helpful. Studies exploring potential cardiovascular benefits of SGLT2 inhibitors and GLP-1 receptor agonists in people with type 1 diabetes are ongoing and may reduce future risks.

Using risk calculators, including the QRISK3 Lifetime calculator in younger people; helping everyone make lifestyle choices and changes such as smoking cessation; remembering to help manage the elevated cardiovascular risk in people with non-diabetic hyperglycaemia; and avoiding clinical inertia by initiating SGLT2 inhibitors, GLP-1 receptor agonists, statins and ezetimibe will help to reduce CVD risk. Yet again, it is all about finding time to "Make every contact count."

Neppala S, Rajan J, Yang E, DeFronzo RA (2024) Unexplained residual risk in type 2 diabetes: How big is the problem? *Curr Cardiol Rep* **26**: 623–33

Patsoukaki V, Lind L, Lampa E et al (2025) Risk differences and underlying factors of cardiovascular events and mortality in patients with type 2 diabetes versus type 1 diabetes: A longitudinal cohort study of Swedish nationwide register data. *Lancet Diabetes Endocrinol* **13**: 848–62

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