

A 2-hour oral glucose tolerance test result ≥ 11.1 mmol/L predicted all-cause mortality better than a fasting glucose level ≥ 7.0 mmol/L

The DECODE Study Group on behalf of the European Diabetes Epidemiology Group. Glucose tolerance and mortality: comparison of WHO and American Diabetes Association diagnostic criteria. *Lancet*. 1999 Aug 21;354:617-21.

QUESTION

What is the relative accuracy of fasting plasma glucose (FPG) levels alone (American Diabetes Association [ADA] diagnostic criteria for diabetes mellitus) compared with 2-hour glucose levels (World Health Organization [WHO] criteria) for predicting the risk for mortality associated with diabetes?

DESIGN

Comparison of the ADA and WHO diagnostic criteria for diabetes for predicting all-cause mortality (the Diabetes Epidemiology: Collaborative Analysis of Diagnostic Criteria in Europe [DECODE] study).

SETTING

13 centers in Europe.

PARTICIPANTS

18 048 men and 7316 women ≥ 30 years of age who had had baseline FPG levels and standard 2-hour oral glucose tolerance test (OGTT) results recorded and who were part of 13 European cohort studies. Follow-up was a median of 7.3 years.

DESCRIPTION OF TESTS AND DIAGNOSTIC STANDARD

Diagnostic tests were 2 different criteria for diabetes: the ADA criteria (FPG level ≥ 7.0 mmol/L or fasting glucose level \geq

6.1 mmol/L for capillary or whole-blood samples) and the 2-hour WHO criteria (glucose level after the 2-h 75 g OGTT ≥ 11.1 mmol/L for plasma and capillary blood samples or ≥ 10.0 mmol/L for whole-blood samples). All-cause mortality was used as the diagnostic standard.

MAIN OUTCOME MEASURES

Hazard ratios (HRs) for all-cause mortality based on the 2 glucose criteria.

MAIN RESULTS

HRs for all-cause mortality, adjusted for age, sex, and center, were calculated for the different glucose cut points based on the ADA and WHO diagnostic criteria for diabetes and glucose intolerance. HRs were

also compared with persons who had normal FPG (< 6.1 mmol/L) or normal 2-hour glucose levels (< 7.8 mmol/L) (Table). FPG levels did not predict mortality after adjustment for the 2-hour glucose level.

CONCLUSION

Both a fasting plasma glucose level ≥ 7.0 mmol/L and a 2-hour glucose level ≥ 11.1 mmol/L predicted all-cause mortality.

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Association between a fasting plasma glucose (FPG) level ≥ 7.0 mmol/L or a 2-hour glucose level ≥ 11.1 mmol/L and all-cause mortality in men and women

| Glucose criteria | Hazard ratio (95% CI)* | |
|-----------------------------------|------------------------|----------------------|
| | Men | Women |
| FPG ≥ 7.0 mmol/L | 1.75 (1.45 to 2.12) | 1.77 (1.18 to 2.65) |
| FPG 6.1 to 6.9 mmol/L | 1.21 (1.04 to 1.40) | 1.09 (0.70 to 1.68)† |
| 2-hour glucose ≥ 11.1 mmol/L | 1.99 (1.63 to 2.43) | 2.60 (1.84 to 3.69) |
| 2-hour glucose 7.8 to 11.1 mmol/L | 1.49 (1.30 to 1.71) | 1.54 (1.17 to 2.03) |

*Hazard ratio is adjusted for age, sex, and center and compares men and women with diabetes or glucose intolerance with those with a normal FPG level (< 6.1 mmol/L) and a normal 2-hour glucose level (< 7.8 mmol/L).

†Not significant.

COMMENTARY

This European study examined the relation between glucose tolerance and mortality. The results support 2 conclusions: The new ADA criteria for diabetes based on FPG levels alone underestimate the risk for long-term mortality more than the WHO criteria, which are based on glucose levels after the 2-hour 75 g OGTT. The new ADA criteria for impaired fasting glucose levels (FPG 6.1 to 6.9 mmol/L) underestimate the risk for mortality more than the ADA or WHO criteria for impaired glucose tolerance (OGTT 7.8 to 11.1 mmol/L). Similar conclusions have been drawn in recent studies (1, 2). In the Cardiovascular Health Study of 4515 persons > 65 years of age, 22% had diabetes and impaired fasting glucose according to the ADA criteria, and 47% had diabetes and impaired glucose tolerance according to the WHO criteria (2). Therefore, the ADA criteria to determine impaired fasting glucose level have low sensitivity for predicting diabetes and cardiovascular mortality. A subgroup analysis of the DECODE study in older men and women suggests that a third of persons with undiagnosed diabetes have 2-hour glucose levels ≥ 11.1 mmol/L, and half of these have FPG levels < 7.0 mmol/L (3).

A recent meta-analysis suggested that a 2-hour glucose level > 7.8 mmol/L was a better determinant of cardiovascular events than FPG levels > 6.1 mmol/L (4).

Increasing evidence suggests an association between impaired glucose tolerance and cardiovascular disease or mortality even in the absence of fasting hyperglycemia. Patients who have an impaired fasting glucose level should be further assessed by a 2-hour glucose challenge test as well as for other cardiovascular risk factors.

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References

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