

The relation between insulin resistance and risk of cardiovascular events, vascular interventions and all-cause mortality in people with type 1 diabetes: results from the UCC-SMART cohort study

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Background: The presence of the metabolic syndrome and insulin resistance (IR) is increasing among people with type 1 diabetes (T1D). The estimated glucose disposal rate (eGDR) is a validated measure of IR in patients with T1D with lower eGDR levels indicating higher IR. The aim of this study was to identify determinants associated with a lower eGDR and to assess the association between eGDR and cardiovascular events, vascular interventions and mortality.

Methods: 195 people with T1D from the Utrecht Cardiovascular Cohort - Secondary Manifestations of ARterial disease (UCC-SMART) study were included. The effect of eGDR on cardiovascular events, cardiovascular events or vascular interventions (combined endpoint) and on all-cause mortality was analysed using Cox proportional hazard models adjusted for confounders.

Results: A total of 25 cardiovascular events, 26 vascular interventions and 27 deaths were observed during a median follow-up of 12.1 years (interquartile range 5.2-16.9). A lower eGDR was associated with a higher risk of cardiovascular events (HR 0.74; 95% CI 0.61-0.91), a higher risk of cardiovascular events or vascular interventions (HR 0.74; 95% CI 0.63-0.87) and a higher risk of all-cause mortality (HR 0.81; 95% CI 0.67 – 0.98).

Conclusions: A lower eGDR as a measure of IR in individuals with T1D is associated with a higher risk of cardiovascular events, cardiovascular events and vascular interventions and all-cause mortality. Therefore, individuals with T1D and insulin resistance should be identified early and treated appropriately to prevent cardiovascular disease.

Table 1 – Relation between eGDR and cardiovascular events, vascular interventions and all-cause mortality

		High risk n = 48	Low risk n = 147	Total n = 195
Model		HR (95% CI)	HR (95% CI)	HR (95% CI)
Cardiovascular events	# events	12	13	25
	I	0.81 (0.54-1.21)	0.71 (0.55-0.91)	0.72 (0.58-0.88)
	II	0.71 (0.44-1.17)	0.73 (0.57-0.93)	0.74 (0.61-0.91)
Cardiovascular events and vascular interventions	# events	22	18	40
	I	0.82 (0.59-1.14)	0.71 (0.58-0.88)	0.71 (0.60-0.83)
	II	0.86 (0.59-1.26)	0.74 (0.60-0.91)	0.74 (0.63-0.87)
All-cause mortality	# events	11	16	27
	I	0.59 (0.38-0.92)	0.85 (0.69-1.06)	0.79 (0.65-0.96)
	II	0.51 (0.29-0.88)	0.86 (0.70-1.08)	0.81 (0.67-0.98)

Model I: adjusted for age and sex. Model II: adjusted for age, sex, current smoking, non-HDL and eGFR.

High risk is defined as a history of CVD or eGFR < 60 ml/min/1.73 m². Low risk is defined as no history of CVD or eGFR ≥ 60 ml/min/1.73 m². CVD is defined as coronary artery disease, cerebrovascular disease, peripheral artery disease, and/or aneurysm of the abdominal aorta.

Cardiovascular events is defined as myocardial infarction, stroke, subarachnoid hemorrhage or vascular mortality. Vascular interventions is defined as revascularisation, vascular surgical intervention or amputation.