



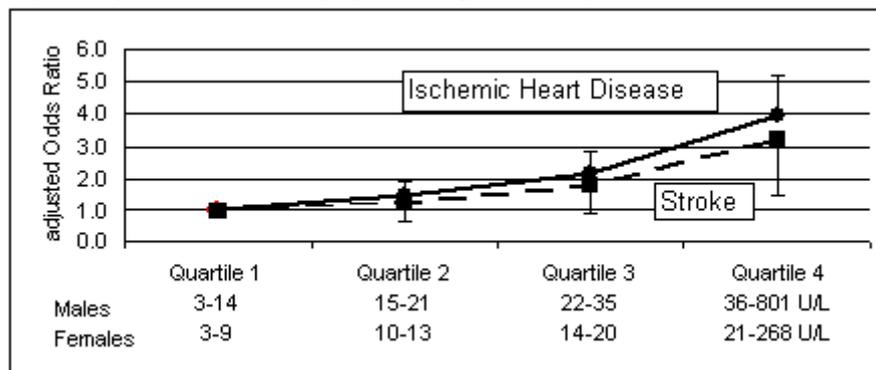
[2006] [1886] Longitudinal repeated measurements of gamma-glutamyl transferase and the risk for fatal cardio- and cerebrovascular disease

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Purpose: There is evidence from recent studies that gamma-glutamyl transferase (GGT) is associated with cardiovascular disease (CVD). However, the longitudinal effects of repeated GGT measurements have never been evaluated.

Methods: We present a prospective investigation of GGT and CVD mortality in 140,196 participants of the Vorarlberg Health Monitoring & Promotion Programme followed-up for 17 years. Participants were under age 60 and there were 781 CVD-related deaths. Since participants underwent an unequal number of examinations (four on average), we evaluated the effects of repeated GGT measurements on CVD mortality, utilising a nested matched case-control design allowing an unbiased comparison. Proportional hazards and longitudinal random-effects logistic models, adjusting for established risk factors, were performed to estimate relative risks (RR) and their 95% confidence intervals per log GGT increase and per GGT quartiles.

Results: For all participants, based on their first examination GGT measure only, elevated GGT was significantly ($p < 0.001$) associated with fatal CVD events, showing a clear dose-response relationship. Adjusted RR (95%CI) per log GGT increase were 2.03 (1.53-2.69) in men and 2.60 (1.53-4.42) in women. Based on repeated GGT measurements, RR increased to 3.12 (1.76-5.56) in men and to 4.33 (1.49-12.64) in women. As shown in the figure, there was a RR of 3.93 (2.12-7.28) and 3.22 (1.07-9.69) for ischemic heart disease and stroke, respectively, in persons belonging to the highest GGT quartile relative to the lowest.



GGT and the risk for fatal CVD

Conclusions: The results provide strong evidence of positive associations between high GGT and mortality from CVD in both cardio- and cerebrovascular events. Multiple elevated GGT measurements further add to the strength of this association.

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