

## Insulin-like growth factors, insulin and cardiovascular disease risk factors

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Insulin-like growth factors (IGF) are important for normal growth and development. IGF-I and IGF-II are single chain polypeptides which are structurally similar to pro-insulin. The cluster of factors known to be associated with increased risk of cardiovascular disease include hypertension, obesity, elevated blood lipids and hyperinsulinaemia. There is limited evidence that levels of IGFs are associated with some of these factors but very few population studies have been conducted.

A cross-sectional survey was conducted in 357 people (176 men and 181 women) aged between 18 and 66 years. These subjects were selected randomly from the electoral roll. A blood sample was taken after an overnight fast to measure IGF-I, IGF-II, insulin, total cholesterol, HDL cholesterol and glucose. Resting blood pressure was measured with an automated sphygmomanometer. Height and weight were measured using a stadiometer and electronic scales, and BMI was calculated ( $\text{weight}:\text{ht}^2$ ). The mean values  $\pm$  SEM of these parameters for the total group were as follows: SBP/DBP  $124 \pm 1/71 \pm 1$  mmHg; BMI  $25.1 \pm 0.2$ ; blood glucose  $5.31 \pm 0.03$  mmol/L; total cholesterol  $5.3 \pm 0.1$  mmol/L, HDL-cholesterol  $1.36 \pm 0.02$  mmol/L; triglycerides  $1.30 \pm 0.04$  mmol/L; IGF-I  $196 \pm 4$  ng/ml; IGF-II  $404 \pm 6$  ng/ml; and insulin  $8.2 \pm 0.3$   $\mu$ U/ml.

IGF-I and fasting plasma insulin were log transformed to correct for non-normal distribution. Univariate correlations revealed that there were significant ( $P < 0.05$ ) associations between log IGF-I and DBP ( $r = -0.15$ ), mean arterial blood pressure (MAP) ( $r = -0.12$ ), total cholesterol ( $r = -0.25$ ), IGF-II ( $r = 0.36$ ), age ( $r = 0.45$ ), BMI ( $r = -0.14$ ), HDL cholesterol ( $r = -0.11$ ), and log insulin ( $r = 0.11$ ). Correlations of IGF-I with DBP, HDL and IGF-II were greater in men whereas correlations of IGF-I with total cholesterol and age were higher in women. IGF-II correlated with triglycerides ( $r = 0.20$ ) and this association was strongest in men. IGF-II and HDL correlated in men only ( $r = -0.19$ ). Log insulin correlated with DBP ( $r = 0.16$ ), SBP ( $r = 0.21$ ), MAP ( $r = 0.18$ ), BMI ( $r = 0.38$ ), fasting glucose ( $r = 0.23$ ), HDL cholesterol ( $r = 0.28$ ), total cholesterol ( $r = 0.13$ ) and triglycerides ( $r = 0.29$ ). Correlations of log insulin with DBP, BMI, total cholesterol and triglycerides were greater for men whereas correlations with SBP and glucose were greater in women.

Since univariate correlations do not consider other covariates, forward stepwise multiple regressions were performed. Statistical significance was  $P < 0.05$ . For the total group, IGF-I was a significant positive predictor of SBP as were age, BMI, glucose and gender. IGF-II was a significant predictor of DBP (after removal of outliers) as were age, BMI, insulin and gender. IGF-II also was a significant predictor of plasma triglycerides as were insulin, MAP, total and HDL cholesterol. Insulin was a significant predictor of DBP, BMI, HDL, TG and fasting glucose.

These findings indicate that plasma concentrations of IGFs are associated with several biomedical factors implicated in the development of cardiovascular disease. Whether or not IGFs play a role in the aetiology of cardiovascular disease remains to be elucidated.