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Adolescence arterial stiffness precedes insulin resistance in young adulthood: A 7-year temporal longitudinal findings using cross-lagged structural equation model

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Abstract

Background: A recent study among adults concluded that arterial stiffness may be causally associated with incident type 2 diabetes. However, whether arterial stiffness precedes insulin resistance, a risk factor for the development of young-onset type 2 diabetes, has never been investigated.

Objective: To examine the temporal causal associations of carotid-femoral pulse wave velocity (cfPWV), a measure of arterial stiffness, with insulin resistance at age 17.7 through 24.5 years.

Methods: We studied 3862 participants (56% female) from the Avon Longitudinal Study of Parents and Children, England, UK. cfPWV was measured by ultrasound, body composition by dual-energy Xray absorptiometry, and insulin resistance was computed from homeostatic model assessment of insulin resistance (HOMA-IR) with (fasting insulin x fasting glucose / 22.5). We conducted cross-lagged structural equation models and adjusted for baseline covariates viz; age, sex, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, triglyceride, high-sensitivity C-reactive protein, heart rate, moderate to vigorous physical activity, smoking status, family history of cardiometabolic diseases, fat mass, and lean mass. All variables were repeatedly measured at baseline and follow-up.

Results: Fewer than 8 participants had young-onset type 2 diabetes at ages 17.7 and 24.5 years. HOMA-IR and cfPWV increased from ages 17.7 through 24.5 years. Higher cfPWV at 17.7 years predicted higher HOMA-IR at 24.5 years [Regression co-efficient (β) = 0.05, standard error (SE) = 0.12, p=0.026], but HOMA-IR at 17.7 years was not associated with cfPWV at 24.5 years [β = -0.03, SE = 0.01; p=0.310].

Conclusion: Adolescence arterial stiffness appears to precede insulin resistance in young adulthood.

Keywords: Atherosclerosis, Young-onset-type 2 diabetes, Health Promotion, Pediatrics

Abbreviations: BP- Blood pressure, cfPWV- Carotid-femoral pulse wave velocity.