

Body fat at adolescence and early changes in atherogenic metabolomic measures during young adulthood

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Background: Obesity in adulthood is a strong risk factor for cardiovascular disease. It is unknown whether total fat mass at adolescence is associated with early changes in atherogenic metabolomic measures during adolescence and young adulthood.

Methods: In the first-generation offspring of the Avon Longitudinal Study of Parents and Children (ALSPAC), total fat mass was measured using dual-energy X-ray absorptiometry at age 15, and 146 nuclear magnetic resonance (NMR)-based metabolomics were repeatedly measured at age 15, 18 and 24 years. Using multilevel models with two splines we examined changes in metabolomic measures between age 15 to 18, and age 18 to 24 years in relation to baseline fat mass, adjusted for sex, ethnicity, age at peak height velocity, and educational level of the mother.

Results: We included 3851 participants in the analyses, 51% men, with a mean(SD) age of 15.5(0.4) years, mean BMI of 21.5(3.6) kg/m² and total fat mass of 15.4(9.2) kg. 1 SD higher log fat mass at age 15 was associated with increasing levels of several atherogenic metabolomic measures between age 15 to 18 (e.g. triglycerides in large VLDL 0.003 mmol/l [95% 0.002; 0.004], ApoB 0.005 g/l [0.003; 0.007]) and a decrease in extra-large to large HDL particles. In contrast, between age 18 to 24 baseline fat mass was associated with a decrease in VLDL and LDL particles, small HDL (e.g. cholesterol in small HDL -0.002 mmol/l [-0.003; -0.002]) and glycoproteins (-0.002 mmol/l [-0.003; -0.0008]), whereas levels of extra-large to medium HDL particles increased.

Conclusion/discussion: Body fat mass at age 15 years was associated with changes in metabolomic measures towards an atherogenic metabolomic profile between age 15 and age 18, but with a subsequent decreased atherogenic metabolomic profile between age 18 and 24. Our results suggest that adolescence is a critical period with regard to adiposity-related changes in atherogenic risk factors.