

Association Between Longitudinal Changes in Body Mass Index (BMI) and Body Fat With Cardiometabolic Risk Factors in Indian Children and Adolescents

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Objectives: To evaluate the associations between longitudinal changes in body mass index (BMI) and body fat mass (FM%) with cardiometabolic risk factors in school-aged children and adolescents from South India.

Methods: This prospective school-based study comprised 4,289 children and adolescents (44.2% male) aged 5–17y participating in the PEACH-II and III studies in Bengaluru, India. Anthropometry and FM% (BOD POD, Cosmed; 5.2.0) were measured twice with a median age gap of 2.8y. Waist circumference (WC), systolic/diastolic blood pressure, HbA1c, and lipid profile were measured at endline. BMI-for-age z-scores were calculated using the World Health Organization Child Growth Standards, and were used to define overweight ($\geq +1$ SD to $< +2$ SD) and obesity ($\geq +2$ SD). Linear regression was used to examine the associations between longitudinal changes in BMI-for-age z-scores and FM% with cardiometabolic risk factors, after adjusting for parental

BMI, socioeconomic status, age of menarche, inflammation (c-reactive protein), physical activity and night sleep duration.

Results: The prevalence of overweight/obesity and mean FM% increased from 15.2% to 20.5%, and 19.5% to 21.7%, respectively during follow-up. Overall, 43.8% and 15.5% of the participants had high triglycerides (TG, ≥ 200 mg/dL), and elevated HbA1C ($\geq 5.7\%$), while 40.9% had low HDL (< 40 mg/dL); a total of 69.1% of participants had ≥ 1 abnormal biomarker(s). Increment in BMI for-age z-score of 1SD overtime was significantly associated with higher WC (β : 2.9, [SE:0.20] cm), TG (8.4, [1.3] mg/dL), HbA1c (0.17, [0.06] %), total cholesterol (1.6, [0.56] mg/dL), and lower HDL (-1.3 , [0.26] mg/dL). Longitudinal increment in FM% was associated with higher WC (0.3, [0.03] cm), TG (1.2, [0.15] mg/dL) and total cholesterol (0.4, [0.1] mg/dL).

Conclusions: The burden of overweight/obesity and FM% substantially increased in this population of South Indian children and adolescents overtime, and were associated with cardiometabolic risk factors. Regular monitoring of BMI and body composition can help to identify children at risk of developing cardiovascular diseases. Appropriate dietary and lifestyle interventions for children at risk are needed in India, where chronic diseases and associated deaths are increasing at alarming rate in young and older adults.

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