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Association between Metabolic Syndrome Components and Cardiac Autonomic Modulation among Children and Adolescents: A Systematic Review and Meta-Analysis

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Abstract

The clustering of metabolic syndrome (MetS) risk factors is becoming more prevalent in children, leading to the development of type 2 diabetes (T2D) and cardiovascular diseases in early adulthood. The impact of MetS risk factors on cardiac autonomic modulation (CAM) or vice versa has been noted to track from childhood to pre-adolescence and adolescence. Understating associations in this age group may help to improve the clinical outcomes of the MetS, even when MetS symptoms are not visible. Potential damage from each individual MetS component and the ability to predict early cardiac damage or upcoming cardiovascular events is very important. Therefore, the present systematic review and meta-analysis investigated the associations between CAM and MetS risk factors individually to verify which of the MetS risk components were significantly correlated with heart rate variability (HRV) indices before or at the onset of the MetS among young people. The purpose of this review was to outline the importance of potentially screening HRV indices in young people even with only one MetS risk factor, as a pre-indicator for early cardiovascular risk stratification. Methods: cross-sectional studies that examined the relationship of MetS risk factors with HRV indices were searched using four databases including PubMed, the Cochrane clinical trials library, Medline and the Web of Science. Correlation coefficients with 95% confidence intervals (95% CI), and random effects meta-analyses of the association between MetS risk factors with HRV indices were performed. Results: out of 14 cross-sectional studies and one case-control study, 8 studies (10 data sets) provided association data for the meta-analysis. Our results indicated significant positive correlations for systolic blood pressure (SBP) (correlation coefficient 0.13 (95%CI: 0.06; 0.19), I^2 = 47.26%) and diastolic blood pressure (DBP) (correlation coefficient 0.09 (95%CI: −0.01; 0.18), I^2 = 0%) with a Low Frequency/High Frequency ratio (LF/HF). Significant positive correlations for high density lipoprotein (HDL) (correlation coefficient 0.08 (95%CI: 0.05; 0.11), I^2 = 0%) and significant negative correlations of ≥2 MetS risk (correlation coefficient −0.04 (95%CI: −0.12; 0.03), I^2 = 0.0%) with low frequency (LF) were revealed. Significant negative correlations for TGs (correlation coefficient −0.09 (95%CI: −0.23; 0.05), I^2 = 2.01%) with a mean square root of the sum of differences between mean time between two successive intervals (rMSSD) and significant positive correlation of HDL (correlation coefficient 0.09 (95%CI: −0.01; 0.19), I^2 = 0.33%) with standard deviation of the time between two successive intervals (SDNN) were also revealed. An Egger's test indicated that there was no obvious publication bias for any of the above relationships except for TGs and rMSSD. The significance level stipulated for the meta-analysis was $p < 0.05$.

Biography

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