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Links between Inflammation and Insulin Resistance in Children with Morbid Obesity and Metabolic Syndrome

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Abstract : Obesity is a clinical state associated with low-grade inflammation. It is also a major risk factor for insulin resistance (IR). In its advanced stages, metabolic syndrome (MetS), a much more complicated disease which may lead to life-threatening problems, may develop. Obesity-mediated IR seems to correlate with the inflammation. Human studies performed particularly on pediatric population are scarce. The aim of this study is to detect possible associations between inflammation and IR in terms of some related ratios. 549 children were grouped according to their age- and sex-based body mass index (BMI) percentile tables of WHO. MetS components were determined. Informed consent and approval from the Ethics Committee for Clinical Investigations were obtained. The principles of the Declaration of Helsinki were followed. The exclusion criteria were infection, inflammation, chronic diseases and those under drug treatment. Anthropometric measurements were obtained. Complete blood cell, fasting blood glucose, insulin, and C-reactive protein (CRP) analyses were performed. Homeostasis model assessment of insulin resistance (HOMA-IR), systemic immune inflammation (SII) index, tense index, alanine aminotransferase to aspartate aminotransferase ratio (ALT/AST), neutrophils to lymphocyte (NLR), platelet to lymphocyte, and lymphocyte to monocyte ratios were calculated. Data were evaluated by statistical analyses. The degree for statistical significance was 0.05. Statistically significant differences were found among the BMI values of the groups (p < 0.001). Strong correlations were detected between the BMI and waist circumference (WC) values in all groups. Tense index values were also correlated with both BMI and WC values in all groups except overweight (OW) children. SII index values of children with normal BMI were significantly different from the values obtained in OW, obese, morbid obese and MetS groups. Among all the other lymphocyte ratios, NLR exhibited a similar profile. Both HOMA-IR and ALT/AST values displayed an increasing profile from N towards MetS3 group. BMI and WC values were correlated with HOMA-IR and ALT/AST. Both in morbid obese and MetS groups, significant correlations between CRP versus SII index as well as HOMA-IR versus ALT/AST were found. ALT/AST and HOMA-IR values were correlated with NLR in morbid obese group and with SII index in MetS group, (p < 0.05), respectively. In conclusion, these findings showed that some parameters may exhibit informative differences between the early and late stages of obesity. Important associations among HOMA-IR, ALT/AST, NLR and SII index have come to light in the morbid obese and MetS groups. This study introduced the SII index and NLR as important inflammatory markers for the discrimination of normal and obese children. Interesting links were observed between inflammation and IR in morbid obese children and those with MetS, both being late stages of obesity.

Keywords : children, inflammation, insulin resistance, metabolic syndrome, obesity
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