Discriminative ability of TyG, TyG-WC, BAI, FGIR, and QUICKI indexes in identifying metabolic syndrome in a pediatric population with obesity.

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Background/Objectives: pediatric obesity is closely associated with metabolic syndrome (MetS), a condition linked to increased cardiometabolic risk. Early identification of high-risk individuals remains challenging. This study aimed to evaluate the diagnostic performance of selected anthropometric, metabolic dysfunction and insulin resistance indexes for identifying MetS in children and adolescents with obesity.

Methods: in this retrospective, cross-sectional, single-center study, 758 children and adolescents with obesity (mean age 14.8 ± 2.1 years; 59.9% females) hospitalized for a body weight-reduction program were included. MetS was defined according to International Diabetes Federation criteria, in which central obesity is a mandatory diagnostic component. The triglyceride–glucose (TyG), TyG–waist circumference (TyG-WC), body adiposity index (BAI), fasting glucose-to-insulin ratio (FGIR), and quantitative insulin sensitivity check index (QUICKI) were calculated. Receiver operating characteristic curve analysis was used to assess their discriminative ability.

Results: the prevalence of MetS was 27.8% and was significantly higher in males than females (34.9% vs. 23.1%, $p < 0.0001$). TyG and TyG-WC showed the best discriminative performance (AUC 0.75 and 0.76, respectively), although with only moderate sensitivity and specificity. FGIR and QUICKI demonstrated lower accuracy (AUC 0.64 and 0.63), whereas BAI showed no discriminative ability (AUC 0.48). These findings were consistent across sexes, although sex-specific differences in both MetS prevalence and optimal cut-off values were observed. Correlation analyses confirmed moderate associations between TyG-based indexes and MetS, whereas other indexes showed weaker relationships.

Conclusions: in the present cohort of children and adolescents with obesity, TyG and TyG-WC showed the best performance in identifying MetS compared with the other evaluated indexes. However, their performance remained moderate, and the proposed cut-off values require validation
in independent populations. These indexes may represent simple supportive screening and risk-stratification tools but should be used alongside comprehensive clinical assessment and established diagnostic criteria rather than as stand-alone diagnostic measures.