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Original Article

Single point insulin sensitivity estimator as a marker of metabolic syndrome in a South Indian cohort

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Background and objectives: Insulin resistance is an important mechanism linking metabolic syndrome, type 2 diabetes mellitus (T2DM) and cardiovascular disease. Accurate assessment of insulin resistance is vital for early detection, but existing methods have limitations. The gold standard euglycemic-hyperinsulinemic clamp is impractical for large-scale studies, while homeostatic model assessment for insulin resistance (HOMA-IR) requires fasting insulin measurement. This study aimed to validate single point insulin sensitivity estimator (SPISE), a lipid-based non-invasive test for detection of metabolic syndrome by comparing it with HOMA-IR. The primary objective was to determine a suitable cut-off for SPISE in South Indian population.

Methods: Between June and December 2024, we conducted a cross-sectional study among 151 adults (>30 years) living in the semi-urban outskirts of Madurai, Tamil Nadu, using systematic random sampling to select participants. Participants were categorised as individuals with metabolic syndrome (n=76) or individuals without metabolic syndrome (n=75) using South Asian-modified National Cholesterol Education Program (NCEP) criteria. Anthropometry, blood glucose, lipid profile, and insulin levels were measured in fasting state. SPISE and HOMA-IR were calculated using the formulas SPISE=600 x HDL–C $^{0.185}$/ (TG $^{0.2}$ x BMI $^{1.338}$) HOMA-IR=[fasting blood glucose (mg/dL) x fasting insulin (μU/mL)]/405. The values were calculated using photometric method for lipid profile and ECLIA for serum insulin levels, and the ideal cut off, sensitivity, and specificity were found using receiver operating characteristic (ROC) analysis.

Results: Participants with metabolic syndrome showed significantly higher BMI (28.55±3.91 *vs.* 26.95±4.06) and HOMA-IR (6.56±2.04 *vs.* 1.89±1.09), and lower SPISE values (4.93±0.82 *vs.* 5.73±1.48 $P<0.05$). A SPISE cut-off of 4.05 yielded 89% sensitivity and 88% specificity, outperforming HOMA-IR (sensitivity 64.9%, specificity 70.6%). Area under the curve values were comparable for SPISE (0.662) and HOMA-IR (0.638).

Interpretation and conclusions: The SPISE index is a simple, non-invasive tool for assessing insulin resistance in the South Indian population, exhibiting superior sensitivity (89%) and specificity (88%) compared to HOMA-IR at a cut-off of 4.05. By utilising routine lipid and anthropometric data rather than expensive insulin assays, SPISE serves as a practical alternative for large-scale metabolic syndrome screening in semi-urban settings. SPISE is a surrogate point of care marker for insulin resistance, suitable for large-scale studies in resource-limited settings. Further multicentre studies are warranted to validate population-specific cut-offs.

Keywords HOMA-IR; Insulin resistance; Metabolic syndrome; South Indian population; Type 2 diabetes mellitus

Insulin resistance is clinically