Simplifying Metabolic Syndrome Screening

Validation of the TyG Index in Nepalese Adults

Rachana Pandey,

Kathmandu University School of Medical Sciences-Dhulikhel Hospital

Background

- Metabolic Syndrome increases risk of CVD and diabetes
- High burden in South Asian populations
- Screening is difficult in resource-limited settings
- TyG index: simple insulin resistance marker

Objectives

- **General:**

To assess the diagnostic accuracy of the TyG index for detecting Metabolic Syndrome using the IDF South Asian criteria.

- **Specific**
- Assess diagnostic accuracy of TyG index
- Use IDF South Asian criteria
- Determine optimal population-specific cut-off

Methodology

Study Design

Hospital-based cross-sectional study

- Adults 18–65 years
- **Exclusions**: Chronic illness, pregnancy
- Ethical approval obtained from IRC, KUSMS (203/25).

Methodology contd…

Study Variables

- **Anthropometry**: Waist circumference
- **Blood pressure**: SBP, DBP, Hypertension (yes/no)
- **Labs:** Fasting glucose, Triglyceride, HDL assessed
- **TyG Calculation**: TyG = ln [TG × glucose / 2]
- **Metabolic syndrome:** Defined using IDF South Asian criteria

According to the new IDF definition, for a person to be defined as having the metabolic syndrome they must have:

Central obesity (defined as waist circumference* with ethnicity specific values)

plus any two of the following four factors:

Raised triglycerides	≥ 150 mg/dL (1.7 mmol/L) **or specific treatment for this lipid abnormality**
Reduced HDL cholesterol	< 40 mg/dL (1.03 mmol/L) in males < 50 mg/dL (1.29 mmol/L) in females **or specific treatment for this lipid abnormality**
Raised blood pressure	systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg **or treatment of previously diagnosed hypertension**
Raised fasting plasma glucose	(FPG) ≥ 100 mg/dL (5.6 mmol/L), **or previously diagnosed type 2 diabetes** If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended but is not necessary to define presence of the syndrome.

** If BMI is >30kg/m², central obesity can be assumed and waist circumference does not need to be measured.*

Methodology contd…

Statistical Analysis

- Prevalence of MetS.
- ROC curve analysis.
- Deriving the optimal cutoff for TyG (Youden’s index)
- Diagnostic performance of TyG (Sensitivity, specificity, PPV, NPV, LR+, LR-).
- Correlation of TyG with SBP, DBP, HDL, and WC.

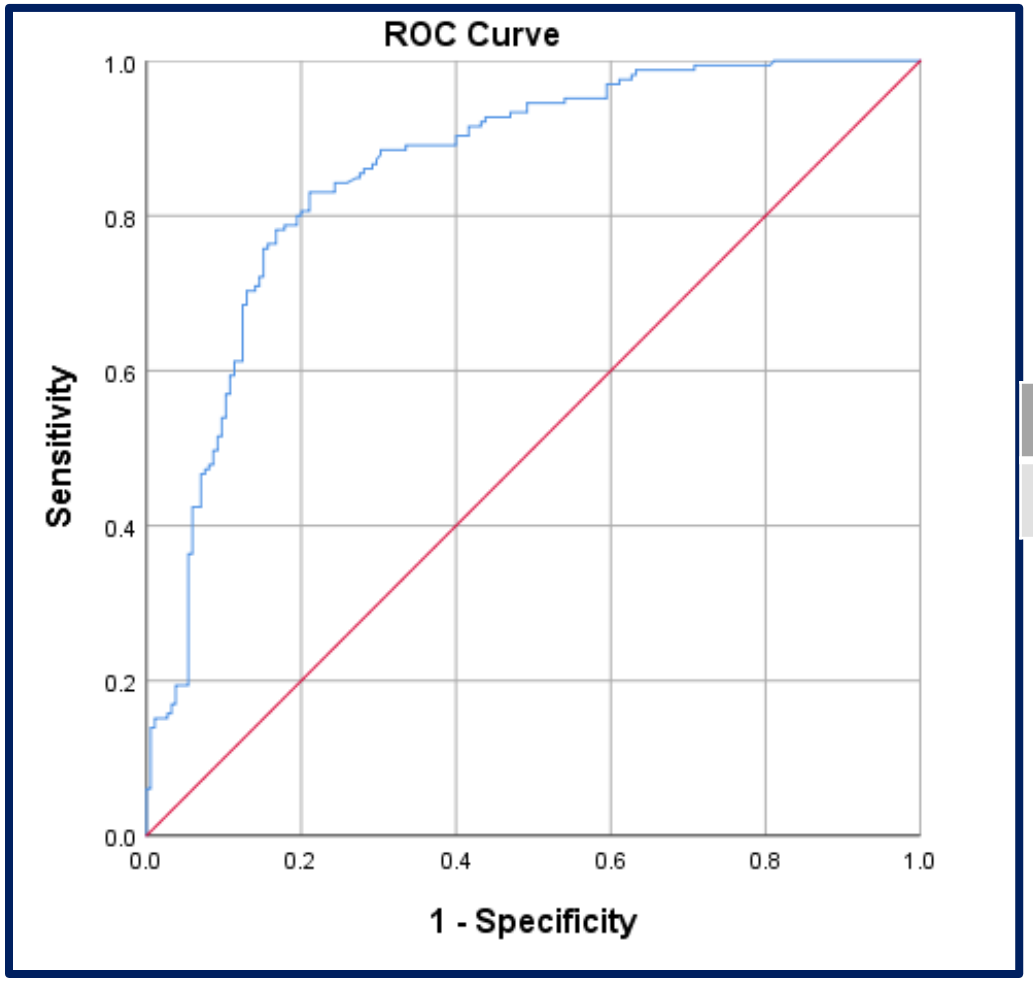
Results

1. **Prevalence of MetS:**

- Out of 350 participants, 165 had MetS.
- **Prevalence**: **47.1%** (95% CI: 41.8% to 52.5%).

2. ROC curve analysis:

- Numerical variable: TyG
- Binary variable: MetS (Yes/No)



AuC	P-value	95% CI
0.859	< 0.001	0.819 – 0.898

3. Youden’s index and optimal cutoff:

- Highest Youden’s Index = 0.619
- Corresponding TyG value = 8.7896
- Cut-off chosen for TyG index = 8.79.

Youden’s Index =
Sensitivity + Specificity -1

4. Diagnostic performance:

- TyG cut-off: 8.79

Sensitivity	Specificity	PPV	NPV	LR+	LR-
83.03%	78.38%	77.40%	83.82%	3.84	0.22

CROSSTAB		Metabolic Syndrome	
		Yes	**No**
TyG ≥ 8.79	**Yes**	137	40
	No	28	145

5. Correlation of TyG with SBP, DBP, WC, HC, HDL-C and Total-C

- Spearman correlation analysis was done.

(TyG was normally distributed, but other parameters deviated significantly from normality).

Correlation of TyG index with	Correlation coefficient (ρ)	P-value	Interpretation
SBP	0.128	**0.016**	Very weak positive; significant
DBP	0.094	0.080	Negligible; not significant
WC	0.313	**< 0.001**	Weak positive; significant
HC	0.188	**< 0.001**	Very weak positive; significant
HDL-C	- 0.311	**< 0.001**	Weak negative; significant
Total-C	0.438	**< 0.001**	Moderate positive; significant

Interpretation

- The TyG index demonstrated good overall diagnostic performance in identifying metabolic syndrome.

➢ The relatively high **sensitivity (83%)** makes it suitable as a screening tool.

➢ The moderate **specificity (78.4%)** suggests some false positives, acceptable in screening contexts.

➢ An **LR+ of 3.84** indicates a modest increase in post-test probability

➢ An **LR− of 0.22** shows that a negative test meaningfully reduces disease probability.

- **Overall**: TyG index may be more useful for ruling out rather than definitive diagnosis.

Why TyG ?

- Combines glucose and triglycerides.
- Captures hepatic insulin resistance.
- Reflects lipotoxicity and glucotoxicity, both of which are central to the pathogenesis of MetS.
- Uses routine, low-cost laboratory tests.

Comparison with Other Markers

- Fasting glucose alone has limited sensitivity.
  - May remain normal in early insulin resistance.
- Triglycerides alone have variable specificity.
- HOMA-IR is costly and not widely available.

✓**TyG provides a simple and cost-effective alternative**

Population-Specific Relevance

- South Asians have a higher metabolic risk at a lower BMI.
- Greater visceral adiposity and insulin resistance.
- Local validation ensures appropriate cut-off values.

Strengths of the Study

- First validation in Nepalese adults.
- Adequate sample size.
- Use of IDF South Asian criteria.
- Direct clinical applicability.

Limitations

- Hospital-based sample limits generalizability.
- Single-center study.
- A cross-sectional design prevents causal inference.
- Incorporation bias due to shared variables.
- No comparison with HOMA-IR.

Clinical Implications

- Can be implemented in primary care settings.
- Supports early identification of high-risk individuals.
- Useful in resource-limited healthcare systems.

Conclusions

- The TyG index shows good diagnostic accuracy for MetS.
- Optimal cut-off of 8.79 for Nepalese adults.
- Simple, cost-effective, and practical screening tool.

A simple calculation from routine tests can uncover hidden metabolic risk—TyG makes early detection possible.”

References

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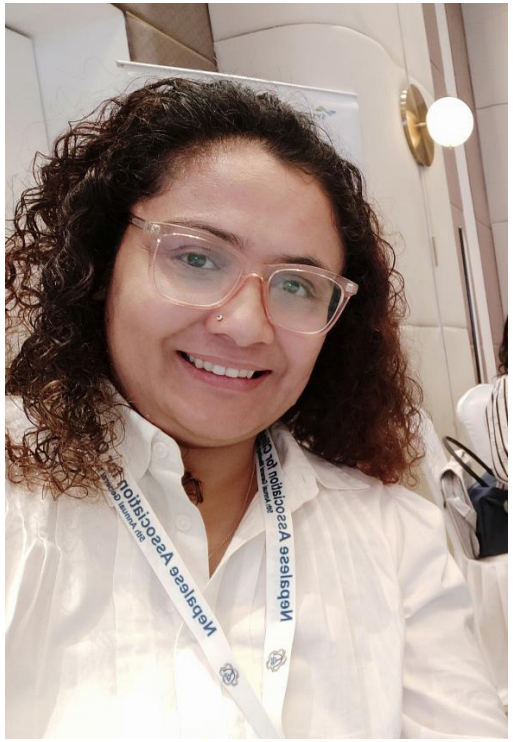

Thank you

Rachana Pandey, MD Biochemistry

Fellow, FAIMER (Health Professionals Education).

Currently working as an Assistant Professor in the Department of Biochemistry in KUSMS-DH.

Research interest in NCDs, and medical education.