Comparison of Triglyceride-Glucose Index with HbA1c and HOMA-IR as a risk marker for prediabetes and insulin resistance in a tertiary care hospital in Chittagong

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A thesis submitted in the partial fulfillment of the requirements for the degree of Master of Science in Public Health

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Authorization

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List of Abbreviations

Abbreviation	Elaboration
AACE	American Association of Clinical Endocrinologists
ACT NOW	Actos Now for Prevention of Diabetes
ADA	American Diabetic Association
ALT	Alkaline Phosphatase
AUC	Area under the curve
AUSDIAB	The Australian Diabetes, Obesity and Lifestyle Study
BMI	Body Mass Index
BP	Blood Pressure
CAD	Coronary Artery Disease
CANRISK	Canadian Diabetes Risk Assessment Questionnaire
cm	centimeter
CVD	Cerebrovascular Disease
DAG	Diacylgyerol
DECODE	Diabetes Epidemiology: Collaborative analysis Of Diagnostic Criteria in Europe
DPP	Diabetes Prevention Program
FFA	Free Fatty Acids
FINDRISK	Finnish Diabetes Risk Score
FPG	Fasting Plasma Glucose
GDM	Gestational Diabetes Mellitus
GLUT4	Glucose Transporter 4
HbA1c	Glycated Haemoglobin
HDL	High Density Lipoprotein
HEGC	Hyperinsulinaemic-Euglycaemic Clamp
HOMA-IR	Homeostasis Model for Insulin Resistance
HPLC	High Performance Lipid Chromatography

IDF	International Diabetes Federation
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance
IL-6	Interleukin 6
IR	Insulin Resistance
JNK-1	Janus Kinase 1
mg/dl	Milli gram per deciliter
LAP	Lipid Accumulation Products
LDL	Low Density Lipoprotein
MS	Metabolic Syndrome
NAFLD	Non-alcoholic Fatty Liver Disease
OGTT	Oral Glucose Tolerance Test
QUICK1	Quantitative Insulin Sensitive Check Index
ROC	Receiver Operating Characteristics
RPG	Random Plasma Glucose
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
TAG	Triacylglycerols
T2DM	Type 2 Diabetes Mellitus
TB	Tuberculosis
TG	Triglycerides
Tk	Bangladeshi Tk
TIA	Transient Ischaemic Attack
TNF-α	Tumor Necrosis Factor Alpha
TyG Index	Triglyceride-Glucose Index
VAI	Visceral Adiposity Index
US$	United States Dollar
VLDL	Very low-density lipoprotein
WHO	World Health Organization

Abstract

Prediabetes is a state of intermittent hyperglycaemia which has the potential to the future development of Diabetes Mellitus and cause micro as well macrovascular complications. Triglyceride Glucose (TyG) Index is a cheaper alternative to the more expensive Homeostasis Model for Insulin Resistance (HOMA-IR) and Haemoglobin A1c (HbA1c) essays are quick, reliable and easily reproducible in everyday clinical settings. The aim of this study is to find whether TyG index is comparable to HOMA-IR for insulin resistance and to HbA1c as a reliable screening tool for prediabetes.

A descriptive type of observational case-control study was conducted among 100 prediabetes individuals and matched with 100 of their corresponding age and sex equivalent normoglycaemic controls in the outpatient department of Chittagong Diabetic General Hospital between October 2021 till end of September 2022. Anthropometric Measurements and Laboratory parameters like Fasting Plasma Glucose, Fasting Serum Insulin and Triglycerides, HOMA-IR, HbA1c were measured, and comparative analysis were done between Tyg Index and HbA1c and HOMA-IR with Receiver Operator Characteristics (ROC) curves and Pearson correlation analysis respectively.

The Area under the curve (AUC) demonstrated a higher ROC AUC score for HbA1c (0.923) as compared to the TyG Index (0.874) for diagnosing prediabetes but the differences were not statistically significant with a p-value of 0.062 which demonstrates that TyG Index is comparable to HbA1c. The Pearson correlation coefficients between the various anthropometric measurements related to insulin resistance with TyG Index and HOMA-IR demonstrates a highly significant difference in weight (0.186 vs 01.54) in favor of TyG Index with a p-value of <0.01 and a significant difference in Body Mass Index (0.421 vs 0.372), Waist Circumference (0.286 vs 0.253) and Waist to height Ratio (0.392 vs 0.333) in favor of TyG index which stipulates that TyG is comparable and in fact a better indicator of insulin resistance and thereby metabolic dysfunction as opposed to HOMA-IR with a p-value of <0.05.

TyG index is a reliable surrogate marker for IR and is also comparable to HbA1c for monitoring glycaemic status and predicting/identifying prediabetes as well. Hence, it can be used as an alternative screening tool for the better management of high-risk individuals prone to develop prediabetes.

Key words: **TyG Index, HOMA-IR, HbA1c, Prediabetes**