# The Association between Obesity Index and Cardiovascular Risk Factors in Chinese Primary Care Adults

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## Introduction

The objective of this study was to explore the associations between different obesity-related indicators (ORIs) and cardiovascular risk factors (CRFs) including hypertension, hyperlipidemia, and diabetes, in Chinese adults.

## Methods

The data were derived from the 2024 chronic disease and risk factor surveillance program in Wuhan City, China.

- Blood pressure, fasting blood lipid, and glucose levels were measured.
- There were eight ORIs in this study including Body Roundness Index **(BRI)**, Triglyceride-Glucose Index **(TYG)**, Conicity Index **(CI)**, Chinese Visceral Adiposity Index **(CVAI)**, Metabolic Syndrome-Insulin Resistance **(METS-IR)**, Metabolic Syndrome-Visceral Fat **(METS-VF)**, Triglyceride-Glucose-Body Mass Index **(TYG-BMI)**, and Triglyceride-Glucose-Waist-to-Height Ratio **(TYG-WHtR)**.
- The ability of different ORIs to predict CRFs was assessed by calculating the area under the receiver operating characteristic **(ROC)** curves **(AUCs)** with 95% confidence intervals **(CIs).** Logistic regression model was used to evaluate the associations between ORIs and CRFs.

**Table 1** Basic characteristics of the study population

| Characteristic | | Female | Male | *P*-value |
|---|---|---|---|---|
| Age | 18-50 | 35.56±7.28 | 35.38±7.88 | 0.803 |
| | 51-70 | 60.13±5.40 | 59.70±5.84 | |
| | >71 | 76.34±4.10 | 75.92±3.00 | |
| Level of education | Primary education level or below | 254 (68.10) | 188 (51.09) | 0.742 |
| | Secondary education level | 76 (20.38) | 105 (28.53) | |
| | University level or above | 43 (11.53) | 75 (20.38) | |
| Smoking | | 20 (5.36) | 159 (43.21) | <0.001 |
| Drinking | | 55 (14.75) | 207 (56.25) | <0.001 |
| Hypertension | | 120 (32.17) | 147 (39.95) | <0.001 |
| Hyperlipidemia | | 158 (42.36) | 179 (48.64) | 0.005 |
| Diabetes | | 60 (1.09) | 64 (17.39) | 0.342 |
| BRI | | 4.23±1.49 | 4.12±1.17 | <0.001 |
| TYG | | 8.61±0.63 | 8.85±0.77 | 0.004 |
| CI | | 1.24±0.10 | 1.27±0.07 | <0.001 |
| CVAI | | 87.95±47.33 | 96.72±40.08 | <0.001 |
| METS-IR | | 36.18±6.99 | 38.19±7.71 | 0.117 |
| METS-VF | | 6.32±1.77 | 7.24±1.40 | <0.001 |
| TYG-BMI | | 214.32±41.77 | 223.67±45.40 | 0.296 |
| TYG-WHtR | | 4.66±0.83 | 4.76±0.76 | 0.084 |

## Results

A total of 741 primary care adults were included in this study, with a mean age of 49.11±15.74years.

- The prevalence of hypertension, hyperlipidemia, and diabetes was **267 (36.03%)**, **337 (45.48%)**, and **124 (16.73%)**, respectively. In the total population, **CVAI** was the best predictor of hypertension **(AUC = 0.755)**, **METS-IR** was the best predictor of hyperlipidemia **(AUC = 0.669)**, and **CVAI** was the best predictor of diabetes **(AUC = 0.727)**, respectively.
- Stratified analysis showed that in the male group, **CVAI (AUC=0.759)**, **METS-IR (AUC = 0.700)**, and **CVAI (AUC = 0.673)** were the best predictor of hypertension, hyperlipidemia, and diabetes, respectively. While in the female group, **CVAI (AUC = 0.750)**, **METS-VF (AUC = 0.651)**, and **CVAI (AUC = 0.775)** were the best predictor of hypertension, hyperlipidemia, and diabetes, respectively.

## Conclusions

Different obesity indices can predict cardiovascular risk factors in adults and can serve as early warning indicators for cardiovascular diseases. Future research can further explore the applicability of different obesity indices in different populations to optimize early screening strategies for cardiovascular diseases.

**Table 2** Area Under the Curve (AUC) for the Prediction of Cardiovascular Risk Factors (CRFs) by Obesity-Related Indicators (ORIs)

| Obesity Index | hypertension | hyperlipidemia | diabetes |
|---|---|---|---|
| | AUCs (95%CI) | AUCs (95%CI) | AUCs (95%CI) |
| BRI | 0.684 (0.644-0.723) *** | 0.655 (0.616-0.694) *** | 0.664 (0.614-0.714) *** |
| TYG | 0.633 (0.592-0.675) *** | 0.744 (0.709-0.779) *** | 0.790 (0.749-0.831) *** |
| CI | 0.641 (0.600-0.682) ** | 0.595 (0.554-0.636) ** | 0.625 (0.575-0.675) ** |
| CVAI | 0.755 (0.721-0.790) *** | 0.689 (0.651-0.726) *** | 0.727 (0.683-0.771) *** |
| METS-IR | 0.647 (0.605-0.689) *** | 0.669 (0.630-0.708) *** | 0.700 (0.653-0.748) *** |
| METS-VF | 0.738 (0.702-0.774) *** | 0.662 (0.623-0.701) *** | 0.704 (0.658-0.749) *** |
| TYG-BMI | 0.658 (0.617-0.699) *** | 0.707 (0.671-0.744) *** | 0.723 (0.677-0.769) *** |
| TYG-WHtR | 0.691 (0.652-0.730) *** | 0.723 (0.687-0.760) *** | 0.763 (0.719-0.807) *** |

Note: AUC refers to the area under the curve, and CI refers to the confidence interval. Due to the inclusion of triglycerides (TG) and/or high-density lipoprotein cholesterol (HDL) in the components of TYG, CVAI, TYG-BMI, and TYG-WHtR, these indicators were excluded from the statistics for the strongest predictors of dyslipidemia; when analyzing the strongest predictors for diabetes, TYG, TYG-BMI, and TYG-WHtR were excluded because their components include fasting plasma glucose (FPG). ** P <0.001.