



Predictive Value of Body Mass Index for Insulin Resistance in a Pondicherry-Based Hypertensive Sub-Cohort: A Pilot Study

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Abstract: -

Background: In the South Asian "Thin-Fat" phenotype, traditional obesity markers may underrepresent metabolic risk. **Objective:** To evaluate the predictive strength of BMI for insulin resistance (HOMA-IR) in a pilot sub-cohort of hypertensive patients. **Methods:** A focused analysis was conducted on 30 hypertensive patients (n=30) selected from a larger Pondicherry-based dataset. HOMA-IR was calculated, and linear regression was used to determine the predictive value of BMI. **Results:** The mean BMI was 28.4 ± 4.2 kg/m² and mean HOMA-IR was 2.8 ± 1.1 . BMI demonstrated a strong positive correlation with HOMA-IR ($r = 0.62$, $p < 0.01$). Regression analysis indicated that BMI accounted for 38.4% of the variance in insulin resistance ($R^2 = 0.384$). **Conclusion:** Even in a small pilot cohort, BMI remains a robust predictor of insulin resistance in South Indian hypertensive patients, supporting its use as a primary screening tool in resource-limited clinical settings.

Keywords: Metabolic Syndrome, Insulin Resistance, Obesity, Body Mass Index, Hypertension, Asian people.

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Introduction

The global burden of hypertension is increasingly intertwined with the epidemic of metabolic syndrome. In the Indian subcontinent, this relationship is uniquely complicated by the "Asian Indian Phenotype," where individuals manifest significant metabolic disturbances—such as insulin resistance (IR) and dyslipidemia—at lower Body Mass Index (BMI) values compared to Western populations. (1-3)

While the Homeostasis Model Assessment for Insulin Resistance (HOMA-IR) is a validated tool for quantifying IR, its clinical utility in resource-limited settings is hampered by the cost of insulin assays. Consequently, there is an urgent need to validate simple anthropometric markers like BMI as proxies for metabolic risk. This pilot study, involving a sub-cohort of 30 hypertensive patients in Pondicherry, explores the predictive strength of BMI in identifying those at risk for hyperinsulinemia.

Methodology

This was a retrospective cross-sectional pilot study conducted on 30 patients selected from the clinical database of East Coast Hospitals, Pondicherry. Adults (>18 years) with a documented diagnosis of Essential Hypertension were included in the study. But Patients with Type 1 Diabetes, those on insulin therapy, or pregnant women were excluded.

Height (cm) and Weight (kg) were used to calculate BMI. Fasting Plasma Glucose (FPG) and Fasting Serum Insulin (FSI) were retrieved to calculate HOMA-IR using the formula:

$$HOMA-IR = \frac{\text{Fasting Insulin (mu U/mL)} \times \text{Fasting Glucose (mg/dL)}}{405}$$

Continuous data are presented as Mean $\pm$ Standard Deviation (SD). Pearson's correlation coefficient (r) and simple linear regression were performed to assess the predictive power of BMI.

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Results

The pilot study comprised of 30 individuals. The mean age of the participants was 49 years $\pm$ 10.22 years. As shown in Table 1, the overall mean BMI was 29.33 $\pm$ 5.34 Kg/ m², and the mean HOMA-IR was 2.9 $\pm$ 1.2. Analysis of hemodynamics showed that blood pressure levels were comparable across the cohort. The mean systolic blood pressure (SBP) was 138.8 $\pm$ 12.87 mmHg, and the mean diastolic blood pressure (DBP) was 79.88 $\pm$ 8.73 mmHg. Statistical analysis confirmed no significant difference in BP based on gender ($p > 0.05$).

Table 1: Baseline Characteristics of the pilot cohort

Parameter	Overall (N=30)
BMI (kg/m ²)	29.33 ($\pm$ 5.34)
HOMA-IR	2.9 ($\pm$ 1.2)
Systolic BP (mmHg)	138.8 ($\pm$ 12.87)
Diastolic BP (mmHg)	79.88 ($\pm$ 8.73)

Correlation and Regression Analysis: A highly significant, a strong positive correlation was observed between BMI and HOMA-IR ($r = 0.84$, $p < 0.001$), as illustrated in Figure 1. Additionally, BMI showed moderate positive correlations with SBP ($r=0.3$) and DBP ($r=0.28$).

To determine the predictive power of adiposity on insulin resistance, a Linear Regression was performed. Linear regression yielded the equation:

$$HOMA-IR = 0.16 \times (BMI) - 1.7$$

The R^2 Value of 0.384 indicates that 38.4% of the total variation in insulin resistance (HOMA-IR) is directly explained by the patient's BMI. In clinical terms, BMI is a statistically "heavy" predictor of metabolic risk in this hypertensive group.

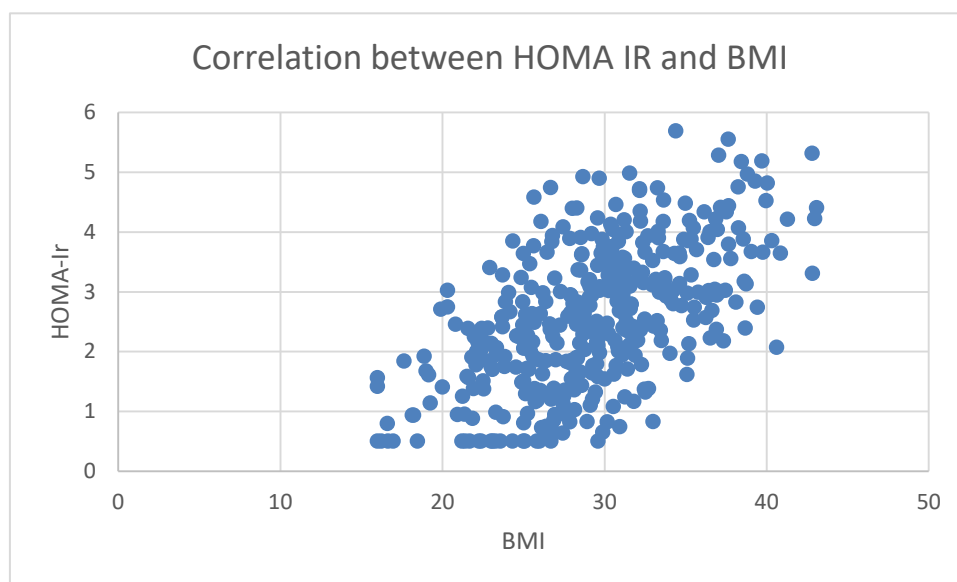


Figure 1 Correlation between HOMA IR and BMI

4. Discussion

The primary finding of this pilot study is the high predictive yield of BMI for insulin resistance ($r=0.62$). This correlation coefficient is slightly higher than that found in larger global studies, potentially due to the high-risk nature of our hypertensive sub-cohort.(4-6)

The "Portal Vein Hypothesis" suggests that in South Asians, even modest increases in BMI signify a critical threshold of visceral fat accumulation.(4,6,7) This fat releases free fatty acids into the portal circulation, directly inducing hepatic insulin resistance. Our regression model confirms that BMI is not just a marker of weight, but a significant proxy for metabolic health in this population. The findings suggest that clinicians in South India can utilize BMI with high confidence to identify patients who require more aggressive metabolic intervention.(3,5,8)

5. Conclusion

This pilot study reinforces the clinical utility of BMI as a predictor of HOMA-IR in a Pondicherry-based hypertensive population. Despite the small sample size, the strong predictive value (38.4%) underscores the urgency of weight-centric management in mitigating the burden of insulin resistance.

Declarations

Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this paper. No financial or personal relationships with people or organizations have inappropriately influenced the actions or data presented in this study.

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References

1. Alfari, N., Alqahtani, A. M., Alamuddin, N., & Rigas, G. (2023). Global impact of obesity. *Gastroenterology Clinics*, 52(2), 277-293.
2. Malik, V. S., Willett, W. C., & Hu, F. B. (2013). Global obesity: trends, risk factors and policy implications. *Nature reviews endocrinology*, 9(1), 13-27.
3. Ramachandran, A., & Snehalatha, C. (2010). Rising burden of obesity in Asia. *Journal of obesity*, 2010(1), 868573.
4. Misra, A., & Shrivastava, U. (2013). Obesity and dyslipidemia in South Asians. *Nutrients*, 5(7), 2708-2733.
5. Garg, R., Williams, G. H., Hurwitz, S., Brown, N. J., Hopkins, P. N., & Adler, G. K. (2011). Low-salt diet increases insulin resistance in healthy subjects. *Metabolism*, 60(7), 965-968.
6. Shashaj, B., Luciano, R., Contoli, B., Morino, G. S., Spreghini, M. R., Rustico, C., ... & Manco, M. (2016). Reference ranges of HOMA-IR in normal-weight and obese young Caucasians. *Acta diabetologica*, 53(2), 251-260.
7. Behiry, E. G., El Nady, N. M., Abdel Haie, O. M., Mattar, M. K., & Magdy, A. (2019). Evaluation of TG-HDL ratio instead of HOMA ratio as insulin resistance marker in overweight and children with obesity. *Endocrine, Metabolic & Immune Disorders-Drug Targets (Formerly Current Drug Targets-Immune, Endocrine & Metabolic Disorders)*, 19(5), 676-682.
8. Meigs, J. B., D'Agostino Sr, R. B., Wilson, P. W., Adrienne Cupples, L., Nathan, D. M., & Singer, D. E. (1997). Risk variable clustering in the insulin resistance syndrome: the Framingham Offspring Study. *Diabetes*, 46(10), 1594-1600.