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Sensibility and specificity analysis for waist-to-height ratio, body mass index and waist circumference as a screening criterion for metabolic syndrome in an adult North-East Portuguese population

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INTRODUCTION

Obesity is a central component of Metabolic Syndrome (MetS) and a major public health concern. A harmonizing MetS definition was developed to aggregate the different criteria used by the umbrella organizations, however there is still controversy over the most sensitive and specific parameter to characterize each MetS component.

AIM

The aim of this study was to compare the sensibility and specificity for waist-to-height ratio (WHtR), body mass index (BMI) and waist circumference (WC) to discriminate subjects with and without MetS in an adult North-East Portuguese population.

METHOD

Participants

A cross-sectional retrospective analysis was conducted between January 2019 and December 2020 from patients' clinical records of two primary health care centers in a North-East Portuguese region.

A total of 6570 individuals aged 18–102 years were included for analysis, among which:

- **Women:** 3865 women (57.37±18.67 years);
- **Men:** 2705 men (59.97±16.76 years);

Procedures and Data Collection

- **MetS** defined by HARM2009 (Alberti et al., 2009);
- **WHtR** ≥ 0.5 cm;
- **BMI** ≥ 30 kg/m².
- **WC** >88 cm (women) | **WC** >102 cm (men)

Statistical Procedures:

A binary logistic regression was performed (95% CI):

- Areas under receiver operating characteristic curves (AUC) using a receiver operating characteristic (ROC) analysis.
- Adjusted odd ratios (OR);
- Statistical significance was set at $p < 0.05$.

CONCLUSIONS

Adjusting individual's waist circumference to height revealed a greater sensitivity and specificity for MetS screening than isolated WC and BMI. Current research suggests that WHtR is as a better predictor for MetS, specifically in its obesity component.

KEYWORDS:

Metabolic Syndrome; obesity; waist-to-height ratio, waist circumference, body mass index.

RESULTS

MetS was present in 3,581 (54.51%) subjects, where 1,914 (49,52%) were women and 1,667 (61.63%) men. AUC demonstrated that WHtR was significantly more powerful than WC and BMI ($p < 0.05$) for screening MetS ($AUC_{WHtR} = 0.785$, 95% CI: 0.774–0.796; $AUC_{WC} = 0.768$, 95% CI: 0.757–0.779; $AUC_{BMI} = 0.751$, 95% CI: 0.703–0.796). Men are 1.53 (95% CI: 1.37–1.72, $p < 0.001$) times more likely of having MetS compared to women. Also, the discriminative power of the three criteria for predicting MetS is higher in men ($AUC_{WHtR} = 0.795$, 95% CI: 0.778–0.812; $AUC_{WC} = 0.783$, 95% CI: 0.766–0.801; $AUC_{BMI} = 0.740$, 95% CI: 0.722–0.759) than women ($AUC_{WHtR} = 0.782$, 95% CI: 0.768–0.797; $AUC_{WC} = 0.760$, 95% CI: 0.744–0.775; $AUC_{BMI} = 0.699$, 95% CI: 0.683–0.716). However, WHtR is still the most powerful screening criterion for MetS in both sexes.

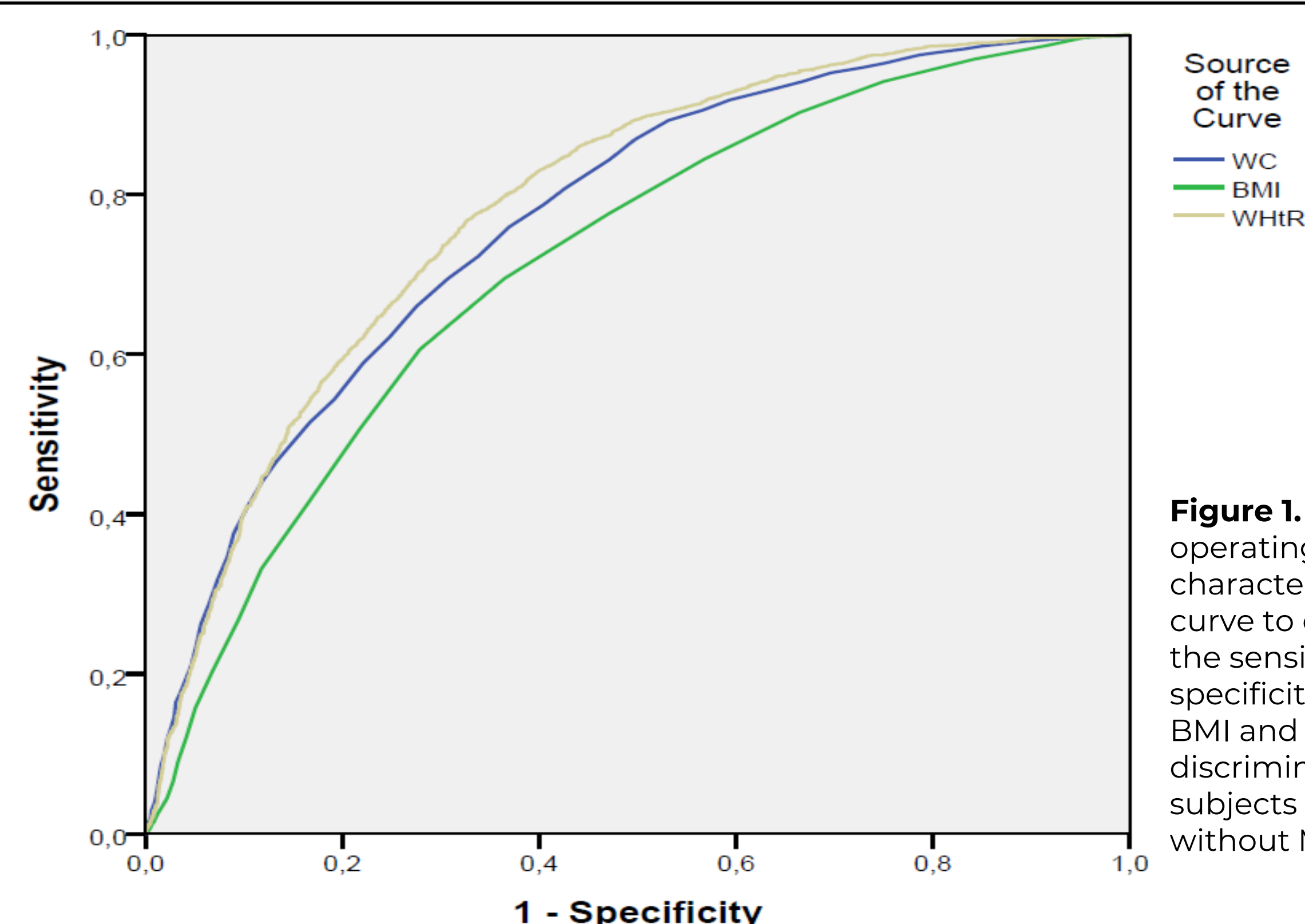


Figure 1. Receiver operating characteristic (ROC) curve to compare the sensibility and specificity for WHtR, BMI and WC to discriminate subjects with and without MetS.

REFERENCES

- Ashwell, M., Gunn, P., & Gibson, S. (2011). Waist-to-height ratio is a better screening tool than waist circumference and BMI for adult cardiometabolic risk factors: Systematic review and meta-analysis. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 13, 275–286. <https://doi.org/10.1111/j.1467-789X.2011.00952.x>
- Hajian-Tilaki, K., Heidari, B., Hajian-Tilaki, A., Firouzjahi, A., & Bagherzadeh, M. (2014). The Discriminatory Performance of Body Mass Index, Waist Circumference, Waist-To-Hip Ratio and Waist-To-Height Ratio for Detection of Metabolic Syndrome and Their Optimal Cutoffs among Iranian Adults. *Journal of Research in Health Sciences*, 14(4), 276–281. <https://doi.org/10.34172/jrshs141844>
- Pasdar, Y., Moradi, S., Moludi, J., Saiedi, S., Moradinazar, M., Hamzeh, B., Jafarabadi, M. A., & Najafi, F. (2020). Waist-to-height ratio is a better discriminator of cardiovascular disease than other anthropometric indicators in Kurdish adults. *Scientific Reports*, 10(1), 16228. <https://doi.org/10.1038/s41598-020-73224-8>
- Raposo, L., Severo, M., & Santos, A. C. (2018). Adiposity cut-off points for cardiovascular disease and diabetes risk in the Portuguese population: The PORMETS study. *PLoS ONE*, 13(1), e0191641. <https://doi.org/10.1371/journal.pone.0191641>
- Yang, H., Xin, Z., Feng, J.-P., & Yang, J.-K. (2017). Waist-to-height ratio is better than body mass index and waist circumference as a screening criterion for metabolic syndrome in Han Chinese adults. *Medicine*, 96(39). <https://doi.org/10.1097/MD.00000000000008192>

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