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Body Density Index (BoDI): A Novel Anthropometric Indicator for Assessing Abdominal Obesity and Cardiometabolic Risk

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Abstract

Background. Obesity is a chronic, multifactorial disease that requires accessible and low-cost diagnostic tools in primary care. Body mass index (BMI) has well-known limitations because it does not distinguish fat mass from lean mass and does not capture body fat distribution. We propose the Body Density Index (BoDI), a transparent mathematical model based on a cylindrical geometric approximation, to estimate body density and evaluate its association with anthropometric and cardiometabolic risk indicators. **Methods.** 126 adults underwent standardized anthropometry (weight, height, waist circumference, and hip circumference). BMI, waist-to-hip ratio (WHR), waist-to-height ratio (WHtR), and BoDI were computed. Systolic and diastolic blood pressure (SBP/DBP), glucose, total cholesterol, triglycerides, LDL, and HDL were measured. Associations were assessed using Spearman correlations; BoDI was compared across risk categories using ANOVA or Kruskal Wallis tests, as appropriate; and diagnostic performance was evaluated using ROC curves. **Results.** BoDI was strongly and inversely correlated with waist circumference ($r = -0.8465$, 95%CI -0.89 – -0.78, $p < 0.0001$), WHtR ($r = -0.8018$, 95%CI -0.85 – -0.72, $p < 0.0001$), and WHR ($r = -0.6991$, 95%CI -0.78 – -0.59, $p < 0.0001$), but only weakly correlated with BMI ($r = -0.4174$, 95%CI -0.55 – -0.25, $p < 0.0001$). ROC analyses showed excellent discrimination of high-risk groups, with optimal cutoffs in the range 0.63 - 0.67. BoDI also showed weak but significant inverse correlations with Systolic Blood Pressure ($r = -0.2236$, 95%CI -0.38 – -0.04, $p = 0.0119$), Diastolic Blood Pressure ($r = -0.2421$, 95%CI -0.40 – -0.06, $p = 0.0063$), glucose ($r = -0.2720$, 95%CI -0.43 – -0.09, $p = 0.0021$), and triglycerides ($r = -0.2871$ 95%CI -0.44 – -0.11, $p = 0.0011$). **Conclusions.** BoDI is a simple, low-cost index sensitive to central adiposity and associated with cardiometabolic risk markers. Its mathematical transparency and operational simplicity support its potential as a screening tool in primary care, particularly in resource-limited settings. External validation against reference methods (DXA) is warranted.

Introduction

Obesity is defined by the World Health Organization as an abnormal or excessive fat accumulation that may impair health. It is a chronic, multifactorial disease with increasing worldwide prevalence; therefore, its diagnosis and management are major public health priorities[1,2].

Several methods are available to diagnose obesity; however, body mass index (BMI), defined as weight divided by height squared, remains the most widely used. BMI classifies adults as underweight (IMC < 18.5 kg/m^2), normal weight (IMC 18.5 – 24.9 kg/m^2), overweight (IMC 25 – 29.9 kg/m^2) and obesity (IMC > 30.0 kg/m^2). Nevertheless, BMI does not distinguish lean mass from fat mass and does not describe adipose tissue distribution, which can lead to misclassification in some individuals[3–5].

To address these limitations, complementary anthropometric indices have been proposed to capture central adiposity, which is strongly associated with cardiometabolic risk. Two widely used indices are the waist-to-hip ratio (WHR), defined as waist circumference divided by hip circumference, and the waist-to-height ratio (WHtR), defined as waist circumference divided by height. In clinical practice, both are used as screening tools because they require simple measurements and reflect abdominal fat distribution, a key component in the development of insulin resistance, dyslipidemia, and hypertension[6,7].

Other approaches estimate body composition more directly (e.g., hydrodensitometry, computed tomography, magnetic resonance imaging, dual-energy X-ray absorptiometry [DXA], or bioelectrical impedance analysis) [3,5]. However, the need for specialized equipment and infrastructure often limits their feasibility in primary care. Therefore, we propose the Body Density Index (BoDI), a simple, low-cost, non-invasive model to approximate body density from routine anthropometry.

The BoDI approach is based on a three-dimensional cylindrical approximation of the body using easily obtainable measurements (height and waist circumference). It starts from the definition of density:

$$(1)\quad D = \frac{m}{v}$$

where D is density, m is mass (in grams), and v is body volume.

To calculate body volume, we rely on the cylindrical model:

$$(2)\quad V = \pi r^2 h$$

where r is the radius of the cylinder base (representing the subject's radius), h is height (in centimeters), and π is the mathematical constant pi.

The subject's radius can be derived from the circumference equation:

$$(3)\quad r = \frac{C}{2\pi}$$

where C is abdominal circumference (in centimeters).

Substituting Equation (3) into Equation (2) yields:

$$(4)\quad V = \pi(\frac{C}{2\pi})^2 h$$

Simplifying:

$$(5)\quad v = \frac{C^2 h}{4\pi}$$

Substituting Equation (5) into Equation (1) yields:

$$(6)\quad D = \frac{m}{\left(\frac{C^2 h}{4\pi}\right)}$$

Therefore:

$$(7)\quad D = \frac{4\pi m}{C^2 h}$$

Here, m is mass in grams, C is abdominal circumference in centimeters, and h is height in centimeters. Thus, an individual's body density can be estimated using this cylindrical model with relatively simple anthropometric measurements. Consequently, in Equation (7), D is defined as the Body Density Index (BoDI).

$$BoDI = \frac{4\pi m}{C^2 h}$$

Methods

Study population

A total of 126 adults were included. Participants were volunteers referred from the Comprehensive Medical Service (Obesity Program) of the Graduate Studies Section, Superior School of Medicine (Instituto Politécnico Nacional, IPN). All participants enrolled voluntarily and provided written informed consent. The study was approved by the Behavioral Research Ethics Board of the Superior School of Medicine (approval number: ESM-CEI-01/25/06-2019).

Sample Selection Criteria

Inclusion Criteria

Men and women.

BMI between 18.5 and 39.9 kg/m².

Age 18 – 60 years.

Written informed consent.

Exclusion Criteria

Pregnancy.

Lactation.

Thyroid disorders (hypothyroidism and hyperthyroidism).

Anthropometry

Height

Height was measured using a wall-mounted SECA stadiometer (206 cm). Participants stood with heels together, buttocks and upper back in contact with the wall, and the head aligned to the Frankfort plane.

Waist Circumference

Waist circumference was measured using a Lufkin Executive metal tape measure. The midpoint between the last rib and the upper border of the iliac crest was identified. With the participant standing, the tape was placed horizontally at this level and the circumference was recorded.

Hip Circumference

Hip circumference was measured with a Lufkin Executive metal tape measure. The tape was placed horizontally around the gluteal region at the level of the maximum circumference. The measurement was recorded at the end of a normal exhalation.

Anthropometric Indices

From the measurements of weight, height, waist circumference (C), and hip circumference (H), the following indices were calculated.

Body Mass Index (BMI)

BMI was calculated as the ratio between weight (in kilograms) and the square of height (in meters):

$$\mathrm{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}.$$

BMI classification was performed according to the cut-off points recommended by the World Health Organization (WHO):

Underweight: $\mathrm{BMI} < 18.5\,\mathrm{kg/m^2}$.

Normal weight: $18.5 \leq \mathrm{BMI} < 25.0\,\mathrm{kg/m^2}$.

Overweight: $25.0 \leq \mathrm{BMI} < 30.0\,\mathrm{kg/m^2}$.

Obesity: $30.0 \leq \mathrm{BMI} \geq 40.0\,\mathrm{kg/m^2}$.

Waist-Hip Ratio (WHR)

The waist-hip ratio (WHR) was calculated as:

$$\text{WHR} = \frac{C}{H}$$

where C is waist circumference and H is hip circumference (both in centimeters). Classification was performed by sex with the following intervals:

Women: low (WHR ≤ 0.80), moderate (0.81 – 0.85), and high (WHR > 0.85).

Men: low (WHR ≤ 0.95), moderate (0.96 – 1.00), and high (WHR > 1.00).

Waist-Height Ratio (WHtR)

The waist-height ratio (WHtR) was calculated as:

$$\text{WHtR} = \frac{C}{\text{talla (cm)}}$$

Classified as healthy (0.4 – 0.49) or increased risk (0.5 – 0.59).

Clinical Analyses

Systolic (SBP) and diastolic (DBP) blood pressure were measured with a validated digital sphygmomanometer and an appropriately sized cuff. Before measurement, participants rested for at least 5 minutes in a seated position. At least two measurements were taken 1 – 2 minutes apart, and the average was recorded.

For glucose, total cholesterol, triglycerides, HDL, and LDL, blood chemistry analyses were performed following standard clinical laboratory procedures. Samples were obtained by peripheral venipuncture after an 8 – 12-hour fast.

Statistical Analyses

Descriptive analyses were performed using Jamovi (v2.4.1.0, macOS), and inferential analyses were performed using GraphPad Prism (v10.4.1 (532), macOS). All tests were two-tailed, with a significance level of $p < 0.05$ and 95% confidence intervals.

Normality was assessed using the Kolmogorov--Smirnov test.

To evaluate the association between the Body Density Index (BoDI) and anthropometric and clinical variables (weight, height, waist circumference, hip circumference, waist-hip ratio, waist-height ratio, body mass index, systolic and diastolic blood pressure, glucose, cholesterol, triglycerides, LDL, and HDL), Spearman correlation tests were applied.

To determine differences in BoDI values between health risk categories, one-way ANOVA with Tukey's multiple comparison test was performed for women according to waist-hip ratio classification. For men, according to waist-hip ratio classification and for waist-height ratio and weight status (by BMI), the Kruskal–Wallis test with Dunn's multiple comparison test was applied.

Additionally, ROC curves were constructed to evaluate the diagnostic value of BoDI for discriminating health risk defined by waist-hip ratio (in women and men), waist-height ratio, and weight status.

Results

Descriptive Statistics

The sample consisted of 126 participants, predominantly women (women: n = 98, 77.8%; men: n = 28; 22.2%). The mean age was 47.56 years (95% CI: 45.67 – 49.46). Mean height was 1.59 m (95% CI: 1.58 – 1.60) and mean weight was 82.29 kg (95% CI: 79.43 – 85.15). Mean circumferences were 101.87 cm for waist (95% CI: 99.32 – 104.41) and 110.51 cm for hip (95% CI: 108.19 – 112.83). Mean BMI was 32.59 kg/m² (95% CI: 31.53 – 33.65) and mean BoDI was 0.636 (95% CI: 0.618 – 0.653).

Correlation of BoDI with Anthropometric Measurements

Spearman correlation analysis showed that BoDI was inversely associated with weight, with a moderate negative correlation ($r = -0.465$; $p < 0.0001$); whereas height was not significantly associated with BoDI ($r = -0.03152$; $p = 0.726$) (Figure 1).

Waist circumference showed the strongest association, with a strong inverse correlation ($r = -0.8465$; $p < 0.0001$), indicating that BoDI decrease as a central adiposity increases. Hip circumference showed a moderate negative association with BoDI ($r = -0.4217$; $p < 0.0001$) (Figure 1).

Overall, the patterns suggest that BoDI is particularly sensitive to changes in waist circumference, while height provides limited information to explain BoDI variation in this sample.

Correlation of BoDI with Anthropometric Indices

BoDI was inversely associated with all three anthropometric indices (Figure 2). WHR showed a moderate-to-strong inverse correlation ($r = -0.6991$; $p < 0.0001$), and WHtR showed a stronger inverse correlation ($r = -0.8019$; $p < 0.0001$). In contrast, BMI showed a weaker inverse correlation ($r = -0.4174$; $p < 0.0001$), suggesting that BoDI is more closely related to waist-centered measures (WHR and, particularly, WHtR) than to BMI.

Differences in BoDI across risk categories and BMI classes

BoDI values were compared across risk categories defined by WHR (sex-specific), WHtR, and BMI classes (Figure 3).

In women, stratification by WHR showed a decreasing pattern of BoDI as risk increased. The low-risk group presented the highest values ($n = 11$, mean 0.81, SD ±0.09, 95% CI 0.74 – 0.87), with significant differences compared to the moderate-risk group ($n = 9$, mean 0.71, SD ±0.05, 95% CI 0.67 – 0.75; $p = 0.013$) and the high-risk group ($n = 76$, SD ±0.07, 95% CI 0.58 – 0.61; $p < 0.0001$). The moderate-risk group also differed from the high-risk group ($p < 0.0001$) (Figure 3A).

In men, no differences were identified between low risk ($n = 9$, median 0.72, IQR 0.67 – 0.76) and moderate risk ($n = 7$, median 0.68, IQR 0.55 – 0.69; $p = 0.13$), nor between moderate and high risk ($n = 10$, median 0.57, IQR 0.55 – 0.58; $p = 0.41$). Significant differences were observed between low and high-risk $p = 0.0005$) (Figure 3B).

According to WHtR, no differences were detected between the healthy ($n = 6$, median 0.75, IQR 0.70 – 0.87) and increased risk groups ($n = 27$, median 0.71, IQR 0.67 – 0.76; $p > 0.99$). The high-risk group ($n = 88$, median 0.58, IQR 0.55 – 0.62) presented the lowest BoDI values compared to healthy ($p = 0.0003$) and increased risk ($p < 0.0001$) (Figure 3C), suggesting that BoDI differentiates more clearly the highest risk group defined by central adiposity.

In the BMI classification, BoDI values were comparable between normal weight (n = 18, median 0.70, IQR 0.66 – 0.73) and overweight (n = 15, median 0.68, IQR 0.64 – 0.75), without significant differences. Conversely, the group with obesity (n = 93, median 0.59, IQR 0.55 – 0.64) showed lower BoDI values compared to normal weight ($p < 0.0001$) and overweight ($p = 0.0077$) (Figure 3D). Despite this shift towards lower values, overlap between groups was observed, along with the presence of high BoDI values within the group classified as obesity (maximum value 0.975), which is consistent with BMI's limitation in differentiating fat mass from lean mass in a subset of individuals.

ROC Curves and Diagnostic Thresholds of BoDI

ROC curves were constructed for WHR (by sex), WHtR, and BMI classification (Figure 4). Overall, performance was higher when comparing extreme categories.

WHR (Women)

In women, BoDI showed discriminative power between the Low Risk and Moderate Risk categories with an Area Under the Curve (AUC) of 0.79 (SE 0.1045, 95% CI: 0.58 – 0.99; $p = 0.02$) with a BoDI threshold < 0.7672 (sensitivity 77.78%, specificity 72.73%, LR = 2.85) (Figure 4A).

Between Low Risk and High Risk categories, an AUC = 0.9665 (SE 0.022, 95% CI 0.92 – 1.00; $p < 0.0001$) was found with a BoDI threshold < 0.6440 (sensitivity 80.26%, specificity 90.91%, LR 8.829) (Figure 4B).

Additionally, between the Moderate Risk and High Risk categories, an AUC = 0.9254 (SE 0.03, 95% CI 0.85 – 0.99; $p < 0.0001$) was observed with a BoDI threshold < 0.666 (sensitivity 88.16%, specificity 88.89%, LR 7.934) (Figure 4C).

These results indicate excellent discrimination when including the high-risk group, with cut-off points around BoDI ≈ 0.64 – 0.67.

WHR (Men)

In men, BoDI could significantly discriminate between the Low Risk and Moderate Risk categories with an AUC = 0.8095 (SE 0.1132, 95% CI 0.58 – 1.00; $p = 0.03$) with a BoDI threshold < 0.6852 (sensitivity 71.43%, specificity 66.67%, LR 2.143) (Figure 4D).

Comparing the Low Risk and High Risk categories, an AUC = 1.00 (SE 0.00, 95% CI: 1.00 – 1.00; p = 0.0002) was found with a BoDI threshold < 0.6650 (sensitivity 100%, specificity 88.89%, LR 9.00) (Figure 4E).

Between the Moderate Risk and High Risk categories, no significant discriminative ability was observed with an AUC = 0.7286 (SE 0.1555, 95% CI 0.4239 – 1.00; p = 0.1184) (Figure 4F).

WHtR

Based on WHtR, BoDI was not very effective in discriminating Healthy Subjects from Subjects with increased risk, with an AUC = 0.6667 (SE 0.1225, 95% CI 0.4267 – 0.9067; p = 0.2076) (Figure 4G). However, it was effective in discriminating Healthy Subjects from those at High Risk, with an AUC = 0.9489 (SE 0.028, 95% CI 0.8936 – 1.00; p = 0.0002) with a BoDI threshold < 0.6603 (sensitivity 84.09%, specificity 83.33%, LR 5.045) (Figure 4H).

Similarly, BoDI was also effective in discriminating Subjects with increased risk from Subjects with High Risk, with an AUC 0.9099 (SE 0.02, 95% CI 0.85 – 0.96; p < 0.0001) with a BoDI threshold < 0.6290 (sensitivity 77.27%, specificity 96.3%, LR 20.86) (Figure 4I).

These results show that BoDI differentiated more clearly the group of subjects at high risk, while the comparison between adjacent groups (Healthy Subjects vs. Subjects with Increased Risk) was limited.

BMI (Weight Status)

According to BMI classification, BoDI was not able to significantly discriminate Normal Weight Subjects from Overweight Subjects (AUC = 0.50, SE 0.1072, 95% CI 0.29 – 0.71; p > 0.999) (Figure 4J); however, in discriminating Normal Weight Subjects from Subjects with Obesity, BoDI showed highly significant efficacy (AUC = 0.8381, SE 0.03, 95% CI 0.7642 – 0.9120; p < 0.0001) with a BoDI threshold < 0.6366 (sensitivity 74.19%, specificity 88.89%, LR 6.677) (Figure 4K), as well as discrimination between Overweight and Obese Subjects (AUC = 0.7362, SE 0.07, 95% CI 0.59 – 0.88; p = 0.0034) with a BoDI threshold < 0.6440 (sensitivity 76.34%, specificity 80%, LR 3.817) (Figure 4L).

In this sense, the cut-off values that best separated the higher-risk groups were mainly located in the BoDI range ≈ 0.63 – 0.66, reinforcing the interpretation that lower BoDI values are associated with greater central adiposity and a worse cardiometabolic risk profile.

Correlation of BoDI with Physiometabolic Variables

In ordet to determine whether BoDI was related to physiometabolic status, Spearman correlations were performed between BoDI values and systolic and diastolic blood pressure, as well as glucose, cholesterol, triglycerides (TAG), and low and high-density lipoproteins (LDL and HDL) (Figure 5).

Firstly, both systolic (Figure 5A) and diastolic (Figure 5B) blood pressure showed weak, though significant, negative correlations ($r = -0.2236$, $p = 0.0119$ and $r = -0.2421$, $p = 0.0063$, respectively), suggesting that higher blood pressure values are associated with lower BoDI values.

Similarly, glucose presented a weak, though significant, inverse correlation ($r = -0.2720$, 95% CI -0.43 – -0.096, $p = 0.0021$) (Figure 5C). Likewise, TAG showed a weak negative correlation that was also significant ($r = -0.2871$, 95% CI -0.44 – -0.11, $p = 0.0011$) (Figure 5E).

These findings suggest that BoDI is not only associated with body composition status but could also indirectly reflect a less favorable cardiometabolic profile (e.g., higher blood pressure, glucose, and TAG) when BoDI decreases.

In contrast, for total cholesterol, an association of small magnitude was observed ($r = -0.1704$, 95% CI -0.33 – -0.0098) (Figure 5D), while for LDL values, a null and non-significant correlation was found ($r = 0.088$, 95% CI -0.09 – 0.26, $p = 0.32$) (Figure 5F), similar to HDL levels ($r = 0.1579$, 95% CI -0.02 – 0.32, $p = 0.077$) (Figure 5G).

Discussion

This study proposes the Body Density Index (BoDI) as a simple mathematical model to approximate body composition based on a theoretical density calculation using anthropometry with an emphasis on central adiposity. Overall, BoDI values were more closely associated with waist-centered measures (waist circumference, WHtR, and WHR) than with a global indicator such as BMI, a pattern consistent with the

literature indicating that abdominal distribution indices (particularly WHtR) often discriminate central adiposity and cardiometabolic risk better than BMI [6,8–10].

BoDI as an Indicator of Abdominal Obesity

The strong inverse correlation between BoDI and waist circumference is expected due to the algebraic structure of the cylindrical model, where abdominal perimeter (and therefore radius) plays a dominant role in the estimation of body volume. Consequently, BoDI captures anthropometric variation relevant to abdominal obesity and appears particularly useful to identify individuals at higher probability of central adiposity (high-risk groups), while discrimination between adjacent categories was less consistent.

The differential performance by sex observed in WHR stratification may reflect sex differences in body fat distribution and the smaller sample size in men, which can reduce statistical power and increase uncertainty of subgroup estimates such as AUC[11–15].

BoDI and Cardiometabolic Risk

In addition to its association with central adiposity, BoDI values showed weak but significant negative correlations with SBP and DBP, as well as with glucose and TAG. Taken together, these results suggest that lower BoDI values (compatible with greater abdominal adiposity) tend to be accompanied by a less favorable physiometabolic profile. The weak magnitude of the associations is expected given the cross-sectional nature of the study, the biological variability of the markers, and the influence of uncontrolled factors (pharmacological treatment, diet, or physical activity). Nevertheless, the overall pattern is consistent with previous evidence supporting the use of waist-based indices (especially WHtR) to identify cardiometabolic risk in adult populations[7,8].

In contrast, no clear associations were observed with LDL and HDL, which could reflect the influence of external factors (lipid-lowering medication, recent dietary intake, and interindividual variability), as well as the fact that central adiposity does not necessarily translate into linear changes in all lipid fractions in a heterogeneous clinical sample.

Advantages of BoDI Compared to Classical Body Density (Siri/Brozek)

Classical body composition models based on density (Siri and Brozek) rely on the measurement of body density using techniques such as hydrodensitometry or plethysmography, and on assumptions of the two-compartment model (constant density of fat and fat-free mass). Although these approaches have been fundamental, their application in primary care is limited by cost, infrastructure, need for specialized equipment, and standardized measurement conditions[16,17].

In this context, a key advantage of BoDI is its operational simplicity, as it uses low-cost anthropometric measurements (weight, height, and waist circumference) available in routine clinical practice. This may facilitate its adoption as a screening tool in primary care, especially in settings with geographic or socioeconomic limitations, where methods such as DXA, magnetic resonance imaging, hydrodensitometry, or even bioelectrical impedance are not feasible. Additionally, unlike multiple body composition formulas that incorporate empirical coefficients or adjustment constants derived from specific populations, BoDI's formulation arises from algebraic constants and explicit geometric relationships of the cylindrical model, providing mathematical transparency and avoiding arbitrary parameters, favoring the interpretation of the index as an objective and reproducible construct.

Although BoDI does not directly separate fat mass and lean mass, from an arithmetic perspective it can be anticipated that the index reflects differences in body composition, as it is well known that fat has a lower density than muscle tissue; therefore, a relative increase in the adipose component tends to decrease the estimated global density[18,19]. Consequently, it was expected to observe higher BoDI values in subjects with lower central adiposity (or lower risk) compared to subjects in higher-risk categories. This interpretation also helps to understand why, unlike BMI, BoDI might discriminate more easily between individuals with a high percentage of lean mass and those with high adiposity, even when both could share similar BMI values.

In this sense, BoDI could function as a simple anthropometric indicator that, through an approximate mass-volume relationship, indirectly captures the balance between denser tissue (lean mass) and less dense tissue (fat mass). Although this inference does not substitute compartmental quantification (DXA), it represents a pragmatic advantage for primary care, especially in hard-to-reach locations, where the absence of specialized equipment is common and where rapid screening in vulnerable populations can have high impact.

This work has important limitations. First, BoDI is based on a geometric simplification of the human body and, therefore, does not represent a direct physical measurement of body density nor does it separate compartments (fat mass vs. lean mass). Second, by depending on waist circumference, the index is sensitive to measurement technique and the selected anatomical site. Third, validation of cut-off points requires external studies with larger sample sizes, sex balance, and comparison against reference methods (DXA, imaging techniques, and/or bioelectrical impedance) to quantify visceral and total adiposity.

The results suggest that BoDI is a promising index for screening abdominal obesity and identifying subjects with a higher probability of cardiometabolic alterations in clinical contexts where simplicity, low cost, and accessibility are priorities. Future work should evaluate its interobserver reproducibility, its longitudinal predictive performance for cardiometabolic events, and its calibration in different populations.

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Author contributions

Study concept and design: PRM; acquisition, analysis and interpretation of data: PRM, CB, EMF, JHR, EHL; drafting of the manuscript: PRM, EMF, JHR, EHL; critical revision of manuscript: CB, EMF, JHR, EHL; statistical analysis: PRM, CB; administrative support: EHL; study supervision: PRM, CB.

Competing interests

The authors declare no conflict of interest

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figure legends

Figure 1. Correlation plot between BoDI and weight, height, waist circumference, and hip circumference. BoDI = Body Density Index.

Figure 2. Correlation plot between BoDI and WHR, WHtR, and BMI. BoDI = Body Density Index; WHR = Waist-Hip Ratio, WHtR = Waist-Height Ratio, BMI = Body Mass Index

Figure 3. Distribution of BoDI according to classification by (A) WHR in women, (B) WHR in men, (C) WHtR, and (D) weight status based on BMI. BoDI = Body Density Index; WHR = Waist-Hip Ratio, WHtR = Waist-Height Ratio, BMI = Body Mass Index

Figure 4. ROC curves for BoDI to discriminate risk categories by WHR in women (A–C) and men (D–F), by WHtR (G–I), and by BMI (J–L). BoDI = Body Density Index; WHR = Waist-Hip Ratio, WHtR = Waist-Height Ratio, BMI = Body Mass Index

Figure 5. Correlations plots between BoDI and (A) systolic blood pressure, (B) diastolic blood pressure, (C) glucose, (D) total cholesterol, (E) TAG, (F) LDL, and (G) HDL. BoDI = Body Density Index; TAG = Triglycerides; LDL = Low Density Lipoprotein; HDL = High Density Lipoprotein.