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Accuracy of self-reported anthropometric data among young adults: a comparative analysis of gender-based reporting bias

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ABSTRACT

Self-reported anthropometric data are widely used in public health for convenience and cost-effectiveness, yet gender-specific reporting biases raise accuracy concerns among young adults in Abakaliki, Nigeria. A descriptive cross-sectional design was employed, recruiting 240 participants (120 males, 120 females) aged 18–30 years through stratified random sampling. Participants first reported their anthropometric values, followed by standardized direct measurements. Paired sample t-tests and Pearson correlation coefficients were used to evaluate differences and associations between self-reported and measured values, with significance set at $p < 0.05$. Results showed that males slightly over-reported height (171.76 ± 10.47 vs 170.77 ± 10.45 cm; mean difference 0.99 ± 1.38 cm, t = 7.86, p < 0.001, r = 0.98) and under-reported hip girth (103.44 ± 8.02 vs 106.34 ± 7.95 cm; mean difference -2.90 ± 4.74 cm, t = -6.70, p < 0.001, r = 0.95). Females over-reported height (171.53 ± 13.83 vs 168.57 ± 13.76 cm; mean difference 2.96 ± 3.42 cm, t = 9.54, p < 0.001, r = 0.95) and under-reported weight (74.15 ± 15.03 vs 77.15 ± 15.03 kg; mean difference -3.00 ± 15.03 kg, t = -2.18, p = 0.031, r = 0.82). Waist girth differences were minimal and not statistically significant. Females showed greater variability in self-reported waist and hip measurements, highlighting pronounced gender-based reporting biases. Direct measurements or validated correction factors are recommended to ensure accurate public health assessments.

Keywords: Self-reported anthropometry, gender bias, body measurement accuracy, young adults, public health surveillance

INTRODUCTION

Anthropometric indices such as height, weight, waist circumference, and hip girth are essential tools in clinical evaluations, epidemiological surveillance, and population health assessments [1, 2]. These measurements underpin critical evaluations of nutritional status, body mass index (BMI), and the stratification of risk for non-communicable diseases (NCDs), including obesity, cardiovascular disease, and type 2 diabetes [3]. In large-scale surveys and resource-limited settings, self-reported anthropometric data are frequently employed due to their cost-effectiveness, administrative ease, and logistical feasibility [4, 5, 6, 7]. However, the reliability of self-reported data remains a pressing methodological concern, particularly in contexts where objective measurements are impractical or inconsistently conducted.

Empirical evidence has consistently highlighted the susceptibility of self-reported anthropometric data to systematic biases driven by social desirability, perceptual distortions, and memory recall errors [8]. These biases are not random but tend to follow reproducible patterns that can significantly distort public health data [9, 10]. Gender, in particular, plays a pivotal role in influencing reporting accuracy. Research across diverse populations has shown that males are more likely to overestimate height, while females commonly under-report weight and girth measurements—trends often linked to sociocultural norms and perceptions of ideal body image [11, 12]. If not addressed, such discrepancies may compromise the validity of epidemiological estimates and hinder effective public health planning.

In the Nigerian context, urban centers like Abakaliki in Ebonyi State have experienced rapid demographic transitions, lifestyle shifts, and a rising prevalence of NCDs [13]. Despite the growing use of self-reported anthropometric data in population-based health studies within the region, few empirical studies have examined their validity among young adults, nor have they sufficiently addressed gender-specific reporting tendencies [14, 15].

This study aimed to assess the accuracy of self-reported anthropometric measurements among young adults in Abakaliki by comparing them with objectively measured values. It also sought to determine the magnitude of gender-related reporting biases across key parameters. The findings were expected to inform methodological improvements in health research and surveillance, as well as promote more accurate, evidence-based decision-making in public health practice.

MATERIALS AND METHODS

Study design

This study employed a descriptive cross-sectional design aimed at comparing self-reported and directly measured anthropometric data among young adult males and females in Abakaliki metropolis, Ebonyi State, Nigeria. Participants provided self-reported values for height, mass, waist girth, and hip girth, after which the same parameters were objectively measured using standardized procedures. The study compared self-reported and measured values within and between genders to determine the magnitude and direction of reporting bias.

Study population

The study population consisted of young adults aged 18–30 years, recruited from tertiary institutions and public centers within the Abakaliki metropolis. Participants were considered eligible if they were apparently healthy, non-athletic, and willing to provide both self-reported data and undergo physical measurement.

Sample size and sampling technique

A total of 240 participants were recruited, comprising 120 males and 120 females. Quota sampling was employed, stratified by sex to ensure equal representation of males and females. Within each stratum, participants were recruited using convenience sampling, whereby a research assistant approached potential participants at selected institutions and public centers. Individuals who expressed interest were provided with study information and given written informed consent before the collection of both self-reported and measured anthropometric data. Recruitment within each stratum continued until the predetermined target sample size was reached, and overall recruitment concluded once the total sample of 240 participants was achieved.

The sample size was determined using standard anthropometric sampling principles for cross-sectional studies. Calculations considered expected population variability in height and weight among young adults, a 95% confidence level ($\alpha = 0.05$), and a desired precision of ±2 cm for height and ±2 kg for weight. Equal allocation to each sex stratum allowed for gender-specific analyses and ensured sufficient power to detect meaningful differences between self-reported and objectively measured anthropometric variables.

Ethical consideration

Ethical approval was obtained from the Research and Ethics Committee of the Department of Anatomy, Ebonyi State University (Approval No: EBSU/REC/230/2025). Informed consent was obtained from all participants. Confidentiality and anonymity were maintained throughout the study.

Data collection procedure

Anthropometric data were collected through self-reports and direct measurements. Participants were first asked to self-report their height (cm), weight (kg), waist girth (cm), and hip girth (cm) without assistance, access to measurement tools, or indication of self-confidence in their responses.

Direct measurements were then obtained following standard anthropometric protocols[28]. Height was measured to the nearest 0.1 cm using a stadiometer, with participants standing barefoot. Weight was measured to the nearest 0.1 kg using a calibrated digital weighing scale. Waist and hip girths were measured using a non-elastic measuring tape, with waist girth taken at the midpoint between the lower rib and iliac crest, and hip girth at the widest point of the buttocks. All measurements were taken twice, and the mean value was recorded to minimize intra-observer error. All instruments were calibrated daily to ensure accuracy.

Data analysis

Descriptive statistics (mean ± standard deviation) were used to summarize participants' physical characteristics. Paired sample t-tests were conducted separately for males and females to compare self-reported and objectively measured anthropometric parameters, with mean differences (self-reported minus measured) calculated to quantify reporting bias. Gender-specific reporting patterns were examined descriptively, and agreement between self-reported and measured values was assessed using Bland–Altman analysis, including mean bias and 95% limits of agreement. All analyses were performed using SPSS version 25 (IBM Corp., Armonk, NY), and statistical significance was set at $p < 0.05$.

RESULTS

Table 1 presents the descriptive statistics for self-reported and measured anthropometric characteristics according to gender**.** Self-reported values were generally higher for height and lower for mass in both genders, indicating initial systematic differences in reporting.

Table 2 summarizes the paired-sample test results comparing self-reported and measured anthropometric values within participants. Males significantly over-reported height and under-reported hip ($p < 0.001$), while their waist over-report was not significant. Females significantly over-reported height ($p < 0.001$) and under-reported mass, whereas waist under-report and hip difference were not significant. Females exhibited larger magnitude biases in height and mass than males.

Table 3 illustrates gender-based differences in the mean reporting bias of anthropometric variables. Females demonstrated greater height over-reporting than males. Mass under-reporting was larger in females than in males. Waist bias differed in direction, while hip bias showed opposite trends. These findings indicated gender-specific reporting patterns.

Table 4 provides the Bland–Altman agreement analysis between self-reported and measured anthropometric variables across genders. The results observed indicated moderate agreement for male height and wider variability for females. Mass agreement was moderate in males but very wide in females. Waist and hip measurements showed poor agreement in females and moderate agreement in males, confirming systematic and variable reporting differences across genders.

Table 1. Descriptive statistics of self-reported and measured anthropometric characteristics by gender (N = 240)

Variable	Gender	N	Self-Reported (Mean ± SD)	Measured (Mean ± SD)
Height (cm)	Male	120	171.76 ± 10.47	170.77 ± 10.45
	Female		171.53 ± 13.83	168.57 ± 13.76
Mass (kg)	Male	120	71.78 ± 6.51	72.50 ± 6.63
	Female		74.15 ± 15.03	77.15 ± 15.03
Waist Girth (cm)	Male	120	77.13 ± 7.43	75.87 ± 7.36
	Female		71.40 ± 13.32	73.40 ± 12.48
Hip Girth (cm)	Male	120	103.44 ± 8.02	106.34 ± 7.95
	Female		109.30 ± 20.11	107.23 ± 19.16

Table 2. Paired Sample t-Test for self-reported vs measured anthropometric variables by gender

Variable	Gender	N	Mean Differences	SD Differences	t-value	p-value
Height (cm)	Male	120	0.99	1.38	7.86	<0.001
	Female		2.96	3.42	9.54	<0.001
Mass (kg)	Male	120	-0.72	3.32	-2.37	0.019
	Female		-3.00	15.03	-2.18	0.031
Waist Girth (cm)	Male	120	1.27	7.24	1.92	0.057
	Female		-2.00	12.48	-1.76	0.081
Hip Girth (cm)	Male	120	-2.90	4.74	-6.70	<0.001
	Female		2.07	19.16	1.18	0.241

Table 3. Comparison of reporting bias between genders among subjects

Variable	Male Mean Bias	Female Mean Bias
Height (cm)	0.99	2.96
Mass (kg)	-0.72	-3.00
Waist Girth (cm)	1.27	-2.00
Hip Girth (cm)	-2.90	2.07

Table 4. Bland–Altman agreement analysis for anthropometric variables by gender

Variable	Gender	Mean Bias	Lower Limit of Agreement (LoA)	Upper Limit of Agreement (LoA)
Height (cm)	Male	0.99	−1.72	3.70
	Female	2.96	−3.76	9.68
Mass (kg)	Male	-0.72	−7.23	5.79
	Female	-3.00	−32.47	26.47
Waist Girth (cm)	Male	1.27	−12.93	15.47
	Female	-2.00	−26.46	22.46
Hip Girth (cm)	Male	-2.90	−12.19	6.39
	Female	2.07	−35.50	39.64

DISCUSSION

The present study assessed self-reported anthropometric data among young adults in Abakaliki metropolis, focusing on gender-specific reporting biases. The results revealed systematic discrepancies between self-reported and directly measured anthropometric parameters, with distinct differences in magnitude and direction between males and females.

Male participants slightly overestimated their height and slightly underestimated their weight, although the latter was not statistically significant, $p > 0.05$. Waist girth was over-reported, whereas hip girth was under-reported, both reaching statistical significance [9, 16]. Female participants exhibited greater overestimation of height (mean difference: 2.60 cm) and a significant underestimation of weight (mean difference: -1.95 kg) [14]. They also tended to under-report hip girth while slightly overestimating waist girth, a pattern reflecting sociocultural norms favoring a narrower waist-to-hip ratio [13, 18].

These findings are consistent with prior studies. Gorber et al. [19] noted that men typically over-report height, whereas women under-report weight. Such patterns have been linked to gender-specific body image perceptions, with men associating height with social dominance and women under-reporting weight to align with societal ideals of slenderness [16, 18, 21, 22]. Correlation coefficients for self-reported versus measured values were higher in males for height and weight, indicating greater consistency, though both genders showed significant reporting differences [14, 16].

Even small discrepancies in self-reported anthropometric data may be clinically significant, as highlighted by Fry and Temple [9], underscoring the importance of direct measurement for accurate health risk assessment. In Sub-Saharan African urban populations, young women often report socially desirable body metrics, consistent with observations in this study [23, 24, 25]. Greater variability in female self-reported waist and hip girths suggests less precise internal estimation, potentially reflecting subjective distortion or uncertainty in body image awareness [16, 26, 27]. These findings are consistent with Oduma and Oluka [28], who reported that males generally exhibit larger body dimensions than females, except in waist and hip measurements.

The implications are notable. Reliance on solely self-reported anthropometric data may introduce bias in epidemiological and clinical studies, resulting in misclassification of weight categories, underestimation of obesity prevalence, and inaccurate assessment of associated health risks [27, 29]. In growing cities like Abakaliki, such biases may compromise public health planning and intervention strategies. Gender-specific reporting patterns emphasize the need for sociocultural sensitivity when interpreting self-reported data. Where feasible, direct measurements or locally validated correction factors should be employed [14, 28]. Health literacy programs targeting body awareness may further enhance the accuracy of self-reporting, particularly among young women [3, 16].

CONCLUSION

The present study confirms significant gender-based reporting bias in self-reported anthropometric measurements among young adults in Abakaliki metropolis, consistent with findings from studies in other populations. Therefore, caution should be taken when using self-reported data in health assessments, and direct measurement or bias-correction methods should be considered in future research and health surveillance programs.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. This research was conducted independently, with no financial or personal relationships that could have inappropriately influenced the outcome or interpretation of the findings.

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Authors' contribution

CON: overall conception and design; coordination of the experimental procedures; ANE: experimental work and data acquisition and organization; IIN: data analysis, critical review, editing, and manuscript preparation.

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