JOGECA
Journal of Obstetrics and Gynaecology of Eastern and Central Africa

ORIGINAL RESEARCH

Fertility & Endocrinology

Prevalence of weight disorders among infertile women in a private facility in North-Central Nigeria: A retrospective study

AbdulAzeez I. Musbau[1], Biliaminu A. Sikiru[1], Mubarak M. Yunusa[2*], Adeoye Oyewopo[2]

1. Department of Chemical Pathology and Immunology, University of Ilorin, Ilorin, Nigeria
2. Department of Anatomy, University of Ilorin, Ilorin, Otukpo, Nigeria

***Correspondence:** mubbydr@gmail.com

Received: 4 February 2026; Revised: 13 July 2026; Accepted: 23 July 2026; Available online: September 2026

DOI: 10.59692/61f39h10

Abstract

Background: Infertility affects millions of women worldwide, and obesity may adversely affect reproductive health. This study determined the prevalence and pattern of weight disorders among female partners of infertile couples in a private facility in North-Central Nigeria.

Methods: A five-year retrospective study included 52 consecutive women presenting for initial evaluation of infertility. Weight, height, body mass index (BMI), and ponderal index (PI) were assessed. Comparative analysis used unpaired t-tests and Fisher's exact test, with effect sizes (η^2) calculated. Significance was set at $P < .05$.

Results: Mean age was 32.65 ± 5.21 years (range 22–42). Primary infertility was reported in 22 (42.3%) and secondary infertility in 30 (57.7%). Weight, height, and marriage duration were all significantly greater in secondary infertility compared to primary infertility. Mean BMI did not differ between groups ($P = .554$, $\eta^2 = 0.007$). Overall, 33 (63.5%) were obese, while 15 (28.8%) were overweight, and 4 (7.7%) had normal weights; none were underweight. Ponderal index classified 48 (92.3%) as overweight, with no statistical difference between groups ($P > 0.999$).

Conclusion: Obesity and excess weight were highly prevalent among women presenting for infertility evaluation, with no significant difference in BMI between women with primary and secondary infertility. These findings support systemic assessment of weight status as part of infertility care and highlight the need for larger, multicenter studies to evaluate the relationship between weight status and infertility outcomes.

Keywords: Anthropometry, Female, Infertility, Nigeria, Obesity, Overweight

Introduction

Infertility is defined as a disease of the reproductive system characterized by the failure to achieve a clinical pregnancy following 12 months or more of regular unprotected sexual intercourse (1). Primary infertility refers to women who have never conceived, while secondary infertility refers to those who have had a previous conception but are unable to repeat it successfully (2). Female infertility affects approximately 110 million women worldwide, with the highest prevalence in Sub-Saharan Africa, South Asia, Central Asia, North Africa, the Middle East, and Central and Eastern Europe (3-4). In African contexts, fertility is known to carry a notably high societal value; hence, infertile couples in the region are often faced with societal exclusion, with women being blamed for their inability to conceive (5). This stigma likewise affects approximately 64% of infertile women worldwide, impacting their quality of life and their chances of receiving early interventions (6).

Obesity affects both metabolic and physiological states. Obesity-related reproductive complications include endometrial factors affecting menstruation and treatment success (7). Obesity is also implicated in pregnancy loss, miscarriage, and other maternal and fetal complications (8). The psychological effects of infertility, such as stress and depression, may also increase weight gain through stress-related eating and reduced physical activity, creating a vicious cycle (6-7). However, these reports have originated from studies in Asia, Latin America, and other regions (6-8). An Asian cohort reported that women with obesity were older and had more menstrual irregularities than those with normal BMI (9). A Latin American cohort found that obese women had a 3.1-fold greater risk of anovulatory infertility (10). This has prompted experts to recommend the reduction of body weight in women with obesity before infertility treatments and before pregnancy (8). However, there is a paucity of African data, including those from Nigeria.

Most related studies conducted in the Sub-Saharan region are based on public tertiary institutions, potentially overlooking urban and higher socioeconomic populations typically identified as having different obesity profiles and lifestyle patterns (11-14). Findings from a systematic review and meta-analysis included 22,303 participants across ten Sub-Saharan African countries reporting that one in six couples are affected by infertility with a prevalence of 16.98% (11), while studies in Nigeria have mostly reported obesity and overweight as being connected to infertility and were based on data from public tertiary institutions (12-16). Data from private health facilities in Nigeria remain scarce. This study addresses this gap. This study aimed to determine the prevalence and pattern of weight disorders among female partners of infertile couples in a private facility in North-Central Nigeria.

Methods

Study design and setting

This retrospective observational study was conducted over 5 years at Nizamiye Hospital, Abuja, Nigeria, between January 2015 and December 2019.

Study population

The study included all consecutive female partners of infertile couples who presented for initial infertility evaluation during the study period. Eligibility was based on first presentation for infertility management. Exclusion criteria included repeat visits to avoid duplication and incomplete anthropometric records. Age was recorded with no additional restrictions based on parity or age. The study focused specifically on female infertility.

Data collection and management

Anthropometric measurements of weight and height were taken by clinical staff using a digital weighing scale and a stadiometer during the initial clinic visit. Weight was measured to the nearest 0.1 kg with participants wearing light clothing and having no shoes on. Height was measured to the nearest 0.01 m. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). BMI was classified according to standard adult BMI categories as underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), class I obesity (30.0–34.9), class II obesity (35.0–39.9), and class III obesity (≥40.0) (17,18).

Ponderal index (PI) was included as a complementary measure of body proportionality (19-20). Although PI has been investigated as an alternative anthropometric index, its clinical use for adult weight classification is less established than that of BMI (21). This study findings revealed significant correlations with cardiovascular indices that differed from those observed for BMI. BMI does not effectively account for fat distribution. It also fails to distinguish between body fat and lean mass. These are important metrics for evaluating obesity-related health risks (22-23). Therefore, PI was used as a complement to BMI in this study. PI categories were adapted from Mohajan and Mohajan (19) and classified as underweight (<11 kg/m^3), normal weight (11–15 kg/m^3), and overweight (>15 kg/

m^3), with the latter encompassing both overweight and obese classifications. Data were collated and categorized to establish prevalence patterns.

Data analysis

Data were analyzed using GraphPad Prism version 10.2.0 (GraphPad Software, Boston, Massachusetts, USA). Descriptive statistics, including mean, standard deviation, frequencies, and percentages, were used to summarize participant characteristics. Comparative analyses between primary and secondary infertility groups were conducted using unpaired t-tests for continuous variables and Fisher's exact test for categorical variables. Fisher's exact test was preferred over chi-square because of the small sample size (n = 52) and sparse cells in contingency tables (24). Effect sizes were quantified using eta squared (η^2), where η^2 = 0.01 indicates a small effect, η^2 = 0.06 a medium effect, and η^2 = 0.14 a large effect (25-26). The 95% CI of the mean difference was calculated for all continuous comparisons. Post hoc power analysis was performed using G*Power 3.1 (Heinrich-Heine-Universität Düsseldorf, Germany) (27-28). By adopting Cohen's conventional benchmarks (small: d = 0.2; medium: d = 0.5; large: d = 0.8) (26), the study had 41.6% power to detect a medium effect at α = 0.05. Study-specific effect sizes were calculated using Cohen's d (26), yielding d = 0.62 for weight (power = 58.2%) and d = 1.45 for marriage duration (power > 99%). The observed effect sizes therefore exceeded conventional medium thresholds, which grounds confidence in the statistically significant findings despite our adopted modest sample size. Statistical significance was set at $P < 0.05$.

Ethical consideration

The study was conducted following the ethical principles of the Declaration of Helsinki. The Research Protocol was reviewed and subsequently approved by the Nizamiye Hospital Ethics Review Board, Abuja, Nigeria. As the study was retrospective and involved existing anonymized clinic records, informed consent was waived by the board. No formal ethics registration number was assigned by the institution for retrospective chart reviews. Patient confidentiality was maintained, and no identifying information was recorded.

Results

A total of 52 female partners of infertile couples were included. Mean age did not differ significantly between women with primary and secondary infertility (32.09 ± 5.44 vs. 33.07 ± 5.10 years, respectively; P = 0.509, η^2 = 0.009) **(Table 1)**. Primary infertility was reported in 22 (42.3%) women and 30 (57.7%) with secondary infertility **(Figure 1).** Comparative analysis revealed that women with secondary infertility had significantly higher mean weights compared to those with primary infertility (86.40 ± 15.30 kg vs. 77.01 ± 15.07 kg; mean difference 9.39 kg, 95% CI: .82-17.96; P = 0.032, η^2 = 0.088, medium effect). Similarly, the mean height was significantly greater in the secondary infertility group (1.64 ± 0.07 m vs. 1.60 ± 0.06 m; mean difference 0.04 m, 95% CI: 0.003 - 0.077; P = 0.036, η^2 = 0.085, small-to-medium effect). However, the mean BMI values did not differ significantly between the groups (32.11 ± 5.36 kg/m^2 vs. 31.23±5.13 kg/m^2; mean difference 0.88, 95% CI: -2.09 to 3.85; P = 0.554, η^2 = 0.007), nor did the ponderal index (19.63 ± 3.54 kg/m^3 vs. 19.52 ± 3.54 kg/m^3; mean difference .11, 95% CI: -1.89 to 2.11; P = 0.912, η^2 = 0.0002). Marriage duration was significantly longer in the secondary infertility group (9.87 ± 4.77 vs. 4.27 ± 2.00 years; mean difference 5.60 years, 95% CI: 3.43-7.78; P < 0.0001, η^2 = 0.349, large effect). Infertility duration was 4.27 ± 2.00 years in primary infertility and 5.07 ± 2.79 years in secondary infertility. The difference was not significant (mean difference 0.80, 95% CI: 0.60 to 2.20; P = 0.258, η^2 = 0.026) **(Table 1).**

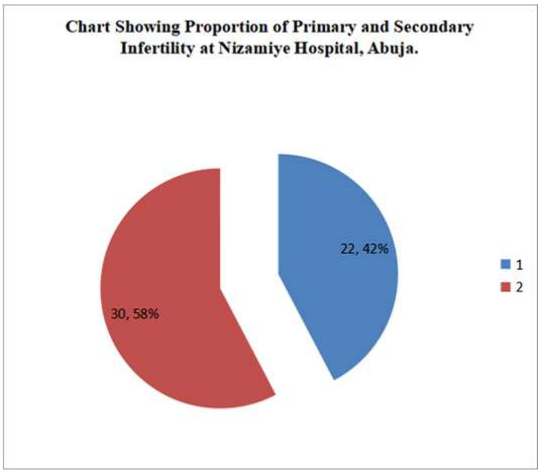

Figure 1: Distribution of infertility type among women presenting to Nizamiye Hospital, Abuja
1, primary infertility, 2, secondary infertility

Table 2 summarizes the anthropometric mean ± SD parameters of the study participants.

Table 1. Mean ± SD age, marriage duration, infertility duration, and anthropometric parameters among women with primary and secondary infertility at Nizamiye Hospital, Abuja

Parameter	Primary Mean ± SD	Secondary Mean ± SD	Mean Diff. (B −A)	95% CI of Difference	P value	η²
Age (years)	32.09 ± 5.44	33.07 ± 5.10	0.98	−1.98 - 3.94	0.51	0.01
Weight (kg)	77.01 ± 15.07	86.40 ± 15.30	9.39	0.82 - 17.96	0.032*	0.09
Height (m)	1.60 ± .06	1.64 ± .07	0.04	0.003 - .077	0.036*	0.09
BMI (kg/m²)	31.23 ± 5.13	32.11 ± 5.36	0.88	−2.09 - 3.85	0.55	0.01
Ponderal index (kg/m³)	19.52 ± 3.54	19.63 ± 3.54	0.11	−1.89 - 2.11	0.91	0
Duration of marriage (years)	4.27 ± 2.00	9.87 ± 4.77	5.6	3.43 - 7.78	<.0001*	0.35
Duration of infertility (years)	4.27 ± 2.00	5.07 ± 2.79	0.8	−0.60 - 2.20	0.26	0.03

*Where * denotes Statistical significance ($P < .05$). η^2 = eta squared (effect size): .01 = small, .06 = medium, .14 = large effect.*

Table 2. Mean ± SD anthropometric parameters of among women with primary and secondary infertility at Nizamiye Hospital, Abuja

Parameter	Mean ± SD
Age (years)	32.65 ± 5.21
Weight (kg)	82.89 ± 15.45
Height (m)	1.62 ± 0.07
BMI (kg/m²)	32.07 ± 5.34
Ponderal index (kg/m³)	19.83 ± 3.63

Based on BMI classification, 4 women (7.7%) had normal weight, 15 (28.8%) were overweight, 17 (32.7%) had class I obesity, 14 (26.9%) had class II obesity, and 2 (3.8%) had class III obesity. BMI category distributions did not significantly differ between groups (Fisher's exact test, P = 0.87). However, class III obesity occurred only in the secondary infertility group (3.8% vs. 0%). **(Table 3).**

Based on the ponderal index findings, 4 women (7.7%) were categorized as normal weight, while 48 (92.3%) were overweight. PI category distributions were also nonsignificant between groups (Fisher's exact test, P > 0.999). Most women in both groups were classified as overweight (90.9% in primary vs. 93.3% in secondary infertility) **(Table 4).**

Table 3. Distribution of BMI categories by infertility type among women with primary and secondary infertility at Nizamiye Hospital, Abuja

BMI Classification	Primary (n=22) number (%)	Secondary (n=30) number (%)	Test	P value
Normal	2 (9.1%)	2 (6.7%)	Fisher's exact	0.87
Overweight	5 (22.7%)	10 (33.3%)		
Class I obesity	8 (36.4%)	9 (30.0%)		
Class II obesity	7 (31.8%)	7 (23.3%)		
Class III obesity	0 (0.0%)	2 (6.7%)		
Total	22 (100%)	30 (100%)		

Table 4. Distribution of Ponderal Index categories by infertility type among women with primary and secondary infertility at Nizamiye Hospital, Abuja

Ponderal index classification	Primary (n=22) number (%)	Secondary (n=30) number (%)	Test	P value
Normal	2 (9.1%)	2 (6.7%)	Fisher's exact	1
Overweight	20 (90.9%)	28 (93.3%)		
Total	22 (100%)	30 (100%)		

The overweight category includes both overweight (15–17 kg/m³) and obese (> 17 kg/m³) classifications. Percentages represent proportion within each infertility group.

Discussion

This study demonstrated a high prevalence of weight disorders, particularly obesity, among female partners of infertile couples in a private hospital in North Central Nigeria. Over 90% of participants in this study was found to be overweight, with 63.5% classified as obese by BMI. In contrast, only 7.7% had a normal BMI, highlighting the burden posed by adiposity in this population. Both BMI and ponderal index confirmed its widespread prevalence, although BMI remains the standard clinical measure.

Only 7.7% of infertile women in this cohort had a normal BMI. This is concerning, as 92.3% were overweight or obese, and none were underweight. This contrasts with Nigerian studies reporting normal BMI prevalence of 43.5% in their cohorts (13). Other studies placed both fertile and infertile women in the overweight category (12). Another study reported an obesity prevalence of up to 36% and overweight of 29.8%, indicating that approximately 34% of women had a normal BMI (29). These disparities suggest that women in this private hospital cohort were disproportionately overweight or obese. These findings support systemic assessment of weight status as part of infertility care. Given the established association between obesity and metabolic comorbidity, assessment of metabolic risk factors may be considered where clinically indicated.

High obesity prevalence is relevant to PCOS. One Nigerian study reported that 90% of women with PCOS had a BMI > 25 kg/m² (30). Another study found that women with PCOS were obese without dyslipidaemia (31). These findings support a bidirectional relationship between obesity and PCOS. PCOS is a multifactored disruption of the endocrine system resulting in various health complications, such as infertility and menstrual irregularities (32-33). Nigerian studies have reported PCOS prevalence based on Rotterdam criteria to range between 16.7% -27.6% of infertility cases (30,32). While it is difficult to directly relate obesity to PCOS prevalence in these studies, it has been documented to worsen PCOS symptoms and contribute to poor responses to ovulation induction agents (30).

The Nigeria-PEP study found that 20.6% of its cohort overweight and 23.0% were obese (BMI ≥30 kg/m^2) (34). It reported a PCOS prevalence of 8.6% in reproductive-age women with phenotypes C and D being most predominant. This further links obesity to PCOS prevalence. Non-hyperandrogenic PCOS also known as phenotype D was detected in 53% of presentations among the cohort of a Lagos study stressing that many more had menstrual dysfunctions and could have increased the reported prevalence of PCOS should the presence of hyperandrogenemia had been demonstrated (35). These findings illustrate the heterogeneity of PCOS phenotypes reported in Nigerian populations; however, this study did not assess PCOS status or metabolic or androgenic parameters. Because PCOS status was not assessed in this retrospective study, the relationship between the observed weight patterns and PCOS cannot be determined.

Normal ovulatory cycles are dependent on the fine-tuned coordination between the release of hormones from the hypothalamus and the ovaries. Excess adiposity disrupts this hormonal cascade (36-37). This provides a possible biological explanation for the association between excess adiposity and reproductive health. The observed significant difference in height seen in women with secondary infertility ($P = .036$, $\eta^2 = .085$, small-to-medium effect) may be related to older ages and longer marriage durations typical of this group (9.87 ± 4.77 vs. 4.27 ± 2.00 years; $P < .0001$, $\eta^2 = .349$, large effect). This observed height difference is unlikely to be biologically meaningful and may reflect random variation within this relatively small sample. Despite significant weight and height differences, BMI did not differ between the groups ($P = .554$). This may reflect BMI's inability to account for fat distribution and lean mass (22-23) and may thus mask relevant anthropometric disparities. These reports support the integration of complementary indices, such as the ponderal index, to provide a more detailed assessment of body proportionality, linearity, or leanness, especially in short-statured populations (19-21).

Urbanization and associated lifestyle patterns may partly contribute to the higher prevalence of obesity observed in this cohort (38). A systematic review and meta-analysis published in 2021, using data from 35 Nigerian studies (n = 52,816), reported pooled prevalence rates of 25% for overweight and 14.3% for obesity (39). Rates were higher among urban dwellers (27.2% overweight, 14.4% obese) than rural dwellers (16.4% overweight, 12.1% obese). Similarly, the present study found that women with secondary infertility had higher mean weights compared to those with primary infertility (86.40 ± 15.30 kg vs. 77.01 ± 15.07 kg; $P = .032$, $\eta^2 = .088$, medium effect). This difference may partly reflect differences in age or other unmeasured characteristics between the two groups. Women aged 35 years and above have a two-fold risk of maternal obesity compared with younger women (40). Studies across Africa reported the prevalence of maternal obesity to range between 6.5% and 50.7%, with multiparous mothers being more susceptible to obesity and increased risks of adverse labor or any adverse pregnancy outcomes (40-41). The found stepwise increase between parity and maternal obesity therefore, indicates the effects of gestational weight gain and retention of weight postpartum (40).

Between 1990 and 2021, global age-standardized obesity prevalence increased by 155.1% among males and 104.9% among females (42). In Nigeria, the number of adults with overweight and obesity is projected to increase from approximately 26.6 million in 2021 to 141 million by 2050, making Nigeria the country with the fourth-largest projected population with overweight or obesity. Height was significantly higher in the secondary infertility group (1.64 ± 0.07 vs. 1.60 ± 0.06 m; P = .036, η^2 = .085). This contrasts with a Mexican study reporting more obesity comorbidities in women with short stature (≤1.5 m) (43). This may be explained by the observed ethnic-dependent differences in the relationship between BMI and percent body fat (44) and the limitations of BMI as a diagnostic tool in short statured populations (43). In this cohort, PI classified 92.3% of participants as overweight, whereas BMI classified 92.3% as overweight or obese. Although the proportions were identical, the categories are not directly equivalent because the PI overweight category encompassed participants classified as overweight or obese by BMI. This difference in classification reflects the distinct mathematical relationships between weight and height used by the two indices. However, the clinical significance of PI-based categories in adults remains uncertain, and the thresholds used in this study are less established than standard BMI categories. In this study, the PI overweight category (>15 kg/m^3) included participants classified as obese by the original source (19). This highlights the importance of index selection in anthropometric assessments. It also underscores the need for population-specific BMI cut-off points in North-central Nigeria (44).

Study strengths and limitations

The use of two anthropometric indices (BMI and Ponderal Index) adds methodological depth, and the standardized measurement procedures enhance reliability. The use of Fisher exact tests for categorical comparisons was appropriate given the small sample size and sparse cell counts. This avoids the inaccurate approximations characteristic of chi-square tests when the expected cell counts fall below 5.

Limitations include the retrospective design and reliance on existing records. This hindered the assessment of confounders, such as PCOS status. The study was also restricted to a single private hospital with a small sample (n = 52), which may limit generalizability. Because PCOS status, hormonal profiles, menstrual characteristics, and other potential causes of infertility were not consistently available in the retrospective records, the study could not determine whether the observed weight patterns were associated with specific infertility etiologies.

Despite these limitations, the findings have important implications. The high prevalence of obesity among infertile women underscores the need for targeted interventions, including lifestyle modification and dietary counseling. Weight optimization may improve fertility outcomes, as supported by existing literature. Future studies with larger, more diverse populations are warranted to confirm these findings and explore additional mechanisms linking obesity and infertility.

Conclusion

This study identified a high prevalence of excess weight, particularly obesity, among women presenting for infertility evaluation at a private facility in North-Central Nigeria. More than 90% of participants was classified as overweight or obese by BMI, although BMI did not significantly differ between women with primary and secondary infertility. These findings support systematic assessment of weight status as part of infertility care. Larger, multicenter studies are needed to determine the generalizability of these findings and to evaluate the relationship between weight management and fertility outcomes.

Conflicts of interest

The authors have no conflicts of interest to declare.

Funding

None

Data availability

All data generated or analyzed during this study are included in this article, and additional details or raw data are available from the corresponding author upon reasonable request.

References

1. World Health Organization. Infertility [Internet]. 2025 [cited 2026 May 3]. Available from: https://www.who.int/news-room/fact-sheets/detail/infertility
2. Abebe MS, Afework M, Abaynew Y. Primary and secondary infertility in Africa: systematic review with meta-analysis. *Fertil Res Pract*. 2020;6(1):20.

Published 2020 Dec 2. doi:10.1186/s40738-020-00090-3

3. Liu J, Qin Y, Liu H, et al. Global, regional, and national burden of female infertility and trends from 1990 to 2021 with projections to 2050 based on the GBD 2021 analysis. *Sci Rep*. 2025;15(1):17559. Published 2025 May 21. doi:10.1038/s41598-025-01498-x
4. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. *PLoS Med*. 2012;9(12):e1001356. doi:10.1371/journal.pmed.1001356
5. Roomaney R, Salie M, Jenkins D, et al. A scoping review of the psychosocial aspects of infertility in African countries. *Reprod Health*. 2024;21(1):123. Published 2024 Aug 23. doi:10.1186/s12978-024-01858-2
6. Xie Y, Ren Y, Niu C, Zheng Y, Yu P, Li L. The impact of stigma on mental health and quality of life of infertile women: A systematic review. *Front Psychol*. 2023;13:1093459. Published 2023 Jan 9. doi:10.3389/fpsyg.2022.1093459
7. Zheng L, Yang L, Guo Z, Yao N, Zhang S, Pu P. Obesity and its impact on female reproductive health: unraveling the connections. *Front Endocrinol (Lausanne)*. 2024;14:1326546. Published 2024 Jan 9. doi:10.3389/fendo.2023.1326546
8. Jeong HG, Cho S, Ryu KJ, Kim T, Park H. Effect of weight loss before in vitro fertilization in women with obesity or overweight and infertility: a systematic review and meta-analysis. *Sci Rep*. 2024;14(1):6153. Published 2024 Mar 14. doi:10.1038/s41598-024-56818-4
9. Itoi S, Sampei M, Tatsumi T, et al. Within-individual changes in BMI and menstrual irregularity: a cohort study using real-world data. *BMC Womens Health*. 2026;26(1):124. Published 2026 Jan 28. doi:10.1186/s12905-026-04308-2
10. Fichman V, Costa RSSD, Miglioli TC, Marinheiro LPF. Association of obesity and anovulatory infertility. *Einstein (Sao Paulo)*. 2020;18:eAO5150. Published 2020 Mar 9. doi:10.31744/einstein_journal/2020AO5150
11. Gedef GM, Taye EB, Mohammed OY, Abegaz MY, Asratie MH, Andualem F. Prevalence of infertility and its risk factors in Sub-Saharan Africa: a systematic review and meta-analysis. *Contracept Reprod Med*. 2025;10(1):73. Published 2025 Nov 17. doi:10.1186/s40834-025-00411-1
12. Okafor IA, Saanu OO, Olayemi O, Omigbodun AO. Characterization of primary female infertility in a Nigerian tertiary hospital: A case-control study. *Afr J Reprod Health*. 2022;26(8):66-82. doi:10.29063/ajrh2022/v26i8.7
13. Ehidiamhen, F.E., Nwigwe, I.C., Inyima, N.A., Okoawoh, A.I., Isaac, W.C., Jegede, O.O., Ogbata, S.E. and Basil, B. (2025) Prevalence and Determinants of Obesity Among Healthcare Workers in a Nigerian Tertiary Hospital: A CrossSectional Study. Open Journal of Pathology, 15, 1-15. https://doi.org/10.4236/ojpathology.2025.151001
14. Dankyau M, Shu'aibu JA, Oyebanji AE, Mamven OV. Prevalence and correlates of obesity and overweight in healthcare workers at a tertiary hospital. Journal of Medicine in the Tropics. 2016 Jul 1;18(2):55-9.
15. Bashir MA, Yahaya AI, Muhammad M, Yusuf AH, Mukhtar IG. Prevalence of central obesity in Nigeria: a systematic review and meta-analysis. *Public Health*. 2022;206:87-93. doi:10.1016/j.puhe.2022.02.020
16. Chukwuonye II, Ohagwu KA, Ogah OS, et al. Prevalence of overweight and obesity in Nigeria: Systematic review and meta-analysis of population-based studies. *PLOS Glob Public Health*. 2022;2(6):e0000515. Published 2022 Jun 10. doi:10.1371/journal.pgph.0000515
17. World Health Organization. Obesity and overweight [Internet]. 2025 [cited 2026 May 3]. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
18. Centers for Disease Control and Prevention. Adult BMI categories [Internet]. 2024 [cited 2026 May 3]. Available from: https://www.cdc.gov/bmi/adult-calculator/bmi-categories.html
19. Devajit Mohajan, Haradhan Kumar Mohajan. Ponderal Index: An Important Anthropometric Indicator for Physical Growth. JIMR [nternet]. 2023 Jun. 6 [cited 2026 Aug. 15];2(6):15-9. Available from: https://www.paradigmpress.org/jimr/article/view/630
20. Hussain WG, Akbar A, Shehzad F. Gaussian (Z-Score) percentiles of ponderal index (pi) in Pakistani children and adults: a quantitative approach to human growth analysis.*MOJ Gerontol Ger.* 2024;9(3):61-70. DOI: 10.15406/mojgg.2024.09.00329
21. Musbau AI, Biliaminu SA, Omokunmi YJ, Abimbola AB, Uthman HA, Yunusa MM, et al. Body mass index and ponderal index as biopredictors of cardiovascular parameters in apparently well Nigerian undergraduates. Ann Clin Cardio. 2026;8(2):107-10. doi: 10.4103/ACCJ/ACCJ_8_26
22. Nuttall FQ. Body Mass Index: Obesity, BMI, and Health: A Critical Review. *Nutr Today*. 2015;50(3):117-128. doi:10.1097/NT.0000000000000092
23. Huang B, DePaolo J, Judy RL, et al. Relationships between body fat distribution and metabolic syndrome traits and outcomes: A mendelian randomization study. *PLoS One*. 2023;18(10):e0293017. Published 2023 Oct 26. doi:10.1371/journal.pone.0293017
24. Agresti A. An introduction to categorical data analysis. 3rd ed. Hoboken (NJ): Wiley; 2019
25. Bobbitt Z. What is partial eta squared? (definition & example) [Internet]. Statology; 2022 [cited 2026 May 3]. Available from: https://www.statology.org/partial-eta-squared/
26. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Front Psychol*. 2013;4:863. Published 2013 Nov 26. doi:10.3389/fpsyg.2013.00863
27. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39(2):175-191. doi:10.3758/bf03193146
28. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods*. 2009;41(4):1149-1160. doi:10.3758/BRM.41.4.1149
29. Maruf FA, Udoji NV. Prevalence and Socio-Demographic Determinants of Overweight and Obesity in a Nigerian Population. *J Epidemiol*. 2015;25(7):475-481. doi:10.2188/jea.JE20140099
30. Vaduneme Kingsley Oriji (FWACS), Chidi Onwuegbulam (FWACS). Prevalence of Polycystic Ovary Syndrome (PCOS) Among Infertile Women Attending Fertility Clinic at a University Teaching Hospital in Nigeria. J Gynecol Women's Health. 2019: 15(5): 555922. DOI: 10.19080/JGWH.2019.15.555922
31. Ihim AC, Onyenekwe CC, Eze NN, Obi PC, Awalu JC, Ikwelle TA. Assessment of metabolic, cardiovascular, and anthropometric parameters in PCOS women attending gynecology clinic at

Nnewi, Anambra State, Nigeria. Int J Res Sci Innov. 2024;11(5):707-716

32. Akpata, C.B., Uadia, P.O. and Okonofua, F.E. (2018) Prevalence of Polycystic Ovary Syndrome in Nigerian Women with Infertility: A Prospective Study of the Three Assessment Criteria. Open Journal of Obstetrics and Gynecology, 8, 1109-1120. https://doi.org/10.4236/ojog.2018.812112
33. Alnakash AH, Al-Tae'e NK. Polycystic ovarian syndrome: The correlation between the LH/FSH ratio and disease manifestations. Middle East Fertil Soc J. 2007;12(1):35-40
34. Makwe CC, Olamijulo JA, Balogun MR, et al. SAT363 The Prevalence And Phenotype Of Polycystic Ovary Syndrome (PCOS) In A Community-Based Population In Sub-Sahara Africa: The Nigeria-PEP Study. *J Endocr Soc*. 2023;7(Suppl 1):bvad114.1668. Published 2023 Oct 5. doi:10.1210/jendso/bvad114.1668
35. Balogun M, Coker O, Samuel T, et al. PMON245 Clinical Phenotypes of Polycystic Ovary Syndrome (PCOS) in Nigerian Women: Preliminary Results of the Nigeria PCOS Epidemiology & Phenotype (Nigeria-Pep) Study. *J Endocr Soc*. 2022;6(Suppl 1):A696. Published 2022 Nov 1. doi:10.1210/jendso/bvac150.1436
36. Hanana Hameed, Sajjad Ul Hasan, Muhammad Naveed Najeeb, Maha Sajjad, Sajida Imran, Abdul Wadood Shah. Impact of Obesity on Female Reproductive Hormones and Ovulatory Function. A Clinical and Biochemical Evaluation of Endocrine Disruption in Women of Reproductive Age. Pakistan Journal of Medical & Health Sciences [Internet]. 2023 Nov. 30 [cited 2026 Aug. 16];17(11):315. Available from: https://pjmhsonline.com/pjmhs/article/view/6365
37. Chukwuma FE, Nelson OE. Assessment of reproductive hormones in obese infertile women in southern (Niger Delta region), Nigeria. Int J Curr Res. 2021;13(9):18774-18780
38. Akpan E, Ekpenyong C. Urbanization Drift and Obesity Epidemic in Sub-Saharan Africa: A Review of the Situation in Nigeria. EJSD [Internet]. 2013Jun.1 [cited 2026Aug.15];2(2):141. Available from: https://ecsdev.org/ojs/index.php/ejsd/article/view/58
39. Adeloye D, Ige-Elegbede JO, Ezejimofor M, et al. Estimating the prevalence of overweight and obesity in Nigeria in 2020: a systematic review and meta-analysis. *Ann Med*. 2021;53(1):495-507. doi:10.1080/07853890.2021.1897665
40. Adeoye IA, Bamgboye EA, Omigbodun AO. Maternal obesity, lifestyle factors and associated pregnancy outcomes in Ibadan, Nigeria: a Nigerian cohort study. *Sci Rep*. 2025;15(1):11129. Published 2025 Apr 1. doi:10.1038/s41598-025-90079-z
41. Onubi OJ, Marais D, Aucott L, Okonofua F, Poobalan AS. Maternal obesity in Africa: a systematic review and meta-analysis. *J Public Health (Oxf)*. 2016;38(3):e218-e231. doi:10.1093/pubmed/fdv138
42. GBD 2021 Adult BMI Collaborators. Global, regional, and national prevalence of adult overweight and obesity, 1990-2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021. *Lancet*. 2025;405(10481):813-838. doi:10.1016/S0140-6736(25)00355-1
43. Lara-Esqueda A, Aguilar-Salinas CA, Velazquez-Monroy O, et al. The body mass index is a less-sensitive tool for detecting cases with obesity-associated co-morbidities in short stature subjects. *Int J Obes Relat Metab Disord*. 2004;28(11):1443-1450. doi:10.1038/sj.ijo.0802705
44. Deurenberg P, Yap M, van Staveren WA. Body mass index and percent body fat: a meta analysis among different ethnic groups. *Int J Obes Relat Metab Disord*. 1998;22(12):1164-1171. doi:10.1038/sj.ijo.0800741