Tropical Journal of Drug Research March 2026; 3 (2): 382 - 389
ISSN: 2476-8065 (Electronic)
Available online at http://www.tjdr.org
https://doi.org/10.26538/tjdr/v3i2.2

Original Research Article

Comparative Analysis of Infertility Etiologies and ART Practices in Abuja and Jos, Nigeria (2016–2022)

Swesme Enyioma-Alozie[1], Fiona Xiaomelli Nencherit Golwa[1], Rais Shuaibu Mohammed Ibraheem[2], Catherine Chimuanya Wali[1]
[1]*Department of Anatomy, Faculty of Basic Medical Sciences, Baze University, Abuja, Nigeria*
[2]*Department of Obstetrics and Gynaecology, National Hospital, Abuja, Nigeria.*
*For correspondence: Email: swesme.alozie@bazeuniversity.edu.ng, +2348056403347

Sent for review: 10 June 2025 Revised accepted: 29 March 2026

Abstract

Purpose*:* Infertility, defined as failure to conceive after one year of unprotected sexual intercourse, remains a major reproductive health challenge with significant social consequences in sub-Saharan Africa. It has multifactorial causes involving both male and female factors. This study evaluated infertility etiologies and assisted reproductive technology (ART) practices in Abuja and Jos, Nigeria, between 2016 and 2022.
Methods*:* A retrospective review of 26,233 patient records from four fertility hospitals (two in Abuja and two in Jos) was conducted. Data extracted included patient demographics, identified male and female infertility factors, and ART utilization patterns. Statistical analysis was performed to compare regional variations in infertility etiologies.
Results*:* Of the 26,233 records analyzed, 14,590 (55.6 %) were from Jos and 11,643 (44.4 %) from Abuja. Among males, azoospermia and oligozoospermia were the most prevalent causes of infertility, with the highest azoospermia burden recorded at Abuja Hospital B (22 ± 4 cases). Female infertility was predominantly associated with polycystic ovarian syndrome (PCOS) and tubal disease, with Abuja Hospital B reporting the highest number of PCOS cases (143). Significant regional variation was observed in male infertility, particularly azoospermia ($F = 5.622$, $p = 0.014$), whereas female infertility rates did not differ significantly between the two locations. Variations were also observed in ART utilization patterns across the centres.
Conclusion: Male infertility, especially azoospermia, showed significant regional differences between Abuja and Jos, while female infertility patterns were relatively similar. These findings highlight the need for region-specific reproductive health strategies and improved access to ART services in Nigeria.

Keywords: Infertility, Male infertility, Female infertility, Assisted Reproductive Technologies, Azoospermia, Polycystic ovarian syndrome, Nigeria

Tropical Journal of Drug Research is indexed by Chemical Abstracts, Embase, Index Copernicus, EBSCO, African Index Medicus, Journal Seek, Directory of Open Access Journals
(DOAJ), African Journal Online, Bioline International, Open-J-Gate and Pharmacy Abstracts

INTRODUCTION

Infertility, defined as the inability of a couple to conceive after 12 months of regular unprotected sexual intercourse, poses significant medical, psychological, and social challenges, particularly in low- and middle-income countries (LMICs).[1] In Nigeria, the prevalence of infertility is increasing, with male and female infertility contributing to this growing concern. It remains a significant public health concern affecting millions of individuals and couples globally. Epidemiologically, it is described by the absence of conception after one year of consistent, unprotected sexual activity, regardless of the underlying cause.[2,3] Recent global estimates suggest that approximately 48 million couples and 186 million individuals experience infertility, impacting not only physical health but also psychological, economic, and social Wellbeing.[4,3] In sub-Saharan Africa, infertility carries an especially heavy burden due to strong cultural and societal emphasis on procreation, where infertility can lead to stigma, marital instability, and social exclusion.[5]

Etiologies of infertility are multifactorial and differ between males and females. Male infertility is predominantly attributed to disorders of semen production and function, including low sperm count (oligospermia), poor sperm motility (asthenozoospermia), and abnormal sperm morphology (teratozoospermia).[6,7] Female infertility, on the other hand, is often due to ovulatory dysfunctions, tubal blockages, uterine abnormalities, and endocrine disorders such as polycystic ovarian syndrome (PCOS).[8,9] Furthermore, genital tract infections and sexually transmitted infections remain major causes of infertility in many low- and middle-income countries.[10,11] Distinguishing between primary infertility (no prior pregnancy) and secondary infertility (difficulty conceiving after a previous pregnancy) is crucial for clinical evaluation and management strategies.

Assisted Reproductive Technologies (ART) such as In Vitro Fertilization (IVF) and Intra-Cytoplasmic Sperm Injection (ICSI) have revolutionized infertility treatment, offering hope to affected couples. ICSI, a refinement of IVF, entails the direct injection of a single sperm into an oocyte, particularly beneficial in cases of male factor infertility. ART has seen tremendous growth and adaptation worldwide, including in Nigeria. Despite the promise of ART, significant barriers such as high costs, limited access, cultural perceptions, and inadequate data recording continue to impede widespread utilization in Nigeria.[12]

In Nigeria, ART services have expanded considerably over the past two decades, yet there is limited comparative research detailing patterns of infertility etiologies and ART practices across different regions. Abuja, the federal capital territory, and Jos, the Plateau State capital, offer unique sociocultural, demographic, and healthcare access contexts, which may influence infertility patterns and treatment practices. Understanding these regional variations is vital for informing tailored public health strategies, optimizing clinical management, and addressing patient needs more effectively.

This study aims to compare the etiologies of male and female infertility and the patterns of ART practices in Abuja and Jos, Nigeria, from 2016 to 2022. This research is driven by the need to bridge the knowledge gap in regional infertility profiles and ART utilization in Nigeria. A comparative analysis will not only provide critical insights into underlying factors influencing infertility outcomes but also highlight disparities in ART access, success rates, and challenges faced by patients in different urban centers.

This study holds substantial significance, as infertility poses profound psychosocial and economic consequences in Nigerian society, where parenthood is highly valued. By identifying trends and patterns, policymakers, clinicians, and public health stakeholders can develop more equitable, accessible, and culturally sensitive infertility interventions. Furthermore, improved data on ART outcomes will enhance clinical decision-making, boost patient confidence in infertility treatments, and support advocacy for more affordable and regulated ART services across Nigeria.

MATERIALS AND METHODS

Study Setting

This study was conducted in two Nigerian cities: The Federal Capital Territory (FCT), Abuja, and Jos, the capital of Plateau State. In Abuja, data were collected from Hospitals labeled A & B. Similarly, in Jos, data were obtained from Hospitals labeled A and B for the purpose of this study.

Ethical Clearance for the study

The Research Ethics Committee of the Department of Anatomy, Faculty of Basic Medical Sciences, Baze University, Abuja, considered and approved the study and issued a Research Reference Code: BU/URES/ANA/1005. The health ethics committees of the various participating hospitals also gave approval for this study. Patient anonymity and confidentiality were strictly maintained throughout the study. Permissions were also granted by the Heads of the IVF Departments at the respective hospitals to access and utilize the required data.

Sample Size

The study utilized data from a total of 26,233 patient folders representing couples who sought in vitro fertilization (IVF) treatment between 2016 and 2022. Fourteen thousand, five hundred and ninety (14,590) folders of these were retrieved from the hospitals in Jos, while eleven thousand, six hundred and forty-three (11,643) folders were obtained from the hospitals in Abuja.

Study Design

Data were extracted retrospectively from patient medical records at the four participating hospitals. A purpose-designed proforma was employed to collect relevant information systematically. Data collection was conducted daily by trained personnel, and pertinent variables included infertility factors categorized as male-related, female-related, or genetic in origin. Additionally, the frequency and percentage distributions of various factors associated with infertility in both males and females were documented.

Inclusion Criteria

1. Patient medical records from couples or individuals evaluated for infertility at the selected fertility hospitals in Abuja and Jos between January 2016 and December 2022.
2. Records of patients who met the clinical definition of infertility (failure to conceive after ≥12 months of regular unprotected sexual intercourse).
3. Medical records containing documented evaluation of male and/or female infertility factors, including semen analysis, ovulatory assessment, tubal evaluation, or endocrine investigations.
4. Records of patients who underwent or were evaluated for assisted reproductive technology (ART) procedures (e.g., IVF, ICSI, or related interventions).
5. Complete patient folders with essential demographic information (age, sex, diagnosis, and treatment history).

Exclusion Criteria

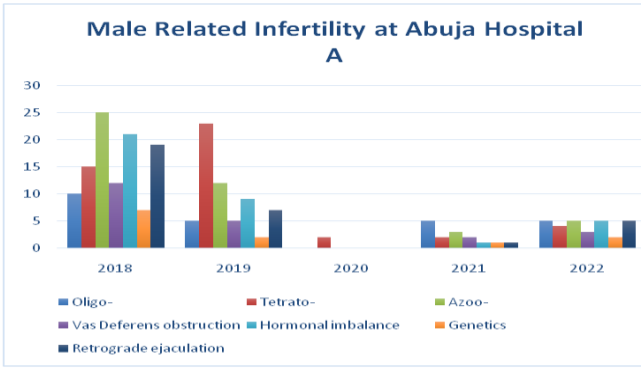
1. Medical records outside the study period (before 2016 or after 2022).
2. Records of patients evaluated for gynecological or urological conditions not related to infertility.
3. Patient folders with incomplete, missing, or poorly documented data on infertility diagnosis or ART use.
4. Records of patients with secondary causes of infertility unrelated to reproductive pathology, such as active malignancy or systemic illness requiring gonadotoxic therapy, where infertility evaluation was not the primary concern.
5. Duplicate records or repeat visits that could not be reliably linked to a single patient.

Data Analysis

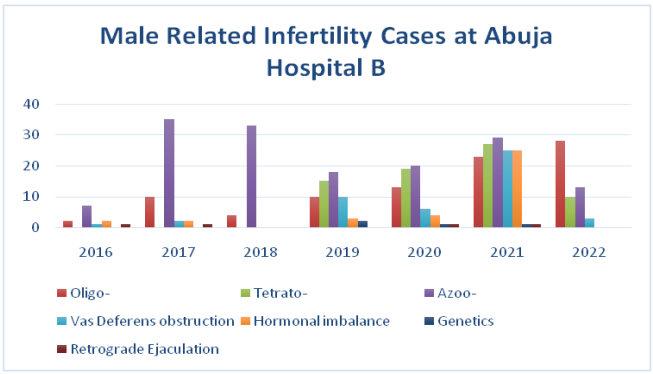
Data analysis was performed using Microsoft Excel 2016. Descriptive statistics were used to summarize the findings. Comparative analysis and correlation assessments were conducted to explore relationships between variables. Results are organized in tables to facilitate the observation of risk factors and outcomes associated with IVF treatments in Abuja and Jos.

RESULTS AND DISCUSSION

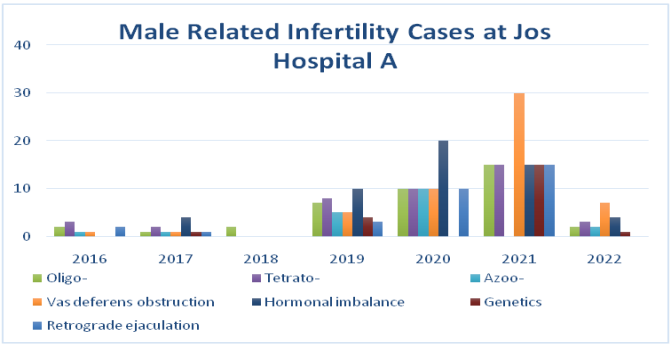
In this study, records of patients with infertility issues in 4 hospitals in Abuja and Jos were evaluated. Results of male-



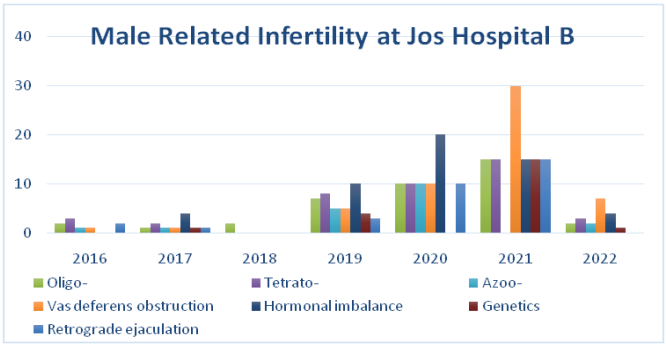
A. Abuja Hospital A



B. Abuja Hospital B



C. Jos Hospital A



D. Jos Hospital B

Figure 1 (A – D): Simple Bar Charts showing the Male – Related Infertility Cases across the Selected Hospitals per Year.

related infertility cases across the hospitals analyzed are presented in Figure 1 (A-D). The data reveals varying patterns over the years for different infertility conditions. At Abuja Hospital A, there was a notable decline in male infertility cases in 2020, with zero occurrences reported for most categories, including oligozoospermia (low sperm count), azospermia (absence of sperm), and retrograde ejaculation. However, in 2018, 2019, and 2022, there were consistent cases of oligozoospermia and azoospermia, as well as significant cases of vas deferens obstruction and hormonal imbalance. Abuja Hospital B showed a significant increase in infertility cases over the years, particularly from 2020 to 2022. Notably, oligozoospermia and azoospermia are the most frequently reported issues, with a substantial rise in 2021, highlighting a possible increase in infertility diagnoses or referrals to the hospital for treatment. The hospital also experienced a peak in vas deferens obstruction cases in 2021. Despite fluctuations in other categories, this hospital consistently reported cases of male infertility, with fewer hormonal imbalances and genetics-related infertility issues reported in 2022. There was a decrease in cases of infertility from 2016 to 2022, with zero cases reported in 2022, in Hospital A in Jos. Initially, the hospital had high cases of oligozoospermia in 2016 and 2017; however, in 2020, the cases of male infertility showed a slight reduction, except for a spike in 2020 for azoospermia and retrograde ejaculation. The decline in cases in the subsequent years could reflect improved treatment efficacy or possibly fewer infertility referrals during that period. Hospital B in Jos reported fluctuating trends in male infertility, with peak years in 2020 and 2021. The years 2020 and 2021 show a consistent presence of oligozoospermia and azoospermia, as well as a notable rise in vas deferens obstruction. The data highlights the dynamic nature of male infertility treatment and diagnosis across these hospitals, with varying trends in infertility types over the years.

The data presented in Table 1 compares the prevalence of male-related infertility cases across selected hospitals in Abuja and Jos using one-way ANOVA. For oligozoospermia, the mean number of cases across the hospitals shows no statistically significant difference ($F = 2.376$, $P = 0.125$). While Abuja Hospital A reported the lowest mean (5±2), Jos Hospital A had the highest mean (15±3). Similarly, there was no significant difference in the prevalence of teratozoospermia ($F = 0.454$, $P = 0.643$). The mean values were fairly consistent across the hospitals. A significant difference was observed in azoospermia cases ($F = 5.622$, $P = 0.014$), with Abuja Hospital B reporting the highest mean (22±4), compared to Jos Hospital A (6±3) and Abuja Hospital A (9±4). There was no significant difference in the occurrence of vas deferens obstruction ($F = 0.255$, $P = 0.778$), with similar means across the hospitals (4±2 for Abuja Hospital A, 7±3 for Abuja Hospital B, and 4±3 for Jos Hospital A). Similarly, no significant difference was found for hormonal imbalance cases ($F = 1.643$, $P = 0.224$), with Hospital A in Abuja showing the highest mean

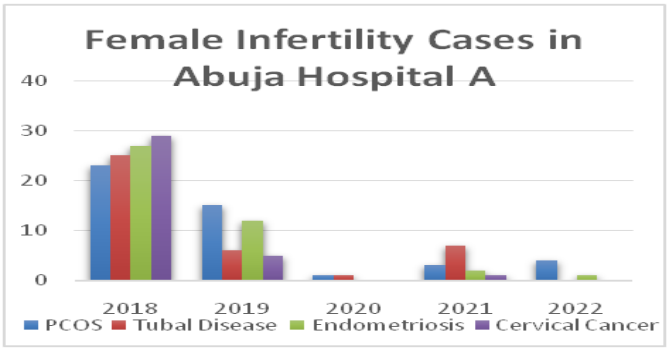
Table 1: Showing the Number of Male – Related Infertility Cases across Hospitals Compared on One – Way ANOVA

	HOSPITAL			F	P - value
	Abuja Hospital A	Abuja Hospital B	Jos Hospital A		
Oligo-	5±2	13±4	15±3	2.376	.125
Tetrato-	9±4	10±4	6±3	.454	.643
Azoo-	9±4	22±4	6±3	5.622	.014
Vas Deferens Obstruction	4±2	7±3	4±3	.255	.778
Hormonal Imbalance	7±4	5±3	0±0	1.643	.224
Genetics	2±1	1±0	1±1	1.022	.382
Retrograde Ejaculation	6±3	1±0	3±2	1.946	.175

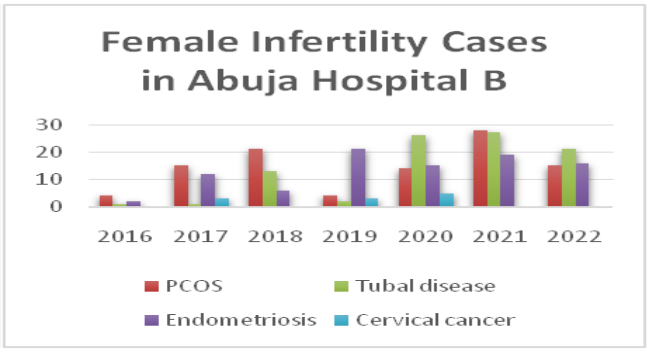
Values are expressed MEAN±SEM, *P<0.05 (Statistically significant difference)

(7±4), followed by Hospital B in Abuja (5±3), and Jos Hospital A (0±0). No significant difference was found for genetically related infertility ($F = 1.022$, $P = 0.382$), with low prevalence rates across the hospitals (ranging from 1±0 to 2±1). For Retrograde Ejaculation, there was no significant difference observed ($F = 1.946$, $P = 0.175$), with varying results across the hospitals (6±3 for Abuja Hospital A, 1±0 for Abuja Hospital B, and 3±2 for Jos Hospital A).

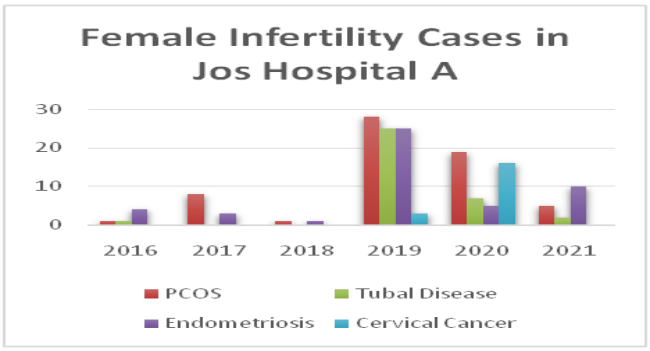
However, significant differences were only noted in the prevalence of azoospermia, highlighting its higher frequency at hospital B in Abuja compared to the other hospitals. The remaining infertility conditions showed no statistically significant differences between the hospitals. This suggests that while there are some variations in male infertility cases across hospitals, certain conditions, such as azoospermia, might be more pronounced in specific locations.



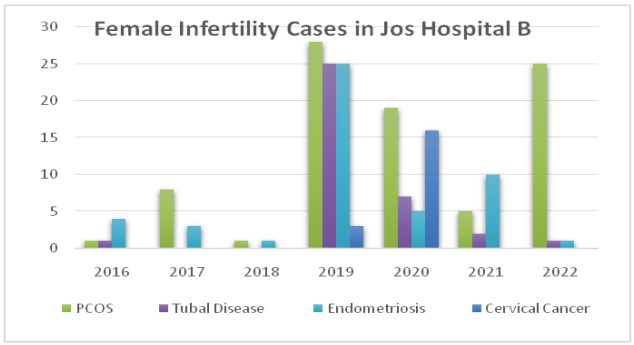
A. Abuja Hospital A



B. Abuja Hospital B



C. Jos Hospital A



D. Jos Hospital B

Figure 2 (A – D): Simple Bar Charts showing the Female – Related Infertility Cases across the Selected Hospitals per Year

The data of female-related infertility cases across the hospitals are presented in Figure 2 (A – D). The data shows the frequency of female-related infertility cases across the selected hospitals over the period of 2016 - 2022. At Abuja Hospital A, there was a notable variation in the number of female-related infertility cases over the years. In 2018, the hospital reported high numbers for conditions like tubal disease (25 cases) and endometriosis (27 cases), as well as cervical cancer (29 cases). The frequency of cases generally decreased over the years, with significant reductions seen in 2020 and 2021. Tubal disease cases dropped from 25 in 2018 to just 7 in 2021, while cervical cancer cases fell from 29 in 2018 to only 1 by 2021. By 2022, there was a resurgence in cases, with age-related infertility in women over 35 years (6 cases) surpassing those under 35 (2 cases). At Abuja Hospital B, the frequency of female infertility cases fluctuated across the years. A marked increase in cases occurred in 2020 and 2021, with tubal disease (26 and 27 cases, respectively) and polycystic ovary syndrome (PCOS, 14 and 28 cases) being the most frequent. In contrast, fewer cases of cervical cancer were reported. In 2022, a decline in the overall number of cases was observed, with tubal disease, endometriosis, and PCOS remaining prevalent but fewer in numbers. Notably, the hospital saw a significant number of patients aged over 35 years seeking IVF treatments. Jos Hospital A had a distinct pattern, with a notable decline in the number of infertility cases between 2016 and 2022. In 2016, the hospital reported a relatively high number of cases, particularly for conditions like PCOS and tubal disease. However, over the years, the number of cases diminished, and by 2022, no infertility cases were reported. The hospital showed a steady reduction in age-related infertility over time, with a particular drop in cases for women less than 35 years, particularly in 2022, when no cases were reported. At Jos Hospital B, the data indicate sporadic fluctuations in infertility cases. A significant spike in 2019 was observed, with the highest numbers recorded for tubal disease (25 cases), PCOS (25 cases), and endometriosis (25 cases). This surge was followed by a decline in 2020, with tubal disease and PCOS remaining prominent. In 2021, the cases were fewer, and by 2022, the frequency of female-related infertility cases was notably lower, with only five cases of PCOS and one of tubal disease. The data reflect varying trends across the hospitals, with some showing an increase in specific conditions over time while others displayed a decline in the frequency of infertility cases. This variation could be due to changes in patient demographics, treatment protocols, or other regional factors affecting reproductive health.

Furthermore, female-related infertility cases across the selected hospitals were compared in this study, as presented in Table 2. The table shows the comparative analysis of female-related infertility cases across the selected hospitals in Abuja and Jos. The analysis results showed that there were no statistically significant

Table 2: Showing the Number of Female – Related Infertility Cases across Hospitals Compared on One – Way ANOVA

	HOSPITAL			F	P - value
	Abuja Hospital A	Abuja Hospital B	Jos Hospital A		
Age >35	135	92	43	1.802	.197
Age <35	63	63	52	.013	.987
PCOS	94	143	93	.939	.412
Tubal Disease	85	134	31	2.004	.167
Endometriosis	85	133	52	1.684	.217
Cervical Cancer	76	21	11	1.305	.298

Values are expressed MEAN±SEM, *P<0.05 (Statistically significant difference)

differences (P>0.05) in the distribution of the infertility indicators among the hospitals. For instance, infertility among women aged above 35 years was more reported at Abuja Hospital A (135 cases), followed by Abuja Hospital B (92 cases), and Jos Hospital A (43 cases), with a P-value of 0.197. Similarly, cases among women under 35 years were nearly evenly distributed across the three hospitals (P = 0.987), suggesting a similar patient demographic. In terms of clinical conditions, PCOS was most frequently observed at Abuja Hospital B (143 cases), followed by Abuja Hospital A (94 cases), and Jos Hospital A (93 cases), yet the variation was not statistically significant (p = 0.412). Likewise, tubal disease and endometriosis were more frequently recorded in the Abuja hospitals, with p-values of 0.167 and 0.217, respectively. Cervical cancer had relatively lower case numbers across all hospitals, and the differences were also statistically insignificant (P = 0.298). The analysis suggests that although numerical differences exist in the distribution of female-related infertility conditions across the selected hospitals, these differences are not statistically significant. This implies a relatively uniform pattern of female infertility indicators in the studied locations, which may reflect similarities in regional demographics, healthcare access, or diagnostic practices.

The results from this study provide significant insights into the dynamics of male and female infertility cases across four hospitals in Abuja and Jos, Nigeria, spanning the years 2016 to 2022. The findings highlight notable variations in the prevalence and trends of infertility conditions, providing a comparative analysis of male and female infertility patterns across these regions. The male infertility data reveal varying trends across hospitals in Abuja and Jos. At Abuja Hospital A, a marked decline in male infertility cases in 2020 is particularly notable, with zero occurrences reported for several infertility conditions, including oligozoospermia, azoospermia, and retrograde ejaculation. However, the recurrence of these issues in other years, especially 2018, 2019, and 2022, suggests fluctuations in patient demographics or treatment practices. These results echo findings from other studies that report inconsistent trends in male infertility diagnoses, which are often influenced by factors such as lifestyle, environmental exposures, and evolving diagnostic techniques.[13]

Conversely, Abuja Hospital B witnessed a substantial increase in infertility cases between 2020 and 2022, particularly for oligozoospermia and azoospermia, with a notable peak in vas deferens obstruction cases in 2021. This aligns with studies indicating a rise in male infertility diagnoses in certain regions, likely due to improved diagnostic facilities, increased awareness, and better referral systems.[14] The consistently higher numbers at Abuja Hospital B may also suggest a greater reliance on specialized infertility care in this region, a trend corroborated by a study which reported that urban centers in Nigeria tend to report more infertility cases due to better diagnostic and treatment infrastructures. [15]

In Jos, Hospital A witnessed a decline in male infertility cases over the years, with no infertility cases reported in 2022. This reduction might reflect improvements in treatment efficacy or a decrease in infertility referrals, a trend observed in similar studies that report improvements in ART outcomes over time.[16] On the other hand, Jos Hospital B reported fluctuating trends, with peaks in 2020 and 2021, particularly in azoospermia and vas deferens obstruction cases. These fluctuations could be attributed to variations in regional healthcare access, patient population dynamics, or changes in diagnostic protocols. Comparison of male infertility conditions across hospitals reveals significant differences in azoospermia cases, with Abuja Hospital B showing the highest mean. This finding suggests that azoospermia might be more prevalent in Abuja, as also indicated by recent studies.[17] The lack of significant differences in other infertility conditions, such as oligozoospermia, vas deferens obstruction, and hormonal imbalances, indicates a relative uniformity in these conditions across hospitals, suggesting common environmental or lifestyle factors affecting male infertility in both cities.

The results for female-related infertility reveal varying trends across hospitals, with Abuja Hospital A reporting high numbers for conditions like tubal disease, endometriosis, and cervical cancer, particularly in 2018. However, a decrease in these cases in subsequent years, especially in 2020 and 2021, may be attributed to improvements in treatment protocols or regional shifts in patient demographics. Similar reductions in female

infertility cases over time have been observed in other Nigerian studies, where changes in healthcare access and awareness campaigns have led to better early interventions.[18] At Abuja Hospital B, a marked increase in cases of tubal disease and PCOS occurred in 2020 and 2021, with a resurgence of infertility issues in 2022. This increase could reflect a combination of factors, including an aging population seeking ART treatments and improved diagnostic capabilities. This hospital's data aligns with recent studies indicating that conditions like PCOS are rising in urban Nigerian populations, potentially due to lifestyle changes, including dietary patterns and stress.[19] Furthermore, the higher numbers of patients over 35 years seeking IVF treatments at Abuja Hospital B suggest a growing trend of age-related infertility, a finding that echoes research on delayed childbearing trends globally.[20, 21] Similarly, hospital A in Jos showed a steady decline in female infertility cases from 2016 to 2022, with no infertility cases reported in 2022. This decline might be indicative of improved public health strategies or a reduction in referrals, although it also suggests that fewer women in Jos sought ART services in the later years. Similarly, Hospital D in Jos showed fluctuations, with a significant spike in 2019, particularly for tubal disease and PCOS, followed by a reduction in cases in subsequent years. This pattern could be linked to regional variations in healthcare access, patient socioeconomic status, or the availability of specialized infertility care.[22] Comparison of female infertility conditions across hospitals reveals no statistically significant differences in the prevalence of conditions such as tubal disease, PCOS, and cervical cancer. However, the overall higher incidence of infertility cases in women aged above 35 years, particularly at Abuja Hospitals A and B, suggests that age-related infertility may be a growing concern in Abuja. This is consistent with findings from similar studies showing an increasing trend of infertility in women over 35 in Nigeria, likely due to delayed childbearing.[22]

The findings from this study highlight critical implications for infertility management in Nigeria. The significant hospital-specific peaks suggest that resource allocation, patient education, and targeted intervention programs must be hospital-specific and responsive to local patient profiles. Furthermore, the surge in azoospermia cases at Abuja Hospital B underscores the urgent need for improved male reproductive health diagnostics and treatment. The relative uniformity in female infertility cases suggests common regional factors such as similar cultural practices, healthcare accessibility, environmental exposures, and lifestyle influences across Abuja and Jos. Hence, public health efforts to tackle infertility should adopt a regional approach but also consider localized hospital trends. Given the temporal variations, there is a need for continuous monitoring and large-scale epidemiological studies to better understand the evolving infertility landscape in Nigeria, particularly in the context of rapid urbanization, changing lifestyles, and emerging healthcare technologies like Assisted Reproductive Technology (ART).

CONCLUSION

The study provides valuable comparative insights into male and female infertility patterns in Abuja and Jos, Nigeria, between 2016 and 2022. Findings reveal significant hospital-specific variations, with notable trends such as rising azoospermia cases and age-related female infertility, particularly in Abuja. The relative uniformity in female infertility conditions across both cities suggests shared regional factors influencing reproductive health. These results emphasize the need for hospital-specific interventions, enhanced male infertility diagnostics, and targeted public health strategies

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' DECLARATION

The authors hereby declare that the works presented in this article are original and that any liability for claims relating to the content of this article will be borne by them.

ACKNOWLEDGEMENTS

Authors are very thankful to the Management of the hospitals where the study was carried out, for approving the use of their facilities. The authors are also, thankful to the Heads of the IVF units at the respective hospitals and their staff for their support throughout the period of data collection.

REFERENCES

1. Practice Committee of the American Society for Reproductive Medicine. Definitions of infertility and recurrent pregnancy loss: a committee opinion. Fertil. Steril. 2020;113(3):533-535.
2. Ofovwe CE, Agbontaen-Eghafona KA. Infertility in Nigeria: A risk factor for gender-based violence. Gend. Behav. 2009;7(2):2326-2344.
3. World Health Organization. WHO fact sheet on infertility. Glob. Reprod. Health. 2021;6(1): e52.
4. Inhorn MC, Patrizio P. Infertility around the globe: new thinking on gender, reproductive technologies and global movements in the 21st century. Hum. Reprod. Update. 2015;21(4):411-26.
5. Oyuyo C. Psychological Impact of Perceptions of Infertility and Childlessness: A Systematic Literature Review (Doctoral dissertation), California Southern

University; 2024; DocuSign Envelope ID: B00E686F-37E2-4947-BEE6-9C7050B0FA5D
6. Agarwal A, Selvam MK, Ambar RF. Validation of LensHooke® X1 PRO and computer-assisted semen analyzer compared with laboratory-based manual semen analysis. World J Mens Health. 2021; 39(3): 496.
7. World Health Organization. WHO laboratory manual for the examination and processing of human semen. 6th ed. WHO Press; 2021.
8. Mascarenhas MN, Cheung H, Mathers CD, Stevens GA. Measuring infertility in populations: constructing a standard definition for use with demographic and reproductive health surveys. Popul. Health Mtr. 2012; 10(1):17.
9. Kasna S, Agrawal SS. Infertility in Women: A Review on Causes, Treatment, and Management. IJMB. 2022;8(2):30-38.
10. Ombelet W. Global access to infertility care in developing countries: a case of human rights, equity and social justice. Facts, views & vision in ObGyn. 2011;3(4):257.
11. Anderson DJ. Sexually transmitted infections and infertility. J. Reprod. Immunol. 2014;100(101-102):13.
12. Bakare B, Gbala MO, Oke OF, Adeniyi AA, Olanrewaju BO, Akinsipe CI, Oluwayomi SG, Olofinbiyi BA. In Vitro fertilization in Nigeria: A critical review of challenges, successes, and future directions. Int. J. Gynecol. Obstet. 2024;6(2):56-60.
13. Adewale MO, Adeleye AO, Olayemi O. Access to infertility treatment services in Nigeria: Challenges and opportunities. Niger Med J. 2020; 62(4), 201–207.
14. Omisakin SI, Ugwu AO, Adebayo A, Araotan K, Ayodeji OA. Epidemiology of Infertility and Characteristics of Infertile Women Requesting Assisted Reproduction Techniques in a Low Resource Setting in Western Nigeria. Int J Trop Dis Health. 2024;45(10):10-9734.
15. Ottun TA, Adewunmi AA, Jinadu FO, Olumodeji AM, Akinlusi FM, Rabiu KA, Akinola OI, Fabamwo AO. A decennial cross-sectional review of assisted reproductive technology in a Tertiary Hospital in Southwest Nigeria. BMC Pregnancy Childbirth. 2023;23(1):680.
16. Ogundele OA, Okonkwo JE, Ajayi RA. Regional variations in the diagnosis of male infertility in Nigerian tertiary hospitals: A multicenter study. Niger. J. Clin. Med. 2022; 24(1), 44–53.
17. Obajimi GO, Saanu O, Ilesanmi AO. Expanding access to assisted reproductive technology in a developing country: getting more for less. Afr. J. Med. Sci. 2021;50(2):171-5.
18. Abebe MS, Afework M, Abaynew Y. Primary and secondary infertility in Africa: systematic review with meta-analysis. Fertility Research and Practice. 2020;6(1):20.
19. Zabak S, Varma A, Bansod S, Pohane MR, Varma Sr A. Exploring the complex landscape of delayed childbearing: factors, history, and long-term implications. Cureus. 2023;15(9).
20. Liang Y, Huang J, Zhao Q, Mo H, Su Z, Feng S, Li S, Ruan X. Global, regional, and national prevalence and trends of infertility among individuals of reproductive age (15–49 years) from 1990 to 2021, with projections to 2040. Hum. Reprod. 2025; 40(3):529-44.
21. Brodeur TY, Grow D, Esfandiari N. Access to fertility care in geographically underserved populations, a second look. Reprod. Sci. 2022;29(7):1983-7.
22. Obeagu EI, Njar VE, Obeagu GU. Infertility: Prevalence and consequences. Int. J. Curr. Res. Chem. Pharm. Sci. 2023;10(7):43-50.