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Trends and Clinical Outcomes of In Vitro Fertilization in Selected Nigerian Cities: A Multi-Center Retrospective Study

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Abstract

Background: The advent of In vitro fertilization (IVF) in the late 20th century has greatly transformed reproductive medicine. It has brought hope to millions of individuals and couples facing the challenges of infertility. Assisted Reproductive Technology (ART), notably In Vitro Fertilization (IVF), has shown promise in treating infertility, yet its use in Nigeria is limited by high costs, inconsistent success rates, and a lack of standardized clinical protocols. ***Aim:*** The current study investigated the trends and clinical outcomes of IVF treatments in two Nigerian cities, Abuja and Jos, between 2016 and 2022, providing a comprehensive analysis of IVF demand, success rates, and associated risk factors. ***Methodology:*** A retrospective analysis of 26,233 medical records from four fertility centers in Abuja and Jos was conducted. Data, including clinical indications, treatment outcomes, and infertility-related variables, were extracted from patient records spanning six years. Descriptive statistics and comparative analyses were employed to examine trends and identify significant factors affecting IVF success. ***Results:*** The study revealed a notable increase in IVF cases, with Abuja Hospital showing a surge from 503 cases in 2018 to 1,665 in 2022. Success rates varied, with Abuja Hospital achieving a 94% success rate in 2021. Male infertility was a primary cause of IVF failure, and multiple pregnancies were common, especially in 2022, with 974 multiple pregnancies out of 1,552 successful IVF treatments at Abuja North Hospital. ***Conclusion:*** The findings demonstrate growing demand for IVF services in Nigeria, with a high incidence of multiple pregnancies. These trends highlight the need for improved embryo selection and management protocols. This study provides valuable insights for optimizing IVF practices and improving patient outcomes in Nigeria.

Keywords: In Vitro Fertilization, infertility, assisted reproductive technology, IVF success rates, multiple pregnancies, management protocols, patient outcomes

1. Introduction

The burden of infertility is particularly heavy in low- and middle-income countries (LMICs), where cultural and societal pressures often link reproductive success with personal and familial fulfillment (Inhorn & Patrizio, 2015). Current global estimates suggest that infertility affects approximately 48 million couples and 186 million individuals worldwide (WHO, 2020), with sub-Saharan Africa shouldering a disproportionate part of this burden.

In this region, the most common causes of infertility include infections of the genital tract and sexually transmitted infections, which account for a significant proportion of both male and female infertility cases (Ombelet *et al*., 2020). Male infertility is frequently attributed to low sperm count, impaired sperm motility, or abnormal sperm morphology (WHO, 2020), while female infertility may result from ovulatory disorders, tubal blockages, uterine abnormalities, or endocrine dysfunctions (Koster-Oyekan, 1999; Ekwuazi *et al*., 2022). Beyond the biological causes, access to infertility care in Nigeria remains hampered by poor documentation,

limited public health infrastructure, and a high reliance on expensive private facilities (Owolabi *et al*., 2021).

Assisted Reproductive Technology (ART), particularly In Vitro Fertilization (IVF), has emerged as a transformative tool in addressing infertility. IVF involves fertilizing an ovum with sperm outside the human body, followed by embryo transfer into the uterus (Murtaza *et al*., 2019). Since the birth of the first IVF baby, Louise Brown, in 1978, IVF has become increasingly utilized across various global regions, including Africa. IVF now offers hope even in severe male factor infertility (Bungum *et al*., 2021). IVF has proven particularly useful in cases where infertility stems from tubal disease, endometriosis, ovulatory dysfunction, advanced maternal age, or idiopathic factors (Macklon & Fauser, 2004).

Despite its promise, IVF utilization in Nigeria is limited by high costs, lack of insurance coverage, variable clinical success rates, and inadequate health information systems (Okafor *et al*., 2023). Many IVF clinics in Nigeria operate privately, often without standardized documentation and follow-up data, making it difficult to evaluate trends, outcomes, or optimize protocols. In many cases, couples who fail to conceive following IVF experience emotional and financial distress, which could further undermine their trust in ART services.

This study addresses a critical gap in local evidence by conducting a multi-center retrospective analysis of IVF trends and clinical outcomes in selected fertility centers in Abuja and Jos, Nigeria, between 2016 and 2022. These two cities are key hubs for assisted reproductive care in North-Central Nigeria. By systematically reviewing records from multiple centers, this study aims to provide a comprehensive profile of patients accessing IVF, understand and assess success rates and challenges encountered during treatment.

This research is significant in several respects. First, it contributes to the limited empirical data on IVF trends and outcomes in Nigeria, a context where infertility is heavily stigmatized, and ART remains inaccessible to many. Second, by offering multicenter data over a six-year period, the study enhances the reliability of its findings and offers a foundation for benchmarking IVF practices across the country.

2. Materials and Methods

2.1 Study Area

This retrospective study was conducted in selected tertiary health facilities within the Federal Capital Territory (FCT), Abuja, and Jos, Plateau State, Nigeria. In Abuja, data were obtained from one IVF hospital in Abuja North, and one in Abuja South. In Jos, data were collected also from one IVF facility in Jos North and one in Jos South respectively.

2.2 Sample Size

A total of 26,233 medical records of couples who sought in vitro fertilization (IVF) treatment between 2016 and 2022 were reviewed across the selected hospitals. Of these, 14,590 records were retrieved from facilities in Jos, while 11,643 records were obtained from the hospitals in Abuja.

2.3 Data Collection Procedure and Technique

Data were retrospectively extracted from patient case folders over a period spanning 5 to 7 years using a pre-designed proforma sheet. Information was collected daily from the case records and included clinical indications for IVF, outcomes of treatment, and relevant demographic and etiological variables. Specific variables recorded included the number of IVF failures categorized by cause (e.g., male factor, female factor, or genetic causes), as well as the frequency and percentage distribution of associated risk factors contributing to infertility in both male and female patients.

2.4 Data Analysis

Data were entered and analyzed using Microsoft Excel 2016. Descriptive statistics were applied to determine frequencies and percentages, which were illustrated using bar charts. Comparative analyses were performed to explore correlations between IVF indications, outcomes, and associated risk factors across the two study locations. All findings were presented in tabular form for clarity and interpretation.

2.5 Ethical Considerations

Ethical approval for the study was obtained from the University Research Ethics Committee. Approvals were also obtained from the heads of IVF departments in all participating hospitals. Patient confidentiality and anonymity were strictly maintained throughout the study, and all data were handled in compliance with ethical standards for research involving human subjects.

3. Results

3.1 Number of IVF Cases Across the Selected Hospitals in Abuja and Jos

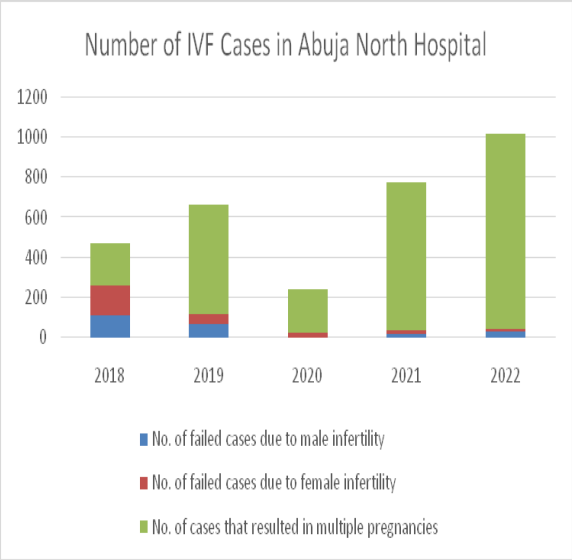
Figure 1 (A – D) shows the data from four hospitals across Abuja and Jos spanning 2016 – 2022. The Data reveal several key insights into the frequency, success rates, and outcomes of IVF treatments in these regions. The

number of IVF cases across the hospitals fluctuated yearly, with Abuja North hospital showing a significant increase in the number of IVF cases from 503 in 2018 to 1665 in 2022. This reflects a marked rise in IVF demand, potentially due to improved awareness, accessibility, and advancements in fertility treatments. The success rates also varied, with a high success rate in 2021, where 899 out of 957 IVF attempts were successful, resulting in a success rate of approximately 94%. Similarly, Abuja South hospital also showed fluctuations in case numbers, with a peak in 2021 at 1559 cases, and a steady success rate across the years, particularly in 2016 and 2017. The two hospitals from Jos North and South respectively had a steady flow of IVF cases over the years, with Jos North hospital showing a marked rise in successful cases in 2022.

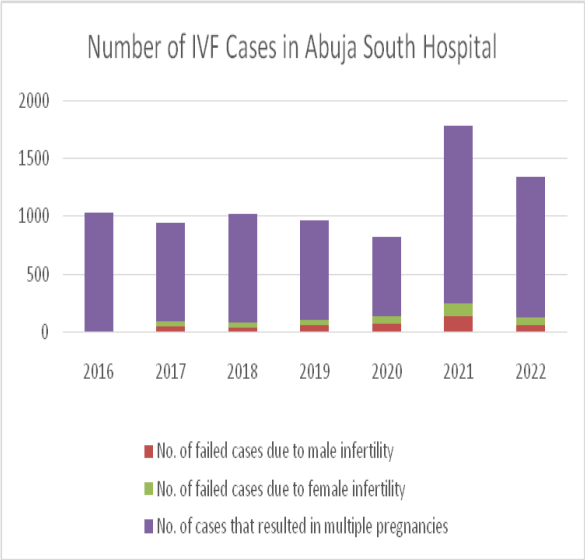
The analysis of failed cases revealed that male infertility contributed significantly to the failures across the hospitals. Abuja North Hospital in 2018 had 109 cases attributed to male infertility. Similarly, Abuja South Hospital had a notable proportion of failed cases due to male infertility, particularly in 2021 with 131 failed cases. On the other hand, female infertility was also a major contributing factor, with Abuja North Hospital reporting 150 failed IVF cases in 2018 due to female infertility. This trend was consistent across other hospitals as well, highlighting the multifactorial nature of infertility and the need for targeted interventions.

Another significant observation was the occurrence of multiple pregnancies in successful IVF cases. Abuja North Hospital reported a substantial number of multiple pregnancies in 2022, with 974 cases out of 1552 successful IVF treatments, reflecting the higher likelihood of multiple births associated with IVF treatments, especially when multiple embryos are implanted. This trend was observed across other hospitals as well, with Jos South hospital showing 1201 multiple pregnancies out of 1284 successful IVF cases in 2022.

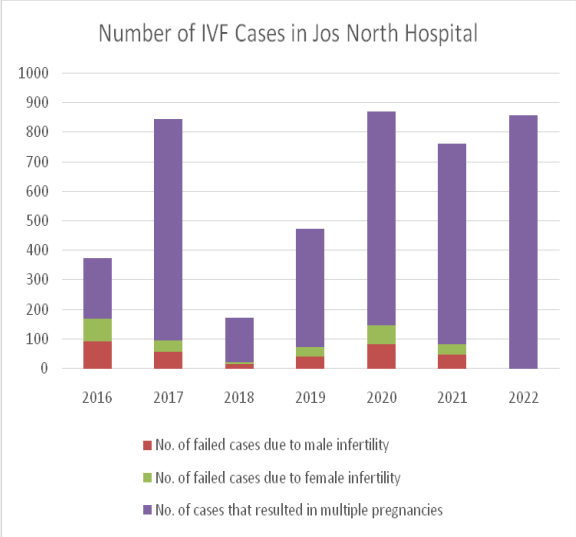
The data illustrates that IVF success rates across the hospitals are generally high, though variations exist due to factors such as male and female infertility issues and the occurrence of multiple pregnancies. The rising number of IVF cases, particularly in the Abuja hospitals, indicates an increasing demand for fertility treatments, which may be driven by greater awareness and improved technologies.

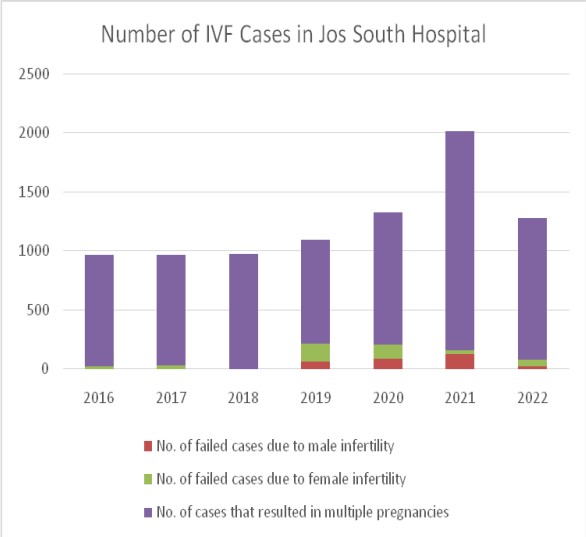


A. Abuja North Hospital



B. Abuja South Hospital





C. Jos North Hospital D. Jos South Hospital

Figure 1 (A – D). Simple Bar Charts showing the Number of IVF Cases across the Selected Hospitals

3.2 Comparison of Number of IVF Cases Across the Selected Hospitals

The comparison of in-vitro fertilization (IVF) cases across selected hospitals in the Federal Capital Territory (Abuja) and Jos, Plateau State is presented in Table 1. No significant differences were observed in the total number of IVF cases, the number of successful IVF cases, or the number of fetuses for successful cases across the hospitals, as indicated by the *P*-values (0.706, 0.577, and 0.227, respectively). Also for failed IVF cases due to male or female infertility, no significant differences were observed, with *P*-values of 0.762 and 0.624, respectively.

A statistically significant difference ($P = 0.014$) was observed in the number of cases that resulted in multiple pregnancies, with Abuja South hospital reporting notably higher rates (1014±108) compared to Abuja North and Jos North hospitals. This suggests that while the overall IVF success rates and failures due to infertility factors were similar across the hospitals, there is a distinct difference in the prevalence of multiple pregnancies.

This result highlights that while the total number of IVF cases and success rates are comparable, the incidence of multiple pregnancies stands out as a significant variable, especially in the Abuja South hospital, which may be attributed to differences in treatment approaches or patient selection criteria.

Table 1. Showing the Total Number of IVF Cases across Hospitals Compared on One – Way ANOVA

	HOSPITAL			**F**	***P* - value**
	Abuja North Hospital	**Abuja South Hospital**	**Jos North Hospital**		
No. of IVF Cases	874±225	1039±108	907±126	.356	.706
No. of Successful IVF Cases	749±232	924±95	824±122	.569	.577
No. of Fetuses for Successful Cases	1609±489	1075±110	1717±250	1.627	.227
No. of Failed Cases due to Male Infertility	44±19	58±14	46±13	.277	.762
No. of Failed Cases due to Female Infertility	51±26	57±13	37±10	.486	.624
No. of Cases that Resulted in Multiple Pregnancies	538±148	1014±108*	538±107	5.683	.014

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

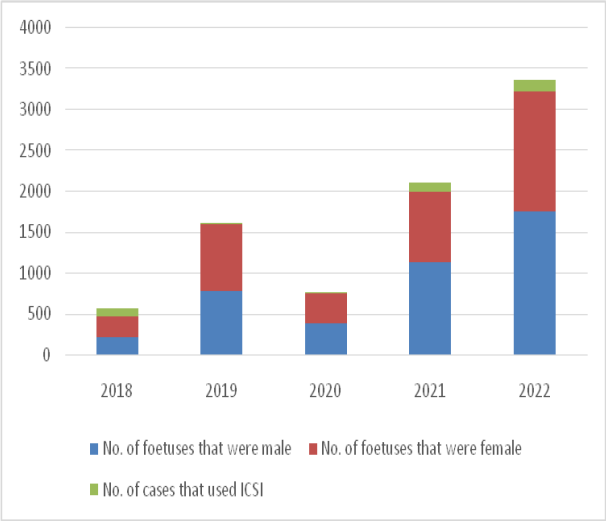
3.3 Number of Fetuses Across the Hospitals

The data on the number of fetuses across selected hospitals in the Federal Capital Territory (FCT), Abuja, and Jos, Plateau State as presented in Figure 2 (A – D), reveals trends in the distribution of male and female fetuses over a span of several years, as well as the use of intracytoplasmic sperm injection (ICSI) in these cases. At the hospital in Abuja North, the number of fetuses fluctuated considerably over the five years. In 2018, there were more female fetuses (258) than male fetuses (217), but by 2022, the trend reversed, with 1750 male fetuses and 1474 female fetuses. The use of ICSI was most prevalent in 2021 and 2022, with 112 and 137 cases, respectively, showing a marked increase in ICSI use during these years. At the hospital in Abuja South, the male and female fetus numbers were more balanced over the years. Notably, in 2016 and 2017, the number of male fetuses exceeded that of female fetuses, but this shifted in 2021, when the number of female fetuses (797) slightly exceeded male fetuses (790). The use of ICSI remained relatively low, with only a slight increase in 2020 and 2021.

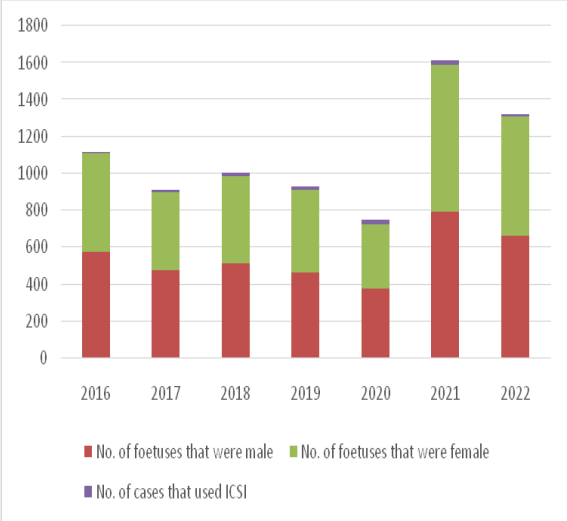
In the Jos North hospital, there was a notable shift in the distribution of male and female fetuses. In 2017, the hospital recorded a significantly higher number of female fetuses (1700) compared to male fetuses (1200). However, in subsequent years, the number of male fetuses steadily increased, especially in 2022 when 1327 male fetuses were recorded compared to 773 female fetuses. Interestingly, ICSI was mostly used in 2020 (23 cases), and the number of cases involving ICSI dropped in the following years, with no reported use of ICSI in 2021 and 2022.

The hospital in Jos South showed a steady distribution of male and female fetuses, with a slight predominance of female fetuses in most years. In 2016 and 2020, the number of female fetuses (469 and 487) slightly outnumbered the male fetuses (415 and 453), whereas this trend slightly reversed in 2022. The use of ICSI in this hospital also exhibited an increasing trend, with the highest usage recorded in 2020 (19 cases) and consistently present use in subsequent years.

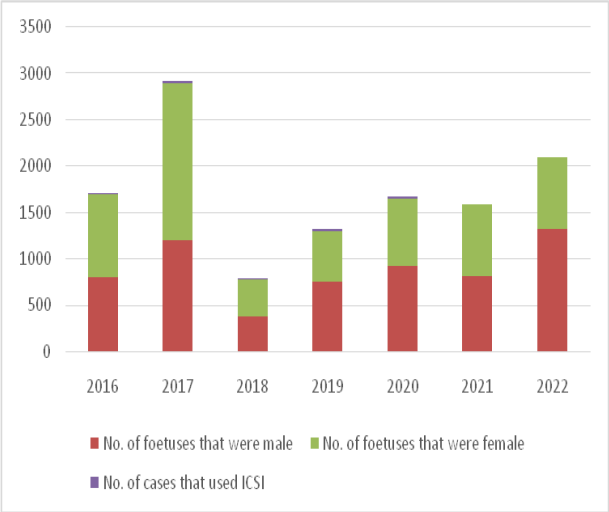
The data suggests an increasing tendency towards the use of ICSI in recent years, especially in Abuja North hospital, while the male-to-female fetus ratio varied by hospital. While Abuja North Hospital had a marked shift towards more male fetuses, other hospitals like Abuja South and Jos South Hospitals exhibited relatively balanced distributions.



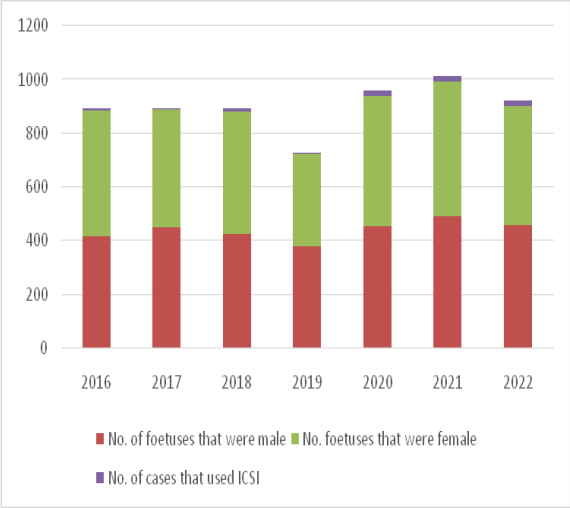
A. Abuja North Hospital



B. Abuja South Hospital



C. Jos North Hospital



D. Jos South Hospital

Figure 2 (A – D). Simple Bar Charts Showing the Number of Fetuses across the Selected Hospitals

3.4 Comparison of Number of Fetuses across the Selected Hospitals

The results presented in Table 2 shows comparison in the number of fetuses and the use of Intracytoplasmic Sperm Injection (ICSI) across the selected hospitals in Abuja and Jos. The findings showed no statistically significant difference in the number of male fetuses (P = 0.222) and female fetuses (P = 0.289) among the hospitals, suggesting that fetal gender distribution was relatively similar across the institutions.

There was a statistically significant difference in the number of cases that utilized ICSI (P = 0.002). The hospital in Abuja North recorded the highest mean number of ICSI cases (77±24), which was significantly higher compared to Abuja South Hospital (16±3) and Jos North Hospital (12±4). This implies that Abuja North Hospital may have a higher preference or indication for ICSI, possibly due to more complex infertility cases or different treatment protocols.

This result implies that, while fetal sex ratios were comparable across hospitals, significant variation existed in the application of ICSI, highlighting differences in clinical practices or patient demographics between the centers.

Table 2. Showing the Total Number of Fetuses across Hospitals Compared on One – Way ANOVA

	HOSPITAL			**F**	***P* - value**
	Abuja North Hospital	**Abuja South Hospital**	**Jos North Hospital**		
Number of fetuses that were male	854±275	551±53	885±118	1.654	.222
Number of fetuses that were female	755±215	525±58	833±157	1.341	.289
Number of cases that used ICSI	77±24*	16±3	12±4	9.191	.002

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

4. Discussion

The analysis of in-vitro fertilization (IVF) cases and their associated outcomes across the selected hospitals in Abuja and Jos provides a comprehensive understanding of fertility treatment dynamics in Nigeria between 2016 and 2022. The data presented highlights both trends and variations in the demand for IVF services, treatment success rates, and the incidence of multiple pregnancies and fetuses.

The significant increase in the number of IVF cases, particularly at the hospital in Abuja North, from 503 in 2018 to 1665 in 2022, underscores a growing demand for fertility treatments in the region. This increase could be attributed to several factors, including greater awareness of IVF as a viable option for infertility, improved accessibility to fertility clinics, and advancements in reproductive technologies. A similar upward trend in IVF demand has been observed in other regions of sub-Saharan Africa, particularly in urban centers, reflecting a

global shift towards more advanced fertility treatments (Akinola *et al*., 2021). The consistent success rates at Abuja North hospital, especially in 2021, with a success rate of 94%, further supports the idea that advancements in IVF technologies and better clinic facilities contribute to better outcomes.

The success rates varied slightly between the hospitals, but generally, the rates were high across the board. The hospital in Abuja South, for example, exhibited fluctuations in case numbers, peaking in 2021 with 1559 IVF cases, yet maintaining a steady success rate in the years under review. This is consistent with global reports, which suggest that while IVF success rates are generally high in specialized hospitals, individual success is influenced by various factors, including the clinic's experience, technology, patient demographics, and underlying infertility issues (Zhou *et al*., 2022). The success rate at Abuja North hospital, particularly in 2021, aligns with the findings of recent studies that show high success rates in well-established IVF centers with advanced laboratory techniques, including cryopreservation and genetic screening (Yin *et al*., 2022).

A particularly striking finding was the high number of multiple pregnancies, especially at the Abuja North hospital, where 974 out of 1552 successful IVF treatments in 2022 resulted in multiple pregnancies. This trend is consistent with global studies that indicate a higher likelihood of multiple births following IVF, particularly when multiple embryos are implanted (Liu *et al*., 2022). The trend of multiple pregnancies, though an expected outcome of certain IVF practices, raises concerns regarding maternal and fetal health risks. Recent studies highlight the importance of reducing the incidence of multiple pregnancies through better embryo selection practices and single embryo transfers (Jiang *et al*., 2021). When comparing IVF case numbers across hospitals in Abuja and Jos, no significant differences were found in terms of total IVF cases, successful IVF cases, or failed cases due to infertility factors. This suggests a consistency in the availability and utilization of IVF services across the hospitals in both cities. However, a statistically significant difference was observed in the occurrence of multiple pregnancies, with the hospital from Abuja South reporting notably higher rates than the other hospitals. This could be due to differences in treatment protocols, such as the number of embryos transferred, patient selection, or clinic-specific practices that emphasize higher embryo transfer rates. A similar study by Zhang *et al*. (2022) also found variations in multiple pregnancy rates across IVF centers, often attributable to differences in patient management protocols and clinic-specific practices.

The data on the number of fetuses in successful IVF cases indicates a shift in the male-to-female fetus ratio over the years, particularly at Abuja North hospital, where the number of male fetuses outnumbered female fetuses by 2022. This shift, however, was not observed at other hospitals, where the ratio remained more balanced. Similar trends in sex ratios have been observed in other IVF studies, with some suggesting that sex selection, often influenced by clinic practices and patient preferences, could account for such imbalances (Zhao *et al*., 2021). The data from the hospital in Abuja North also showed an increased use of Intracytoplasmic Sperm Injection (ICSI), particularly in 2021 and 2022, reflecting a growing preference for ICSI in complex infertility cases. This increase in ICSI use is consistent with global trends, where ICSI has become a preferred method for male infertility cases due to its success in overcoming male-related infertility issues (González *et al*., 2020). While the distribution of male and female fetuses was relatively similar across the hospitals, a significant variation was noted in the use of ICSI. The Abuja North hospital had the highest number of ICSI cases, which is consistent with findings from other studies where higher rates of ICSI are associated with more complex infertility cases, including male infertility (Stojanov *et al*., 2021). The findings from the current study align with these studies, suggesting that the major female infertility conditions are consistently observed across different regions in Nigeria.

5. Conclusion

This study shows a marked increase in IVF demand, especially at Abuja North hospital, reflecting growing awareness and improved access to fertility services. Findings underscore the growing incidence of multiple pregnancies, especially at Abuja North hospital, highlighting the need for improved embryo selection practices. These insights provide valuable information for improving IVF practices and patient care, emphasizing the need for tailored treatments and better management protocols.

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