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**Research Paper**

# Polycystic ovary syndrome and infertility in niger state, nigeria: challenges, outcomes, and early intervention

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**ABSTRACT**

**Background:** Polycystic Ovary Syndrome (PCOS) is among the most common endocrine diseases which affect women of reproductive age and causes infertility in women across the globe. The complexity of diagnosis and lack of regional data pose current difficulties to successful clinical management especially within sub-Saharan Africa.
**Objective:** To investigate the diagnostic issues, clinical presentation, and treatment outcome of women diagnosed with PCOS in Niger state, Nigeria.
**Methods:** A prospective study was carried out among 47 women who had PCOS based on the Rotterdam diagnostic criteria. Clinical features such as menstrual irregularity, obesity and infertility were reported. The modalities of treatment and the reproductive outcome thereof were compared and contrasted among the participants of the study.
**Results:** The study population had a high correlation with PCOS and infertility. Clinical manifestations that were most commonly reported were irregular menstrual cycles and obesity. Out of the treatment options, the use of the combination of Clomiphene Citrate and Metformin showed the greatest success rate of pregnancy as opposed to the other treatment options.
**Conclusion:** PCOS is a major cause of infertility in women of reproductive age in Nigeria, in particular in Niger State. The early identification of the situation with the help of standardized criteria and personalized treatment plans, especially combined Clomiphene Citrate and Metformin treatment, are essential to enhance the reproductive functioning in this group of people. These results suggest that clinical guidelines tailored to different regions and greater awareness of PCOS management in Nigeria are in order.

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## 1. INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is recognized as the most prevalent endocrine disorder among women of reproductive age, affecting approximately 6-12% of women globally [1]. This condition is characterized by a combination of hyperandrogenism, ovulatory dysfunction, and polycystic ovaries, which contribute to a broad spectrum of symptoms [2]. These symptoms often include irregular menstrual cycles, excessive hair growth, acne, and obesity. Among the most troubling manifestations of PCOS is its strong association with infertility, particularly due to anovulation the absence of ovulation which makes conception difficult for affected women [3]. In Nigeria, as in many parts of the world, PCOS poses a significant health challenge, exacerbated by limited access to healthcare resources and specialized treatment [4].

The link between PCOS and infertility is well-established, with PCOS being one of the leading causes of an ovulatory infertility worldwide [5], [6]. Women with PCOS often experience hormonal imbalances that disrupt the normal ovulatory cycle, making it difficult for them to conceive naturally. Elevated androgen levels in women with PCOS contribute to this disruption, leading to the formation of multiple small cysts in the ovaries that further hinder ovulation [7]. Additionally, insulin resistance, commonly associated with PCOS, exacerbates hyperandrogenism, creating a vicious cycle that further impairs reproductive function. For many women, the inability to conceive results in significant emotional and psychological stress, impacting their overall well-being and quality of life.

In Nigeria, the burden of PCOS-related infertility is particularly pronounced due to inadequate healthcare infrastructure, cultural stigmas associated with infertility, and limited awareness about the condition [8]. Many Nigerian women with PCOS are often undiagnosed or misdiagnosed, leading to delays in treatment and prolonged suffering [9]. The emotional toll of infertility is further magnified by societal pressures and expectations regarding childbearing, placing an additional strain on affected women [10]. This highlights the critical need for increased awareness and better diagnostic practices to identify and manage PCOS more effectively in Nigeria.

Despite the global prevalence of PCOS, research on this condition remains relatively underdeveloped, especially in the context of infertility [11]. In Nigeria, the lack of comprehensive studies and data on PCOS has hindered the development of effective treatment strategies tailored to the specific needs of Nigerian women [12]. This gap in research is concerning, given the significant impact that PCOS has on women's health and fertility. Understanding the mechanisms by which PCOS leads to infertility is essential for developing targeted interventions that can improve reproductive outcomes and overall health for women with this condition [13].

This study seeks to address the research gap by investigating the pathophysiology, diagnostic challenges, and treatment outcomes associated with PCOS-related infertility in Nigeria. By exploring the underlying mechanisms of PCOS, the study aims to provide insights into how this condition disrupts reproductive function and contributes to infertility. Additionally, the study will evaluate the effectiveness of current diagnostic criteria and practices in predicting infertility among women with PCOS, with the goal of improving early detection and intervention strategies.

Another key focus of the study is to assess the outcomes of various treatment strategies for infertility in women with PCOS in Nigeria. Given the diverse range of treatment options available, including lifestyle modifications, medication, and assisted reproductive technologies, it is crucial to understand which approaches are most effective in the Nigerian context [14]. The findings from this study are expected to inform clinical practices and guide healthcare providers in offering more personalized and effective care for women with PCOS-related infertility.

## 2. RELATED WORK

Research into Polycystic Ovary Syndrome (PCOS) and its impact on infertility has steadily increased over the past decade. Globally, PCOS is recognized as a leading cause of an ovulatory infertility, with hormonal imbalances such as hyperandrogenism and insulin resistance disrupting normal ovulation and contributing to reproductive challenges [3], [5]. Studies have highlighted the complex pathophysiology of PCOS, particularly its effects on ovulatory dysfunction, and emphasized the importance of early diagnosis and intervention [2], [5]. However, while these studies provide valuable insights, research focusing on sub-Saharan Africa, especially Nigeria, remains limited. The lack of population-specific studies has hindered the development of tailored treatment strategies for Nigerian women suffering from PCOS-related infertility [4].

In Nigeria, the few available studies [4], [10] reveal a high prevalence of infertility in women with PCOS, with obesity and insulin resistance exacerbating reproductive dysfunction [4], [10]. These findings align with global research but also highlight unique challenges in diagnosis and treatment within the Nigerian context, such as limited healthcare access and cultural stigmas associated with infertility. While treatment strategies like Clomiphene Citrate and Metformin remain the first line of therapy for PCOS-related infertility worldwide [7], more research is needed to explore the effectiveness of these treatments in Nigerian populations and to address issues like low compliance with lifestyle interventions, as noted by studies in other regions [11].

## 3. METHODOLOGY

This study was conducted prospectively on 47 women diagnosed with PCOS between March 16, 2022, and January 31, 2023, at the Ibrahim Babangida Specialist Hospital and El Hussain Specialist Hospital, both in Niger State, Nigeria. These centers are equipped to provide comprehensive diagnostic and treatment services for women with PCOS. The study adopted the Rotterdam criteria for diagnosing PCOS, which requires the presence of at least two out of the following three criteria:

1. Oligo or anovulation.
2. Clinical and/or biochemical signs of hyperandrogenism.
3. Polycystic ovaries on ultrasound.

Women presenting with infertility or menstrual disorders were enrolled in the study. A detailed history was obtained, and physical examinations were conducted. Diagnostic investigations included hormonal assays, transvaginal ultrasound, and, where necessary, hysterosalpingography or laparoscopy. Men were evaluated with semen analysis when indicated.

Women were categorized based on their clinical presentation into three groups:

- **Anovulatory Infertility Only:** Patients who presented with infertility without other significant factors.
- **Combined Factor Infertility:** Patients with both anovulatory infertility and additional factors like tubal or male infertility.
- **Menstrual Disorders Only:** Patients who presented with menstrual irregularities but were not seeking pregnancy.

## 4. RESULTS AND DISCUSSION

A total of 47 women were diagnosed with PCOS. The analysis was performed using descriptive statistics.

Figure 1 presents the age distribution of 47 women diagnosed with Polycystic Ovary Syndrome (PCOS). The largest proportion of women (53.2%) are in the 25-34 age group, a period typically regarded as prime reproductive years. A smaller percentage (21.3%) are in the 15-24 age group, while 25.5% of the women are between 35 and 44 years old. This distribution suggests that most women with PCOS seek

medical attention for reproductive concerns primarily in their late twenties to early thirties, likely due to heightened awareness of fertility challenges during this period.

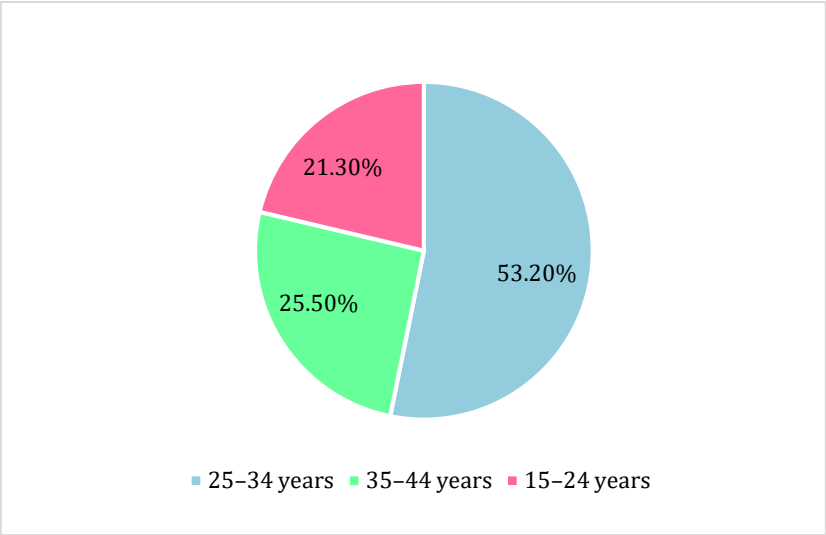


Figure 1. Age Distribution of Women with PCOS

Table 1. Clinical and Biochemical Features of PCOS among Study Population

| Clinical/Biochemical Feature | Number | Percentage |
|---|---|---|
| Infertility | 39 | 83.0 |
| LH/FSH Ratio > 2 | 18 | 38.3 |
| Hyperprolactinemia | 15 | 31.9 |
| Elevated Testosterone (Biochemical Hyperandrogenism) | 9 | 19.1 |
| Oligomenorrhea | 34 | 72.3 |
| Obesity (BMI > 25 kg/m$^2$) | 22 | 46.8 |
| Acne | 14 | 29.8 |
| Hirsutism | 16 | 34.0 |

Table 1 presents the clinical and biochemical features observed among the 47 women diagnosed with Polycystic Ovary Syndrome (PCOS) in the study. A significant majority of the women (83.0%) presented with infertility, highlighting the common association between PCOS and reproductive challenges. Oligomenorrhea was also prevalent, affecting 72.3% of the women, which aligns with the hormonal imbalances typically seen in PCOS. Obesity, defined as a BMI greater than 25 kg/m$^2$, was present in nearly half of the study population (46.8%), underscoring the frequent metabolic disturbances associated with this syndrome.

In terms of biochemical features, an elevated LH/FSH ratio was observed in 38.3% of the women, while hyperprolactinemia was found in 31.9%. Biochemical hyperandrogenism, indicated by elevated testosterone levels, was detected in 19.1% of the patients. Additionally, clinical signs of hyperandrogenism, such as hirsutism and acne, were present in 34.0% and 29.8% of the women, respectively. These findings collectively illustrate the diverse clinical and biochemical manifestations of PCOS, emphasizing the importance of a comprehensive diagnostic approach in managing this condition.

The Figure 2 above presents the outcomes of different treatment modalities among 39 women with PCOS, who specifically sought treatment for infertility. The most common treatment was Clomiphene Citrate alone, used by 18 women (46.2%), which resulted in a pregnancy rate of 33.3%. Clomiphene Citrate combined with Metformin was used by 10 women (25.6%), yielding a higher pregnancy rate of 50.0%. Gonadotropins (HMG) were used by 6 women (15.4%) and showed a pregnancy rate of 33.3%. Finally, ovarian drilling was performed on 5 women (12.8%), with a pregnancy rate of 40.0%. Overall, 15 out of the 39 women (38.5%) who underwent these treatments achieved pregnancy.

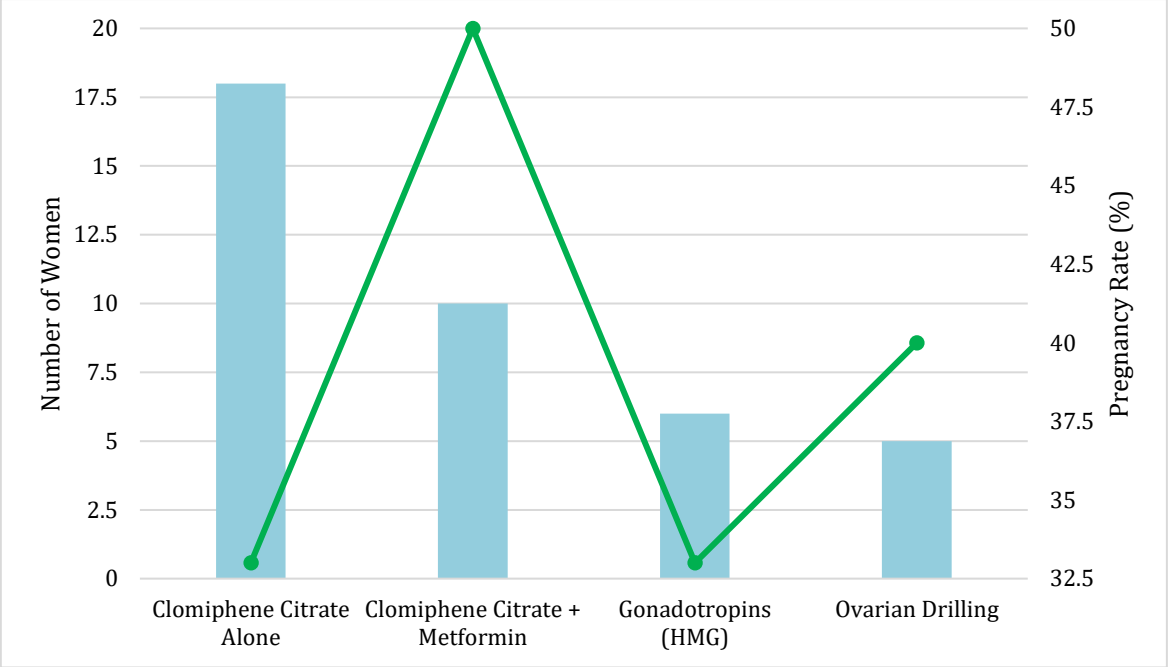


Figure 2. Treatment Modalities and their Outcomes among Women with PCOS

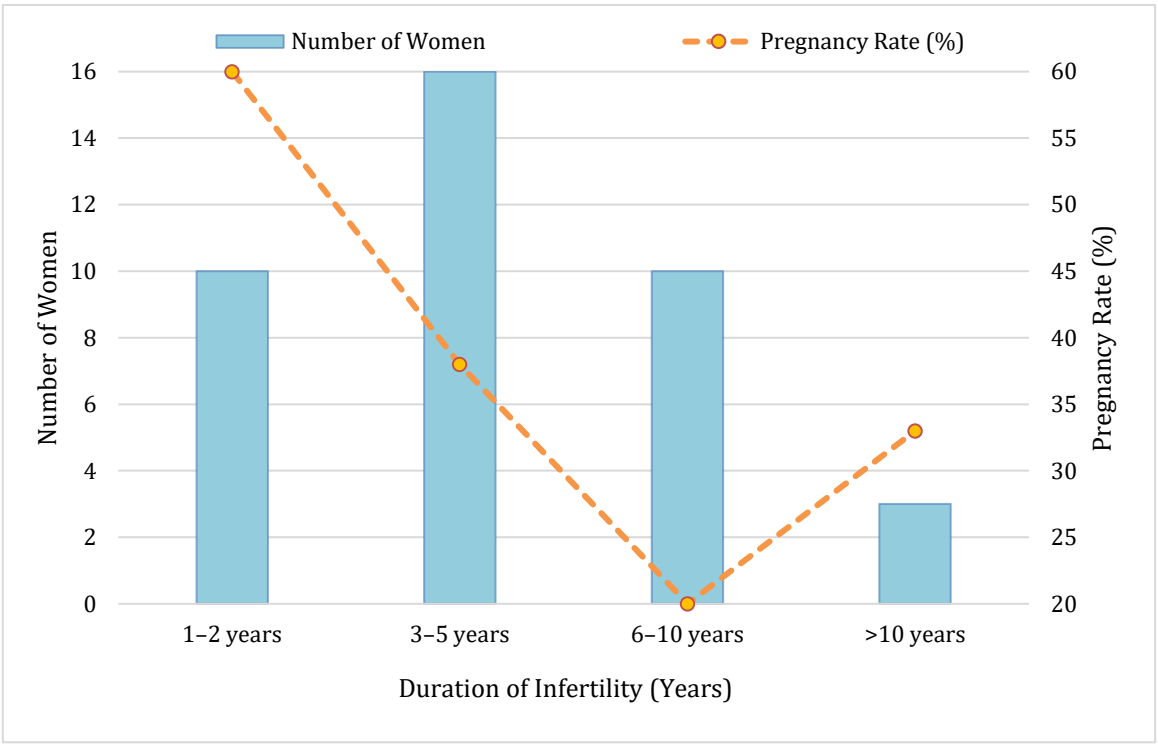


Figure 3. Duration of Infertility and Success of Treatment of Women with PCOS

Figure 3 presents the relationship between the duration of infertility and the success of treatment among 39 women with PCOS who received treatment. The majority of these women (41.0%) had experienced infertility for 3-5 years, with a corresponding pregnancy rate of 37.5%. Women with the shortest duration of infertility (1-2 years) showed the highest pregnancy success rate at 60.0%, which emphasizes the potential benefit of early intervention. In contrast, women who had been infertile for 6-10 years had a lower success rate of 20.0%, and those with infertility lasting over 10 years saw a moderate success rate of 33.3%.

Table 2. Compliance with Adjunctive Treatments and Impact on Pregnancy

| Adjunctive Treatment | Number Offered | Compliance Rate (%) | Pregnancy Rate (%) |
|---|---|---|---|
| Weight Reduction Counselling | 25 | 40.0% | 7 (70.0%) |
| Metformin | 15 | 66.7% | 8 (53.3%) |
| Dexamethasone | 12 | 50.0% | 4 (33.3%) |
| Total | 52 | 52.2% | 19 (36.5%) |

The Table 2 illustrates the outcomes of adjunctive treatments provided to women with PCOS, focusing on the number of patients offered each treatment, their compliance rates, and the resulting pregnancy rates. Weight reduction counseling was offered to 25 women, with a compliance rate of 40.0% and a notably high pregnancy rate of 70.0% among those who complied. Metformin, provided to 15 women, had a higher compliance rate of 66.7% and resulted in a pregnancy rate of 53.3%. Dexamethasone, offered to 12 women, showed a 50.0% compliance rate, but the pregnancy rate was lower at 33.3%. Overall, across all adjunctive treatments, the average compliance rate was 52.2%, leading to a cumulative pregnancy rate of 36.5%. This suggests that higher compliance with adjunctive treatments may enhance the chances of conception in women with PCOS.

## Discussion

The findings of this study provide key insights into the clinical, biochemical, and treatment aspects of Polycystic Ovary Syndrome (PCOS), reaffirming its complex, multifactorial nature [15]. Most women diagnosed with PCOS were aged 25-34, a time when reproductive concerns often emerge. This highlights the importance of earlier diagnosis and intervention to prevent complications such as infertility and metabolic issues [16]. Awareness campaigns targeting younger women and healthcare professionals could improve early detection.

The prevalence of infertility (83.0%) and oligomenorrhea (72.3%) among women with PCOS is well-aligned with established research linking these symptoms to the hormonal imbalances' characteristic of PCOS [17]. The high rate of obesity (46.8%) observed in this cohort further underscores the relationship between PCOS and metabolic dysfunction, as obesity exacerbates insulin resistance and negatively impacts reproductive function. Addressing obesity through lifestyle interventions remains critical, not only for improving reproductive outcomes but also for reducing long-term risks such as diabetes and cardiovascular disease.

Treatment modalities for PCOS-related infertility in this study largely reflect current clinical practices, where Clomiphene Citrate remains the first-line therapy [18]. The observed pregnancy rates of 33.3% with Clomiphene alone and 50.0% when combined with Metformin suggest that combination therapy may offer superior outcomes, particularly in women with insulin resistance, as previous studies have demonstrated. However, the limited success with gonadotropins (33.3%) and ovarian drilling (40.0%) reflects the ongoing challenge in treating Clomiphene-resistant PCOS. Ovarian drilling, though effective in some cases, carries surgical risks and is often reserved for women who fail to respond to pharmacological treatments. These findings support the need for further research into more personalized treatment strategies for Clomiphene-resistant patients, including novel pharmacological agents or combinations tailored to individual metabolic and hormonal profiles.

The relationship between the duration of infertility and pregnancy success observed in this study highlights an important clinical consideration. Women with a shorter duration of infertility (1-2 years) had the highest pregnancy success rates, while success diminished as the duration of infertility increased. This finding supports the importance of early intervention, as prolonged untreated infertility can negatively affect outcomes. It also suggests that clinicians should adopt a proactive approach when managing PCOS-related infertility, initiating treatment earlier to improve the likelihood of conception.

Compliance with adjunctive treatments, particularly weight reduction counseling, was another notable finding. While only 40.0% of women adhered to weight reduction recommendations, those who did achieved the highest pregnancy rates (70.0%). This underscores the critical role of lifestyle modification in managing PCOS, not only for improving metabolic health but also for enhancing fertility outcomes. The

relatively low compliance with weight reduction counseling and other adjunctive treatments, such as Metformin and Dexamethasone, highlights a challenge in the long-term management of PCOS. Future research should explore strategies to improve adherence, such as integrating behavioral therapy, patient education, and regular follow-up support.

While this study provides valuable insights into PCOS management, there are several limitations that should be considered. The relatively small sample size limits the generalizability of the findings, and the study's cross-sectional nature does not allow for the assessment of long-term outcomes. Furthermore, while the study focused on women who actively sought medical attention, many women with PCOS remain undiagnosed, particularly those with milder symptoms or metabolic presentations. This may introduce selection bias, as the sample may not fully represent the broader PCOS population. Future studies should aim to include larger and more diverse populations to better understand the full spectrum of PCOS and its varying clinical manifestations. Continued research into personalized treatment options and strategies to enhance patient compliance will be critical for advancing the care of this complex and prevalent condition.

## 5. CONCLUSION

This study emphasizes the significance of individualized treatment approaches for women diagnosed with Polycystic Ovary Syndrome (PCOS). The research highlights that early and timely intervention, particularly in cases where the duration of infertility is shorter, is crucial for improving pregnancy outcomes. The combination therapy of Clomiphene Citrate and Metformin demonstrated notable efficacy in achieving successful pregnancies, underlining the importance of targeted medical treatments.

Moreover, the study underscores the necessity of patient compliance with adjunctive treatments, including weight reduction and the use of Metformin, as these factors play a vital role in enhancing reproductive success. Given the complex and multifaceted nature of PCOS, a holistic approach that considers both medical and lifestyle interventions is recommended for optimizing fertility outcomes. This approach should be tailored to the individual patient's clinical profile to address the diverse manifestations of PCOS effectively. Furthermore, the findings advocate for increased awareness and education among healthcare providers and patients regarding the benefits of early diagnosis and the adoption of comprehensive management strategies. By focusing on personalized treatment plans and encouraging adherence to prescribed therapies, there is potential to significantly improve the quality of life and reproductive health for women suffering from PCOS in Niger State, Nigeria, and beyond.

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### Author Contributions Statement

| Name of Author | C | M | So | Va | Fo | I | R | D | O | E | Vi | Su | P | Fu |
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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

### Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

### Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and approved by the relevant institutional authorities.

### Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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