**Hormonal Profiles in Primary Infertility: Evaluating AMH, LH, and Progesterone Levels in Women Attending a Tertiary Hospital in Abuja, Nigeria**

**Abstract**

**Background:** Infertility is a reproductive health issue affecting millions of couples worldwide, with women experiencing delayed childbirth into their late 30s.

**Methods:** This study measured levels of anti-Müllerian hormone (AMH), luteinizing hormone (LH), and progesterone (PRG) in 71 women with primary infertility and 71 fertile controls at the University of Abuja Teaching Hospital. Blood samples were collected at standard points in the menstrual cycle and tested using ELISA and CLIA methods.

**Results:** Lower AMH (1.85 ± 1.40 ng/ml vs. 3.52 ± 2.41 ng/ml; p<0.001) and PRG (11.44 ± 7.91 ng/ml was observed in women with primary infertility compare to control (13.65 ± 6.86 ng/ml; p=0.034). LH levels of both groups were similar. A moderate negative correlation was observed between age and AMH (r=–0.305, p<0.001).

**Conclusion:** Primary infertility may be associated with low AMH and PRG level among these women. These hormones should be included in routine infertility tests to support earlier diagnosis and tailored care.

**Keywords**: Primary infertility, AMH, LH, progesterone, ovarian reserve

**Introduction**: Infertility is a significant reproductive health challenge worldwide, affecting millions of couples and carrying substantial medical, psychological, and socioeconomic burdens. In Nigeria, infertility remains a common reason for gynecological consultations, with profound sociocultural consequences for affected women, including stigmatization, marital tension, and psychological distress (Panti and Sununu, 2014). The World Health Organization defines infertility as the inability to achieve pregnancy despite at least 12 months of regular, unprotected sexual intercourse (WHO, 2020). Clinically, it is classified into primary infertility, where a woman has never conceived, and secondary infertility, where a woman who has previously conceived cannot do so again (Zegers-Hochschild et al., 2017).

Primary infertility is of particular concern in sub-Saharan Africa, including Nigeria, where cultural expectations strongly emphasize childbearing as a measure of a woman’s social status (Agarwal et al., 2021). This societal pressure can exacerbate emotional distress and delay timely medical evaluation. Limited access to advanced reproductive technologies and the high cost of treatment further constrain effective infertility management in Nigeria (Ombelet et al., 2008).

Multiple factors contribute to female infertility, including anatomical abnormalities, infections, genetic predisposition, environmental exposures, lifestyle factors, and hormonal imbalances (Sauer, 2021). Among hormonal factors, anti-Müllerian hormone (AMH), luteinizing hormone (LH), and progesterone play central roles in regulating ovarian function and fertility (Hagen et al., 2018). AMH, secreted by granulosa cells of growing ovarian follicles, serves as a sensitive biomarker of ovarian reserve and reproductive lifespan (Lukaszuk et al., 2014). Abnormal AMH levels can signal diminished ovarian reserve or disorders such as polycystic ovary syndrome (PCOS).

Luteinizing hormone, produced by the anterior pituitary gland, triggers ovulation and supports luteal function (Jeppesen et al., 2012). Disruptions in LH secretion patterns can lead to anovulation or luteal phase defects. Progesterone, synthesized by the corpus luteum after ovulation, prepares the endometrium for implantation and supports early pregnancy maintenance (Broer et al., 2014). Inadequate luteal progesterone production may compromise implantation and increase miscarriage risk.

An imbalance among these hormones may result in ovulatory dysfunction, inadequate luteal support, and ultimately, infertility (Maheshwari et al., 2008). Accurate evaluation of AMH, LH, and progesterone is thus crucial in the diagnostic workup of women with infertility, especially where invasive tests or assisted reproductive techniques are limited. While previous studies have examined these hormones in various populations, limited data exist on Nigerian women, highlighting the need for context-specific research (Panti and Sununu, 2014).

This study was conducted to assess serum levels of AMH, LH, and progesterone among women with primary infertility attending the University of Abuja Teaching Hospital in Abuja, Nigeria, and compare them to those of fertile controls. By providing localized hormonal data, the findings aim to contribute to improved diagnostic accuracy and individualized treatment strategies, ultimately enhancing reproductive outcomes for Nigerian women facing infertility.

**Materials and Method**

**STUDY DESIGN:** The study was a Cross-sectional study of confirmed pregnant women who consented to be part of the study, age and gender- was matched monitored visiting the antenatal clinic at university of Abuja teaching Hospital

**STUDY AREA:** This study was conducted in university of Abuja Teaching Hospital gwagwalada, Federal Capital Territory (FCT) Abuja, Gwagwalada is about 62 km away from the FCT. It is one of the settler’s towns of the FCT. The town is close to the Nnamdi Azikwe international air port along the Abuja –Lokoja Express way, it is located between latitude 8°55’ and 9°00’N and longitudinal 7°00’ and 7°05’E.

The centrality of this town in relation to other area councils’ headquarters makes it influential and important in various socio‑economic activities. The climate condition of this town is not far-fetched from that of the tropics having several climatic elements in common; most especially the wet and dry season characteristic. The temperature of the area ranges from 30°C to 38°C yearly, with the highest temperature experienced in the month of March and mean total rainfall of approximately 1650 mm/annum.

About 60% of this rain falls between the months of May to August. The area council is an industrial zone of FCT that stands out as the second most cosmopolitan city of the FCT, after the capital city with 10 political wards. These have brought about the inflow of people into the council. 75% of the residents live in close proximity with poor drainage system, several pot-holes on their streets and indiscriminate environmental dumpsites.

**Study Population:** Women of reproductive age (20–40 years) diagnosed with primary infertility (inability to conceive after 12 months of regular unprotected intercourse) attending the infertility clinic at the University of Abuja Teaching Hospital, Gwagwalada, were recruited between December 2024 and February 2025.

**Sample Size Determination:** The minimum sample size for this analytical cross-sectional study was determined using Fisher’s formula, as described by Ogbeibu (2014):

N = (Z² × P × q) / d²

Where:

N = the desired sample size

Z = the standard normal deviation (1.96 at 95% confidence level)

P = the estimated prevalence of primary infertility in women

q = 1 − P

d = the margin of error (typically 0.05)

The estimated prevalence of infertility among women in Nigeria is 3.9% (Mascarenhas *et al*., 2012). Substituting into the formula:

Z = 1.96

P = 0.039

q = 1 − 0.039 = 0.961

d = 0.05

N = (1.96)² × 0.039 × 0.961 / (0.05)²

= 3.8416 × 0.037479/ 0.0025

= 0.1434/ 0.0025

= 57.592

≈ 58

Na = n/1-r

Nadjustment (Na) = sample adjustment

n = initial sample size (58)

r = non response rate (18%)

Na = 58/1-0.18

= 58/0.82 = 70.7 ≈ 71

Thus, the final sample size for this study was rounded up to 71 participants.

**Selection Criteria**

**Inclusion Criteria:**Women aged 20–40 years,Diagnosed with primary infertility (for cases).Fertile women with at least one live birth and no history of infertility (for controls).

**Exclusion Criteria:** Known endocrine disorders (e.g., polycystic ovary syndrome, thyroid disorders).Chronic medical conditions (e.g., diabetes, hypertension).History of ovarian surgery or pelvic radiation.Use of hormonal contraceptives or fertility medications within the last three months.

**Blood Sample Collection and Processing**

Blood samples (5 mL) were collected between 8:00–10:00 AM into serum separator tubes (BD Vacutainer) on days 2–5 of the menstrual cycle for AMH and LH measurement, and on days 21–23 for progesterone, following standard venipuncture procedures. This timing reflects physiological baseline and luteal phase levels (Lee *et al*., 2010). Samples were allowed to clot, centrifuged, and serum aliquots were stored at −80°C until analysis within three months (Moolhuijsen and Visser, 2020).

**Analytical Methods**

Serum anti-Müllerian hormone (AMH) concentrations were measured using a validated enzyme-linked immunosorbent assay (ELISA) kit (Calbiotech Inc., USA), following the manufacturer’s instructions and as described (Lotierzo et al., 2021). Luteinizing hormone (LH) and progesterone levels were analyzed using the MAGLUMI 1000 plus automated chemiluminescence immunoassay analyzer (Snibe Diagnostic, Shenzhen, China). All assays were performed according to manufacturers’ protocols. Results were expressed in ng/mL for AMH and progesterone, and mIU/mL for LH. Quality control procedures were applied to ensure analytical reliability.

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**Statistical Analysis:** Data analysis was conducted using IBM SPSS Statistics, version 29. Descriptive statistics (means, standard deviations, and frequencies/percentages) were used to summarize demographic and clinical characteristics. Independent sample t-tests compared continuous hormone levels between the primary infertility group and the control group. Pearson’s correlation coefficient was used to evaluate the relationships between continuous variables, such as age and hormone levels. Chi-square (χ²) tests were used to evaluate associations between categorical variables (e.g., distribution of participant characteristics across groups). For cells with expected counts < 5, Fisher’s exact test was applied as appropriate. A p-value < 0.05 was considered statistically significant (IBM Corp., 2023)

**Result:** A total of 142 women participated in the study, comprising 71 women diagnosed with primary infertility and 71 age-matched fertile control women. All participants in both groups were female, representing 100% of the study population.

Table1. Participant

| Group | Total Participants | All Female (%) |
| --- | --- | --- |
| Primary Infertility Women | 71 | 100% |
| Fertile Control women | 71 | 100% |
| Total | 142 | 100% |

**Table 2** showing The age distribution of participants was categorized into four ranges: ≤25, 26–30, 31–35, and 36–40 years. In the primary infertility group, 8 participants (11.3%) were aged ≤25 years, 17 (23.9%) were 26–30 years, 25 (35.2%) were 31–35 years, and 21 (29.6%) were 36–40 years.  
Among the fertile control women, 8 (11.3%) were also aged ≤25 years, 21 (29.6%) were 26–30 years, 20 (28.2%) were 31–35 years, and 22 (31.0%) were 36–40 years.  
The overall age distribution was relatively balanced between the two groups, with the highest proportion of participants falling within the 31–35 year range (31.7%), followed by 36–40 years (30.3%).

**Table2. Age Distribution of the study participants**

| Age Range (Year) | Primary Infertility Women (n=71) | Fertile Control Women (n=71) | Total (n=142) |
| --- | --- | --- | --- |
| 20-25 | 8 (11.3%) | 8 (11.3%) | 16 (11.3%) |
| 26–30 | 17 (23.9%) | 21 (29.6%) | 38 (26.8%) |
| 31–35 | 25 (35.2%) | 20 (28.2%) | 45 (31.7%) |
| 36–40 | 21 (29.6%) | 22 (31.0%) | 43 (30.3%) |

**Table 3 showing** The mean age of women in the primary infertility group was 32.51 ± 4.86 years, while that of the control group was 33.27 ± 5.66 years. Statistical comparison using the independent t-test showed no significant difference in mean age between the groups (p = 0.38).  
However, when age was dichotomized into >35 years and ≤35 years, a Chi-square test revealed a statistically significant difference in distribution between the groups (p = 0.038), with an odds ratio (OR) of 0.59. This indicates that women with primary infertility were less likely to be over 35 years of age compared to the fertile controls.

**Table 3 Age Comparison Between Primary Infertility Women and Control Groups**

| Group | Sample Size (n) | Age (Mean ± SD) | p-value | Odds Ratio (Age >35) |
| --- | --- | --- | --- | --- |
| Primary Infertility | 71 | 32.51 ± 4.86 years | 0.38 | 0.59 |
| Control | 71 | 33.27 ± 5.66 years |  |  |

This table 4 presents the descriptive statistics (mean ± standard deviation) for age, luteinizing hormone (LH), progesterone (PRG), and anti-Müllerian hormone (AMH) levels in primary infertile women compared with fertile controls. Statistical comparisons between the groups were conducted using an independent samples t-test, with significance set at p < 0.05. AMH and PRG levels were significantly higher in the fertile control group (p < 0.001 and p = 0.034, respectively), while no statistically significant differences were observed in age and LH levels (p = 0.974 and p = 0.739, respectively).

**Table.4: Comparison of Mean Age, LH, Progesterone, and AMH Levels Between Primary Infertility Women and Fertile Controls**

| Parameters | Primary Infertility Women (n = 71) | Fertile Control Women (n = 71) | p-value (t-test) |
| --- | --- | --- | --- |
| Age (years) | 32.63 ± 4.78 | 32.66 ± 5.36 | 0.974 (NS) |
| LH (mIU/ml) | 8.65 ± 3.58 | 8.48 ± 3.43 | 0.739 (NS) |
| PRG (ng/ml) | 11.44 ± 7.91 | 13.65 ± 6.86 | 0.034 (Significant) |
| AMH (ng/ml) | 1.85 ± 1.40 | 3.52 ± 2.41 | <0.001 (Highly Significant) |

NS = Not Significant at p<0.05  
Note:  
Age is expressed in years. LH in mIU/ml. PRG = Progesterone, expressed in ng/ml. AMH = AntiMullerian Hormone, expressed in ng/ml.

Table 5 summarizes the Pearson correlation coefficients among key hormonal and age-related variables for the combined population of primary infertile and fertile control women. At a significance level of p < 0.05, a moderate and statistically significant negative correlation was observed between age and AMH levels. A weak but statistically significant positive correlation was also found between PRG and AMH. All other correlations were weak and not statistically significant at the p < 0.05 threshold.

**Table 5: Pearson Correlation Coefficients Between Age, LH, PRG, and AMH Across All Participants**

| Correlated Variables | Pearson r | p-value | Interpretation |
| --- | --- | --- | --- |
| Age vs AMH | -0.305 | <0.001 | Moderate negative correlation |
| LH vs AMH | +0.152 | 0.078 | Weak, NS |
| PRG vs AMH | +0.180 | 0.036 | Weak positive, significant |
| Age vs PRG | +0.010 | 0.912 | No correlation |
| LH vs PRG | +0.126 | 0.137 | Weak, NS |

NS = Not Significant at p<0.05

**Discussion:** This study assessed the hormonal profiles, specifically anti-Müllerian hormone (AMH), luteinizing hormone (LH), and progesterone (PRG) of women with primary infertility in Abuja and compared them with fertile control women.

**Table1** presents the summary of participant distribution in the study. A total of 142 women were enrolled and grouped into two categories: women diagnosed with primary infertility (n = 71) and age-matched fertile control women (n = 71). Each group represented 50% of the total study population, facilitating an even comparative analysis.

All participants were biologically female, which aligns with the study's focus on evaluating female reproductive hormones, AMH, LH, and PRG. This uniformity in biological sex among participants is consistent with the study focus on the evaluation of reproductive hormones, (AMH), (LH), and (PRG). The exclusive inclusion of female participants eliminates sex-related biological variability, thus enhancing the internal validity of the hormonal comparisons between the two groups.

The equal sample size between groups ensures statistical balance and comparability, minimizing potential bias in group-specific findings. This design is particularly valuable in cross-sectional studies, where equal representation enhances the robustness of comparative analysis between cases and controls.

The demographic distribution in Table 2 demonstrates methodological rigor by maintaining equal group sizes and a focused population, allowing for accurate assessment of hormonal variations associated with primary infertility in the study cohort.

**Table 2** presents the age distribution of women with primary infertility and fertile controls. The age ranged from 20 to 40 years, providing a representative spread across key reproductive stages. Among women with primary infertility, the highest proportion (35.2%) was within the 31–35-year age group, followed by the 36–40-year group (29.6%). This distribution reflects established literature indicating that female fertility declines notably after age 30, with a steeper reduction after age 35 (Broer *et al*., 2014; Wallace and Kelsey, 2010).

This age-related decline is primarily attributed to the progressive depletion of ovarian follicles, decreased oocyte quality, and reduced endocrine function of the ovaries, particularly a decline in AMH levels and an increase in follicle-stimulating hormone (FSH) (Broekmans *et al.*, 2009; Nelson, 2013). Consequently, women in the 31–35 and 36–40 age groups may experience more pronounced difficulties with conception.

In contrast, the fertile control group showed a relatively balanced distribution between the 36–40 (31.0%) and 26–30 (29.6%) age groups. This may suggest that a proportion of women maintain reproductive competence into their late 30s, potentially due to higher ovarian reserve, healthier lifestyle choices, or earlier parity. The 20-25 age group had the lowest representation in both groups (11.3%), possibly due to underreporting, delayed diagnosis, or lower awareness of infertility issues at earlier reproductive ages.

These findings support global data that emphasize age as a major determinant of fertility potential. According to Nelson (2013), female fertility peaks in the mid-20s and begins to decline gradually in the early 30s, with a steeper decline after 35 years. The data also reflect the growing trend of delayed childbearing in urban populations, which is often associated with increased infertility rates (Ombelet *et al*., (2008).

The age distribution in this study highlights the importance of early fertility assessment and reproductive health education, particularly for women approaching their mid-thirties, to improve the chances of timely conception and reduce the emotional and financial burden of infertility.

**Table 3** compares the mean age and age-related infertility odds between women with primary infertility and fertile controls. The mean age for the primary infertility group was 32.51 ± 4.86 years, while that of the control group was slightly higher at 33.27 ± 5.66 years. The p-value of 0.38 indicates that the difference in mean age between the two groups was not statistically significant, suggesting that both groups were age-matched and comparable for fertility-related analysis.

Interestingly, the odds ratio (OR) of 0.59 for age >35 years implies that women with primary infertility were less likely to be older than 35 years compared to the fertile control group. Although not statistically significant, this observation may suggest that non-age-related factors, such as endocrine abnormalities, anatomical defects, or lifestyle influences, may be contributing to infertility in this population.

Numerous studies have established age as a critical factor influencing female fertility. Fertility declines with advancing age due to the depletion of ovarian follicles and a decrease in oocyte quality, particularly after age 35 (Wallace and Kelsey, 2010; Broekmans *et al*., 2009). However, the non-significant age difference in this study implies that primary infertility may be present even in younger women. Additionally, the mean age of over 32 years in both groups highlights the trend of delayed childbearing in urban Nigerian settings, often due to education, career, or late marriage (Ombelet *et a*l., (2008). This aligns with findings from international studies indicating that women are increasingly attempting conception at older ages, which may expose them to greater risk of infertility regardless of individual health status (Broer *et al*., 2014).

While age is a recognized determinant of female fertility, the findings from this study emphasize the need to consider other reproductive and environmental factors when assessing infertility, especially in populations where women are still relatively young.

Our findings align with previous studies showing hormonal differences in women with primary infertility. Specifically, we observed lower AMH and progesterone levels compared to fertile controls, suggesting diminished ovarian reserve and possible luteal phase deficiency. These results are similar to earlier studies that reported hormonal changes among infertile populations (Panti and Sununu, 2014; Maheshwari et al., 2008). Furthermore, differences between explained and unexplained infertility have been highlighted in other research, which noted unique hormonal and clinical profiles among women with unexplained infertility compared to other causes (Siristatidis et al., 2020)

**Table 4** presents the comparison of mean age, LH, progesterone, and AMH levels between women with primary infertility and fertile controls. The mean ages of both groups were nearly identical (32.63 ± 4.78 years vs. 32.66 ± 5.36 years; p = 0.974), confirming that age was well matched and unlikely to confound hormonal comparisons.

The serum levels of luteinizing hormone (LH) did not significantly differ between the two groups (p = 0.739), indicating that LH concentrations were similar in primary infertile women and fertile controls. LH plays a critical role in ovulation by triggering follicular rupture, and its pulsatile secretion pattern is essential for normal reproductive function (Marshall and Eagleson, 2020). The absence of a significant difference in LH levels suggests that hypothalamic-pituitary-ovarian axis dysfunction related to LH may not be a predominant cause of infertility in this group.

Progesterone (PRG) levels, however, were significantly lower in women with primary infertility (11.44 ± 7.91 ng/ml) compared to fertile controls (13.65 ± 6.86 ng/ml; p = 0.034). Progesterone is pivotal for the maintenance of the luteal phase and preparation of the endometrium for implantation (Practice Committee of ASRM. (2015). This finding may point to luteal phase insufficiency or suboptimal corpus luteum activity, both of which are implicated in infertility due to impaired endometrial receptivity (Enitan *et al*., (2017).

Most notably, AMH levels were significantly reduced in the primary infertility group (1.85 ± 1.40 ng/ml) compared to controls (3.52 ± 2.41 ng/ml; p < 0.001). AMH is a well-established biomarker of ovarian reserve, reflecting the remaining quantity of antral and pre-antral follicles (La Marca and Sunkara, 2014). Reduced AMH in infertile women supports the hypothesis of diminished ovarian reserve contributing to primary infertility, consistent with findings in various populations (Seifer *et al*., 2011). This decline may also precede clinical manifestations of ovarian aging, emphasizing the utility of AMH in early infertility assessment.

Overall, these findings underline the multifactorial nature of infertility, where normal LH levels coexist with significant differences in progesterone and AMH, highlighting the importance of evaluating both luteal function and ovarian reserve in infertile women.

**Table 5** presents the Pearson correlation coefficients assessing the relationships between age, LH, PRG, and AMH among all study participants. A moderate negative correlation between age and AMH (r = -0.305, p < 0.001) was observed, indicating that as age increases, AMH levels tend to decrease. This inverse relationship aligns with established evidence which consistently shows that AMH levels decline with age due to follicular depletion and reduced granulosa cell activity (Nelson *et al.*, 2012; La Marca *et al*., 2009).

The correlation between LH and AMH was weak and not statistically significant (r = +0.152, p = 0.078), suggesting limited direct association between these hormones. LH secretion, governed by pulsatile GnRH release, may not have a direct regulatory effect on AMH, which is primarily secreted by pre-antral and small antral follicles independently of gonadotropins (Fanchin *et al*., 2005).

Similarly, the weak positive correlation between progesterone and AMH (r = +0.180, p = 0.036) was statistically significant but modest, indicating a slight tendency for higher AMH to be associated with higher luteal phase progesterone levels. This might reflect that better ovarian reserve (higher AMH) supports more robust follicular development and corpus luteum function, leading to increased progesterone production (Mascarenhas *et al*., (2012).

No meaningful correlation was found between age and progesterone (r = +0.010, p = 0.912), indicating that circulating progesterone levels during the luteal phase may not be directly influenced by age in this population. This is consistent with previous findings that progesterone secretion is more closely tied to the functional capacity of the corpus luteum than to chronological age per se (Shebl *et al*., (2009).

The weak, non-significant correlation between LH and progesterone (r = +0.126, p = 0.137) similarly suggests that these hormones vary independently within physiological ranges.

These correlation patterns highlight the complex and partly independent hormonal dynamics involved in female reproductive function. While AMH is closely linked to age and ovarian reserve, LH and progesterone appear to fluctuate based on additional regulatory mechanisms. This observation aligns with broader evidence that comprehensive hormonal profiling is crucial in infertility research, as similarly recommended for evaluating male infertility by Concepción-Zavaleta et al. (2022).  
This study's findings reinforce the importance of hormonal assessments in infertility diagnosis. LH levels were not significantly different, suggesting LH dysfunction may not be a primary issue in this group. Progesterone’s statistically lower levels in PIW highlight its role in implantation and luteal phase sufficiency. AMH’s strong correlation with infertility supports its use in evaluating ovarian reserve in clinical settings.

Further literature comparison supports these findings. The mean LH levels in the infertility group (6.88 ± 1.95 IU/L) were not significantly different from the control group (7.13 ± 2.14 IU/L; p = 0.549; Table 5), consistent with Ikechebelu et al. (2023), who reported that serial progesterone and LH monitoring offers more reliability for luteal phase assessment in IVF patients.The observed progesterone differences similar to the findings Soules et al. (1989) who reported recurrent luteal progesterone insufficiency in infertile women. This also aligns with updated recommendations from the ASRM Committee Opinion (2021) on luteal phase deficiency and its role in implantation failure. These results support emerging regional hormonal profiling studies in Nigeria, such as the Niger Delta cohort showing progesterone and LH variations between infertile and fertile women (Eze et al., 2022)

**Summary of Findings:** This study found that although infertility risks generally increase with age, there was no statistically significant age difference between infertile and fertile women in the study population. This indicates that age alone may not be a determining factor for infertility among the participants.

The results also emphasize the importance of hormonal balance and ovarian reserve in female fertility. Infertile women had significantly lower levels of progesterone and anti-Müllerian hormone (AMH) compared to fertile controls, while luteinizing hormone (LH) levels did not differ significantly between the groups. These findings suggest that deficiencies in ovarian reserve and progesterone may contribute more directly to primary infertility than LH levels.

Overall, the findings highlight the value of including AMH and progesterone assessments in fertility evaluations and the need for targeted reproductive health interventions beyond age-based assumptions.

**Conclusion**: This study compared serum AMH, LH, and progesterone levels in women with primary infertility and fertile controls attending the University of Abuja Teaching Hospital. Women with primary infertility had significantly lower AMH and progesterone levels, suggesting reduced ovarian reserve and possible luteal phase insufficiency. LH levels were not significantly different, aligning with evidence that basal LH alone has limited diagnostic utility.

A moderate inverse correlation between age and AMH underscores the impact of biological aging on ovarian reserve, while the positive correlation between AMH and progesterone indicates a subtle link between ovarian reserve and luteal function. These findings emphasize that primary infertility cannot be fully explained by chronological age alone; comprehensive hormonal evaluation, especially AMH and mid-luteal progesterone, remains essential for accurate diagnosis and personalized management.

By contributing localized hormonal data, this study supports the need for tailored fertility assessment strategies and underscores the importance of including ovarian reserve and luteal function markers in routine infertility evaluation for women in Nigeria.

**Ethical Approval and consent:** Ethical clearance was obtained from the ethical committee of university of Abuja teaching Hospital. Informed consent will also be obtained from all participating subjects in accordance with the standards of human experimentation and with the Helsinki Declaration of 1975, as revised in 70. This will be done via informed consent from study participants.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that generative AI technologies such as Large Language Models (e.g., ChatGPT) were used during the editing of this manuscript. Details of AI usage are provided below:

1. Rewriting and shortening the abstract for clarity and conciseness.
2. Suggesting valid, peer-reviewed replacement references with proper DOIs.
3. Proofreading for grammar, spelling, and consistency throughout the manuscript.

The scientific content, data interpretation, and final conclusions were developed solely by (we) the authors without AI assistance.

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