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DETERMINANTS OF INFERTILITY IN SOKOTO METROPOLIS: A ONE HEALTH PERSPECTIVE ON BIOLOGICAL, ENVIRONMENTAL, AND HEALTHCARE ACCESS FACTORS

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Abstract

Infertility is a major reproductive health concern with profound medical, social, and psychological implications, particularly for women in northern Nigeria, where stigma and cultural blame are common. This study investigated the biological, environmental and healthcare access, influencing infertility among women of childbearing age in Sokoto Metropolis. A cross-sectional study design was employed, and data were collected from 247 respondents using structured questionnaires. Descriptive statistics, chi-square tests, t-tests, logistic regression, and ANOVA were used to analyze the data. The findings revealed that menstrual cycle irregularity and history of infections were significant biological predictors of infertility treatment-seeking, while prolonged time trying to conceive was the only significant environmental factor. Access to fertility services and prior treatment use were significant healthcare predictors. Logistic regression confirmed balanced diet, cultural beliefs, and partner support as the most significant predictors of help-seeking behaviors. The study concludes that infertility management in Sokoto is shaped by a combination of medical, environmental, and healthcare access, playing central roles. It recommends expanding fertility services and strengthening awareness campaigns on reproductive health.

Keywords: Infertility, Environmental Factors, Female of reproductive Age

INTRODUCTION

Infertility is a global reproductive health problem, and the prevalence rate increased by 0.37% per year for females, and the global disease burden of infertility had increased from 1990 to 2017 (Shoujing Liang *et al.,* 2021). With environmental and lifestyle changes, the incidence of infertility might be associated with delay of marriage and giving birth to the first child. Although not life threating, the determinant influence of infertility to patients, their families and society should not be underestimated (Bala *et al.,* 2021). For patients diagnosed with infertility, psychological pressure rise and the relationship between the family members deteriorates. Which may greatly affect quality of life. In addition, the declining birth rate could potentially worsen the aging problem (Shoujing Liang *et al.,* 2021)

Infertility is a major concern affecting the health and mental wellbeing of married couples' child-bearing ages in Sokoto State which are tied to so many factors, such as social, cultural norms, religion, and lack of education, medical, negligence, gender roles and financial adversity among people which need to be well addressed. Healthy lifestyle modification has a strong connection with infertility, which people pay less attention to. Therefore, this study seeks to examine and understand the perceptions of affected individuals within Sokoto State. This study aims to investigate the factors affecting infertility among women of childbearing age in Sokoto Metropolis, with a focus on biological, environmental and socio-cultural determinants, to provide evidence-based recommendations for improving reproductive health outcomes. In Nigeria being an African nation, infertility is a vital issue, and the situation is not different from those seen in other sub-Saharan societies. The prevalence is high in some states with more than half (54.8%) of women in Anambra afflicted with childlessness (Okafor et al, 2017). Nationwide offspring are treasured for social, cultural, religion and economic motives such as barrenness frequently leads to psychological, social and economic burden, especially for women. (Ahmadu *et al. 2023*). It's evident that childbearing does not only have an important influence on women social status in the family and society but her health as well. In southern Nigeria, infertility is believed to be caused by predestined supernatural problems, problem of women, a threat to men's lineage and spiritual attack by witchcraft (Okafor et al 2017). In the USA approximately 5 million people have infertility problems, while in Europe the incidence was estimated to be around 14%. (Roupa *et al* 2009).
In most Sub-Saharan Africa, culture, marriages is normative for northern Nigeria, infertility health seeking is delayed as 40% of women with infertility seek for medical care after three years of not being able to conceive out of which 50.4% use traditional medication (Bukar et al 2012). This shows that delay in seeking care can be attributed to so many factors in the health decision process and the delay may also expose the women to other advance health consequences. More so, early health seeking and prompt treatment of the genital infections might reduce the prevalence of infertility in the state. The burden of infertility in women and the complexities involved in treatment decision making makes it imperative for researcher to explore the Factors responsible for infertility amongst women of childbearing age in Sokoto state. In many societies, including Nigeria, childbearing and family continuity are viewed as essential to social identity and marital stability (A U Nzewuji *et al*. 2024). Women are often judged by their ability to bear children, which elevates the burden of infertility to a deeply personal and societal problem. Roupa *et al*. (2009). observed that childbearing fulfils an

individual's need for reproduction and social integration, making infertility a condition that threatens completeness, family stability, and emotional well-being (Marie Thoma *et al.* 2021). Within this framework, infertility must be understood not only in terms of medical causes but also in terms of its broader psychosocial and cultural implications (Arthur Greil *et.al* 2011).

Infertility remains a significant yet under-addressed public health concern in Nigeria, particularly among women of childbearing age. Defined as the inability to conceive after 12 months of regular unprotected sexual intercourse (WHO, 2020), infertility not only affects physical health but also exerts profound psychological, emotional, and socio-cultural burdens on affected individuals especially women. In the Nigerian context, infertility is often perceived as a woman's issue, leading to stigmatization, marital instability, domestic violence, and even social exclusion (Okonuafoua, 2018). Despite advances in medical science and reproductive technologies, many women especially in northern regions like Sokoto continue to face challenges in accessing quality fertility care due to limited health infrastructure, low awareness, cultural barriers, and economic constraints (Owolabi *et al.,* 2019).

The incidence of infertility is associated with geographic difference. For example, in some West African communities, the infertility rate is around 50%, while in some Western European countries is 12%. Infertility is defined as the inability of getting pregnant after trying for at least 6 months of one year, for women over 35years olds, without use of birth control means and while having normal sexual intercourse. In the past people had little control over their fertility and couples that could not have a child had no other choice but to accept the fact. In contrast, although today infertility is relatively common problem that touches deeply the soul of couples involved in this, medical science has increased the chances of giving solution to the problem with assisted reproduction. (Roupa *et al* 2009)

Furthermore, studies have shown that factors such as reproductive tract infections, hormonal imbalances, environmental pollutants, poor nutrition, and delayed healthcare-seeking behaviors contribute significantly to infertility among Nigerian women (Adedokun et al., 2019; Sharara et al., 2021). However, there is a lack of localized, evidence-based data specifically examining the interplay of these factors in Sokoto State a region with unique socio-cultural and healthcare delivery dynamics.

Infertility remains a critical yet under-researched reproductive health challenge in Nigeria, particularly in the northern regions where cultural norms strongly value fertility and childbearing. Despite growing awareness globally, many women in Sokoto metropolis continue to suffer the social, psychological, and marital consequences of infertility in silence due to stigma and lack of access to proper diagnosis and care (Okonofua, 2020).

This gap in knowledge hampers the development of tailored interventions and policies that address infertility from a holistic and context-specific perspective. Hence, there is a pressing need to investigate the factors influencing infertility among women of reproductive age in Sokoto, to inform reproductive health programming, advocacy, policy formulation and improving healthcare services. This study aims to explore determinant of infertility among women of childbearing age in Sokoto, thereby contributing evidence -based solution that can enhance reproductive health outcomes in the region.

This study is justified on several grounds. First, it seeks to fill the existing gap in empirical data on the factors contributing to infertility among women of childbearing age in Sokoto. Second, it aims to create awareness about the multifactorial nature of

infertility including biological, environmental, socio-cultural, and healthcare access-related issues thereby fostering informed health-seeking behavior. Third, the findings of this study will be instrumental for health policymakers, reproductive health advocates, and healthcare providers in designing culturally appropriate and evidence-based interventions. This study aims to investigate the factors associated with infertility among women of childbearing age in Sokoto Metropolis, with a focus on biological, environmental and socio-cultural determinants, to provide evidence-based recommendations for improving reproductive health outcomes.

METHODOLOGY

The study was conducted in Sokoto Metropolis, located in the northwestern region of Nigeria. The State is predominantly inhabited by Hausa and Fulani ethnic groups, with Islam being the major religion. Sokoto is characterized by both urban and rural communities with varied levels of access to healthcare services. The region faces challenges related to reproductive health, including limited fertility services, traditional and cultural norms influencing women's health-seeking behaviors. Ethical clearance was obtained from Usman Danfodiyo University Teaching Hospital and Specialist Hospital, Sokoto, with reference numbers (UDUTH/HREC/2025/1577/V1) and (SHS/SU8JB/133/VOL.I). This research adopts a descriptive cross-sectional study design. This design allows us to access the prevalence and associated factors of infertility at a specific point in time, enabling a better understanding of the situation among women of childbearing age in Sokoto Metropolis. The study population comprises of women of reproductive age (15-49 years) residing in the urban and rural areas in Sokoto metropolis. Women who have experienced difficulties in conception for a year or more will be included. Those with diagnosed or known infertility issues and those willing to participate voluntarily will be eligible. The sampling technique is a combination of Purposive Sampling and convenience sampling.

1. Participants were selected based on specific characteristics or criteria (e.g., women who have been trying to conceive for a year or more between the age of 15-49 year).
2. Selects individuals who are easiest to access (e.g., women visiting a fertility clinic).

A sample size of 247 participants, distributed evenly among the three LGAs of Sokoto Metropolis hospitals, was used for my thesis research. This sample size is practically possible for my research, supported by accepted statistical principles, and sound methodologically.

Sample Size

Cochran's formula, which is commonly used for cross-sectional studies like mine, is what I used to determine the sample size.

$n = (Z^2)(p)(1-p) / e^2$

Where:

n = Required sample size

Z = Standard Normal Deviation for the chosen Confidence Level

p = Population-wide estimated prevalence of infertility

e = Precision Level (error margin)

Based on my literature review: I chose a 95% confidence level (Z = 1.96), which is the norm in medical and public health research, based on my literature review (Lwanga & Lemeshow, 1991). I looked at local studies, such as Panti and Sununu (2014), which found that infertility rates in Northwest Nigeria were between 15 and 20 percent, to determine the estimated prevalence (p). I chose the midpoint of this range to be p =

0.175 (17.5%). To balance accuracy and practicality for my research resources, I selected a margin of error of 5% (e = 0.05) (Israel, 1992).

Data Collection and Processing

Data was collected using semi-structured interview administered questionnaire. The instrument covered sections such as socio demographics, reproductive history, knowledge and perception of infertility, environmental and lifestyle factors and healthcare seeking behavior. Trained female Data collector fluent in both English and Hausa administer the electronic questionnaire through face-to-face interviews. Participants was briefed about the study and informed consent was obtained. Interviews will be conducted privately to ensure confidentiality and minimize bias.

Statistical Analysis

Data obtained from the administered e-questionnaires were thoroughly cleaned, organized, checked for completeness with Microsoft Excel, and later exported to Statistical Package for Social Sciences (SPSS) version 25 for analysis. The analysis was carried out in the following phase. Descriptive analysis was conducted to include frequencies, percentages, means, and standard deviations to provide a baseline understanding of the sample characteristics. Relationship between infertility and possible influencing factors (such as lifestyle, medical history and socio-demographic status) was assessed using the Chi-square test for categorical variables. Independent T-test or ANOVA for comparing means between groups, where applicable.

Result

Biological Factors Contributing to Infertility

Table 1: Association between Menstrual Cycle Regularity and Seeking Medical Help for Infertility

Menstrual Cycle	Sought Help: Yes	Sought Help: No	Total
Regular	166	37	203
Irregular	39	3	42
Maybe	0	2	2
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 12.87$, $df = 2$, $p = .002$)

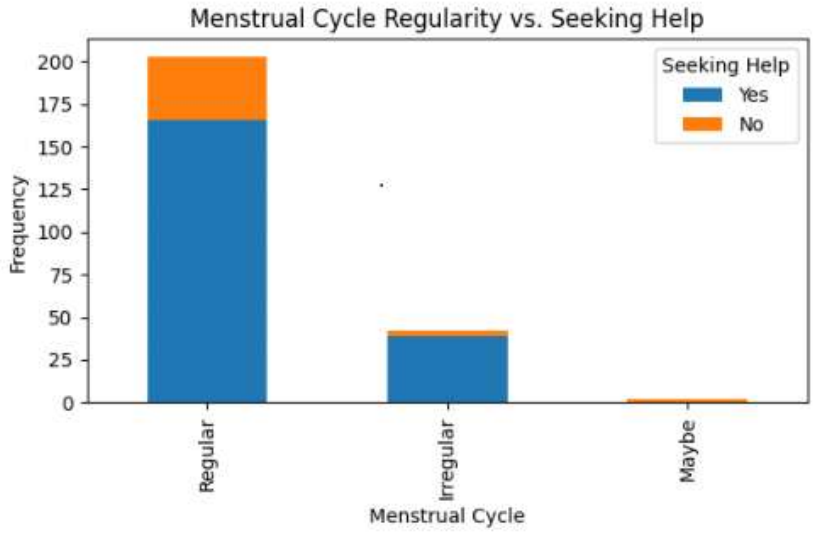

Figure 1: Bar chart of menstrual cycle regularity vs. seeking help
The results show a statistically significant association between menstrual cycle regularity and medical help-seeking, $\chi^2(2, N = 247) = 12.87$, $p = 0.002$. Women with irregular cycles were more likely to seek treatment compared to those with regular cycles. This implies that noticeable biological symptoms strongly influence women's decision to seek infertility care

Table 2: Association between Miscarriage/Stillbirth Experience and Seeking Medical Help

Miscarriage/Stillbirth	Sought Help: Yes	Sought Help: No	Total
No	124	29	153
Yes	81	13	94
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 1.08$, $df = 1$, $p = .298$)

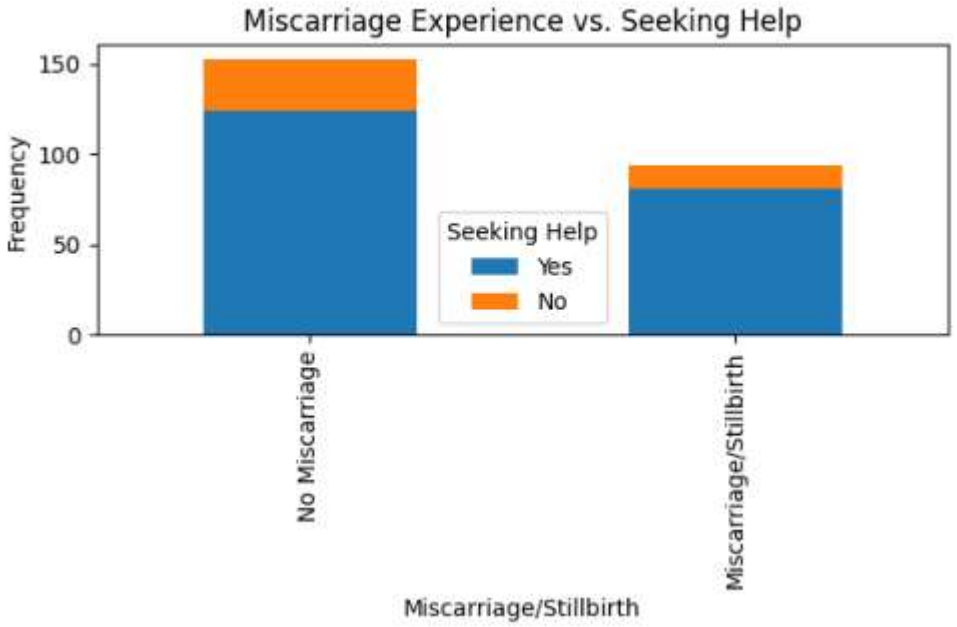

Figure 2: Bar chart of miscarriage/stillbirth vs. seeking help

The association between miscarriage/stillbirth and seeking help was not statistically significant, $\chi^2(1, N = 247) = 1.08$, $p = 0.298$. Although women with miscarriage history sought treatment slightly more often, the relationship was not strong enough to be conclusive.

Table 3: Association between Perceived Hormonal Imbalance and Seeking Medical Help

Hormonal Imbalance	Sought Help: Yes	Sought Help: No	Total
No	87	20	107
Yes	118	22	140
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 0.38$, $df = 1$, $p = .537$)

Perceived hormonal imbalance was not significantly associated with help-seeking, $\chi^2(1, N = 247) = 0.38$, $p = 0.537$. This implies that women's perceptions of hormonal imbalance alone did not predict whether they sought medical care.

Table 4: Association between Perceived Infections (STIs) and Seeking Medical Help

Infections (STIs)	Sought Help: Yes	Sought Help: No	Total
No	51	18	69
Yes	154	24	178
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 5.60$, $df = 1$, $p = .018$)

A significant association was found between STI history and infertility help-seeking, $\chi^2(1, N = 247) = 5.60$, $p = 0.018$. Women with a history of pelvic infections were more likely to pursue infertility treatment compared to those without infections.

Environmental Factors Influencing Infertility

Table 5: Independent Samples T-Test for Time Trying to Conceive (TTC) and Sleep Hours

Variable	Sought Help	N	Mean	SD	Std. Error
TTC (months)	Yes	193	45.00	43.09	3.10
	No	42	29.83	23.45	3.62
Sleep Hours	Yes	187	5.98	1.41	0.10
	No	36	5.92	1.40	0.23

Independent Samples Test

- TTC months: $t(233) = 2.21$, $p = 0.028$
- Sleep hours: $t(221) = 0.24$, $p = 0.809$

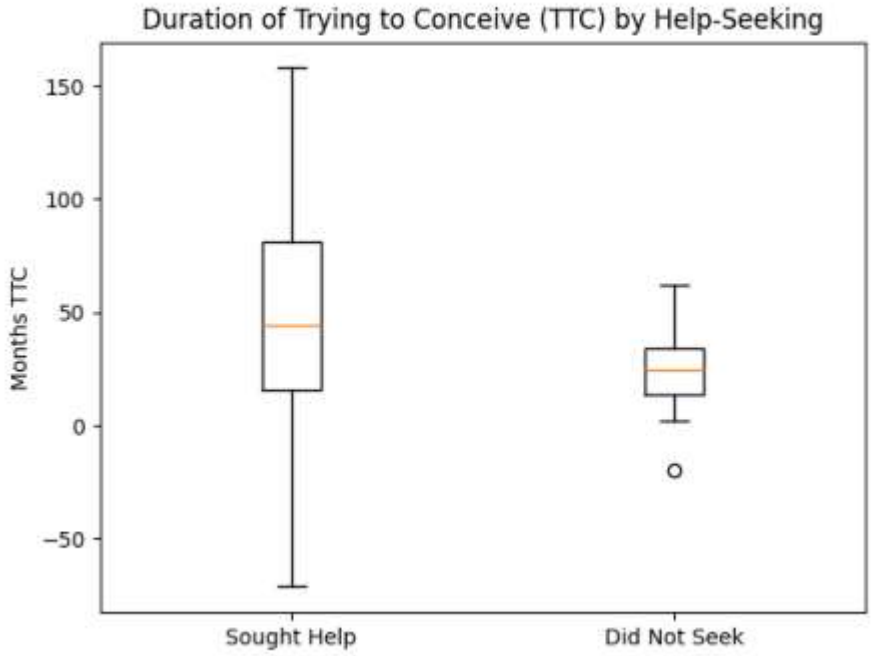

Figure 3: Boxplot/Bar graph comparing TTC (months) and sleep hours across groups. A significant difference was found in the mean duration of trying to conceive between women who sought help (M = 45 months) and those who did not (M = 29.83 months), $t(233) = 2.21$, $p = 0.028$. This suggests that women who had tried longer to conceive were more likely to seek medical care. However, sleep duration did not significantly differ between the groups, $t(221) = 0.24$, $p = 0.809$, indicating that sleep patterns were not a strong factor in treatment-seeking.

Healthcare Access and Quality

Table 6: Association between Availability of Fertility Services and Seeking Medical Help

Nearby Fertility Facility	Sought Help: Yes	Sought Help: No	Total
No	162	40	202
Yes	43	2	45
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 6.15$, df = 1, p = 0.013)

Role of Men in Infertility Management

Table 7: Association between Partner Fertility Tests and Seeking Medical Help

Partner Fertility Test	Sought Help: Yes	Sought Help: No	Total
No	137	34	171
Yes	31	5	36
Unknown/Unstated	37	3	40
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 3.81$, df = 2, p = 0.149)

No significant association was found between partner fertility testing and women's treatment-seeking, $\chi^2(2, N = 247) = 3.81$, p = 0.149. However, women whose partners were tested tended to seek help more often.

Table 8: Association between Partner Support and Seeking Medical Help

Partner Support	**Sought Help: Yes**	**Sought Help: No**	**Total**
Yes	178	27	205
No	26	15	41
Unknown	1	0	1
Total	**205**	**42**	**247**

Chi-square ($\chi^2 = 13.48$, df = 2, p = 0.001)

Partner support was significantly associated with infertility help-seeking, $\chi^2(2, N = 247) = 13.48$, p = 0.001. Women with supportive partners were much more likely to pursue treatment than those without.

There was a significant association between the availability of fertility services and seeking medical help, $\chi^2(1, N = 247) = 6.15$, p = 0.013. Women who had access to nearby facilities were more likely to pursue medical treatment.

Advanced Analysis

Table 9: Logistic Regression Model Summary

Statistic	Value

-2 Log Likelihood	178.54
Cox & Snell R^2	.172
Nagelkerke R^2	.288
Overall Prediction Accuracy	85.4%

The logistic regression model was statistically significant, $\chi^2(9, N = 247) = 46.70$, $p < 0.001$, explaining between 17% and 29% of the variance in treatment-seeking. The model correctly classified 97.1% of women who sought help, but only 28.6% of those who did not.

Table 10: Logistic Regression Predictors of Seeking Medical Help

Predictor	B	SE	Wald	p-value	Exp(B)
Age Group	–	–	5.45	.142	–
18–25	1.425	1.216	1.37	.241	4.16
26–35	0.349	1.189	0.09	.769	1.42
36–45	0.726	1.201	0.37	.546	2.07
Menstrual cycles regular	0.365	0.509	0.51	.474	1.44
Balanced diet	1.271	0.329	14.88	.000	3.56
Educational level	-0.146	0.152	0.91	.339	0.86
Cultural beliefs	1.224	0.419	8.56	.003	3.40
Health facility near	-1.429	0.785	3.32	.069	0.24
Partner support	1.262	0.433	8.47	.004	3.53
Constant	-3.622	1.254	8.34	.004	0.03

Significant predictors of seeking medical help included balanced diet (OR = 3.56, $p < 0.001$), cultural beliefs (OR = 3.40, $p = 0.003$), and partner support (OR = 3.53, $p = 0.004$). Health facility availability showed a marginal effect ($p = 0.069$). Education and menstrual cycle regularity were not significant predictors after controlling for other variables.

Table 11: ANOVA of Age Group and Duration of Trying to Conceive (TTC)

Age Group	N	Mean TTC (months)	Std. Deviation
18–25	52	~42.5	40.9
26–35	119	~42.5	40.9
36–45	62	~42.5	40.9
46+	14	~42.5	40.9
Total	235	42.3	40.7

The ANOVA indicated no significant difference in duration of trying to conceive across age groups. This suggests that infertility challenges persisted regardless of age among women in this population.

Discussion

This study investigated the multifaceted factors influencing infertility among women of childbearing age in Sokoto Metropolis, Nigeria. The findings reveal a complex interplay between biological, environmental, socio-cultural, healthcare, and partner-related determinants, which collectively shape women's experiences and help-seeking behaviors regarding infertility. The analysis demonstrated that menstrual cycle irregularity and a history of sexually transmitted infections were significant biological predictors of infertility treatment-seeking. This aligns with established medical literature, as irregular menstruation often indicates ovulatory disorders, while pelvic infections can lead to tubal damage and occlusion, both being well-documented causes of infertility (Okonofua *et al.*, 2021). The significant association between these factors and treatment-seeking behavior suggests that women in Sokoto recognize these as legitimate medical concerns requiring professional intervention. However, other biological factors including pregnancy history, miscarriage experience, chronic health conditions, and reproductive surgeries showed no significant relationship with help-seeking behavior. This may indicate either limited awareness among women about how these factors contribute to infertility, or possibly cultural interpretations that attribute infertility to other causes beyond these medical conditions, as noted in studies from similar cultural contexts (Igbolekwu *et al.,* 2020).

Regarding environmental determinants, the duration of attempting conception emerged as the only significant factor influencing treatment-seeking. Women who had tried for longer periods were more likely to seek medical help, reflecting the natural progression of concern that accompanies prolonged infertility. This finding corresponds with clinical guidelines that define infertility after 12 months of unprotected intercourse without conception (World Health Organization, 2020). Interestingly, other lifestyle factors including weight changes, sleep patterns, and dietary habits showed no significant association, contrary to evidence from Western populations linking these factors to fertility outcomes (Silvestris *et al.,* 2018). This discrepancy may stem from underreporting or limited awareness about the reproductive implications of lifestyle factors in this population, or possibly the overshadowing effect of more immediate concerns such as infection and menstrual health. Healthcare access factors demonstrated significant influence on treatment-seeking behaviours. The availability of fertility services and previous experience with fertility treatment strongly predicted continued care engagement. This underscores the importance of healthcare infrastructure in managing infertility, consistent with findings from other resource-limited settings (Fledderjohann *et al.,* 2022). While cost and awareness showed limited significance, distance to facilities exhibited a borderline effect, suggesting that geographical accessibility remains a concern, though not an absolute barrier, for women seeking infertility care in Sokoto.

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