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Seroprevalence of Syphilis among Pregnant Women in Onitsha, Nigeria: A Cross-Sectional Study

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ABSTRACT

Background: Syphilis remains a significant global public health concern, particularly in pregnancy where it contributes to adverse maternal and neonatal outcomes. Despite ongoing control efforts, the burden of maternal syphilis persists in many parts of sub-Saharan Africa.

Objective: This study aimed to determine the seroprevalence of syphilis and its association with socio-demographic characteristics, awareness, and medical history among pregnant women in Onitsha, Nigeria.

Methods: A cross-sectional study was conducted among 125 pregnant women attending antenatal clinic at St. Charles Borromeo Specialist Hospital, Onitsha. Blood samples were collected and analyzed for antibodies against *Treponema pallidum* using enzyme-linked immunosorbent assay (ELISA). Socio-demographic data, awareness levels, and medical history were obtained using structured questionnaires. Data were analyzed using descriptive statistics and chi-square tests.

Results: The study recorded a zero prevalence of syphilis (0.0%), with no positive cases detected among all participants. This absence was consistent across all socio-demographic variables including age, marital status, education, occupation, and trimester (p = 1.0). Despite this, 71.2% of participants were aware of syphilis, while 20.8% reported a history of sexually transmitted infections. Additionally, some participants reported potential risk exposures such as prior surgery (23.2%), blood transfusion (5.6%), and needle sharing (3.2%).

Conclusion: The absence of syphilis in this study suggests a very low burden of infection in the study population despite the presence of awareness gaps and risk factors. Continued antenatal screening and surveillance are essential to sustain this trend and prevent re-emergence.

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Keywords
Syphilis, Pregnancy, Antenatal, Nigeria

1. Introduction

Syphilis is a chronic sexually transmitted infection caused by the spirochete bacterium *Treponema pallidum*. It remains a major contributor to maternal and neonatal morbidity worldwide, particularly in low- and middle-income countries where access to early diagnosis and treatment may be limited (Kojima and Klausner, 2018). Maternal syphilis is associated with severe adverse pregnancy outcomes including miscarriage, stillbirth, preterm birth, neonatal death, and congenital infection (Kielaite *et al*., 2025).

Globally, millions of new cases of syphilis are recorded annually, with sub-Saharan Africa bearing a disproportionate burden (WHO, 2017). In Nigeria, several studies have reported varying prevalence rates of syphilis among pregnant women, typically ranging from low to moderate levels depending on geographical location and population characteristics (Iliyasu *et al*., 2022; Maharazu *et al*., 2021; Olowe *et al*., 2014; Al-Mendalawi 2020). Despite intensified efforts toward elimination of mother-to-child transmission, syphilis continues to pose a public health challenge (Adeyinka *et al*., 2018).

Routine antenatal screening has been identified as a key strategy in reducing the burden of congenital syphilis. Early detection through serological testing enables prompt treatment, thereby preventing vertical transmission and associated complications (Joseph Davey *et al*., 2025). However, variations in prevalence across regions necessitate continuous local surveillance to inform targeted interventions.

This study was therefore designed to determine the seroprevalence of syphilis among pregnant women attending antenatal care in Onitsha, Nigeria, and to evaluate its relationship with socio-demographic characteristics, awareness, and potential risk factors.

2. Materials and Methods

2.1 Study Design and Setting

The study was a cross-sectional hospital-based study done from May to September 2025 at St. Charles Borromeo Specialist Hospital, Onitsha, Anambra State, Nigeria. The hospital serves as a major referral center and offers antenatal and laboratory services to women from different socioeconomic groups in urban and surrounding areas (Umeokonkwo *et al.*, 2018).

2.2 Study Population

A total of 125 pregnant women attending the antenatal clinic were recruited. Participants aged 18 years and above who met the eligibility criteria were enrolled from among clinic attendees and provided informed consent prior to inclusion.

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Women who did not consent to participate or were incapable of providing informed consent were excluded from the study.

2.3 Sample Size Determination

Cochran's formula was used to determine the sample size:

$n = (Z^2 \times p \times (1 - p)) / E^2$

Where:

Z = 1.96

p = 0.44

E = 0.1

The estimated minimum sample size was about 94; however, 125 participants were ultimately recruited for the study (Muhammad *et al*., 2021).

2.4 Sampling Technique

Participants were selected using a consecutive sampling method. Pregnant women attending the antenatal clinic were informed about the study, and those who provided consent were enrolled. Data were collected through structured questionnaires and blood samples obtained from the participants.

2.5 Sample Collection and Laboratory Analysis

Approximately 5 mL of venous blood was collected aseptically from each participant. Serum samples were separated and analyzed for antibodies to *Treponema pallidum* using a commercially available ELISA kit (CTK Biotech Inc., USA), following the manufacturer's instructions. Positive and negative controls were included to ensure quality assurance.

2.6 Data Collection and Analysis

Data on socio-demographic characteristics, awareness of syphilis, prior, and medical history were collected using a structured questionnaire. All data were collated and properly organized using Microsoft excel and further analyzed using SPSS software (version 26.0). Descriptive statistics such as frequencies and percentages were computed. Chi-square test was used to assess associations, with p-values < 0.05 considered statistically significant.

2.5 Ethical Considerations

Ethical approval was obtained from the hospital's ethics committee, and informed consent was obtained from all participants prior to sample collection. Participants' autonomy and privacy were respected and confidentiality maintained throughout the study.

3. Results

3.1 Overall Seroprevalence of Syphilis

The serological analysis of blood samples collected from the study participants revealed that none of the 125 pregnant women tested positive for syphilis, resulting in an overall prevalence of 0.0% as represented in figure 1. This finding indicates a complete absence of detectable *Treponema pallidum* infection among the study population at the time of investigation.

3.2 Syphilis and Socio-Demographic Characteristics

There was **no recorded case of syphilis across all socio-demographic variables**, including age groups, marital status, educational level, occupation, and trimester. This is shown in table 1. Statistical analysis showed **no significant association (p = 1.0)** between these variables and syphilis prevalence

3.3 Awareness of Syphilis and History of Sexually Transmitted Infections

Assessment of participants' awareness, as shown in Table 2, revealed that a majority, 89 (71.2%), had prior knowledge of syphilis, while 36 (28.8%) reported no awareness of the infection. Despite this relatively high level of awareness, no active syphilis infection was detected among either group. This uniform absence of infection across awareness categories suggests no observable difference in prevalence based on awareness status within the study population.

Furthermore, 26 participants (20.8%) reported a previous history of sexually transmitted infections, while the majority, 99 (79.2%), had no such history. Notably, none of the participants with prior STI history tested positive for syphilis, suggesting that past exposure to sexually transmitted infections did not translate into current syphilis infection in this study population.

A small proportion of participants, 7 (5.6%), reported having been previously treated for syphilis. However, no active infection was detected among them at the time of testing, which may indicate successful treatment or absence of reinfection.

3.4 Medical History and Potential Risk Factors for Syphilis

Evaluation of medical history (table 3) showed that 29 participants (23.2%) had undergone previous surgical procedures, while 7 (5.6%) reported a history of blood transfusion, and 4 (3.2%) reported needle sharing. These factors are generally considered potential risk exposures for blood-borne or sexually transmitted infections.

Despite the presence of these risk factors, no case of syphilis was detected among any of the affected individuals, indicating that these exposures did not contribute to detectable infection within the study population.

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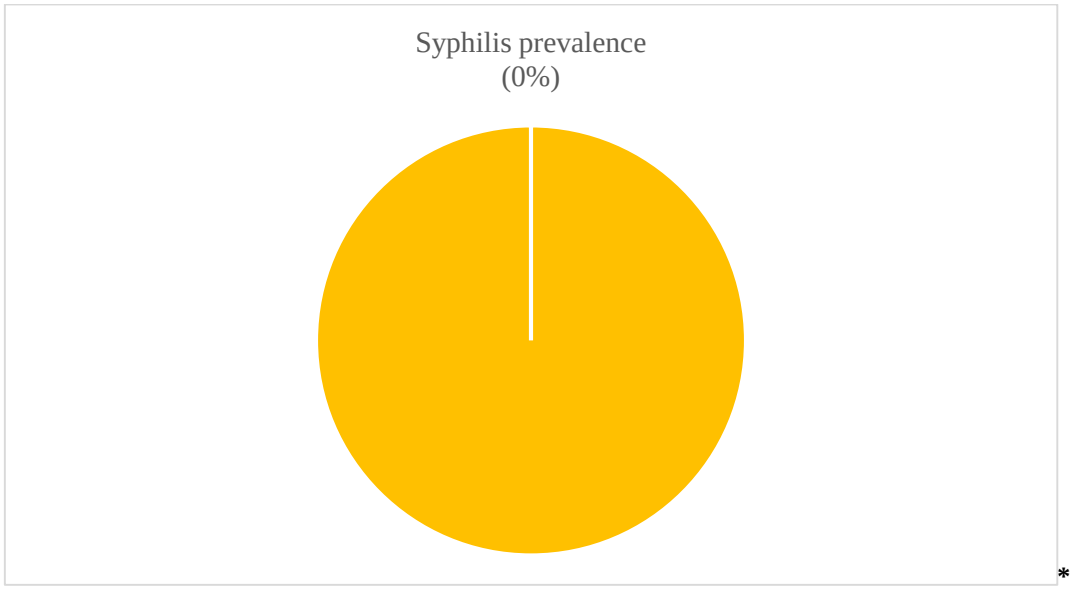

Figure 1: The zero prevalence of Syphilis co-infection among the study participants

Table 1: Prevalence of Syphilis in Relation to Socio-Demographic Features

Variables	Categories	N	Positive	Prevalence	P-value
Age group	15-19	1	0	0	1
	20-24	14	0		
	25-29	48	0		
	30-34	39	0		
	35-39	18	0		
	40 and above	5	0		
Marital status	Single	2	0	0	1
	Married	123	0		
Educational level	Secondary	46	0	0	1
	Tertiary	79	0		
Occupation	Self employed	73	0	0	1
	Employed	37	0		
	Unemployed	6	0		
	Student	9	0		
Trimester	1st	7	0	0	1
	2nd	60	0		
	3rd	58	0		

Table 2: Knowledge and Awareness of Syphilis Among the Study Participants

Variable		Count	%N	Prevalence	P-value
Have you heard of syphilis	Yes	89	71.2	0	1
	No	36	28.8		
Have you ever received treatment for syphilis	Yes	7	5.6	0	1
	No	117	93.6		
	Not disclosed	1	0.8		
Have you had STI prior	Yes	26	20.8	0	1
	No	99	79.2		

Table 3: Medical History of Syphilis Among Study Participants

Variable	Yes		No	
	No. Tested	**%**	**No. Tested**	**%**
History of Surgical operations	29	23.2	96	76.8
History of Blood Transfusion	7	5.6	118	94.4
Have you ever shared a needle	4	3.2	121	96.8

4. Discussion

This study demonstrated a zero seroprevalence of syphilis among pregnant women attending antenatal care in Onitsha, Nigeria. This finding is notably lower than reports from many parts of sub-Saharan Africa, where maternal syphilis prevalence, although declining, remains detectable. Recent multi-country analyses continue to show that syphilis persists as a public health concern in the region, with pooled prevalence estimates generally ranging between 0.5% and 3% among antenatal populations (World Health Organization, 2023; Farahani *et al*., 2024; Mundim de Oliveira *et al*., 2024; Korenromp *et al*., 2019). Similarly, updated epidemiological reviews indicate that despite global control efforts, sub-Saharan Africa still accounts for a substantial proportion of maternal and congenital syphilis cases (Kielaite *et al*., 2025).

The complete absence of syphilis observed in this study may reflect improvements in antenatal screening programs, early diagnosis, and prompt treatment of sexually transmitted infections. Recent global reports have emphasized that strengthened antenatal care systems and the scale-up of routine screening have contributed significantly to reductions in maternal syphilis and congenital transmission in several low- and middle-income countries (World Health Organization, 2023). In addition, increased access to healthcare services and integration of STI screening into routine maternal care may have played a critical role in reducing disease burden in urban settings such as Onitsha.

Another important observation in this study is the relatively high level of awareness of syphilis (71.2%) among participants, which may have contributed to preventive behaviors such as early health-seeking and treatment. Recent studies have shown that improved awareness and education are strongly associated with reduced transmission of sexually transmitted infections, particularly among women of reproductive age (Paul *et al*., 2024; Timoshilov *et al*., 2023; Kılavuz & Yiğit, 2024; El-Sherbiny *et al*., 2025). However, the persistence of an awareness gap among a proportion of participants highlights the need for continued health education interventions.

Despite the absence of active infection, a notable proportion of participants reported previous sexually transmitted infections (20.8%) and potential exposure risks, including surgical procedures, blood transfusion, and needle sharing. This suggests that while exposure to risk factors exists, transmission of syphilis may currently be low or effectively controlled in the study population. Similar findings have been reported across sub-Saharan Africa, where Hussen *et al*. (2019) and Arega *et al*. (2025) noted that the observed decline in syphilis prevalence among pregnant women has been largely attributed to improved antenatal screening, early diagnosis, and strengthened public health interventions targeting sexually transmitted infections.

The lack of association between syphilis and socio-demographic variables in this study is expected given the uniform absence of infection across all categories. In epidemiological terms, such a distribution limits the ability to establish statistical relationships but simultaneously underscores the consistency of the finding across the population. In contrast to previous studies (Geremew & Geremew 2021; Tareke *et al*., 2019; Yideg Yitbarek & Ayele 2019), that reported low but measurable prevalence with varying distribution across risk groups, the present study demonstrated a complete absence of syphilis across all categories, suggesting a distinct epidemiological pattern.

However, this finding should be interpreted with caution. Although the ELISA method used in this study is highly sensitive, recent literature emphasizes the importance of dual testing algorithms (non-treponemal and treponemal tests) to improve diagnostic accuracy and detect latent infections (Centers for Disease Control and Prevention, 2021). The absence of confirmatory testing in this study may therefore limit the detection of early or latent syphilis cases. Additionally, the single-center design and relatively modest sample size may affect the generalizability of the findings.

Overall, the zero prevalence observed in this study is encouraging and may indicate a declining epidemiological trend of syphilis in the study area. Nonetheless, continuous surveillance and sustained public health efforts are essential to ensure that this trend is maintained and to prevent potential re-emergence

5. Conclusion

This study revealed a **zero prevalence of syphilis among pregnant women in Onitsha**, suggesting a very low burden of infection in the study population. Despite the presence of awareness gaps and potential risk factors, no active infection was detected. Sustained screening and surveillance efforts are essential to maintain this favorable epidemiological trend.

6. Recommendations

Based on the findings of this study, it is recommended that routine antenatal screening for syphilis should be sustained and strengthened as a critical component of maternal healthcare services. Although no case of syphilis was detected, the presence of awareness gaps and potential exposure risk factors among participants underscores the need for continuous health education to promote preventive behaviors and early healthcare utilization. Furthermore, the incorporation of more robust diagnostic approaches, including dual testing algorithms involving both treponemal and non-treponemal assays, is essential to enhance detection of latent or early-stage infections. There is also a need for larger, multi-center studies across different regions to validate the observed zero prevalence and provide a more comprehensive epidemiological picture. Strengthening surveillance systems and maintaining effective sexually transmitted infection control programs will be crucial in sustaining the apparent low burden of syphilis and preventing its re-emergence in the population.

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