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Prevalence and Associated Factors of Sexually Transmitted Bacterial Infections among Pregnant Women Attending Selected Health Facilities in Anambra State, Nigeria

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A B S T R A C T

Sexually transmitted infections (STIs) are a major global health issue, especially in developing countries, with significant economic and health consequences. Pregnant women are particularly vulnerable to severe complications from STIs such as stillbirth, low birth weight, and secondary infertility. Limited access to diagnostic tests and healthcare services exacerbates the problem in low-income regions. This study aimed to assess the prevalence and risk factors of sexually transmitted bacterial infections (STBIs) among pregnant women, providing essential data to inform public health strategies and improve maternal care. This was a cross-sectional study. Participants consisted of 229 pregnant women attending antenatal clinics in selected healthcare facilities in Anambra state, Nigeria. Data was collected using a semi-structured questionnaire and a proforma for findings on clinical examination and laboratory investigations. Mean age was 29.8 years. Most had one sexual partner (92.6%), with a history of STI treatment (16.4%). A significant proportion experienced vaginal itching (89.5%) and abdominal pain (65.8%), and over half used tissue paper and water for hygiene. Laboratory analysis revealed that 17.4% had curable STBIs and bacterial vaginosis. Key factors linked to higher STBI prevalence include lower education, polygamy, unemployment, low family income, multiple sexual partners, and HIV status. A multi-faceted approach involving improved education, routine screening, targeted interventions, and community engagement is essential to reducing the burden of STIs among pregnant women in Nigeria.

Keywords: Antenatal, Bacterial vaginosis, Pregnant women, Sexually transmitted bacterial infections, Sexually transmitted infections

1. Introduction

Sexually transmitted infections (STIs) are a group of communicable diseases that are transmitted by sexual contact (Oduvwu, 2024). More than 30 different bacteria, viruses and parasites are known to be transmitted sexually. Eight of these pathogens are associated with the greatest incidence of sexually transmitted diseases globally. Of these eight infections, four are currently curable with existing, effective single-dose regimens of antibiotics (syphilis, gonorrhoea, chlamydia and trichomoniasis), while the other four are viral infections which are incurable (hepatitis B, herpes simplex virus, human immunodeficiency virus (HIV) and human papillomavirus) (World Health Organization, 2025). STIs are spread predominantly by sexual contact through vaginal, anal and oral sex and some can also be spread through non-sexual means via blood or blood products (Oduvwu, 2024). Syphilis, hepatitis B, HIV, chlamydia, gonorrhoea, herpes, and HPV can be transmitted from mother to child during pregnancy and childbirth.(Rowley et al., 2019) Common symptoms of STIs include vaginal and urethral discharge in women, burning sensation in men, genital ulcers and abdominal discomfort (Oduvwu, 2024; Workowski et al., 2021). A person can have an STI without having obvious symptoms of the disease.

Sexually transmitted bacterial infections (STBIs) are caused by bacterial agents. They include *Ureaplasma urealyticum*, *Treponema pallidum*, *Chlamydia trachomatis*, *Neisseria gonorrhoea*, *Shigella* spp., *Campylobacter* spp., Group B *Streptococcus*, *Mycoplasma hominis*, *Calymmatobacterium granulomatis*, *Haemophilus ducreyi* and bacterial vaginosis-associated organisms. These bacterial infections can be transmitted from an infected pregnant mother to the baby during antepartum, intrapartum and postpartum periods. For example, syphilis can cross the placenta and infect the baby in utero while gonorrhoea and chlamydia can be transmitted to the baby during delivery through the birth canal (Workowski et al., 2021).

Chlamydia trachomatis infection is one of the most common STBIs. Fifty to 80% of women infected with *C. trachomatis* do not develop symptoms; these women are considered silent reservoirs of the pathogen and continue to transmit it sexually (De Azevedo et al., 2019). In sub-Saharan Africa, females had a higher prevalence of chlamydia than males in 2020 estimated at 6.9% in females and 4.2% in males. *Neisseria gonorrhoea* was 1.8% and trichomoniasis was 7.6% respectively (Michalow et al., 2025). A recent meta-analysis conducted among pregnant women in sub-Saharan Africa estimated the pooled prevalence of syphilis to be 2.87% in sub-Saharan Africa using 44 studies (Hussen & Tadesse, 2019). Several factors have been identified to

be associated with the prevalence of STIs in pregnant women including young age, low socioeconomic status. cleaning with water as opposed to using tissue paper after visiting the toilet, early sexual debut and the presence of bacterial vaginosis (Masha et al., 2017), occupation, family income, marital status, number of sexual partners in the last 12 months, and infants born of mothers with STIs (De Azevedo et al., 2019).

Pregnant women are a special population of public health importance. The choice of pregnant women for this study was necessary and essential based on their strategic position in the cycle of sexually transmitted infections and diseases and the effects and consequences are more profound compared to their non-pregnant counterparts (Kumar et al., 2022). The hormonal and physiological changes and reduced immune activity in pregnancy make women vulnerable to infections and more likely to acquire STIs during pregnancy (De Azevedo et al., 2019). More than 1 million STIs are acquired every day globally (World Health Organization, 2025), and the number of pregnant women with STIs is increasing by about 250 million yearly in developed countries and twice that number in developing countries. Recent estimates indicate that over 900,000 pregnant women were infected with syphilis resulting in around 350,000 adverse birth outcomes of which 200,000 occurred as stillbirth or neonatal death (Tadesse & Geda, 2022).

Sexually transmitted bacterial infections have tremendous adverse effects on pregnant women and if not identified and treated promptly, can result in serious long-term consequences. They have been linked to conditions such as spontaneous abortions/miscarriages, pelvic inflammatory diseases (PID), stillbirth, prematurity, low birth weight, ectopic pregnancy, infertility, preterm labour, premature rupture of foetal membranes, postpartum endometritis, post-abortal and puerperal sepsis, congenital deformities, foetal, perinatal, neonatal and maternal deaths (Kumar et al., 2022; Tadesse & Geda, 2022). Untreated bacterial STIs in women result in PID in up to 40% of infections; and 1 in every 3 of these will result in infertility. Tubal damage from STIs can lead to ectopic (tubal) pregnancy, the cause of up to 10% of maternal mortality in settings with high STI prevalence. Chronic pelvic pain from untreated bacterial STIs is an important cause of healthcare visits among pregnant women. Up to 4000 newborn babies become blind every year because of eye infections that are attributable to untreated maternal STIs, and that could be easily prevented with topical infant eye medications (US Centers for Disease Control and Prevention & World Bank, 2006). Other long-term morbidities that have been linked to these infections in pregnancy include cervical cancers, hepatocellular cancer, cirrhosis, chronic hepatitis, chronic physical pain, emotional distress as well as social rejection and some women also suffer from reproductive morbidities for a long time because of the prevailing culture of silence (World Health Organization, 2025). In addition to health effects, STDs carry great social and economic consequences, particularly for women. Social consequences include stigmatisation, domestic abuse and even abandonment (Sharma & Sherkhane, 2016).

The WHO Global Health Sector Strategy on STIs, 2016–2021 provides goals, targets, and priority actions for stemming the STI epidemic (World Health Organization, 2016). As data on STI burden are critical for efforts to prevent, control, and manage STIs, the first strategic direction of the Global Strategy is to increase information, including STI prevalence estimates, for focused public health action. Estimating the global burden of STIs is hampered by the limited availability of STI diagnostic testing and surveillance and a scarcity of high-quality published studies of STI prevalence in low- and middle-income countries (World Health Organization, 2016).

There is a paucity of epidemiological data on curable STBIs among pregnant women residing in the study area. It is imperative that current epidemiological data on STBIs in terms of prevalence, intensity, determinants and transmission trends are available to identify needs and areas for better interventions. The findings of this study are expected to strengthen understanding of STI epidemiology among pregnant women attending antenatal clinics in health facilities and help to guide clinical decision-making, public resource allocation, and optimisation of intervention protocols required to address the high burden of STIs. In view of this, this study aimed to determine the prevalence and distribution of curable STBIs (*T. pallidum*, *C. trachomatis, N. gonorrhoeae*), and bacterial vaginosis and associated factors among pregnant women attending antenatal health facilities in Anambra state, Nigeria.

2. Materials and Methods

2.1 Study design and study sites

This was a hospital-based, cross-sectional study conducted at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, in Nnewi north local government area (LGA) and Izunna Specialist Hospital, Awka in Awka south LGA, both in Anambra state, south-east Nigeria. The inhabitants of both LGAs are predominantly of Igbo ethnicity. Christianity is the major religion. Nnewi North is an urban, single-town LGA with four autonomous quarters namely Otolo, Nnewichi, Uruagu, and Umudim. Its population in 2025 is estimated at 1,362,000 (MacroTrends, 2025), and consists mainly of traders, civil servants, artisans and farmers. Nnewi North is also known for its commercial activities particularly in the automotive and manufacturing sectors. Nnewi North have several registered healthcare facilities by level of care comprising primary healthcare, secondary and tertiary facilities. NAUTH Nnewi is a government-own tertiary health facility. Antenatal clinic days are Tuesdays and Fridays with an average monthly new patient booking of 66. Awka south LGA has a mix of urban and rural areas with a population of approximately 2.5 million comprising Awka town and settlements such as Amawbia, Ifite-Awka, Isiagu, Mbaukwu, Nibo, Nise, Okpuno and Umuawulu. There are various markets, educational institutions and public and private health facilities. It is also a hub for commerce and industry in the region. Izunna Specialist Hospital is a private health facility that provides secondary care. The antenatal clinic is held every Wednesday with an average monthly new patient booking of 30.

2.2 Study population

The population for the study consisted of pregnant women attending routine antenatal care at healthcare facilities in Anambra state. Pregnant women in their second trimester (14 to 27 weeks) attending the antenatal clinic for the first time, regardless of gravid status, age and duration of pregnancy and willing to participate in the study and undergo free sexually transmitted bacterial infections screening procedures were included. Those who had been

treated for STIs and/or had been on broad-spectrum antimicrobial agents in the preceding 3 weeks were excluded from the study. Those with any clinical risk for gestation, such as vaginal bleeding, history of accidental fall, placenta previa, loss of amniotic fluid, or dilation of the cervix, among others and those who declined to give consent were also excluded from participating in the study.

2.3 Sample size and sampling technique

The sample size for the study was determined based on an estimated composite antenatal prevalence of C. trachomatis/N. gonorrhoea/T. vaginalis of 15.5%.(Babalola & Klausner, 2025) We used the formula

$$n = \frac{z^2 p(1-p)}{d^2} \qquad (1)$$

where n is the sample size, p is the expected prevalence obtained from a previous study, z is the standard normal deviate corresponding to the 95% confidence level, and d is the margin of error estimated at 5%. The calculated value was further adjusted for attrition thus giving a sample size of 223.6. A total of 229 pregnant women were eventually sampled for this study.

The purposive sampling method was used to select two health care facilities, namely Nnamdi Azikiwe University Teaching Hospital Nnewi, located in Nnewi north LGA and Izunna Specialist Hospital, Awka in Awka south LGA, both in Anambra state. The sample size was equally allocated to each selected health facility and systematic random sampling used to select all eligible and consenting pregnant women attending antenatal clinic. Average monthly attendance for each health facility was determined from the antenatal clinic attendance register and the sampling interval "K" was calculated by dividing the average monthly attendance with the allocated sample size. On each clinic day, the first client to be administered the questionnaire from the list of clients in the clinic attendance register was selected by simple random sampling technique (balloting), afterwards every Kth client was selected until the required sample size was obtained.

2.4 Data collection

A semi-structured questionnaire was adapted from reviewed literature.(Masha et al., 2017; Nirmal et al., 2017) The questionnaire was used to collect data on the socio-demographic characteristics of the respondents such as age, marital status, level of education, employment status, occupation, family income; the sexual and reproductive health history such as number of lifetime sexual partners, number of sexual partners in the last one year, age at first pregnancy, parity, gravidity, abortion history, history of pre-term birth, spontaneous abortion or infant death, clinical symptoms, HIV status; and hygiene practices of the respondents. A proforma was used to capture findings on clinical examination and laboratory investigations.

Nurses were engaged as data collectors and research assistants for the study and they under-went a one-day training on the purpose of the study, the study instruments, data collection methods and ethical considerations including obtaining informed consent and maintaining the privacy and confidentiality of participants' data. The study questionnaire was pretested in a health care facility different from the study site using 5% of the study size. Its validity was checked by experts in the Faculties of Medicine and Basic Clinical Sciences, Nnamdi Azikiwe University, Nnewi campus and modifications were made according to their recommendations and the final version used for data collection.

On each day of data collection, a nurse on duty at the antenatal clinic provided general information about the study to the women who had completed their ANC visit on for that day. Those who indicated interest and met the inclusion criteria received further in-depth information about the study were enrolled after they gave their written consent. The questionnaire was interviewer-administered by the trained data collectors. After their interview, each participant was given a sterile specimen bottle and instructed on how to provide a clean catch urine sample. Following this each participant underwent general clinical and gynaecological examinations in order to detect clinical signs of STBIs. Genital ulcers, warts and abnormal vaginal or cervical discharge were diagnosed clinically and the clinical findings were recorded on the proforma. Venous blood samples were taken for serological analysis of *T. pallidum*, and cervico-vaginal swabs collected to test for N. gonorrhoeae, C. trachomatis and bacterial vaginosis (Mawak J D et al., 2011).

During the gynaecological examination, the cervico-vaginal samples (endocervix, ectocervix and vaginal wall) were collected with the aid of vaginal speculums and sterile cotton wool swabs. Each swab sample was collected by inserting it approximately 2 inches into the vaginal opening and gently turning around twice ensuring rubbing the swab against the vaginal wall. The swab was immersed in TRIS-EDTA (TRIS-HCl 10 mM and EDTA 1mM pH 8,0) buffer and the samples were transported in a thermal box (2°C to 8°C) and stored in the laboratory at -20 °C until processed. The vaginal smears were prepared by rolling the swab onto a microscope glass slide. Slides were air-dried at the health facility before being transported to the laboratory for heat fixation followed by Gram staining and microscopy using the scoring system described by Nugent (Masha et al., 2017; Nugent et al., 1991; Shimano et al., 2020; Workowski et al., 2021).

Active syphilis was diagnosed by positive results of both the rapid plasma regain test (RPR; Becton Dickinson, MD, USA) and a specific Enzyme Immunoassay (EIA) test. The RPR test was performed by mixing the plasma with a reagent containing a cardiolipin-cholesterol-lecithin antigen. The antibodies present bind to the antigen, forming visible clumps and the degree of clumping (or agglutination) was assessed to determine the level of antibodies. A positive result indicated that antibodies were detected, suggesting a current or past syphilis infection. This was further confirmed and the stage of infection determined using Enzyme Immunoassay test.

N. gonorrhoeae was diagnosed with the Nucleic Acid Amplification Test (NAAT) This method detects the genetic material of N. gonorrhoeae and is highly sensitive and specific. Results determined as reported as positive indicated the presence of *N. gonorrhoea*. *Chlamydia trachomatis* was also

diagnosed by NAAT. NAATs are the most common and sensitive tests for detecting chlamydia. They amplify the DNA or RNA of the bacteria, making it easier to detect. Results determined as reported as positive indicated the presence of C. trachomatis.

Bacterial vaginosis (BV) was diagnosed based on criteria described by Nugent (Masha et al., 2017; Nugent et al., 1991; Shimano et al., 2020; Workowski et al., 2021). This clinical diagnosis requires that three of the following four criteria be met: (1) a vaginal pH of greater than pH 4.5; (2) the presence of clue cells in the vaginal fluid; (3) a milky, homogeneous vaginal discharge; and (4) the release of an amine (fishy) odour after addition of 10% potassium hydroxide to the vaginal fluid. The pH was determined directly with the use of pH sticks placed on the vaginal wall in the range covering pH 4.0 to pH 6.5. The swab was then extracted into 0.2 mL of physiological saline and a drop of the extract was then placed on a glass slide. A drop of 10% potassium hydroxide was placed on another glass slide. The swab was then stirred in the 10% potassium hydroxide and immediately evaluated for the presence of a fishy odour. Both drops are then covered with a coverslip and examined at 400x magnification with a light microscope. Clue cells are identified as vaginal epithelial cells with such a heavy coating of bacteria that the peripheral borders are obscured. If three of four criteria are met, then a clinical diagnosis of bacterial vaginosis was made.

2.5 Measurement of variables and data analysis

The primary outcomes were prevalence of curable STBIs and bacterial vaginosis restricted to women who were screened for sexual transmitted bacterial infections during routine ANC. Prevalent curable STBI was defined as the detection of chlamydia, gonorrhoea, and syphilis on the initial screening test. Pregnant women who self-reported discharge and had a Nugent score of 7±10 were considered bacterial vaginosis-positive, while pregnant women with a Nugent score of 7±10 but without discharge were considered bacterial vaginosis-negative (Masha et al., 2017; Shimano et al., 2020).

The data were cleaned, coded and analysed using SPSS statistical software, version 23.0 (SPSS, Chicago, IL, USA). Descriptive statistics included frequencies and cross-tabulations. Comparison between groups was made using the bi-variate test and multi-variate test when appropriate. All analyses were two-tailed and the level of significance was set at 5% ($p<0.05$). Prevalence of STBIs was determined as the number of participants with syphilis, C. trachomatis, N. gonorrhoeae and BV among the pregnant women tested and expressed as a percentage. A logistic regression model was used to evaluate potential risk factors for STBI. Variables identified as statistically significant in initial bi-variate analyses ($p<0.05$) or defined prior were subsequently evaluated, one at a time, in logistic regression models. Variables with high levels of missing data were not included in the models. Next, these variables identified were then included as covariates in larger multivariable logistic regression models for prevalent STBIs. The characteristic with the largest p-value will be eliminated in each iteration until reaching a final, reduced model where the remaining covariates were statistically significant at <0.05 level. Odds ratios (OR) and 95% confidence intervals (CI) were determined with statistical significance set at a p-value of <0.05.

3. Results

3.1 Sociodemographic characteristics

The socio-demographic characteristics of the are summarised in Table 1. The mean age of the respondents was 29.8 ± 7.0 years. Fifty five percent of the respondents were less than thirty years while 11.6% were between the ages of forty years and above. Two hundred and two (88.4%) of the respondents were married as at the time of this study. Majority of the respondents were Christians (98.4%) while only three (1.6%) are traditionalists. In terms of level of education, 13 (5.8%) of the respondents attended primary school, secondary 38 (17.5%) and tertiary 169 (74.1%). Ninety five percent of the respondents came from a monogamous family. Out of one hundred and ninety-seven that were employed; 47 (20.2%) respondents were civil servants while majority were mainly traders (62.0%). Majority of the respondents (96.3%) used water cistern toilets; the remainder (3.7%) made use of pit latrines. More than half (55.6%) mainly used both tissue paper and water for cleaning after usage of toilet (Table 1)

Table 1 - Socio-demographic and hygiene characteristics of the respondents.

Variable	Frequency	Percentage
Age category (Years)		
< 30	126	55.0
30 – 39	76	33.3
40 and above	26	11.6
Mean age (Years)	29.8 ± 7.0	
Marital status		
Married	202	88.4
Single	18	7.9
Widowed	7	2.6

Variable	Frequency	Percentage
Divorced/separated	2	1.1
Religion		
Christian	124	98.4
Islam	0	0.0
Traditional	5	1.6
Level of education		
Non formal	9	2.6
Primary	13	5.8
Secondary	38	17.5
Tertiary	169	74.1
Type of relationship		
Monogamous	208	91.0
Polygamous	20	9.0
Employment status		
Employed	197	86.2
Unemployed	32	13.8
Occupation if employed		
Civil servant	47	20.2
Farmer	9	4.3
Artisan	30	13.5
Trader	142	62.0
Family income		
< 70,000	31	13.2
≥ 70,000	198	86.8
Toilet type		
Water cistern	220	96.3
Pit toilet	9	3.7
Mode of cleaning after using the toilet		
Tissue paper/other solid materials only	53	23.3
Water only	49	21.2
Tissue paper & water	127	55.6
Vaginal washing/douching when bathing		
Yes	216	94.2
No	13	5.8

3.2 Sexual and reproductive characteristics

Table 2 shows the sexual and reproductive characteristics of the study participants. Out of the 229 respondents interviewed in this study, 92.6% had only one sexual partner over time while less than 5% had more two sexual partners. 211 (92.1%) respondents had only sexual partner in the last one year.

Majority of the respondents (90.0%) were less than 30 years at first pregnancy while 19 (8.3%) were between the ages of 30 and 39 years old. Seventy-six respondents (33.2%) were nulliparous whereas one hundred and fifty-three (66.8%) respondents had given birth to one or more. Less than a quarter of the pregnant had history of preterm birth/spontaneous abortion (18.3%). As regards to HIV status, seventeen of the respondents (7.4%) did not know their HIV status. As at the time of this study thirty-nine participants (17.0%) had treated symptoms of STI in the past twelve months. Forty-five (19.6%) respondents mentioned that they had previous history of vaginal discharge. Five women (2.1%) reported that they were experiencing vaginal discharge while 11 (4.8%) were observed to have vaginal discharge on clinical examination.

Table 2 - Sexual and reproductive characteristics of the respondents.

Variable	Frequency	Percentage
Number of sexual partners over a lifetime		
One	212	92.6
Two	11	4.8
More than two	6	2.6
Number of sexual partners in the last one year		
One	211	92.1
Two	11	4.8
More than two	7	3.1
Age at first pregnancy		
less than 30	206	90.0
30 – 39	19	8.3
40 and above	4	1.7
Parity		
Nullipara	76	33.2
Multipara	144	62.9
Grandmultipara	9	3.9
Gravidity		
Primigravida	71	31.0
Multigravida	158	69.0
Abortion (miscarriage) history		
Yes	33	14.4
No	196	85.6
History of preterm birth/spontaneous abortion		
Yes	42	18.3
No	187	81.7
History of infant death/previous pregnancy		
Yes	8	3.5
No	221	96.5
HIV status		
Negative	212	92.6
Positive	0	0.0
Don’t know	17	7.4

Variable	Frequency	Percentage
Ever use of condoms		
Yes	196	85.6
No	33	14.4
Treatment of STI symptoms in the past 12 months		
Yes	39	17.0
No	190	83.0
Clinical complaints		
Yes	38	16.6
No	191	83.4
Previous syndromic treatment of genital infection		
Yes	37	16.4
No	191	83.6
Previous history of vaginal discharge		
Yes	45	19.6
No	184	80.4
Current vaginal discharge (self-reported)		
Yes	5	2.1
No	124	97.9

3.3 Clinical complaints

Thirty-eight (16.6%) had clinical complaints. Vaginal itching was the most frequent complaint (89.5%), followed by pain during intercourse (84.2%) and difficult/painful urination (84.2%) (Figure 1).

3.4 Prevalence of STBIs

Table 3 shows the etiologic bacterial agents isolated from the study population. Out of the 229 samples examined, 14 were positive for at least one STBI giving an overall prevalence of 6.1%. The prevalence of C. trachomatis was 3.5% (8/229), T. pallidum 0.4% (1/229), and N. gonorrhoeae 2.2% (5/229). Bacterial vaginosis was found in 11.4% (26/229). Nine of 14 women with curable STBIs (64.3%) were asymptomatic, 2 (14.3%) were visibly symptomatic while 3 (21.4%) were not visibly showing symptoms.

3.5 Factors associated with STBIs

Table 4 depicts the factors associated with sexually transmitted bacterial infections among pregnant women attending antenatal care at health facilities in Anambra state. The respondents who had no formal education were 51 times more likely to have STBIs compared to those who attended tertiary education (OR- 51.0, CI- 6.586 – 394.94, P<0.001). Fifteen out of thirty-three infected, from polygamous family were 64.2 times more likely to be infected with STBIs compared to those from monogamous homes (OR- 64.2, CI- 13.56 – 303.56, P< 0.001). Unemployed pregnant women selected and interviewed in

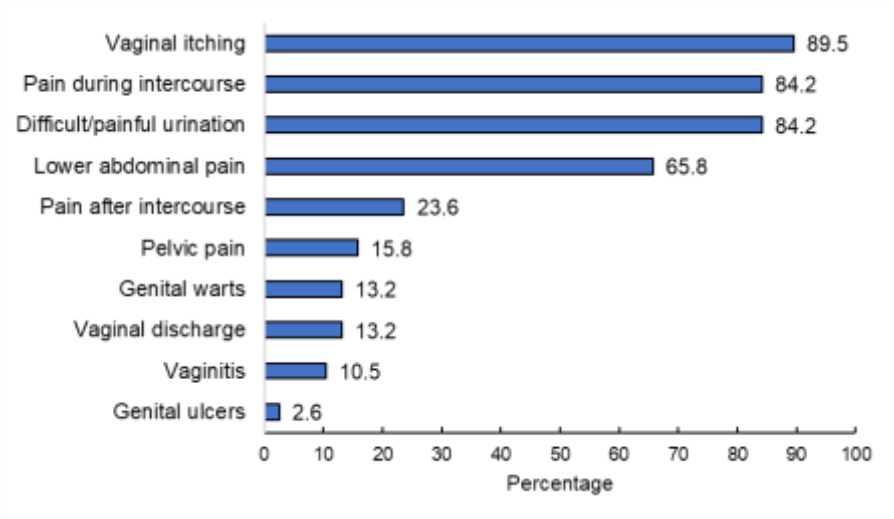

Fig. 1 - Distribution of clinical complaints (N = 38/229).

this study were 5.8 times more likely to be infected with STBIs compared to those who were employed (OR- 5.8, CI- 2.364 – 14.21, P< 0.001). In terms of family income, respondents who earn ≥ 70,000 monthly were 70% less likely to have STBIs compared to those who earn less than 70,000 (OR- 0.3, CI- 0.098 – 0.610, P = 0.001). Those of them who have one sexual partner as at the time of this study were 96% less likely to have STBIs compared to those that have more than two partners (OR- 0.04, CI- 0.004 – 0.336, P = 0.004). The pregnant women studied who were HIV negative, were 90% less likely to have STBIs compared to those who don't know their status (OR- 0.1, CI- 0.027 – 0.286, P<0.001). In terms of use of condoms, those who make use of condoms were 25.1 times were more likely to have STBIs compared to who doesn't use condoms (OR- 25.1, CI- 9.317 – 67.658, P < 0.001). In this study, pregnant women who had previous history of vaginal discharge were 12.6 times more likely to have STBIs compared to those who didn't have any history of vaginal discharge (OR- 12.6, CI- 5.318 – 29.754, P < 0.001).

Table 3 - Prevalence of STBIs and BV in the study population

Causative agents	**Infected n (%)**	**Symptomatic n (%)**		**Asymptomatic n (%)**
		Visible	**Not visible**	
Chlamydia trachomatis	8 (3.5)	0 (0.0)	1 (14.3)	8 (85.7)
Treponema pallidum	1 (0.4)	1 (100.0)	0 (0.0)	0 (0.0)
Neisseria gonorrhoeae	5 (2.2)	1 (25.0)	2 (50.0)	1 (25.0)
Prevalence of STBI (≥ 1)	**14 (6.1)**	**2 (14.3)**	**3 (21.4)**	**9 (64.3)**
Bacterial vaginosis	26 (11.4)	3 (9.5)	3 (9.5)	20 (81.0)

4. Discussion

The findings from this study provided a comprehensive view of the socio-demographic characteristics of pregnant women attending antenatal care in healthcare centres in Anambra State. The ANC attendees mainly comprised younger women. Age is an important predisposing factor that influences health-seeking behaviour (Hassan & Basirka, 2021). Majority of the women were married, suggesting an existing traditional social structure that encourages childbearing within marriage and not outside wedlock. Moreover, in traditional social settings, marital support may afford women increased opportunities to adhere to ANC attendance; such support systems may not be available to unmarried women in need of ANC, contributing to poor ANC attendance, this was reported in studies in other parts of Africa (Degefa et al., 2024), as well as in Nigeria (Babatunde et al., 2022). In this study, Anambra State, being a predominantly Christian setting with monogamous family structures, it is unclear if religion played a role in encouraging ANC attendance, although monogamous settings may provide stable financial support thereby encouraging ANC attendance. Higher family income (of above N70,000) was reported among most respondents, suggesting a level of economic stability and the ability to foot some out-of-pocket expenses like ANC costs. Religion, cultural practices and financial stability have been attributed to influence ANC attendance in previous studies (Al-Mujtaba et al., 2016; Drigo et al., 2021). Majority had completed tertiary education, indicating a relatively high educational level among the study population.

From the reproductive, sexual, and clinical history of respondents, a low proportion of respondents had had multiple sexual partners, suggesting a low risk of exposure to sexually transmitted infections (STIs); however, being self-reported, there is a likelihood of reporting bias. However, a recent study conducted in southwest Nigeria revealed contrasting results, with the majority of respondents reporting more than one sexual partner, suggesting that these differences may be location-specific (Akinyemi & Ibrahim, 2024). The early pregnancy age of below 30 years among most respondents aligns with early maternal age in similar studies conducted across sub-Saharan Africa (Dunlop et al., 2018). Spontaneous abortions were reported in about one-quarter of

Table 4 - Factors associated with STBIs and BV

Variable	Infected (%)	OR	95% CI	P-value
Age (years)				
less than 30	29 (72.7)	3.0	0.654 – 13.764	0.158
30 – 39	8 (21.2)	1.3	0.240 – 6.524	0.791
40 – 49 (Ref.)	2 (6.1)	1	-	-
Marital status				
Married	27 (66.7)	0.1	0.009 – 2.387	0.176
Single	11 (27.3)	1.5	0.078 – 28.890	0.788
Widowed	1 (3.0)	0.3	0.007 – 8.560	0.442
Divorced/separated (Ref.)	2 (6.1)	1	-	-
Level of education				
Non formal	4 (9.1)	51.0	6.586 – 394.94	<0.001*
Primary	1 (2.8)	59.5	12.250 – 288.99	<0.001*
Secondary	23 (57.6)	46.1	13.754 – 154.81	<0.001*
Tertiary (Ref.)	5 (12.1)	1	-	-
Type of relationship				
Monogamy (Ref.)	21 (54.5)	1	-	-
Polygamy	18 (45.5)	64.2	13.56 – 303.56	<0.001*
Employment status				
Employed (Ref.)	25 (63.6)	1	-	-
Unemployed	15 (36.4)	5.8	2.364 – 14.21	<0.001*
Occupation if employed				
Civil servant	15 (36.4)	3.9	1.545 – 9.684	0.004*
Farmer	4 (9.1)	5.1	1.019 – 25.304	0.047*
Artisan	6 (15.2)	2.0	0.627 – 6.318	0.242
Trader (Ref.)	16 (39.4)	1	-	-
Family monthly income				
< 70,000 (Ref.)	12 (30.3)	1	-	
≥ 70,000	28 (69.7)	0.3	0.098 – 0.610	0.001*
Number of sexual partners over a lifetime				
One	27 (66.7)	0.04	0.004 – 0.336	0.004
Two	8 (21.2)	0.9	0.059 -12.975	0.923
More than two (Ref.)	5 (12.1)	1	-	-

Variable	Infected (%)	OR	95% CI	P-value
Number of sexual partners in the last one year				
One	27 (66.7)	0.04	0.004 – 0.336	0.004
Two	8 (21.2)	0.9	0.059 – 12.975	0.923
More than two	5 (12.1)	1	–	–
Age at first pregnancy				
< 30	32 (81.8)	0.4	0.033 – 4.283	0.430
30 – 39	6 (15.2)	1.0	0.072 – 13.868	1.000
40 – 49 (Ref.)	1 (3.0)	1	–	-
History of preterm birth/spontaneous abortion				
Yes	26 (66.7)	22.0	8.768 – 55.198	<0.001*
No (Ref.)	13 (33.3)	1	-	-
Ever use of condoms				
Yes (Ref.)	17 (42.4)	1	-	-
No	23 (57.6)	25.1	9.317 – 67.658	<0.001*
Treatment of STI symptoms in the past 12 months				
Yes (Ref.)	16 (39.4)	1	-	-
No	24 (60.6)	0.2	0.085 - 0.471	<0.001*
Toilet type				
Water cistern toilet	36 (90.9)	0.3	0.056 – 1.237	0.071
Pit toilet (Ref.)	4 (9.1)	1	-	-
Mode of cleaning after visiting the toilet				
Tissue paper/other solid materials only	12 (30.3)	7.4	2.186 – 25.228	0.001*
Water only	23 (57.6)	22.8	7.046 – 74.067	<0.001*
Tissue paper and water (Ref.)	5 (12.1)	1	-	-
Vaginal washing/douching when bathing				
Yes (Ref.)	31 (78.8)	1	-	-
No	8 (21.2)	2.2	0.824 – 5.632	0.111
Previous history of vaginal discharge				
Yes (Ref.)	24 (60.6)	12.6	5.318 – 29.754	<0.001*
No	16 (39.4)	-	-	-

Ref., reference category; * statistically significant; OR, odds ratio; CI, confidence interval

respondents, suggesting the need for further investigation into possible underlying health or lifestyle factors. Moreover, pregnancy risks may be linked to healthcare access and quality in the region (Bolarinwa et al., 2021). High rates of adverse pregnancy outcomes were also reported in studies in Uganda and Kenya and were attributed to poor healthcare infrastructure in the region (Waiswa et al., 2020). Very high rates of STI symptoms recorded in this study suggest poor access to or under-utilization of proper diagnostic facilities in the area, with people opting to self-manage symptoms rather than obtain a proper diagnosis and treatment. Although this is a useful strategy in many settings, it can result in overtreatment or under treatment of STIs, thus the need for adequate diagnosis (Kenyon et al., 2023). A large proportion of respondents reported douching of the vagina, which is linked to an increased risk of bacterial vaginosis due to alteration of the vaginal natural flora and is ineffective in preventing STIs and HIV following sexual exposure (Workowski et al., 2021; Yıldırım et al., 2020). Furthermore, participants who use water to clean up after using the toilet were more likely to have STBIs

compared to those who used tissue paper. This has been attributed to the possibility that such cleaning method can transport bacteria from the perianal area to the vagina, as pathogens causing STBIs may be found in paragenital a rea(Masha et al., 2017).

The prevalence of STBIs recorded in this study reflects the prevalences of STBIs have been reported in Nigeria in recent times.(Oduvwu, 2024) The prevalence of bacterial vaginosis is however much higher that the prevalence of 8.2% observed in Lagos, Nigeria, however as in this study, many cases were asymptomatic thus the need for highly sensitive and specific serological tests (Enwuru et al., 2024).

Younger respondents had higher prevalence of STIs in this study, consistent with previous research in Kwazulu-Natal, South Africa.(Naidoo et al., 2014) This can be attributed to factors such as limited sexual health education, increased engagement in risky sexual behaviours, and lack of access to healthcare services and indicates the need for targeted interventions for younger populations. However, the absence of statistical significance in this study suggests that while the trend is observed, other confounding factors may influence the relationship between age and STI prevalence. Although married women had a high prevalence of STI, they were less likely to be infected compared to singles in this study. The higher prevalence among married individuals in this study could reflect the dynamics of sexual relationships in marriages, where trust might lead to complacency regarding safe sex practices. However, the statistical insignificance suggests a need for further investigation into the complexities of sexual relationships within marriage.

A striking finding is the strong association between low educational attainment and higher STI prevalence. Respondents with non-formal education had an odds ratio lower than those with only primary education. This aligns with previous research which found that individuals with lower educational levels often lack awareness of STIs and preventive measures (Nzoputam et al., 2022). This educational disparity underscores the critical need for comprehensive sexual health education, particularly in low-literacy communities. Initiatives should focus on increasing awareness about STIs and promoting safe sexual practices through targeted educational programs. Furthermore, the data indicates that unemployed individuals have a higher STI prevalence compared to their employed counterparts. However, the difference was not statistically significant. Unemployment is often linked to increased risk-taking behaviours and reduced access to healthcare resources, which may lead to higher STI rates. Family income further complicates this picture often leading to limited access to healthcare services and preventive resources, thereby exacerbating health disparities (Fagbamigbe & Idemudia, 2015). The study also reveals a strong association between the number of sexual partners and STI prevalence.

The data reveals that individuals with a history of preterm birth or spontaneous abortion have a significantly higher STI prevalence, with an odds ratio that suggests a strong link between reproductive health complications and STI risk. This finding aligns with a study by scoping review of preterm births in Africa (Mabrouk et al., 2022), which also found that women with adverse pregnancy outcomes were at increased risk of STIs. Conversely, Okunola, Alawode & Ajayi (2022), reported little differences but no significant association between reproductive health issues and STIs, suggesting that while some populations may show a correlation, this relationship is not universally applicable. The disparity may stem from differences in sample sizes, methodologies, or cultural contexts influencing reproductive health perceptions.

Study results show that those who do not use condoms show a higher prevalence of STIs compared to those who do, with a significant OR. This finding is consistent with research conducted in Nigeria, such as the work by Ajayi, Ismail & Akpan (2019) which emphasized the protective role of condoms in preventing STIs. However, contrasting findings can be seen in some studies outside Nigeria, where factors such as misconceptions about condom effectiveness or limited access can lead to inconsistent use. For example, a study in sub-Saharan Africa (Nyoni & James, 2022) found that while knowledge of condom effectiveness was high, actual usage rates were low, underscoring the gap between awareness and practice. The analysis shows a significant relationship between seeking treatment for STI symptoms and infection rates, though the data specifics were not provided. Previous studies have consistently demonstrated that individuals who seek timely medical attention for STI symptoms are less likely to experience severe complications (Nzoputam et al., 2022). Unfortunately, some individuals with STI symptoms may avoid seeking treatment due to stigma or lack of knowledge, leading to untreated infections and increased transmission rates (Odimegwu et al., 2017). This highlights the critical need for health education and stigma reduction in accessing care.

The type of toilet used and hygiene practices are shown to influence STI prevalence significantly. For instance, those using a water cistern toilet had a lower prevalence, while those relying on pit toilets had higher rates. This aligns with findings from previous research indicating that improved sanitation and hygiene practices are crucial in preventing STIs. The correlation between hygiene practices and STIs is supported by international studies as well. For example, research in rural South Africa demonstrated that inadequate hygiene practices contribute to higher rates of STIs, particularly among women (Naidoo et al., 2014). This suggests that hygiene education could be a vital component of STI prevention strategies. The prevalence of STIs is notably higher among individuals with a previous history of vaginal discharge. Abnormal vaginal discharge can be a sign of an underlying reproductive tract infection, increasing the likelihood of STIs if left untreated. Furthermore, individuals may misinterpret symptoms of vaginal discharge, leading to delayed treatment and higher STI rates, particularly in low-resource settings (Naidoo et al., 2014). This emphasizes the need for effective health education on recognizing and responding to symptoms.

This study makes a valuable contribution to knowledge by providing nuanced insights into antenatal STBI prevalence and the socio-demographic and sexual and reproductive health-related factors that influence it in Anambra State, Nigeria. This knowledge contributes to public health by emphasizing the need for comprehensive STI education within antenatal care services, potentially leading to more effective and culturally sensitive strategies to reduce infection rates. By filling gaps in existing research on STI prevalence and associated factors among pregnant women, this study lays the groundwork for future research and public health programs aimed at improving reproductive health outcomes in Nigeria and similar settings.

The study however has some limitations. This study relied on information self-reported by the participants may be subject to reporting errors, missed values and recall bias. Secondly, since this study touches on sensitive issues such sexual behaviour, the possibility of underestimation and underreporting cannot be excluded. Lastly, due to the cross-sectional design which provides a “snapshot” in time, the study is unable to determine cause-and-effect

relationships or track trends over time. Furthermore, it is difficult to establish the temporal relationship between the occurrence of STBIs and various factors assessed.

5. Conclusion

This study highlights critical socio-demographic and health-related factors influencing the prevalence and awareness of sexually transmitted infections (STIs) among pregnant women attending antenatal care in Anambra State, Nigeria. These findings are largely consistent with existing literature from Nigeria and other regions, although some contrasting results highlight the complexity of STI epidemiology. Understanding these socio-demographic factors is essential for designing targeted interventions and educational programs that address specific community needs, ultimately reducing STI prevalence and promoting better reproductive health outcomes. Continued research and tailored health strategies are critical in combating STIs in diverse populations. Key findings indicate that socio-economic factors such as marital status, educational attainment, income level, and hygiene practices were found to influence STI prevalence, with younger women under 30 years showing higher infection rates. The high incidence of asymptomatic STIs, particularly bacterial vaginosis and Chlamydia trachomatis, underscores the need for routine screening to identify and treat infections before they lead to complications.

Routine screening for STIs should be integrated into antenatal care visits, especially for asymptomatic cases. Early diagnosis and treatment can prevent long-term reproductive health complications and reduce the spread of infections. Special attention should be given to younger women, those with multiple sexual partners, and individuals with a history of adverse pregnancy outcomes (such as spontaneous abortions or preterm birth). These groups exhibit higher vulnerability to STIs and should benefit from tailored health interventions that focus on both prevention and treatment. Given that marital status and family support play a role in encouraging healthcare-seeking behaviours, interventions could aim at enhancing spousal and familial involvement in antenatal care, while also promoting the inclusion of unmarried women in support systems to ensure equitable healthcare access. Education on hygiene practices, particularly in relation to menstrual and sexual health, should be included in health education programs. Improved sanitation and access to clean water are also crucial for preventing STIs, particularly in rural and underserved regions.

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Statement of ethical approval

Ethical approval for this study was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethics Committee, prior to the commencement of the study (reference number: NAUTH/CS/66/VOL.16/VER.3/98/2024/038).

Statement of informed consent

Written informed consent was given by all individual participants included in the study. They were properly enlightened on the objectives, benefits and protocols of study, the need for voluntary participation and the right to stop participation at any time. At the end of the study, the examination/laboratory results were provided free of charge to all the participants.

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