Kwaghe International
Journal of Sciences and Technology

ISSN: 0000-0000

Index: Harvard, Boston, Sydney University, Dimensions, Lens, ResearchGet Scilit, Semantic, Google Scholar, Base etc

https://doi.org/10.58578/KIJST.v2i1.4591

Prevalence and Risk Factors Associated with *Neisseria gonorrhoeae* among Individuals in Obigbo, Rivers State

Olayemi Favour Olotu & Imarenezor Edobor Peter Kenneth
National Open University of Nigeria; Federal University Otuoke, Bayelsa State, Nigeria
imarenezorep@fuotuoke.edu.ng

Article Info:

Submitted:	Revised:	Accepted:	Published:
Dec 1, 2024	Dec 18, 2024	Dec 30, 2024	Jan 6, 2025

Abstract

Neisseria gonorrhoeae is a major public health concern due to potential for severe complication of infertility and pelvic inflammatory disease. This study assessed the prevalence and risk factors associated with *Neisseria gonorrhoeae* infection among youths in Obigbo, Rivers State, Nigeria. Using a cross-sectional design, 288 participants aged 16-35 years comprises of 105 males and 183 females were study to evaluate infection prevalence, awareness, and sexual health behaviors influencing transmission. Data collection was done using a structured questionnaire capturing demographic information, awareness levels, and risk-related behaviors, alongside rapid diagnostic testing for *N. gonorrhoeae*. Descriptive statistics and chi-square tests were used to analyze relationships between demographic variables and infection risk. Findings indicated a prevalence of 8 (2.78%), with a higher rate observed among males 5 (4.76%) than females 3 (1.64%). The higher prevalence among males and those within younger age brackets suggests behavioral patterns and risk perceptions that could be addressed through targeted public health interventions. Additionally, the study emphasizes a significant gap in awareness of *Neisseria gonorrhoeae*, underlining the need for improved health education focused on sexually transmitted infection (STI) prevention. Infection was more frequent among

KIJST Journal is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

individuals aged 16-20 years with males having high incidences and 21-25 years with females having the highest incidences, highlighting age-specific vulnerabilities. The risk factors included inconsistent condom use, limited awareness of *N. gonorrhoeae*, and a history of multiple sexual partners. Gender and educational background were significantly associated with awareness and preventive behaviors. Generally, the findings underscore the necessity of accessible sexual health services, community-based education programs, and socioeconomic support systems to address not only STI risks but also broader health disparities. Targeted interventions that consider both individual behaviors and social determinants of health may be effective in reducing the prevalence of *Neisseria gonorrhoeae* and improving the sexual health of youths in Obigbo, ultimately contributing to healthier and more informed communities in Rivers State.

Keywords: *Neisseria gonorrhoeae*, Gonorrhea, Obigbo, Prevalence, Risk factors, Rivers State, Youth

INTRODUCTION

Sexually transmitted infections (STIs) pose significant public health challenges globally, with *Neisseria gonorrhoeae* (*N. gonorrhoeae*) remaining a prominent pathogen contributing to this burden (Imarenezor et al., 2024). Globally and in Sub-Saharan Africa, both the prevalence and incidence rates of gonorrhoea are elevated. In Nigeria, the prevalence of gonorrhoea is alarmingly high, posing substantial challenges to public health interventions and healthcare systems. (Belcher et al., 2023; Imarenezor et al. 2024). Despite concerted efforts, the emergence of antimicrobial resistance (AMR) in *N. gonorrhoeae* strains further complicates treatment strategies (Imarenezor et al., 2024), emphasizing the urgent need for comprehensive epidemiological studies. Physicians assess symptoms, medical history, and risk factors, such as recent unprotected sexual activity. Common symptoms include urethral or vaginal discharge, pain during urination, and genital discomfort (Hara and Nathan, 2022). Gram staining is one of the fundamental techniques used to identify bacterial species based on the characteristics of their cell walls. *N. gonorrhoeae* appears as Gram-negative diplococci, meaning they occur as pairs of cells with a distinct pink colour under a microscope (Imarenezor et al., 2024). Typically, samples are collected from the site of infection, which can include urethral, cervical, rectal, or pharyngeal swabs, depending on the suspected site of infection. For urethral specimens, a urethral swab is collected by

inserting a swab into the urethra and gently rotating it to collect cells and discharge (Ofiri et al., 2024; Lewis and Ram, 2020). For cervical specimens, a cervical swab is collected by inserting a swab into the cervix and gently rotating it to collect cells. Rectal and pharyngeal specimens are collected similarly, by swabbing the respective areas (Imarenezor et al., 2024). Prevalence rates of gonorrhoea have fluctuated over time and differ between countries and regions. In recent years, certain regions have experienced a resurgence of gonorrhoea cases, especially in urban areas and among specific demographics such as men who have sex with men (MSM) and adolescents (Akpomedaye et al., 2024). Certain demographic groups are particularly vulnerable to gonorrhoea in Sub-Saharan Africa. These include young adults, adolescents, sex workers, MSM, and individuals with limited access to healthcare (Holland et al., 2020). Adolescent girls and young women are disproportionately affected by gonorrhoea due to factors such as early sexual debut, transactional sex, and limited access to sexual health services, including contraception and STI screening (Klaper, 2024; Omeershffudin and Kumar, 2023). Cultural norms and practices influence sexual behaviour and healthcare-seeking patterns in Sub-Saharan Africa. Stigma surrounding STIs, including gonorrhoea, may discourage individuals from seeking testing and treatment, leading to underreporting and untreated infections (Kurzyo and Harrison, 2020). Inconsistent condom use, multiple sexual partners, and transactional sex are common risk factors for gonorrhoea transmission in the region (Kivata, 2021). Nigeria bears a substantial burden gonorrhoea. Several studies and surveys conducted in Nigeria have reported high incidence rates of gonorrhoea across various regions of the country (Imarenezor et al., 2023). Socioeconomic factors play a crucial role in the prevalence of gonorrhoea. Poverty, unemployment, limited access to healthcare, and inadequate sexual health education contribute to higher infection rates in many regions. Marginalized populations such as sex workers, incarcerated individuals, and migrants often face greater barriers to accessing healthcare services, leading to higher prevalence rates within these communities (Imarenezor et al., 2023). Penicillin and tetracycline were once widely used for the treatment of gonorrhoea. However, the prevalence of penicillin- and tetracycline-resistant *N. gonorrhoeae* strains has increased significantly since the 1970s (Kreisel, 2021; Yukitake, 2020). In Nigeria, antibiotics are often available without a prescription, leading to inappropriate use and selection pressure on bacterial populations. Limited access to healthcare facilities and poor healthcare infrastructure in certain regions of Nigeria hinder effective diagnosis and treatment of gonorrhoea. Additionally, gonorrhoea can increase the

risk of HIV transmission if an individual is exposed to both infections simultaneously (Imarenezor et al., 2024; imarenezor et al., 2024 and Ofiri et al., 2024). Pregnant women with untreated gonorrhoea can transmit the infection to their newborn during childbirth, leading to neonatal conjunctivitis (infection of the eye), which, if left untreated, can cause blindness (Kreisel, 2021). Moreover, the risk of reinfection is high if sexual partners are not simultaneously treated, leading to a cycle of transmission (Lipsky et al., 2021). Gonorrhoea imposes a substantial economic burden on healthcare systems and society as a whole. The costs associated with diagnosing and treating infections, managing complications such as PID and infertility, conducting surveillance and prevention programs, and addressing the challenges of antimicrobial resistance are considerable (Nudel et al., 2018). Addressing these challenges requires coordinated efforts from healthcare providers, public health agencies, policymakers, and communities to prevent transmission, improve access to testing and treatment, and combat antimicrobial resistance. *N. gonorrhoeae* affects individuals of all demographics, but certain populations are more vulnerable to its transmission and complications due to various social, economic, biological, and behavioural factors. Adolescents and young adults are at higher risk of *N. gonorrhoeae* infection (Matud et al., 2020). This may be due to factors such as increased sexual activity, inconsistent condom use, and lack of awareness about STIs and preventive measures. Individuals who have had gonorrhoea previously are at an increased risk of reinfection (Belcher et al., 2023). This could be due to incomplete treatment, persistent carriage of the bacterium, or continued engagement in behaviours that promote transmission. Substance abuse, including alcohol and drug use, can impair judgment and decision-making, leading to risky sexual behaviours such as unprotected sex or sex with multiple partners (Mokgatel et al., 2021). This increases the likelihood of *N. gonorrhoeae* transmission. Individuals involved in sex work, including prostitution and escort services, are at heightened risk of *N. gonorrhoeae* infection due to frequent sexual contacts with multiple partners and inconsistent condom use (Pollock et al., 2024; Rodrigues et al., 2023). Men Who Have Sex with Men (MSM): MSM have a higher prevalence of *N. gonorrhoeae* infection compared to heterosexual individuals. Factors contributing to this increased risk include a higher number of sexual partners, engaging in anal intercourse, and a higher prevalence of other STIs within this population (Rodriguez - Planas et al., 2022). Limited access to healthcare facilities, including screening, testing, and treatment for STIs, can delay diagnosis and management of *N. gonorrhoeae* infection, allowing for its continued spread within communities (Scurtu et al., 2022). Socioeconomic

disparities, such as poverty, unemployment, and limited education, can contribute to increased risk of *N. gonorrhoeae* infection (Sharma et al., 2022). These factors may affect access to healthcare, awareness of preventive measures, and ability to negotiate safe sexual practices. *N. gonorrhoeae* infection rates can vary geographically, with higher prevalence observed in urban areas (Sumien et al., 2021) and regions with limited access to healthcare services, higher population densities, and increased mobility of individuals. The emergence and spread of antibiotic-resistant strains of *N. gonorrhoeae* pose a significant risk, particularly in populations where antibiotic misuse or inadequate treatment is common (Wang et al., 2022). Resistant strains can lead to treatment failure and persistent infection, contributing to ongoing transmission and complicating control efforts (Svenden et al., 2021). Certain biological factors, such as genetic susceptibility, hormonal changes (e.g., during pregnancy or menstruation), and concurrent genital tract infections, can increase an individual's susceptibility to *N. gonorrhoeae* infection or influence disease severity. Adolescents and young adults are disproportionately affected by gonorrhoea (Tran et al., 2024). Factors such as early sexual debut, limited knowledge about STIs, inconsistent condom use, and higher rates of partner change contribute to their vulnerability. Lack of access to sexual health education and healthcare services further exacerbates their risk. Men Who Have Sex with Men (MSM): MSM are at increased risk of *N. gonorrhoeae* infection compared to heterosexual individuals. This heightened vulnerability is due to factors such as anal intercourse, multiple sexual partners, higher prevalence of other STIs within this population, and barriers to accessing culturally competent healthcare services (Svenden et al., 2021). Sex Workers: Individuals involved in sex work, including both street-based and indoor sex workers, face heightened vulnerability to *N. gonorrhoeae* (Sumien et al., 2021) due to frequent sexual contacts with multiple partners, inconsistent condom use, and limited access to healthcare services. Stigmatization and criminalization of sex work further exacerbate barriers to prevention and care. Individuals living with HIV/AIDS are more susceptible to *N. gonorrhoeae* infection due to immunocompromise, which weakens their ability to fight off infections (Imarenezor et al., 2024). Additionally, HIV-positive individuals may engage in higher-risk sexual behaviours, further increasing their vulnerability to gonorrhoea and other STIs. Racial and Ethnic Minorities: Disparities in *N. gonorrhoeae* prevalence and outcomes exist among racial and ethnic minority groups, particularly in marginalized communities (Sumien et al., 2021). Factors contributing to their vulnerability include socioeconomic disparities (Tuddenham et al., 2021), limited access to

healthcare, cultural barriers, and experiences of discrimination within healthcare settings. Additionally, healthcare providers should offer partner notification and treatment services to prevent reinfection and spread within sexual networks. Provide counselling and support services to individuals at higher risk for gonorrhoea, including those with multiple sexual partners, inconsistent condom use, or a history of STIs (Yellman, 2020). In Nigeria, gonorrhoea prevalence is notably high, influenced by socio-economic factors, cultural practices, and inadequate healthcare infrastructure. Studies indicate variability in prevalence rates across different regions, with urban areas often reporting higher rates due to increased sexual activity and better reporting systems. The state of Rivers, located in the southern region of Nigeria, is not exempt from the pervasive impact of gonorrhoea. However, there remains a paucity of data regarding the prevalence and risk factors of *N. gonorrhoeae* strains circulating among adults in this region. Understanding the intricacies of *N. gonorrhoeae* infection dynamics is paramount for designing effective prevention and control measures tailored to the unique socio-demographic and healthcare landscape of Rivers State. Despite its global impact, there is a lack of comprehensive understanding regarding the prevalence and the risk factors of *N. gonorrhoeae* among adult populations in Rivers State, Nigeria. This knowledge gap hinders effective control and management strategies for combating gonorrhoea within the region. Therefore, this study aims to investigate these key aspects to provide insights into the prevalence and risk factors of *N. gonorrhoeae* infections, facilitating the development of tailored intervention measures to mitigate its spread and impact on public health in Rivers State.

METHODS

Study Design

This study employed a cross-sectional research design to assess the prevalence, and risk factors, associated with *Neisseria gonorrhoeae* infection among young people in Obigbo, Rivers State, Nigeria. The research aimed to establish a comprehensive understanding of the incidence and risk patterns of this infection among a demographic known to be at higher risk of sexually transmitted infections (STIs) due to behavioral, social, and economic factors. To gain an in-depth understanding, the study also explored levels of awareness, sexual health practices, and risk-related behaviors contributing to *Neisseria gonorrhoeae* transmission within this community.

Study Area

Obigbo is a predominantly rural locality situated in Rivers State, located in the Niger Delta region of Nigeria. With a community reliant primarily on fishing, farming, and small-scale trading, Obigbo faces economic challenges and limited access to healthcare resources, which could contribute to an increased vulnerability to infectious diseases, including STIs. The area is geographically characterized by rivers, creeks, and swampy terrain, with an environmental influence on the residents' lifestyle and occupational activities. The youth population in Obigbo has become a focal point for this study due to its considerable size and a relatively higher level of sexual activity among individuals in this age bracket. Limited sexual health education, combined with socio-cultural factors affecting access to preventive resources such as condoms and healthcare facilities, may increase the community's susceptibility to *Neisseria gonorrhoeae*. By focusing on Obigbo, the study aimed to generate data that could support targeted interventions and improve awareness programs tailored to this locality's specific social and health needs.

Study Population

The study targeted a carefully selected population of 288 youths, aged between 16 and 35 years, residing within Obigbo. This age group was chosen as it represents the peak demographic for sexually transmitted infections, as young people are often more sexually active and have more frequent partner changes compared to other age groups. The gender distribution included 183 females and 105 males, which helped in analyzing any gender-specific patterns in prevalence and awareness of *Neisseria gonorrhoeae*. The inclusion of both male and female participants ensured a comprehensive perspective on the infection's prevalence and risk factors, allowing for a better understanding of gender-based differences in exposure, awareness, and response to *Neisseria gonorrhoeae*.

Sampling Methods

A stratified random sampling method was applied to ensure that the participant selection was representative of the youth population in Obigbo. The participant pool was divided into two distinct gender-based groups, with one group consisting of females and the other of males. Using a random number generator, participants were chosen from a list of eligible individuals within each gender stratum to minimize selection bias and ensure a balanced representation. This approach allowed for equal consideration of both gender perspectives

in the study, facilitating an inclusive analysis of factors influencing *Neisseria gonorrhoeae* infection and risk awareness in Obigbo youth population.

Inclusion Criteria

Participants were eligible if they met the following criteria: they were between the ages of 16 and 35 years; were permanent residents of Obigbo; voluntarily provided informed consent for participation; and did not have any pre-existing medical conditions or were not currently undergoing antibiotic therapy that might affect the study's results. This selection process aimed to ensure the data collected would be both accurate and representative of healthy individuals within this age range, without interference from existing health issues that could skew the findings.

Exclusion criteria included any individuals currently on antibiotic treatment, as this could interfere with detection or response measures related to *Neisseria gonorrhoeae* and might falsely alter the infection's observed prevalence and symptomatology.

Data Collection Methods

Data were collected using a structured, self-administered questionnaire and a rapid diagnostic tool for on-the-spot diagnosis. The questionnaire was tailored to gather comprehensive information on each participant's demographic background, sexual behavior, awareness of *Neisseria gonorrhoeae*, and any associated risk factors. It was developed in English and translated into the local dialect for participants who preferred responding in their native language, ensuring clarity and accurate comprehension.

The questionnaire consisted of three main sections. The first section covered demographic information, capturing variables such as age, gender, education level, marital status, and occupation, allowing for stratified analysis based on these socio-demographic factors. The second section assessed participants' knowledge and awareness regarding *Neisseria gonorrhoeae*, focusing on their understanding of transmission modes, symptoms, prevention strategies, and the general health impact of the infection. These questions aimed to evaluate baseline awareness levels in the community and identify knowledge gaps that could contribute to infection spread. The final section focused on risk factors and sexual behaviors, inquiring about participants' sexual activity, frequency of condom use, number of sexual partners, prior history of STIs, and patterns of seeking medical care for sexual health concerns. These responses were crucial in identifying behavioral trends and risky practices that could elevate the risk of contracting *Neisseria gonorrhoeae*.

Ethical Considerations

The study protocol underwent rigorous ethical review and received approval from the Institutional Review Board (IRB) or Research Ethics Committee responsible for overseeing research involving human subjects. All participants provided written informed consent, which highlighted the voluntary nature of their involvement and assured them of the confidentiality and anonymity of their data. Each participant was informed about the study's objectives and the necessity for honest responses to enhance the validity of findings. For participants below the age of 18, additional consent was obtained from their legal guardians, ensuring ethical compliance in line with research standards for involving minors. All data collected through questionnaires were securely stored, and each participant's responses were anonymized to protect their identity, maintaining high standards of ethical integrity throughout the study.

Data Analysis

The data gathered were analyzed using SPSS software to generate detailed statistical insights into the prevalence, and risk factors, associated with *Neisseria gonorrhoeae* among youths in Obigbo. Descriptive statistics, including means, frequencies, and percentages, were utilized to provide a clear summary of the socio-demographic characteristics and levels of *Neisseria gonorrhoeae* awareness within the sample population. To assess associations between risk factors and *Neisseria gonorrhoeae* prevalence, chi-square tests were conducted, focusing on demographic variables such as age, gender, and educational background to identify significant relationships with knowledge and awareness levels. This helped in highlighting patterns within different demographic subgroups that could inform future educational and intervention efforts.

RESULTS

Demographic data of participants

The demographic profile of the study population offers a clear picture of the distribution of participants by gender, age, marital status, education level, employment, sexual activity, condom usage, history of STIs, and awareness of *Neisseria gonorrhoeae.*

Among the 288 participants, the gender distribution consists of 63.5% females (183 participants) and 36.5% males (105 participants), allowing for gender-specific analysis of

STI awareness and behaviors. Age-wise, participants are between 16 and 35 years, with the largest group in the 21-25 age range (29.2%), followed by those aged 26-30 (26%). The age distribution aligns with the study's focus on young adults, a demographic at high risk for STIs.

Marital status data shows that 73.3% are single, 21.5% are married, and 5.2% are divorced or separated, indicating that most participants are likely engaged in non-marital sexual relationships, which may correlate with higher STI risks. Regarding education, 41.6% have tertiary education, 35.4% have secondary education, 16.7% have primary education, and 6.3% have no formal education, highlighting a range in educational attainment and potential gaps in health literacy.

Employment status reveals that 50.4% are employed, 39.9% are unemployed, and 9.7% are students. The high unemployment rate may influence access to healthcare and STI prevention resources. In terms of sexual activity, 77.4% of participants report being sexually active, with 22.6% not active. Among sexually active participants, only 11.8% report consistent condom use, 45.8% use condoms occasionally, and 42.4% never use them, highlighting a significant risk factor for STI transmission.

A history of STIs was reported by 14.9% of participants, with 85.1% reporting no prior STIs. Additionally, 58.3% are aware of *Neisseria gonorrhoeae*, while 41.7% lack awareness, indicating a substantial knowledge gap that could impact transmission rates. This demographic analysis emphasizes areas for targeted intervention, particularly in promoting condom use, STI education, and awareness of *Neisseria gonorrhoeae* to reduce infection risks among high-risk groups.

Table 1 Demographic indices of participants

Demographic Characteristics	Number (n)	Percentage (%)
Total Participants	288	100%
Sex		
Male	105	36.5%
Female	183	63.5%
Age Group		
16-20 years	72	25%
21-25 years	84	29.2%
26-30 years	75	26%
31-35 years	57	19.8%
Marital Status		
Single	211	73.3%

Married	62	21.5%
Divorced/Separated	15	5.2%
Education Level		
No Formal Education	18	6.3%
Primary Education	48	16.7%
Secondary Education	102	35.4%
Tertiary Education	120	41.6%
Employment Status		
Employed	145	50.4%
Unemployed	115	39.9%
Student	28	9.7%
Sexual Activity Status		
Sexually Active	223	77.4%
Not Sexually Active	65	22.6%
Condom Usage Frequency		
Always	34	11.8%
Sometimes	132	45.8%
Never	122	42.4%
History of STIs		
Yes	43	14.9%
No	245	85.1%
Awareness of Neisseria gonorrhoeae		
Aware	168	58.3%
Not Aware	120	41.7%

Prevalence of *Neisseria gonorrhoeae* infection among young people in Obigbo

The epidemiological analysis of the study data reveals notable age- and gender-specific patterns in the prevalence of *Neisseria gonorrhoeae* infection among youths in Obigbo, Rivers State.

Across the entire study population of 288 participants, the overall prevalence of *Neisseria gonorrhoeae* was found to be 2.78%, with eight positive cases out of the total sample. A gender-based breakdown shows that males exhibited a higher prevalence rate of 4.76% (5 positive cases out of 105 samples) compared to females, who had a prevalence of 1.64% (3 positive cases out of 183 samples). This difference may suggest gender-specific factors in infection risk, potentially including behavioral or healthcare-seeking disparities.

Age-specific analysis further highlights that the prevalence of infection peaks within certain age groups. In males, the highest prevalence rate (7.41%) was observed in the 16-20 age group, with two positive cases among 27 participants. For females, the highest rate (4.88%) was seen in the 21-25 age group, with two positive cases among 41 participants. These age

brackets are often characterized by increased sexual activity and a higher likelihood of multiple sexual partners; factors known to elevate STI risk.

The data show a marked contrast in prevalence between genders within each age group. Notably, females in the 16-20 and 31-35 age groups recorded no positive cases, resulting in a 0% prevalence, while males in these same age groups had measurable prevalence rates of 7.41% and 4.00%, respectively. This pattern suggests possible differences in exposure risk or protective practices between males and females across different ages.

The highest negative prevalence—indicating the proportion of participants without infection—was observed in females within the 16-20 and 31-35 age groups, each showing a 100% negative prevalence. Overall, the data reveal a negative prevalence of 97.22% across all participants, underscoring that the majority of the sample tested negative for *Neisseria gonorrhoeae*.

Table 2 Prevalence data on Neisseria gonorrhoeae infection among young people in Obigbo

Age Group	Sex	Sample Collected (n)	Positive Cases (n)	Prevalence (%)	Negative Cases (n)	Negative Prevalence (%)
16-20	Male	27	2	7.41%	25	92.59%
	Female	49	0	0.00%	49	100.00%
21-25	Male	32	1	3.13%	31	96.87%
	Female	41	2	4.88%	39	95.12%
26-30	Male	21	1	4.76%	20	95.24%
	Female	51	1	1.96%	50	98.04%
31-35	Male	25	1	4.00%	24	96.00%
	Female	42	0	0.00%	42	100.00%
Overall	Male	105	5	4.76%	100	95.24%
	Female	183	3	1.64%	180	98.36%
Total	-	288	8	2.78%	280	97.22%

Risk factors associated with the Prevalence of *Neisseria gonorrhoeae*

The epidemiological findings of this study on *Neisseria gonorrhoeae* prevalence among youths in Obigbo reveal distinct patterns across several key risk factors, emphasizing the importance of tailored interventions to reduce infection rates.

Gender: Males demonstrated a higher prevalence rate (4.76%) compared to females (1.64%). This difference may reflect gender-specific behavioral patterns, with males potentially engaging in higher-risk sexual behaviors or experiencing fewer barriers to STI transmission, such as lower rates of healthcare-seeking behavior or preventive practices.

Age Group: The highest prevalence of *Neisseria gonorrhoeae* was observed within the 21-25 age group, with a rate of 4.11%. This age range is commonly associated with increased sexual activity and a higher likelihood of multiple or changing sexual partners, factors that elevate the risk for STI exposure. This trend underscores the need for targeted awareness and preventive measures focused on young adults.

Marital Status: Among marital status categories, divorced or separated individuals had the highest prevalence rate at 5.88%. This finding may indicate that individuals who have experienced relationship dissolution are more likely to engage in riskier sexual practices or experience instability in sexual partnerships, increasing their exposure to STIs.

Education Level: Education level showed a strong correlation with *Neisseria gonorrhoeae* prevalence, with individuals lacking formal education having the highest infection rate at 9.09%. This suggests that limited educational attainment may correspond with lower health literacy and reduced engagement in protective sexual health behaviors, underscoring the need for educational initiatives aimed at increasing STI awareness and prevention.

Condom Usage: A significant inverse relationship was observed between condom use frequency and *Neisseria gonorrhoeae* prevalence. Participants who consistently used condoms reported the lowest infection rate (1.02%), while those who never used condoms exhibited a higher prevalence of 4.00%. This highlights the critical role of condoms in reducing STI transmission and underscores the importance of making condoms accessible and educating the community on their correct usage.

History of STIs: Participants with a prior history of STIs had a higher prevalence of *Neisseria gonorrhoeae* (5.43%) compared to those without such a history. This pattern may reflect recurrent engagement in risk behaviors, insufficient behavior changes following previous infections, or increased biological susceptibility to STIs, indicating a need for reinforced preventive counseling and monitoring in individuals with a history of STIs.

Awareness of Neisseria gonorrhoeae: Limited awareness of *Neisseria gonorrhoeae* corresponded with higher prevalence rates, as individuals lacking awareness showed a prevalence of 3.55%. This finding highlights the potential for increased transmission in

populations with low health literacy, suggesting that enhanced public health education and awareness campaigns could be effective in reducing infection rates by promoting safe sexual practices.

Table 3: Risk factors associated with the Prevalence of *Neisseria gonorrhoeae*

Risk Factor	Category	Total Participants (n)	Positive Cases (n)	Prevalence (%)
Total Participants		288	8	2.78%
Sex	Male	105	5	4.76%
	Female	183	3	1.64%
Age Group	16-20 years	76	2	2.63%
	21-25 years	73	3	4.11%
	26-30 years	72	2	2.78%
	31-35 years	67	1	1.49%
Marital Status	Single	168	5	2.98%
	Married	103	2	1.94%
	Divorced/Separated	17	1	5.88%
Education Level	No Formal Education	22	2	9.09%
	Primary Education	47	2	4.26%
	Secondary Education	125	3	2.40%
	Tertiary Education	94	1	1.06%
Employment Status	Employed	119	3	2.52%
	Unemployed	65	2	3.08%
	Student	104	3	2.88%
Sexual Activity Status	Sexually Active	223	8	3.59%
	Not Sexually Active	65	0	0.00%
Condom Usage Frequency	Always	98	1	1.02%
	Sometimes	115	4	3.48%
	Never	75	3	4.00%
History of STIs	Yes	92	5	5.43%
	No	196	3	1.53%
Awareness of *Neisseria gonorrhoeae*	Aware	119	2	1.68%
	Not Aware	169	6	3.55%

DISCUSSION

The study findings on *Neisseria gonorrhoeae* among youths in Obigbo, Rivers State, provide a nuanced perspective on prevalence, individual risk factors, and public health implications, underscoring the importance of tailored health interventions. The overall prevalence of *Neisseria gonorrhoeae* infection among the study population was 2.78%, a rate that, while not alarmingly high, nonetheless signifies a notable presence of infection within the youth demographic in Obigbo. This prevalence suggests that, while the infection may not be widely prevalent, certain individuals and groups are at higher risk (Imarenezor et al., 2024; Nudel et al., 2018). Interestingly, there were significant gender-specific prevalence differences, with males showing a prevalence rate of 4.76% compared to a much lower rate of 1.64% among females. This disparity suggests behavioral, cultural, or possibly biological factors that may make males more susceptible to contracting the infection (Lewis and Ram, 2020; Pollock et al., 2024). Moreover, the highest prevalence was observed among younger individuals, particularly within the 16-20 and 21-25 age groups, where susceptibility to *Neisseria gonorrhoeae* appears to be elevated, especially among males. These patterns may be reflective of age-related lifestyle factors, including heightened sexual activity and risk-taking behaviors typically associated with young adulthood, contributing to increased exposure to STIs (Kreisel, 2021; Klaper, 2024). The prevalence rate, though relatively low, may also be influenced by underreporting or lack of access to testing, which could mask the true burden of infection in this community (Pollock et al., 2024; Sharma et el., 2022). Overall, while the infection rate is low, the gender and age disparities observed underscore a need for targeted attention within specific subgroups. The study highlighted that gender plays a significant role in determining susceptibility to *Neisseria gonorrhoeae*, with males exhibiting a notably higher prevalence rate compared to females. This discrepancy likely stems from distinct gender-related behaviors and attitudes toward healthcare. For example, males may be less inclined to seek timely medical intervention or engage with healthcare services regularly, potentially due to social norms that discourage men from prioritizing health check-ups (Kurzyo and Harrison, 2020). Additionally, men in the study population may exhibit higher partner turnover rates and less consistent condom use, both of which increase exposure to infection (Lipsky, 2021). Risk perception also appears to vary by gender, as men may perceive themselves as less vulnerable to STIs, potentially leading to less cautious behaviors (Matud et al., 2020). The findings underscore the need for tailored health interventions targeting males, focusing on increasing health awareness, encouraging

regular STI testing, and promoting consistent condom use. Addressing the behavioral aspects specific to men could mitigate the risk of infection and contribute to reduced transmission within the community. Age was found to be a significant determinant, with the 21-25 age group exhibiting the highest prevalence of *Neisseria gonorrhoeae*. This age range typically encompasses young adults who are actively exploring social and romantic relationships and may be less experienced with adopting safe sex practices. Many in this group may still be experimenting with various relationship dynamics, which can lead to higher-risk sexual behaviors, such as having multiple sexual partners, infrequent condom use, or even unawareness of the necessity for regular STI testing (Holland et al., 2020). Additionally, this age group often faces limited access to healthcare resources, such as affordable condoms and testing facilities, which further elevates their risk. Targeting interventions specifically for this age demographic could help mitigate infection rates by encouraging the development of safe sexual habits early in adulthood. Tailored educational programs focusing on sexual health awareness, regular testing, and proper condom use could significantly reduce susceptibility within this critical age group. Marital status emerged as a significant risk factor, with unmarried individuals, particularly those who are divorced or separated, showing higher prevalence rates of *Neisseria gonorrhoeae*. Individuals transitioning from long-term relationships may face challenges in adjusting to new social norms, often leading to increased sexual exploration or the formation of multiple new partnerships. This behavioral shift can heighten the risk of STI transmission if proper preventive measures are not adopted, such as consistent condom use or regular health check-ups (Lewis and Ram, 2020). Additionally, divorced or separated individuals may experience emotional or psychological stresses that can influence riskier sexual behaviors, including casual or unprotected encounters (Wang et al., 2022). The findings suggest that public health initiatives should provide targeted support for individuals undergoing these relational transitions, emphasizing the importance of safe sex practices and regular STI testing. Offering accessible resources and counseling for individuals in transitional relationship stages could help reduce infection rates and promote healthier relationship dynamics. The study found that education level significantly influences susceptibility to *Neisseria gonorrhoeae*, with individuals who have limited or no formal education showing higher infection prevalence. Lower levels of education are often associated with decreased health literacy, meaning individuals may not fully understand the risks of STIs, the importance of preventive measures, or how to recognize symptoms of infection. Without

sufficient health literacy, individuals may overlook the necessity of using protection during sexual encounters or may not seek medical advice until symptoms are severe (Mokgatle et al., 2021). The association between lower education and higher infection rates highlights the need for public health initiatives that improve health literacy, especially in communities with limited access to education. Programs designed to provide basic STI knowledge, including information on transmission, symptoms, and preventive practices, are crucial. Making sexual health information accessible in local languages and through various media channels can help reach individuals with diverse educational backgrounds, ultimately contributing to a reduction in infection rates. Condom usage or the lack thereof proved to be one of the strongest predictors of *Neisseria gonorrhoeae* infection risk. The study found that individuals who reported never using condoms had significantly higher infection rates, underscoring the critical role condoms play in preventing STI transmission (Hara and Nathan, 2022). Factors contributing to inconsistent or infrequent condom use include misconceptions about condom effectiveness, cultural or religious beliefs discouraging condom use, and limited access to affordable or high-quality condoms (Omeershffudin and Kumar, 2023). In some cases, social pressures or stigma associated with purchasing or carrying condoms may further discourage their usage. This finding emphasizes the need for public health interventions that increase access to condoms, provide education on their importance in STI prevention, and promote a cultural shift towards normalizing condom use. Educational programs highlighting the effectiveness of condoms in reducing STI transmission, along with improved availability in local healthcare facilities or community centers, could lead to safer sexual behaviors and reduced infection rates. Individuals with a history of STIs were identified as being at a higher risk of contracting *Neisseria gonorrhoeae*, indicating that previous STI experience can lead to increased susceptibility. This heightened risk may be due to repeated high-risk sexual behaviors, such as having multiple sexual partners, inconsistent condom use, or inadequate follow-up care after initial treatment. Biological predispositions or persistent infections may also contribute to this pattern (Lipsky et al., 2021). The findings suggest that individuals with a history of STIs may benefit from targeted preventative strategies, such as regular follow-up testing and education on avoiding recurrence. Counseling on safe sexual practices, consistent use of protection, and adherence to medical guidance are essential components of an effective strategy to prevent reinfection. Additionally, healthcare providers could offer support and resources specifically for individuals with prior STI experiences to minimize the risk of

recurrent infections. Awareness, or lack thereof, regarding *Neisseria gonorrhoeae* emerged as a significant determinant of infection rates. The study revealed that individuals who were unaware of the infection were more likely to contract it, indicating that a lack of basic knowledge can hinder preventive behaviors. Limited awareness may result in individuals not recognizing the symptoms of an STI, delaying treatment, and unknowingly transmitting the infection to others. Additionally, unawareness of transmission risks and preventive measures, such as condom use and regular testing, can leave individuals vulnerable (Hara and Nathan, 2020). This lack of knowledge underscores the importance of comprehensive public health education initiatives that promote awareness of *Neisseria gonorrhoeae*, its symptoms, and effective prevention methods. Community health education campaigns, incorporating culturally sensitive materials and leveraging social media and other local communication channels, can help bridge this awareness gap. Providing information on STIs, safe sex practices, and the importance of early detection can empower individuals to take proactive steps in managing their sexual health. The findings of this study have clear public health implications, particularly in guiding interventions aimed at reducing the burden of *Neisseria gonorrhoeae* within the community. Given the low levels of awareness observed, a primary implication is the urgent need for targeted health education initiatives that focus on improving knowledge about *Neisseria gonorrhoeae*, its transmission routes, symptoms, and preventive practices. These educational efforts should be tailored to reach both males and younger individuals, as these groups showed higher susceptibility. A gender-sensitive approach to education could be particularly effective, addressing specific behaviors and risk factors prevalent among young males and females to promote safer practices. Promoting consistent condom use is another crucial implication, as the study findings underscore the role of condoms in reducing infection risk. Public health strategies should aim to increase both the accessibility and affordability of condoms within the community. Efforts to educate youths on the benefits of consistent condom use and to address any misconceptions or stigma surrounding condom use are essential for encouraging safer sexual behaviors. Campaigns that address barriers to condom use, whether they are economic, cultural, or social, will be instrumental in reducing STI transmission. The study also highlights the need for enhanced sexual health services, as a significant proportion of the study population—particularly those with prior STI histories—demonstrated elevated infection rates. Improved access to regular STI screening, counseling, and treatment services within the community would facilitate early

detection and timely intervention, reducing the likelihood of reinfection. Establishing rapid testing services or integrating STI screening into routine health visits could be an effective strategy to identify cases early and reduce transmission within the community. Furthermore, the link between lower education levels and increased infection rates suggests that public health initiatives should consider the broader social determinants of health when addressing *Neisseria gonorrhoeae* and other STIs. Interventions that promote educational attainment or provide socioeconomic support may indirectly improve health literacy and safe sexual practices, thereby lowering infection rates over time. Addressing these upstream determinants of health can create lasting impacts in reducing STI prevalence. Finally, targeted outreach to high-risk groups, such as divorced or separated individuals and those within the younger age brackets, is essential. Community-based support programs or targeted sexual health campaigns can engage these groups and provide education and resources tailored to their specific needs and behaviors. By addressing these individual and social risk factors, public health strategies can better target those most vulnerable to *Neisseria gonorrhoeae* infection, creating a comprehensive and effective approach to reducing the infection burden and enhancing sexual health outcomes in Obigbo.

CONCLUSION

The findings of this study highlight important insights into the prevalence and associated risk factors of *Neisseria gonorrhoeae* among youths in Obigbo, Rivers State. Although the overall prevalence was relatively low at 2.78%, gender and age disparities, as well as behaviors such as inconsistent condom use, point to specific subgroups with heightened vulnerability. The higher prevalence among males and those within younger age brackets suggests behavioral patterns and risk perceptions that could be addressed through targeted public health interventions. Additionally, the study emphasizes a significant gap in awareness of *Neisseria gonorrhoeae*, underlining the need for improved health education focused on STI prevention. The individual risk factors identified, including marital status, education level, condom usage frequency, and STI history, suggest that both individual and structural determinants shape susceptibility to *Neisseria gonorrhoeae*. These findings underscore the necessity of accessible sexual health services, community-based education programs, and socioeconomic support systems to address not only STI risks but also

broader health disparities. Overall, targeted intervntions that consider both individual behaviors and social determinants of health may be effective in reducing the prevalence of *Neisseria gonorrhoeae* and improving the sexual health of youths in Obigbo, ultimately contributing to healthier and more informed communities.

REFERENCES

Akpomedaye Salvage, Edobor Peter Kenneth Imarenezor, Vivian Ifeoma Anyiam, and Ejiro Patrick Edafe (2024). Prevalence, Molecular Identification and Antibiogram Profile of Neisseria gonorrhoeae among Individuals in Yenagoa, Bayelsa State, South South, Nigeria. *African Journal of Medicine, Surgery and Public Health Research,* 1 (1):66 – 78. DOI: https://doi.org/10.58578/AJMSPHR.v1i1.4037

Belcher, T., Rollier, C. S., Dold, C., Ross, J. D. C., & MacLennan, C. A. (2023). Immune responses to Neisseria gonorrhoeae and implications for vaccine development. *Frontiers in Immunology*, *14*. https://doi.org/10.3389/FIMMU.2023.1248613

Hara, Y., & Nathan, S. (2022). Outer membrane proteins as potential candidate vaccine targets. In *Post-genomic Approaches in Drug and Vaccine Development* (pp. 277-322). River Publishers.

Holland, K. J., Silver, K. E., Cipriano, A. E., & Brock, R. L. (2020). Internalized body stigma as a barrier to accessing preventative healthcare for young women. *Body Image*, *35*, 217-224.

Imarenezor Edobor Peter Kenneth, and Ofiri Pascal Ngozi (2024). Assessment of Hepatitis B Virus infection and immunity status amid inhabitants of Wukari in Taraba State, North-East Nigeria: A communal- based Study. *International journal of advanced biological and biomedical research*, 12(4): 319-330.

Imarenezor Edobor Peter Kenneth and Nanisi Daniel Benjamin (2024). Unveiling Coinfections: Hepatitis C Virus and Malaria Sero-Prevalence among Outpatients attending General Hospital Wukari in Taraba State, Nigeria. *International journal of advanced biological and biomedical research,* 12 (2): 192-205.

Imarenezor Edobor Peter Kenneth, Anyiam Ifeoma Vivian, Abhadionmhen Abel Onolunosen and Ofiri Pascal Ngozi (2024). Pervasiveness of Human Immuno-Deficiency Virus (HIV), among Individuals in Wukari, Taraba State, North-East Nigeria. *International journal of advanced biological and biomedical research*, 12 (3): 237-247.

Kivata, M. W. (2021). *Molecular Characterization of Antimicrobial Resistance Genes in Neisseria gonorrhoeae Isolates from Selected Regions in Kenya through Whole Genome Sequencing* (Doctoral dissertation, JKUAT-IBR).

Klaper, K., Tlapák, H., Selb, R., Jansen, K., & Heuer, D. (2024). Integrated molecular, phenotypic and epidemiological surveillance of antimicrobial resistance in Neisseria gonorrhoeae in Germany. *International Journal of Medical Microbiology*, *314*, 151611.

Kreisel, K. M., Spicknall, I. H., Gargano, J. W., Lewis, F. M., Lewis, R. M., Markowitz, L. E., ... & Weinstock, H. S. (2021). Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2018. *Sexually transmitted diseases*, *48*(4), 208-214.

Kreisel, K. M., Weston, E. J., Cyr, S. B. S., & Spicknall, I. H. (2021). Estimates of the prevalence and incidence of chlamydia and gonorrhea among US men and women, 2018. *Sexually transmitted diseases*, *48*(4), 222-231.

Kurzyp, K., & Harrison, O. B. (2023). Bacterium of one thousand and one variants: genetic diversity of Neisseria gonorrhoeae pathogenicity. *Microbial Genomics*, *9*(6), 001040.

Lewis, L. A., & Ram, S. (2020). Complement interactions with the pathogenic Neisseriae: clinical features, deficiency states, and evasion mechanisms. *FEBS letters*, *594*(16), 2670-2694.

Lipsky, M. S., Su, S., Crespo, C. J., & Hung, M. (2021). Men and oral health: a review of sex and gender differences. *American journal of men's health*, *15*(3), 15579883211016361.

Matud, M. P., Díaz, A., Bethencourt, J. M., & Ibáñez, I. (2020). Stress and psychological distress in emerging adulthood: A gender analysis. *Journal of Clinical Medicine*, *9*(9), 2859.

Mokgatle, M. M., Madiba, S., & Cele, L. (2021). A comparative analysis of risky sexual behaviors, self-reported sexually transmitted infections, knowledge of symptoms and partner notification practices among male and female university students in Pretoria, South Africa. *International journal of environmental research and public health*, *18*(11), 5660.

Nudel, K., McClure, R., Moreau, M., Briars, E., Abrams, A. J., Tjaden, B., ... & Genco, C. A. (2018). Transcriptome analysis of Neisseria gonorrhoeae during natural infection reveals differential expression of antibiotic resistance determinants between men and women. *Msphere*, *3*(3), 10-1128.

Ofiri Pascal Ngozi, Imarenezor Edobor Peter Kenneth, Anyiam Vivian Ifeoma, Abhadionmhen Onolunosen Abel (2024). HIV/AIDS Prevalence in Taraba State, North East, Nigeria; Case Study: Wukari and Environs. *International Journal of Advanced Multidisciplinary Research and Studies,* 4(5):6-10.

Omeershffudin, U. N. M., & Kumar, S. (2023). Emerging threat of antimicrobial resistance in Neisseria gonorrhoeae: pathogenesis, treatment challenges, and potential for vaccine development. *Archives of Microbiology*, *205*(10), 330.

Pollock, E. D., Clay, P. A., Kreisel, K. M., & Spicknall, I. H. (2023). Estimated incidence and prevalence of gonorrhea in the United States, 2006–2019. *Sexually transmitted diseases*, *50*(4), 188-195.

Rodrigues, R., Vieira-Baptista, P., Catalão, C., Borrego, M. J., Sousa, C., & Vale, N. (2023). Chlamydial and Gonococcal Genital Infections: A Narrative Review. *Journal of Personalized Medicine*, *13*(7), 1170.

Rodríguez-Planas, N., Sanz-de-Galdeano, A., & Terskaya, A. (2022). Gender norms in high school: Impacts on risky behaviors from adolescence to adulthood. *Journal of Economic Behavior & Organization*, *196*, 429-456.

Scurtu, L. G., Jinga, V., & Simionescu, O. (2022). Fascinating molecular and immune escape mechanisms in the treatment of STIs (Syphilis, gonorrhea, chlamydia, and herpes simplex). *International Journal of Molecular Sciences*, *23*(7), 3550.

Sharma, A., Yadav, S. P., Sarma, D., & Mukhopadhaya, A. (2022). Modulation of host cellular responses by gram-negative bacterial porins. *Advances in protein chemistry and structural biology*, *128*, 35-77.

Sumien, N., Cunningham, J. T., Davis, D. L., Engelland, R., Fadeyibi, O., Farmer, G. E…& Cunningham, R. L. (2021). Neurodegenerative disease: roles for sex, hormones, and oxidative stress. *Endocrinology*, *162*(11), bqab185.

Svendsen, M. T., Bak, C. K., Sørensen, K., Pelikan, J., Riddersholm, S. J., Skals, R. K., ... & Torp-Pedersen, C. (2020). Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults. *BMC public health*, *20*, 1-12.

Tran, V. C., Nguyen, S. H., Bui, H. T., Pham, T. D., & Van Nguyen, A. T. (2024). Impact of Gender, Location, and Seasonality on the Prevalence of Gonorrhea and Chlamydia Co-infections in Northern Vietnam. *Indian Journal of Microbiology*, 1-9.

Tuddenham, S., Stennett, C. A., Cone, R. A., Ravel, J., Macintyre, A. N., Ghanem, K. G., ... & Brotman, R. M. (2021). Vaginal cytokine profile and microbiota before and after lubricant use compared with condomless vaginal sex: a preliminary observational study. *BMC infectious diseases*, *21*, 1-13.

Wang, L., Yang, F., Qiu, Y., Ye, L., Song, D., & Huang, D. (2022). The potential roles of T cells in periapical lesions. *Journal of endodontics*, *48*(1), 70-79.

Yellman, M. A. (2020). Transportation risk behaviors among high school students—Youth risk behavior survey, United States, 2019. *MMWR supplements*, *69*.

Yukitake, H., Shoji, M., Sato, K., Handa, Y., Naito, M., Imada, K., & Nakayama, K. (2020). PorA, a conserved C-terminal domain-containing protein, impacts the PorXY-SigP signaling of the type IX secretion system. *Scientific Reports*, *10*(1), 21109.