Research article

Prevalence and determinants of sexually transmitted infections among women attending Ngurore primary health care, Yola South, Adamawa State, Nigeria

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Abstract
Sexually transmitted infections are an important global health concern as more than 1 million people are newly infected with the four most curable STIs each day: *Treponema pallidum*, *Neisseria gonorrhea*, *Trichomanas vaginalis* and *Chlamydia trachomatis*. STIs are infectious diseases caused by bacteria, viruses, and parasites that spread from person to person through vaginal, oral, and anal sex. Some STIs can also be spread from other activities such as deep kissing, mother to child transmission during pregnancy. This study aimed to investigate the prevalence, risk factors, and distribution of sexually transmitted infections (STIs) among women attending Ngurore Primary Health Care Center, Yola. A total of 367 women, aged 15–45, were randomly selected for the study regardless of age, health status, or ethnic background. The most prevalent STI identified was *Trichomonas vaginalis*, accounting for 36 cases (9.8%), followed by *Chlamydia trachomatis*, which, although less common, affected 16 cases (4.4%) of the surveyed population. This study revealed the association of STIs with socioeconomic factors: age, marital status, education level, occupation, number of children and income level. Behavioral factors such as menstrual hygiene practice, sexual activities, and toilet facilities were identified as contributing to STIs prevalence. This emphasized the need for health promotion activities like clinical STIs testing during antenatal, menstrual hygiene outreach programs, health education programs on STIs prevention measures with more emphasis on trichomonas and chlamydia will assist in early diagnosis, management, and control of the infection.

Keyword: Sexually Transmitted Infection (STI), Prevalence, Women, Ngurore, Yola South.

Introduction
Sexually transmitted infection (STIs) are a variety of clinical syndromes caused by pathogens that can be acquired and transmitted through sexual contact and remain a major public health problem. There are over 30 bacterial, viral and parasitic pathogens that have been identified to date to be transmitted sexually (Kassie *et al.,* 2019). STIs are an important global health concern as more than 1 million people are newly infected with the four most curable STIs each day: *Treponema pallidum, Neisseria gonorrhea*, *Trichomanas vaginalis* and *Chlamydia trachomatis*. This burden has been disproportionally high among low and middle-income countries, and African countries account for 20% of all STIs with an estimated prevalence of 12% for trichomoniasis, 4% for gonorrhea, 2% for chlamydia, and 1.5% for syphilis, in the general population.

STIs are major public health problem worldwide that cause acute illness, long-term complications, infertility, medical as well as psychological consequences and death. Moreover, STIs facilitate the spread of the human immunodeficiency virus (HIV). In 2012 498.9 and 92.6 million new cases of STIs occurred globally and in Africa, respectively. Thus, an average of about 1.4 million people are infected with STIs every day (CDC,

2019). STIs also known as sexually transmitted disease (STDs) might be difficult to talk about but it is important to realize the risks they pose and how common they are. According to the Center for Disease Control and Prevention (CDC, 2015) reported cases of chlamydia, gonorrhea, and syphilis increased by almost 30%. The health agency estimates that in 2018, one in five people in the United States had an STI (CDC, 2019).

Common STIs include: HIV, HPV, chlamydia, gonorrhea, genital herpes, syphilis, trichomoniasis. Untreated STIs can lead to serious health problems (CDC, 2019). For those STIs that cannot be cured there are medicines to manage the symptoms. Women often have more serious health problems from STIs than men for instance: Chalamydia and gonorrhea, if left untreated, raise the risk of chronic pelvic pain, life-threatening ectopic pregnancy, and infertility. Trichomoniasis, if left untreated, can increase the risk of getting HIV, along with other STIs. It cause premature delivery, low birth weight, nasal congestion, pneumonia, and respiratory distress in newborn infants of infected mothers; Humanpapillomavir infection is a common cause of cervical and rectal cancer. Untreated syphilis in pregnant women results in infant death up to 40% of the time.

Women have a higher risk than men of getting an STI during unprotected vaginal sex. Unprotected vaginal sex put women at even more risk of getting an STI than unprotected vaginal sex (OASH, 2022).

STIs have a profound impact on sexual and reproductive health worldwide (WHO, 2023) stated that more than 2 million STIs are acquired everyday world wild, the majority of which are asymptomatic. Each year there are an estimated 374 million new infections with 1 to 4 curable STIs: chlamydia (129 miilion), gonorrhea (82 million), syphilis (7.1million) and trichomoniasis (157 million). More than 490 million people were estimated to be living with genital herpes in 2016, and an estimated 300 million women have human papilloma virus (HPV) infection. (WHO, 2023).

While progress has been made in understanding STIs, more work is still needed. This study is focused on determining the prevalence and determinants of sexually transmitted infections among women attending Ngurore Primary Health Care, Yola South LGA of Adamawa State, Nigeria. This study is proposed to provided information that world be used by health decision makers to provide effective preventive and control measures of STIs among women in Ngurore, Yola South LGA in reducing the burdens of the infection.

Materials and Methods
Description of Study Area
This study was conducted at Ngurore, Yola South LGA, Adamawa State, Nigeria. Ngurore lies between Latitude 9° 17' 19"N and Longitude 12°14' 24"E. Ngurore is located at an elevation of 432 meters above sea level and with a projected population of 8,139 (NPC, 2016). It has a tropical climate marked by dry and rainy seasons. The rainy season commences around May and ends in the middle or late October. The rainfall has a mean total of 1113.3mm. The dry season starts in late October and end in late April rainfall (National Population Commission, 2006). Maximum temperature in Ngurore can reach 40°C around April, while minimum temperature could be as low as 18.3°C between December and early January. Harmattan season occurs between the end of November and the middle of March. It is characterized by the dry and dusty North-Eastern trade wind, which blows from the Sahara Desert over West Africa into the Gulf of Guinea. The relative humidity in the area is about 20% in January, while February is the lowest; with high relative humidity values of 58,69,79,79,77, and 66, for May to October, particularly during July and August as the peak, with about 80% relative humidity (Ngurore Annual Weather Averages, 2023). Most inhabitants are farmers, cattle, and few civil servants.

Research Design
A cross-sectional study was performed on samples belonging to women who were attending Ngurore Primary Health Center, Yola South LGA. The demographic and clinical data of patients including age, place of residence, marital status, level of education, occupation. Cross-sectional study was used after obtaining the informed consent. Following a routine clinical examination, vaginal swab was collected for wet mount preparation and Giemsa-stain (Thomas 2023).
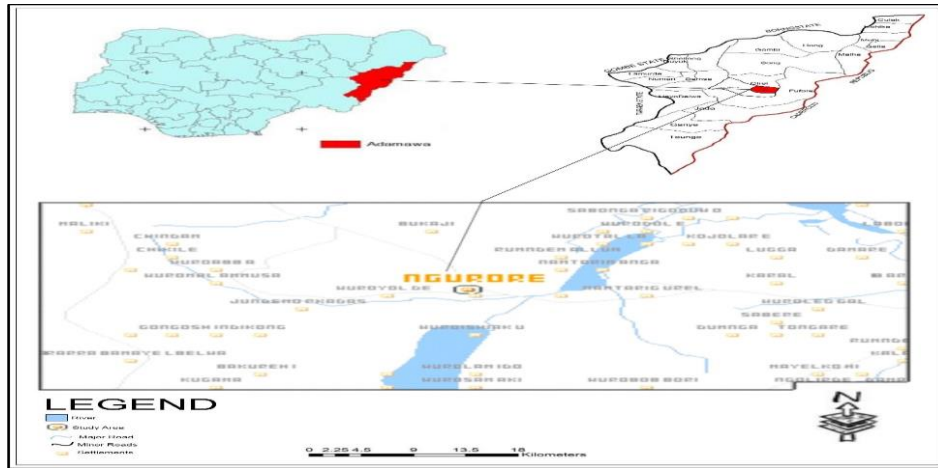
Fig 1: A Map Showing Study area, Yola South *Source: Modified from Global Administrative Map(GADM)(2023)*

Sample Size and Sampling Technique

To determine the sample size drawn from the estimated population of the women attending Ngurore Primary Health Center Yola South Local Government Area, the sample size of this study was estimated by taking the prevalence as 50% because there was no published report on the prevalence of Trichomoniasis, Chlamydiasis and Human papilomavirus infection among women so far in the study area. Hence, the sample size was calculated using the formula For a population greater than 10,000(Cochran,1977).

$$N \; \frac{Z^2 P_q}{L^2}$$

Where

n = Sample size;   Z = Score for a given confidence internal usually 1.96 for 95%
P = Prevalence value of 50% (0.50);   q = (1 – p) = 1 – 0.83 = 0.17
e = Desire level of precision 5% (0.05)

NB: Population proportion of the phenomenon by previous studies = 50%; Margin of error = ±5%

$$n_0 = \frac{(1.96)^2 \text{X } 0.50 \text{ X } 0.50}{(0.05)^2} \qquad n_0 = 384$$

Since our actual population is finite, we can use Cochran formula for finite population, thus

$$n_0 = \frac{n_0}{1 + \frac{n_0}{N}}$$

$$n_0 = \frac{384}{1 + \frac{384}{8139}} = 367 \qquad \text{The sample is size 367.}$$

Data Analysis

Descriptive statistics was used to analyze the data using percentage (%), the association was ascertained using Pearson's Chi-square, significance was set at a P-value less than or equal to 0.05(P<0.05).

Results

Prevalence of STIs among Women in Ngurore

Table 1 provides a detailed breakdown of the prevalence of sexually transmitted infections (STIs) among women in Ngurore, Yola South Local Government Area, Adamawa State. The most prevalent STI in the surveyed population was *Trichomonas vaginalis*, accounting for 36 cases (9.8%) followed by *Chl*amydia, with 16 cases (4.4%).

Table 1: The Prevalence of Sexually Transmitted Infections Among Women of Ngurore, Yola South Local Government Area, Adamawa State (N = 367)

Sexually Transmitted Infections (STI)	Frequency	Percentage Prevalence
Trichomonas vaginalis	36	9.8
Chlamydia	16	4.4
No Infection	315	85.8
Total	367	100.0

Associations Between Specific STIs and Socio-Economic Characteristics

Table 2 highlights the associations between sexually transmitted infections (STIs) and socio-economic characteristics among women in the study.

Age Category: The 20–24 age group showed the highest prevalence of *Trichomonas vaginalis* (13.6%) and chlamydia (6.6%), with no infections reported in the 15–19 group. Age was significantly associated with STI prevalence (p=0.000).

Marital Status: Married women exhibited higher prevalence rates for *Trichomonas vaginalis* (12.8%) and chlamydia (5.7%) compared to others. Marital status was significantly associated with STI prevalence (p=0.006).

Education Level: Women with non-formal education had the highest prevalence of *Trichomonas vaginalis* (18.7%), while those with tertiary education showed 0% prevalence for both STIs. Education was a significant factor (p=0.001).

Occupation: Civil servants had the highest prevalence of *Trichomonas vaginalis* (34.8%), followed by traders (11.5%) and housewives (12.2%). Occupation significantly influenced STI prevalence (p=0.000).

Number of Children: Women with 13 or more children had a 100% prevalence of *Trichomonas vaginalis*, while those with no children showed no infections. The association was significant (p=0.000).

Income: Participants earning between ₦15,001–20,000 had the highest prevalence of *Trichomonas vaginalis* (23.5%), while those earning below ₦10,000 showed lower prevalence rates. Income was significantly associated with STI prevalence (p=0.001).

The risk factors associated with sexually transmitted infections among women in the study area.

Table 3, shows the association between STI prevalence and risk factors.

Sanitary Pad Usage: A striking observation is the absence of trichomoniasis and chlamydia infections among participants who use sanitary pads (0.0%). In contrast, non-users of sanitary pad displayed higher prevalence (13.6% and 6.6%) respectively.(P<0.000).There was a statistically significant association between sanitary pad usage and STIs prevalence.

Douching Practices: Douching with water or antiseptic solution show no significant association with Prevalence of STI.P=0.761(p>0.05)).However, the overall prevalence of trichomoniasis with 15(10.9%) was higher among those who douch antiseptic and chlamydia *5(3.6%)* was higher among participants who douched with water compared to those participants who do not.

Towels Sharing: The practice of sharing towels exhibited a significant association with trichomoniasis (14.4%) and chlamydia (6.6%). There was a statistically significant association between toilet sharing and STIs (P=0.001).

Table 2: The Association Between STI in Relation With Socio-Economic Status

Characteristics	Number examined	Number infected *Trichomoniasis vaginalis* (%)	*Chlamydia* (%)	P-value
Age Category				
15-19	112	0(0)	0(0.0)	
20-24	243	33(13.6)	16(6.6)	
25-29	0	0	0	0.000
30-34	5	0(0.0)	0(0.0)	
35-39	7	3(42.9)	0(0.0)	
Total		36(9.8)	16(4.4.)	
Marital status				
Maried	282	36(12.8)	16(5.7)	
Single	60	0(0.0)	0(0.0)	
Divorced	20	0(0.0)	0(0.0)	0.0006
Widowed	5	0(0.0)	0(0.0)	
Total		36(9.8)	16(4.4.)	
Edu. Level				
Non-formal	123	23(18.7)	4(3.3)	
Primary	135	13(9.6)	7(5.2)	
Sec. education	99	0(0.0)	5(5.1)	0.001
Tertiary education	10	0(0.0)	0(0.0)	
Total		36(9.8)	16(4.4.)	
Occupation				
Civil servant	23	8(34.8)	0(0.0)	
Farmer	45	0(0.0)	0(0.0)	0.000
Student	60	0(0.0%)	0(0.0%)	
Trader	165	19(11.5)	15(9.1)	
House wife	74	9(12.2)	1(1.4)	
Total		36(9.8)	16(4.4.)	
No. of children				
1-4	205	23(11.2)	11(5.4)	
5-8	78	10(12.8)	5(6.4)	
9-12	1	0(0.0)	0(0.0)	0.000
13 above	3	3(100.0)	0(0.0)	
No children	80	0(0.0)	0(0.0)	
Total		36(9.8)	16(4.4.)	
Income				
< 10,000	186	9(4.8)	10(5.4)	
10,001 - 15,000	111	15(13.5)	5(4.5)	0.001
15,001 - 20,000	51	12(23.5)	1(2.0)	
20,001 - 25,000	19	0(0.0)	0(0.0)	
Total		36(9.8)	16(4.4.)	

For Age; χ^2 calculated =35.384; df=6; P-value=0.000 (P<0.05); For Marital Status; χ^2 calculated =18.261; df=6; P-value=0.006 (P<0.05); For Educational Status; χ^2 calculated = 23.775; df=6; P-value=0.001 (P<0.05); For Occupation; χ^2 calculated =45.813; df=8; P-value=0.000 (P<0.05); For Number of children; χ^2 calculated =43.813; df=8; P-value=0.000 (P<0.05); For Income; χ^2 calculated =21.572; df=6; P-value=0.001 (P<0.05).

Sexual History: Women who reported having sex before showed higher prevalence of *t*richomoniasis (12.2%) and chlamydia (5.9%) compared to those who had not. The significance level (P=0.001) there significant relationship between sexual activity and STI prevalence.

Number in House: On the number of people in the house, out of the total 367 women, majority of the household had above 6 people with 241(65.6%), while the least were households with between 1-5 people, with 126(34.3%). *t*richomoniasis with 14.3% was higher than chlamydia with 5.6% in

those households that had between 1-5 people, the result shows no significant difference while for households with 6 and above members had 18 (7.5%) t*richomoniasis* and 9 (3.7%) *chlamydia. There is no relationship between* number of people living in the house and the prevalence of STIs.P-value=0.072 (P>0.05).

 Toilet Facilities: type of toilet, out of 367 women, 32(10.6%) that we're using pit latrine are infected with trichomoniasis,15(5.0%) we're infected with chlamydia, those using water closet 4(9.1) we're infected with trichomoniasis, and 1(2.3) with chlamydia with p-value =0.369(p>0.05).The results show no significant association with STIs prevalence.

Number of toilet: Out of the total 367 women, majority of the households had one toilet with 315 (85.8%), while the least were household with two toilets 52(14.16%). t*richomoniasis with 11.4% was higher than chlamydia with 5.1%, among households with 1 toilet facility. The result shows a significant assosiation between number of toilets in the house and the prevalence of STIs. P-value= 0.007 (P<0.05).

Sharing of Toilet: Out of the 367 women,310(84.4%) share toilet with others, and 57(16.0%) do not share toilet with others. Both trichomoniasis and chlamydia are high among those who share toilet with 31(10.0%) and 11(3.5%), while the prevalence was low among those who don't share toilet with others, with 5(8.8%) for trichomoniasis and 5(8.8%) for chlamydia. P-value=0.204(P>0.05). The results show no significant association with prevalence of STIs.

Table 3: Risk Factors of STI among Women in The Study Area

Factors	Number examined	Number infected		P-value
		Trichomoniasis (%)	*Chlamydia (%)*	
Sanitary Pad				0.000
Yes	112	3(2.7)	0(0.0)	
No	243	33(13.6)	16(6.6)	
				.761
Douching with water				
Yes	137	15(10.9)	5(3.6)	
No	230	21(9.1)	21(9.1)	
				0.63
Douching with antiseptic				
Yes	194	15(7.7)	5(2.6)	
No	173	21(12.1)	11(6.4)	
Towels sharing				.001
Yes	186	10(5.4)	4(2.2)	
No	181	26(14.4)	12(6.6)	
Had sex before				001
Yes	270	33(12.2)	16(5.9)	
No	97	3(3.1)	0(0)	
Multiple sex partners				.662
Yes	14	1(7.1)	0(0)	
No	353	35(9.9)	16(4.5)	
No. in house				.072
1-5	126	18(14.3)	7(5.6)	
6 and above	241	18(7.5)	9(3.7)	
Types of toilets				.369
Pit latrine	303	32(10.6)	15(5.0)	
Water closet	44	4(9.1)	1(2.3)	
Open defeacation	203	0(0)	0(0)	
No. of toilets				.007
1 toilet	315	36(11.4)	16(5.1)	
2 toilets	52	0(0.0)	0(0.0)	
Toilet sharing				.204
Yes	310	31(10.0)	11(3.5)	
No	57	5(8.8)	5(8.8)	

For sanitary pad; χ^2 calculated =6.150; df=2; P-value=0.046 (P<0.05); For Douching with water; χ^2 calculated =0.547; df=2; P-value=0.761 (P>0.05); For douching with anti-septic and soap; χ^2 calculated =5.5.24; df=2; P-value=0.063 (P>0.05); For Sharing of Towel ; χ^2 calculated =13.715; df=2; P-value=0.001 (P<0.05); For if have had sex before; χ^2 calculated =13.696; df=2; P-value=0.001 (P<0.05); For Multiple sex partners; χ^2 calculated =0.824; df=2; P-value=0.662 (P>0.05); For Number of people living in the house; χ^2 calculated =5.268; df=2; P-value=0.072 (P>0.05); For Type of toilet; χ^2 calculated =4.285; df=4; P-value=0.369 (P>0.05); For Number of toilet; χ^2 calculated =10.001; df=2; P-value=0.0.007 (P<0.05); For Sharing of toilet; χ^2 calculated =3.177; df=2; P-value=0.204 (P>0.05).

Discussion

The Prevalence of Sexually Transmitted Infections (STIs) Among Women in Ngurore

The prevalence of STI reported in this study align with global trends on STIs. Notably, the prevalence of *Trichomoniasis vaginalis* (9.8%) and *Chlamydia* (4.4%) among women in Ngurore corresponds with similar studies conducted globally (Kissinger, 2015; Torrone *et al.*, 2018) who reported high level of prevalence. The

absence of Human Papillomavirus (HPV) infections in the current study, as opposed to findings in other regions (Sherrard *et al.*, 2020; Du *et al.*, 2022), underscores the variability in STI prevalence across different populations. Given the high prevalence of *Trichomoniasis vaginalis*, targeted interventions focusing on awareness, education, and preventive measures are crucial (Torrone *et al.*, 2018; Michael *et al.*, ,2023). The relatively lower prevalence of *Chlamydia* does not

diminish its significance; continuous monitoring and preventive measures are necessary to curb its spread (Smolak *et al.*, 2019). The absence of HPV infections warrants further investigation, considering the availability of vaccine and its potential impact on reducing HPV prevalence (Du *et al.*, 2022).

The Association Between Sexually Transmitted Infections (STIs) and Socio-Economic Characteristics of Women

Results from our study on the association between STIs and women's socio-economic status agrees with studies such as Nzoputam *et al.* (2022), who emphasised that younger age groups may face higher susceptibility to STIs due to various factors, such as sexual activity patterns, Marital status and educational level exhibit associations with STI prevalence. Similar findings are reflected in studies by Sekoni *et al.* (2013) and Torrone *et al.* (2018), who reported the role of education and marital status in STIs vulnerability. Occupation and income disparities are apparent in STI prevalence. These results echo the socio-economic dimensions of STIs outlined by Torrone *et al.* (2018) and Sherrard *et al.*, , 2020). The number of children is also linked with STI prevalence, with higher prevalence among women having higher number of children. This is in agreement with the concept of reproductive health vulnerability and correlates with studies by Torrone *et al.* (2018) and Shewarega .,et *al.* (2022). our result is consistent with literature, including studies by Sekoni *et al.,* (2013), Torrone *et al.* (2018) and Sherrard *et al.*, , (2020), validating the association between socio-economic factors and STI prevalence. Understanding these associations is crucial for developing effective public health strategies. The findings underscore the need for targeted interventions addressing specific socio-economic factors. Educational campaigns aimed at vulnerable age groups and tailored at reproductive health services for women with multiple children could be instrumental. Additionally, the association with income and occupation emphasizes the importance of addressing economic disparities in STI prevention efforts.

Risk Factors Associated with Sexually Transmitted Infections (STIs) Among Women in the Study Area

Sanitary Pad Usage: The results indicate a substantial difference in STI prevalence between women who used sanitary pads and those who did not. This aligns with studies such as (Mayo Clinic,2021; Arquilla and Guy, (2023) emphasizing the importance of menstrual hygiene practices in preventing STIs. Proper menstrual hygiene has been linked to reduce vulnerability to infections, emphasizing the role of sanitary pad use in maintaining reproductive health. Our findings on douching, both with water and antiseptic, did not show a significant association with STI prevalence. This finding contradict the works of Sherrard *et al*., (2020) who suggests a potential link between douching and increased STI risk. Towels sharing and engaging in sexual activities were significantly associated with higher STI prevalence, agreed with existing study of Morhason-Bello and Fagbamig e, (2020) who emphasizing the role of sexual behaviors and shared personal items as risk factors for STIs, as well as the study of Nzoputam, Adam and Nzoputam (2022), there findings underscore the importance of safe sex practices and individual hygiene to mitigate STIs transmission. The type and number of toilets did not show significant associations with STI prevalence. However, studies by Sekoni *et al.* (2013) and WHO, (2016) suggests that inadequate sanitation facilities may contribute to increased STI risk. The absence of a clear association in this study may warrant further investigation into the broader environmental and socio-economic factors influencing STI prevalence. Toilet sharing did not exhibit a significant association with STIs prevalence. This in contrasts with Sherrard *et al.*, (2020) and Shewarega *et al.*(2022) who suggested that shared toilet facilities might contribute to STI transmission. The inconclusive findings emphasize the need for context-specific assessments of sanitation practices and their impact on STI prevalence.

Conclusion

This study highlights the varying prevalence of sexually transmitted infections (STIs) among women, with *Trichomonas vaginalis* identified as the most prevalent. Consistent with previous research, socio-economic and behavioral factors, including age, marital status, education level, occupation, income, and number of children, were significantly associated with STI prevalence. Younger women, those with lower education and

income levels, and larger families exhibited higher susceptibility to STIs, aligning with broader epidemiological patterns (Torrone *et al*., 2018; Nzoputam *et al*., 2022; Ambaye *et al*., 2023). Socio-economic disparities underscore the need for targeted public health interventions. Addressing education, income inequality, and occupation-related risks can reduce STI prevalence, particularly in vulnerable populations. Behavioral factors such as menstrual hygiene practices, sexual activity, and shared use of sanitary items like towels were also linked to infection rates. Improved hygiene practices and

safe sexual behaviors should be central to health education campaigns.

The findings emphasize the importance of accessible healthcare services and community-based interventions tailored to the socio-economic realities of women in Ngurore. Efforts to promote preventive healthcare, safer hygiene practices, and sexual health education can significantly reduce STI transmission. These outcomes provide a roadmap for designing public health strategies that address specific risk factors, enhance healthcare accessibility, and improve the overall well-being of women in similar socio-cultural contexts.

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