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Prevalence of *Trichomonas vaginalis* Among Female Patients Attending Some Medical Facilities in Parts of Southern Taraba State, North East Nigeria

Brown Samuel Tamuno Cockeye, Agwaranze Dawn Ify, Yusuf Precious Wama, James Samuel Pelentovun
Federal University Wukari, Taraba State, Nigeria
wamaprecious7@gmail.com

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Abstract

Trichomoniasis, caused by *Trichomonas vaginalis*, remains one of the most prevalent non-viral sexually transmitted infections and poses a substantial public health burden, particularly in low-resource settings. This study aimed to determine the prevalence of *T. vaginalis* infection and identify its associated risk factors among female patients attending health facilities in Wukari, Ibi, and Donga Local Government Areas of Southern Taraba State, Nigeria. A hospital-based cross-sectional design was employed involving 522 female patients aged 18–59 years. High vaginal swab samples were collected and examined microscopically using wet mount preparation, while demographic, behavioural, and awareness-related data were obtained through structured questionnaires. The overall prevalence of *T. vaginalis* infection was 4.4%, with substantial variation across locations, being highest in Donga (9.2%), followed by Ibi (2.9%) and Wukari (1.1%). Infection was more frequently observed among women aged 30–41 years, widowed individuals, and those without formal education; however, these demographic variables were not statistically

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significant (P > 0.05). In contrast, behavioural factors, particularly multiple sexual partnerships and inconsistent condom use, showed significant associations with infection. Awareness of sexually transmitted infections and *T. vaginalis* was generally low and was not significantly associated with infection risk (P > 0.05). The study concludes that behavioural factors are the principal drivers of *T. vaginalis* transmission in this population. These findings underscore the need for targeted interventions that integrate health education, safer sexual behaviour promotion, and improved access to screening services to reduce the burden of trichomoniasis in the region.

Keywords: *Trichomonas vaginalis*; Trichomoniasis; Sexually Transmitted Infections; Risk Factors; Southern Taraba State

INTRODUCTION

Trichomoniasis is a sexually transmitted infection (STI) caused by *Trichomonas vaginalis*, an extracellular flagellated protozoan parasite that thrives in anaerobic conditions (Obetta *et al.,* 2023). It is one of the most widespread non-viral STIs worldwide, with an estimated 156 million new cases recorded annually (Alsaad, 2022). Despite its high prevalence, trichomoniasis often remains undiagnosed and underreported, particularly in low- and middle-income countries such as Nigeria, where healthcare resources and screening programs are limited, making early diagnosis and treatment challenging (Ibáñez-Escribano and Nogal-Ruiz, 2024).

Trichomonas vaginalis is an obligate human parasite, with humans being the only known host (Eyong *et al*., 2023). The infection affects both men and women, though the prevalence is higher among women, particularly those of reproductive age (Wei *et al.,* 2025). In women, trichomoniasis is a common cause of vaginal discharge and has been associated with adverse reproductive outcomes, including increased risk of pelvic inflammatory disease and poor birth outcomes (WHO, 2025). Infection can be either symptomatic or asymptomatic. When present, symptoms in women may include vaginal discharge, itching, dysuria (pain during urination), and dyspareunia (pain during intercourse) (Shankar *et al.,* 2025). The infection can also manifest as vaginitis, cervicitis, urethritis, and prostatitis, and studies indicate that *T. vaginalis* infection may increase susceptibility to other sexually transmitted infections such as human papillomavirus (HPV) and human immunodeficiency virus (HIV) (Tian *et al.,* 2025).

Globally, trichomoniasis is regarded as the most prevalent pathogenic protozoan infection in developing countries, with approximately 50%-70% of infections being asymptomatic (Obetta *et al.*, 2023; Owowo *et al.,* 2022). Although the infection is highly curable, its persistence is largely due to underdiagnosis. Clinical diagnosis based solely on symptoms is challenging because other urogenital infections can present similarly, necessitating laboratory confirmation for definitive diagnosis (Ibáñez-Escribano and Nogal-Ruiz, 2024). The most commonly used diagnostic method is wet mount microscopy, which involves direct observation of the pear-shaped trichomonads exhibiting characteristic jerky or tumbling motility. This method is advantageous because it is rapid, cost-effective, and requires minimal equipment, making it widely accessible in low-resource settings (Imo *et al.,* 2023).

Studies across Nigeria have reported varying prevalence rates of trichomoniasis among women. In Jalingo, Taraba State, the prevalence was 13% (Imo *et al.,* 2023), while Ogun State recorded 12.2% (Ajani *et al.*, 2022), Anambra State 11.0% (Ozougwu *et al.*, 2023), and Lagos State 7.4% (Okunade *et al.,* 2024). *Trichomonas vaginalis* infection has been connected to several risk factors, such as engaging in unprotected sex, having several sexual partners, and a history of other sexually transmitted diseases (Salam, 2025). Socioeconomic factors like low educational attainment and limited access to healthcare also increase the risk of infection. Cultural practices and stigma around STIs can also discourage people from pursuing diagnosis and treatment, which can contribute to continued transmission.

Despite its high prevalence and potential health consequences, trichomoniasis has been largely neglected in public health responses. The asymptomatic nature of the infection, coupled with the lack of baseline prevalence data in many Nigerian communities particularly in Taraba State emphasize the need for targeted studies to assess the burden of T. vaginalis infection among women of reproductive age in some part of Southern Taraba State.

MATERIALS AND METHODS

This study was conducted in Southern Taraba State, located in the North-Eastern region of Nigeria. The state is located at approximately 8.0000° N latitude and 10.5000° E longitude, bordered by Bauchi and Gombe States to the north, Adamawa State to the east, the Republic of Cameroon to the south, and Benue, Nasarawa, and Plateau States to the

west and northwest. Taraba State was established on August 27, 1991, from a portion of the previous Gongola State. The state has a geographic area of approximately 54,000-54,500 km² (Salako *et al.,* 2016) with a population of 2,294,800 according to the National Population Commission's 2006 census. Jalingo is the state capital. The map of the study area is shown in Figure 1.

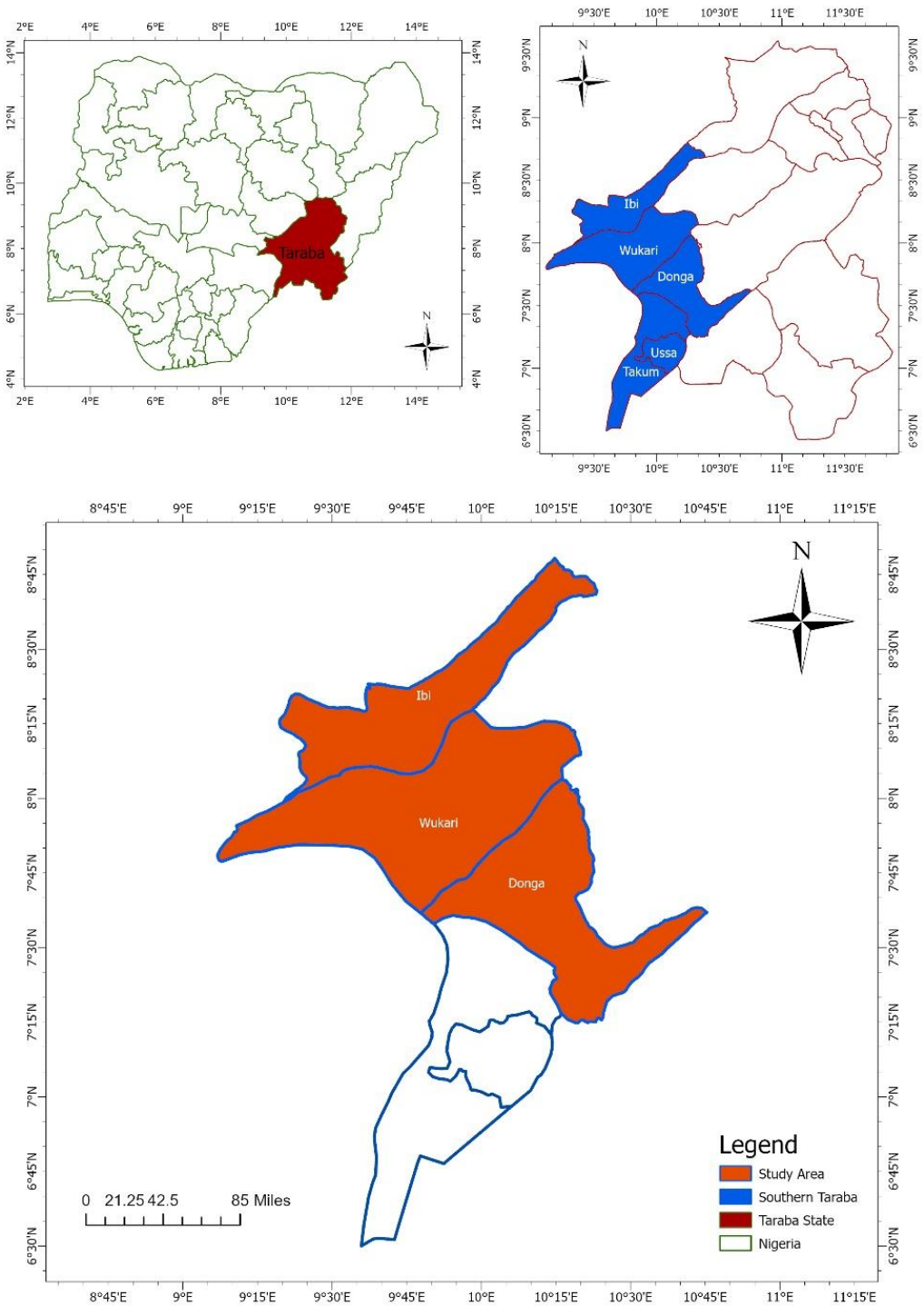


Figure 1: Taraba State showing the study area

Study Design

This is a hospital based cross-sectional study carried out among female's adults visiting some medical health facilities in parts of southern Taraba State, Nigeria.

Study Population

The study population comprises of females attending medical health facilities during the course of the study after receiving informed consent from the patients.

Inclusion Criteria

Only those that volunteered to take part in the study were included, patients aged 18-59 years were recruited for the study.

Exclusion Criteria

While those that refused to give their consent or aged below 18 years and those under treatment with antimicrobials were excluded from the study.

Ethical Clearance

Ethical approval was obtained from the Research and Ethics Committee of First Referral Hospital Ibi, First Referral Hospital Donga, and Mission Clinic Wukari with a letter of introduction from the Department of Microbiology, Federal University Wukari. Subjects were duly informed about the study's objectives in line with the Helsinki Declaration on Ethical Principles for Human Subjects in Medical Research.

Sample Size Determination

The population sample size was determined using the following formula:

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where:

N=Sample size

Z=Critical value at 95% confidence level (standard error (z) = 1.96)

P= an expected prevalence (13%) and

d=is precision or margin of error (2.95%).

A prevalence of 13% which was reported in Jalingo, Taraba state, (Imo *et al.,* 2023) was used as the expected prevalence for this study.

$$N = \frac{1.96^2(0.13)(1-0.13)}{(0.05)^2}$$

$$= \frac{3.8416 \; X \; 0.13 \; X \; 0.87}{0.0025}$$

$$= \frac{0.4343}{0.0025}$$

$$= 173.72$$

$$\approx 174$$

Thus, a minimum of 174 participants was required per study site. The study was conducted in three local government areas: Wukari, Ibi, and Donga. To ensure adequate representation and allow for site-specific analysis, 174 participants were recruited from each study area, resulting in a total sample size of 522.

Sample Collection

High Vaginal Swab (HVS) samples were collected following the method described by Obatta *et al*., (2023). A laboratory scientist obtained the samples using sterile cotton swab sticks. After which a drop of normal saline was added into the samples container to prevent drying; loss of the parasite jacking /tumbling motility and eventually death, samples were transported immediately after collection to the microbiology laboratory of the medical facilities for analysis.

Assessment of Risk Factors

Risk factors for *Trichomonas vaginalis* infection were assessed using a structured questionnaire in English, designed to gather participants' demographic, behavioural and awareness information. For non-educated participants, the questions were read aloud, and for those who had difficulty understanding, the content was carefully explained, to them.

Microscopic Examination of Collected Samples

The HVS samples were microscopically examined in accordance with the methods described by Eyong *et al.,* (2023). A clean, grease-free slide was prepared by placing a drop of 0.85% normal saline on it, after which the swab stick was used to create a smear in the saline. After covering the smear with a cover slip, the x10 and x40 objective lenses were used to examine it under the microscope.

Data Analysis

Data collected were analyzed using Microsoft Excel and IBM SPSS version 27.0. Percentages were used to compare variables descriptively while the Chi square (χ^2) was used to test for associations between categorical variables. Statistical significance was set at P-value of less than or equal to 0.05 ($\leq$0.05).

RESULTS

Identification of Trichomonas vaginalis

Microscopic examination of urine samples from infected participants revealed the presence of *Trichomonas vaginalis* trophozoites. The organisms exhibited an ovoid to pear-like shape and displayed characteristic rapid, jerky movements. These distinctive morphological features and motility patterns allowed for the confident identification of *T. vaginalis* in the examined specimens.

Prevalence of *Trichomonas vaginalis*

Table 1 shows the prevalence of *Trichomonas vaginalis* infection among female patients attending selected health facilities in parts of Southern Taraba State. A total of 522 women were examined across the three study locations (174 per location). The overall prevalence of *T. vaginalis* infection was 4.4% (23/522), indicating that approximately one in every twenty-three women attending the health facilities was infected. The prevalence varied markedly across locations. Donga recorded the highest prevalence at 9.2% (16/174), suggesting a substantially higher burden of infection in this area. Ibi recorded a moderate prevalence of 2.9% (5/174). While Wukari had the lowest prevalence at 1.1% (2/174).

Demographics Prevalence of *Trichomonas vaginalis*

Table 4.2a and 4.2b present the prevalence of *Trichomonas vaginalis* infection among female patients in Donga, Wukari, and Ibi Local Government Areas of Southern Taraba State, Nigeria, based on demographic factors including marital status, educational level, occupation and age.

Marital Status

In Donga, the prevalence was highest among married respondents (62.5%), followed by single (18.8%), divorced (12.5%), and widowed (6.3%) individuals, though

these differences were not statistically significant ($p > 0.05$). In Wukari, infections occurred among single respondents, with no infections reported among married, divorced, or widowed participants. In Ibi, prevalence was slightly higher among married respondents (60.0%) compared to widowed (20.0%) and single (20.0%), with no infections among divorced individuals. Overall, infections were prevalent among married respondents (56.5%), followed by single (26.0%) and widowed/divorced (each 8.7%), suggesting that marital status alone was not significantly associated with infection risk ($p > 0.05$).

Education Level

In Donga, prevalence was highest among respondents with no formal education (56.1%), followed by tertiary (31.1%) and secondary education (12.5%), with no infections reported among primary-level participants. In Wukari, infection occurred equally among respondents with no formal education (50.0%) and secondary education (50.0%), whereas in Ibi, infections were observed among respondents with no formal education (40.0%), secondary (40.0%), and tertiary education (20.0%), with none among primary-level participants. Across all locations, differences in infection prevalence by education level were not statistically significant ($p > 0.05$), indicating that educational attainment alone was not significantly associated with infection.

Occupation

In Donga, infection prevalence was highest among traders (37.4%), followed by civil servants (25.0%), farmers (18.8%), and others (18.8%). In Wukari, infections occurred only among participants classified as "others" (100%), while in Ibi, prevalence was highest among traders (60.0%), followed by civil servants and others (each 20.0%), with no infections among farmers. Overall, infections were most frequent among traders (39.1%), followed by civil servants (21.7%), others (9.3%), and farmers (13.0%), but these differences were not statistically significant across the study sites ($p > 0.05$).

Age group

The prevalence of *Trichomonas vaginalis* infection among female patients varied across different age groups in Donga, Wukari, and Ibi Local Government Areas of Southern Taraba State, Nigeria. Among respondents aged 18-23 years, no infections were recorded in any of the three locations. This age group accounted for 13.4% of the total study population, indicating that it contributed minimally to the overall prevalence. For respondents aged 24-29 years, prevalence was generally low in Donga at 6.3%, while in

Wukari, one of the two infections recorded occurred in this age group, representing 50.0%. In Ibi, prevalence among this group was 40.0%, with infections in this category representing 17.3% of all cases overall. In the 30-35 years age group, prevalence was higher across all locations, with 25.0% in Donga, 50.0% in Wukari, and 40.0% in Ibi. This age group accounted for 30.4% of infections overall, representing the highest proportion of cases. Among respondents aged 36-41 years, Donga recorded the highest prevalence at 37.5%, while no infections were reported in Wukari or Ibi. Overall, this age group contributed 26.0% of the total infections. Infection was rare among those aged 42-47 years, with only one case recorded in Donga (6.3%) and no infections in Wukari or Ibi, accounting for just 4.3% of total cases. These findings indicate that the highest burden of *Trichomonas vaginalis* infection occurred in women aged 30-41 years, while younger and older age groups were less affected.

Across all three study locations, demographic factors including marital status, education level, occupation and age were not significantly associated with the prevalence of *T. vaginalis* infection. This suggests that demographic characteristics alone was not significantly associated with infection risk.

Prevalence of Trichomoniasis in Relation to Behavioural Factors

Table 4.3 presents the prevalence of Trichomonas vaginalis infection among female patients across the three study locations (Donga, Wukari and Ibi) and overall based on behavioural factors.

Number of Sexual Partners

In Donga, infection prevalence was significantly higher among respondents reporting more than one sexual partner (81.3%) compared to those with only one partner (18.7%), and this association was statistically significant ($p < 0.05$). In Wukari, infections were equally distributed between respondents with one (50.0%) and more than one partner (50.0%), while in Ibi, prevalence was higher among respondents with multiple partners (60.0%) compared to those with only one partner (40.0%). Overall, 73.9% of infections occurred among respondents with more than one sexual partner, highlighting multiple sexual partnerships as a major risk factor for trichomoniasis.

Use of Protection

In Donga, no infections were recorded among respondents who reported consistent use of protection, whereas prevalence was higher among those who never used protection (75.0%) and intermediate among those who used it sometimes (25.0%). In Wukari, infections occurred only among respondents who never used protection (100%), while in Ibi, prevalence was highest among respondents who did not use protection (60.0%) and moderate among those who used it sometimes (40.0%). Overall, 73.9% of infections were observed among respondents who never used protection, indicating a strong but not statistically significant trend linking lack of protective measures to infection risk ($p > 0.05$).

Sexual Activity

In Donga, 93.8% of infections occurred among sexually active respondents, with only one infection (6.2%) among those not sexually active. In Wukari, both recorded infections (100%) occurred among sexually active respondents, while in Ibi, 80.0% of infections occurred among sexually active respondents. Overall, 91.3% of infections were observed in sexually active women, although the association was not statistically significant ($p > 0.05$). This indicates that sexual activity is a necessary condition for infection, but prevalence is influenced more by behaviors such as multiple partners and inconsistent protective measures rather than mere sexual activity.

Across all three study locations, behavioral factors including number of sexual partners, use of protection, and sexual activity were closely linked to infection patterns. Multiple sexual partnerships were significantly associated with higher prevalence in Donga, and lack of protection consistently corresponded with higher infection rates across locations. These findings emphasize the importance of targeted behavioral interventions, including promotion of consistent condom use and reduction of multiple concurrent partnerships, in reducing the risk of *T. vaginalis* infection.

The awareness-based prevalence of trichomoniasis

The awareness-based prevalence of *Trichomonas vaginalis* infection among female patients in Donga, Wukari, and Ibi Local Government Areas of Southern Taraba State, Nigeria is presented in Table 4.4a and Table 4.4b.

Awareness of STIs

In Donga, prevalence was slightly higher among respondents aware of STIs (18.8%) compared to those unaware (13.2%). In Wukari, both recorded infections occurred among those aware of STIs, whereas in Ibi, all infections occurred among respondents unaware of STIs. Overall, 65.2% of infections were recorded among respondents reporting awareness of STIs, indicating that awareness alone did not necessarily confer protection against infection. Though the differences were not statistically significant ($p > 0.05$)

Awareness of *T. vaginalis*

In Donga, infection prevalence was equal among respondents aware and unaware of *T. vaginalis* (50.0%). In Wukari, infections were observed only among respondents unaware of the infection, while in Ibi, prevalence was slightly higher among those aware (60.0%) than unaware (40.0%). Across all locations, differences were not statistically significant ($p > 0.05$), with infections distributed almost evenly between those aware (47.8%) and unaware (52.2%) of *T. vaginalis*.

Previous STI Infections

In Donga, prevalence was higher among respondents without a history of previous STIs (75.0%) compared to those with prior infections (25.0%), though not significant ($p > 0.05$). In Wukari, both recorded infections occurred among those with a previous STI history though not significant ($p > 0.05$), In Ibi, prevalence was higher among respondents without prior infections (60.0%) than those with previous STIs (40.0%), with no significant association ($p > 0.05$). Overall, 65.2% of infections occurred in respondents without a previous STI history.

Awareness of *T. vaginalis* Preventive Measures

In Donga, prevalence was higher among respondents aware of preventive measures (68.8%) compared to those unaware (31.3%) with no significant association ($p > 0.05$). In Wukari, all infections occurred among respondents unaware of preventive measures ($p > 0.05$), while in Ibi, prevalence was slightly higher among the unaware (60.0%) than aware (40.0%), with no significant association ($p > 0.05$). Overall, 56.5% of infections occurred among respondents reporting awareness of preventive measures, suggesting that knowledge alone may not ensure adoption of protective behaviors.

Awareness of Partner's Infection Status

In Donga, prevalence was highest among respondents aware of their partner's infection status (50.0%), followed by those with no knowledge of their partner's status (25.0%). The association was not statistically significant ($p > 0.05$). In Wukari, both recorded cases occurred among respondents with no idea of their partner's infection status ($p > 0.05$), while in Ibi, prevalence was higher among respondents without knowledge of their partner's status (60.0%) than those aware (40.0%), with no significant association ($p > 0.05$). Overall, infections were fairly evenly distributed between respondents aware of their partner's status (43.4%) and those without such knowledge (39.1%).

Across all three locations, awareness of STIs, awareness of *T. vaginalis*, previous STI history, awareness of preventive measures, and knowledge of a partner's infection status were not significantly associated with trichomoniasis prevalence. However, in Donga, awareness of preventive measures showed borderline significance, suggesting a potential link worth further investigation. These findings indicate that while awareness is necessary, it is not sufficient on its own to reduce infection risk; effective prevention likely requires consistent behavioral change, safer sexual practices, and improved access to prevention alongside educational campaigns.

Table 1: Prevalence of Trichomonas vaginalis by Study Location

Location	No. Examined	No. Infected	Prevalence (%)
Donga	174	16	9.2
Wukari	174	2	1.1
Ibi	174	5	2.9
Overall prevalence	522	23	4.4

Table 4.2a: Prevalence of trichomoniasis by demographic factors

		Donga		Wukari		Ibi		Over all	
Variables	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
Marital Status	Single	48(27.6)	3(18.8)	47(27.0)	2(100)	45(25.9)	1(20.0)	140(26.8)	6(26.0)
	Married	19(10.9)	1(6.2)	6(3.5)	0(0)	12(6.9)	0(0)	37(7.1)	2(8.7)
	Divorced	19(10.9)	2(12.5)	6(3.5)	0(0)	12(6.9)	0(0)	37(7.1)	2(8.7)
	Widowed	89(51.1)	10(62.5)	110(63.2)	0(0)	100(57.5)	3(60.0)	299(57.3)	13(56.5)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			
Education Level	No formal education	68(39.1)	9(56.1)	34(19.5)	1(50.0)	59(33.9)	2(40.0)	161(30.8)	12(18.7)

		Donga		Wukari		Ibi		Over all	
Variables	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
	Primary	7(4.0)	0(0)	32(18.4)	0(0.0)	14(8.1)	0(0.0)	53(10.2)	0(0.0)
	Secondary	36(20.7)	2(12.5)	69(39.7)	1(50.0)	43(24.7)	2(40.0)	148(28.4)	5(21.7)
	Tertiary	63(36.2)	5(31.1)	39(22.4)	0(0)	58(33.3)	1(20.0)	160(30.7)	6(26.1)
	Total	174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
	P-value	>0.05		>0.05		>0.05			
Occupation	Farmer	30(17.2)	3(18.8)	27(15.5)	0(0.0)	27(15.5)	0(0.0)	84(16.1)	3(13.0)
	Trader	52(29.9)	6(37.4)	69(39.7)	0(0.0)	67(38.5)	3(60.0)	188(36.0)	9(39.1)
	Civil Servant	34(19.5)	4(25.0)	36(20.7)	0(0.0)	35(20.1)	1(20.0)	105(20.1)	5(21.7)
	Others	58(33.3)	3(18.8)	42(24.1)	2(100)	45(25.9)	1(20.0)	145(27.8)	6(9.3)
	Total	174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
	P-value	>0.05		>0.05		>0.05			

Table 4.2b: Prevalence of trichomoniasis by demographic factors

		Donga		Wukari		Ibi		Over all	
Variable	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
Age Group	18-23	17(9.8)	0(0)	31(17.2)	0(0.0)	22(12.6)	0(0.0)	70(13.4)	0(0.0)
	24-29	29(16.7)	1(6.3)	50(28.7)	1(50.0)	35(20.1)	2(40.0)	114(21.8)	4(17.3)
	30-35	47(27.0)	4(25.0)	47(27.0)	1(50.0)	50(28.7)	2(40.0)	144(27.6)	7(30.4)
	36-41	37(21.3)	6(37.5)	23(13.2)	0(0.0)	30(17.2)	0(0.0)	90(17.2)	6(26.0)
	42-47	19(10.9)	1(6.3)	7(4.0)	0(0.0)	15(8.6)	0(0.0)	41(7.9)	1(4.3)
	48-53	8(4.6)	2(12.5)	4(2.3)	0(0.0)	7(4.0)	0(0.0)	19(3.6)	2(8.6)
	54-59	17(9.8)	2(12.5)	12(6.9)	0(0.0)	15(8.6)	1(20.0)	44(8.3)	3(13.0)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100.0)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			

Chi-square (χ^2) test was used to determine associations between categorical variables and trichomoniasis prevalence, with statistical significance defined as $p < 0.05$.

Table 4.3: Prevalence of trichomoniasis based on behavioral factors

		Donga		Wukari		Ibi		Over all	
Variables	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
No. of Sexual Partners	One	87(50.0)	3(18.7)	136(78.2)	1(50.0)	100(57.5)	2(40.0)	323(61.8)	6(26.1)
	More than one	87(50.0)	13(81.3)	38(21.8)	1(50.0)	74(42.5)	3(60.0)	199(38.1)	17(73.9)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)

		Donga		Wukari		Ibi		Over all	
Variables	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
P-value		<0.05		>0.05		>0.05			
Use of Protection	Yes	30(17.2)	0(0.0)	45(25.9)	0(0.0)	52(29.9)	0(0.0)	127(24.3)	0(0.0)
	Sometimes	53(30.5)	4(25.0)	65(37.4)	0(0.0)	48(27.6)	2(40.0)	166(31.8)	6(26.1)
	No	91(52.3)	12(75.0)	64(36.8)	2(100)	74(42.5)	3(60.0)	229(43.9)	17(73.9)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			
Sexual Activity	Sexually active	140(80.5)	15(93.8)	154(88.5)	2(100)	138(79.3)	4(80.0)	432(82.8)	21(91.3)
	Not sexually active	34(19.5)	1(6.2)	20(11.5)	0(0.0)	36(20.7)	1(20.0)	90(17.2)	2(8.7)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			

Chi-square (χ^2) test was used to determine associations between categorical variables and trichomoniasis prevalence, with statistical significance defined as $p < 0.05$.

Table 4.4a: Awareness based prevalence of trichomoniasis

		Donga		Wukari		Ibi		Over all	
Variables	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
Awareness of STIs	Aware	23(13.2)	3(18.8)	162(93.1)	2(100)	20(11.5)	0(0.0)	205(39.3)	15(65.2)
	Unaware	151(86.8)	13(81.2)	12(6.9)	0(0.0)	154(88.5)	5(100)	317(60.7)	8(34.7)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			
Awareness of TV	Aware	68(39.1)	8(50.0)	42(24.1)	0(0.0)	115(66.1)	2(40.0)	225(43.1)	10(43.5)
	Unaware	106(60.9)	8(50.0)	132(75.9)	2(100)	59(33.9)	3(60.0)	297(56.9)	13(56.2)
	Total	174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			
Previous STI Infections	Yes	66(37.9)	4(25.0)	63(36.2)	2(100)	98(56.3)	2(40.0)	227(43.5)	8(34.8)
	No	108(62.1)	12(75.0)	111(63.8)	0(0.0)	76(43.7)	3(60.0)	295(56.5)	15(65.2)
	Total	174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			

Chi-square (χ^2) test was used to determine associations between categorical variables and trichomoniasis prevalence, with statistical significance defined as $p < 0.05$.

Table 4.4b: Awareness based prevalence of trichomoniasis continue

		Donga		Wukari		Ibi		Over all	
Variables	**Category**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**	**No examined (%)**	**No infected (%)**
Awareness of TV Preventive Measures	Yes	96(55.2)	5(31.3)	42(24.1)	0(0.0)	68(39.1)	2(40.0)	206(39.5)	7(30.4)
	No	78(44.8)	11(68.7)	132(75.9)	2(100)	106(60.9)	3(60.0)	316(60.5)	16(69.6)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		<0.05		>0.05		>0.05			
	No	63(36.1)	8(50.0)	87(50.0)	0(0.0)	59(33.9)	2(40.0)	209(40.0)	10(43.5)
Awareness of Partner's Status	Yes	39(22.4)	4(25.0)	34(19.5)	0(0.0)	40(23.0)	0(0.0)	113(21.7)	4(17.4)
	No idea	72(41.4)	4(25.0)	53(30.5)	2(100)	75(43.1)	3(60.0)	200(38.3)	9(39.1)
Total		174(100)	16(100)	174(100)	2(100)	174(100)	5(100)	522(100)	23(100)
P-value		>0.05		>0.05		>0.05			

Chi-square (χ^2) test was used to determine associations between categorical variables and trichomoniasis prevalence, with statistical significance defined as $p < 0.05$.

DISCUSSION

Demographic Prevalence of *Trichomonas vaginalis* Infection

The present study examined the prevalence of *Trichomonas vaginalis* infection across key demographic characteristics, including marital status, educational attainment, occupation, and age, to identify patterns and potential risk factors within the study population.

Analysis of marital status revealed that widowed women accounted for the highest proportion of infections, representing 13 out of 23 cases (56.5%). This observation aligns with findings from Idakwo *et al.* (2020) and Ozougwu *et al.* (2023), who reported the highest infection rates among divorced women, suggesting that women who are no longer in marital unions may be at greater risk of infection. The elevated prevalence among widowed or divorced women may be linked to increased sexual exposure, potentially through multiple sexual partnerships, which is a well-established risk factor for *T. vaginalis* transmission. Infections among married and single women were also observed, though at lower proportions. These cases may result from exposure to infected partners, inadequate personal hygiene, or the persistence of untreated infections, as highlighted by Ozougwu *et al.* (2023). The findings emphasize that marital status alone does not fully predict infection

risk, as exposure can occur across all categories. In agreement to this, Owowo *et al.* (2022) reported no statistically significant differences in prevalence across marital status groups, with married, single, divorced, and widowed women showing relatively similar infection levels.

Educational attainment appeared to influence infection patterns, with the highest prevalence of *Trichomonas vaginalis* infection in this study was observed among women with no formal education. Lower levels of education may contribute to increased infection risk by limiting knowledge about sexually transmitted infections (STIs), reducing access to reliable health information, and decreasing opportunities for preventive healthcare. This pattern highlights the potential role of educational attainment in shaping awareness and adoption of protective sexual health behaviors. However, findings from other studies indicate that education alone does not guarantee protection. Obetta *et al.* (2023) reported that women with secondary education accounted for 38.5% of infections, while Idakwo *et al.* (2020) found the highest prevalence among women with secondary education (46.0%). These findings suggest that even women with formal education may remain at risk if other factors are present. Similarly, Owowo *et al.* (2022) reported a higher prevalence among women who had attended only Quranic school (24%) and 16.7% among women with no formal education, further emphasizing that education level interacts with behavioral and contextual factors to influence infection risk.

Occupational analysis showed variation in infection prevalence across groups, with traders exhibiting the highest prevalence of infections (39.1%). This finding is consistent with observations by Ozougwu et al. (2023), who reported that traders had the highest prevalence (12.24%) in their study population, suggesting that certain occupational groups may be at greater risk, potentially due to increased social interactions, mobility, or engagement in behaviors that elevate exposure to sexually transmitted infections (STIs). However, findings from other regions show variation, highlighting the influence of local epidemiological, social, and behavioral contexts on infection patterns. Chuku et al. (2024) reported a lower prevalence of 2.5% among traders in Lafia, Nasarawa State, indicating that occupation alone does not uniformly predict infection risk across different populations. The elevated prevalence of Trichomonas vaginalis infection among traders observed in this study could be attributed to the fact that traders often interact with a large number of people daily and may travel frequently for business. This increases the likelihood of encountering partners with unknown STI status, facilitating the transmission of T.

vaginalis. Traders may experience financial pressures that influence sexual behaviors, such as transactional sex, which has been associated with higher STI prevalence.

Age-specific analysis indicated that women aged 30-35 years had the highest prevalence of infection, with Wukari Local Government Area recording a town-specific prevalence of 50.0% within this group. This suggests that while age alone may not be associated with infection, women in their early to mid-thirties are particularly susceptible in this population. Comparative findings from other regions in Nigeria show a similar trend, though the peak age groups vary slightly. In Okene, Kogi State, Idakwo *et al.* (2020) reported the highest prevalence among sexually active adults aged 21-30 years (55.1%), reflecting a younger demographic than that observed in the present study. In contrast, Obetta *et al.* (2023) in Nsukka found peak prevalence among adults aged 38-47 years, suggesting susceptibility may extend into later reproductive ages in some populations. Udofia and Owowo (2022) reported the largest share of infections among women aged 26-35 years (43.5%), aligning closely with the present findings. Similarly, in Anambra State, Ozougwu *et al.* (2023) observed the highest prevalence (16.42%) in the 30-39 years age group. These findings indicate that *T. vaginalis* infection is most common among women in their late twenties to late thirties, a period typically characterized by peak sexual activity. The variation in peak age groups across studies may reflect differences in sexual behaviors, socio-cultural factors, and local epidemiological dynamics. This underscores the importance of targeting women in this age range for screening, health education, and behavioral interventions to reduce the burden of infection.

The age-specific variation between studies may be due to differences in sexual behavior patterns, cultural norms, and health-seeking habits across populations. In some communities, early marriage or earlier sexual debut may shift the infection burden toward younger women, while in others, prolonged sexual activity and sustained partnership dynamics may keep prevalence high among older age groups. Biological susceptibility during the reproductive years, combined with factors such as contraceptive use and changes in partner behaviour, may also contribute to these patterns. Women in their late twenties to forties often represent a demographic with stable or multiple partnerships, both of which can increase the risk of exposure. However, the absence of a statistically significant relationship between age and infection in this study suggests that age alone is not a strong determinant of risk. Instead, other factors such as specific sexual practices,

partner behavior, and awareness or use of preventive measures are likely to play a more decisive role in determining susceptibility to *T. vaginalis* infection.

Prevalence of Trichomoniasis in Relation to Behavioural Factors

In the present study, 73.9% of Trichomonas vaginalis infections occurred among respondents reporting more than one sexual partner, highlighting multiple sexual partnerships as a major risk factor for trichomoniasis. This finding aligns with the results of Idakwo et al. (2020), who reported a higher prevalence of 45.8% among women with multiple sexual partners. The observed trend is further supported by previous studies, which demonstrate that T. vaginalis prevalence increases sharply with both the frequency of sexual activity and the number of sexual partners (Erube et al., 2021; Eyong et al., 2023).

The strong association between multiple sexual partnerships and infection is biologically and epidemiologically plausible, as increased exposure to partners with unknown or untreated infection raises the likelihood of transmission. These findings emphasize the critical role of sexual behaviour in determining susceptibility to *T. vaginalis*, suggesting that interventions aimed at reducing concurrent sexual partnerships, promoting consistent condom use, and encouraging regular STI screening could substantially reduce infection risk in this population.

In this study, 73.9% of *Trichomonas vaginalis* infections occurred among respondents who reported never using protection, emphasizing the critical role of condom use in reducing the risk of trichomoniasis transmission. This finding suggests that unprotected sexual intercourse remains a major behavioural determinant of *T. vaginalis* infection within the study population. This observation is consistent with evidence from recent studies conducted in similar settings. A cross-sectional study among women attending health facilities in Port Harcourt, Nigeria, reported a statistically significant association between engaging in unprotected sex and trichomoniasis prevalence, indicating that inconsistent or absent condom use increases exposure to infected partners and facilitates transmission of the parasite (Nyenke *et al.,* 2023). Similarly, a cross-sectional study in the North West Region of Cameroon found that *T. vaginalis* prevalence was significantly associated with having multiple sexual partners and not using condoms during sexual intercourse, further demonstrating that lack of protective measures contributes substantially to infection risk (Eyong *et al.,* 2023). At the global level, a recent meta-analysis also supports these findings, showing that individuals who do not use condoms are more likely to be infected with *T.*

vaginalis, with behavioural subgroups characterized by non-condom use exhibiting higher infection prevalence compared to those who use condoms regularly (Tian *et al.,* 2025). The biological plausibility of these associations is clear: *Trichomonas vaginalis* is transmitted predominantly through genital contact during unprotected intercourse, and condoms act as a mechanical barrier to prevent direct exposure to infected secretions. Global public health guidance underscores that consistent condom use can prevent trichomoniasis and other sexually transmitted infections by limiting pathogen exchange during sexual activity (WHO, 2025).

Prevalence of Trichomoniasis in Relation to Awareness

Awareness of STIs, awareness of *Trichomonas vaginalis*, and knowledge of preventive measures did not show statistically significant associations with infection prevalence in this study.

In the present study, 91.3% of *Trichomonas vaginalis* infections were observed among sexually active women, although the association between sexual activity status and infection was not statistically significant ($p > 0.05$). This finding is epidemiologically expected, given that *T. vaginalis* is primarily transmitted through sexual contact. The observation suggests that sexual activity provides the biological context necessary for exposure, even if sexual activity alone does not fully explain differences in infection risk within the population.

This pattern is consistent with findings by Nyenke *et al.* (2023), who reported that *T. vaginalis* infection occurred exclusively among respondents who were sexually active, with no infections detected among those who reported being sexually inactive. This reinforces the understanding that sexual contact is essential for transmission and that infection among sexually inactive individuals is unlikely under normal circumstances. According to the World Health Organization, *T. vaginalis* spreads primarily through sexual contact, and sexually active individuals are at risk when protective measures such as condom use are absent or inconsistent (WHO, 2025). Similarly, risk factor analyses in clinic and community settings show that sexual behavioural traits associated with active sexual lifestyles such as having two or more sexual partners are correlated with *T. vaginalis* infection. Ambrozio *et al.* (2016) demonstrated that women with multiple recent sexual exposures had higher odds of infection, indicating that increasing sexual exposure elevates transmission risk.

The awareness-based prevalence of trichomoniasis

The study revealed generally low knowledge and awareness of STIs and *Trichomonas vaginalis* among participants, with only 39.3% aware of STIs, 43.1% aware of TV, and 39.5% knowledgeable about preventive measures. Awareness of a partner's STI status was limited, and only 36.9% knew how trichomoniasis is transmitted. These findings indicate poor sexual health knowledge and highlight the need for targeted education and outreach programs, consistent with similar observations by Eyong *et al.* (2023) who also reported low awareness with only 36.9% of participants reported having any knowledge of trichomoniasis, while the majority (63.1%) had no knowledge of the infection. Similarly, awareness of how trichomoniasis is transmitted was also low, with 36.9% of respondents answering "yes" and 63.1% answering "no," suggesting that knowledge about transmission is limited.

Despite these gaps in knowledge, awareness-related factors including awareness of STIs, knowledge of TV, history of previous STIs, awareness of preventive measures, and knowledge of a partner's infection status were not significantly associated with trichomoniasis prevalence in the present study ($p > 0.05$). Infections occurred among both aware and unaware participants and were fairly evenly distributed across these categories, indicating that awareness alone did not consistently reduce infection risk. This suggests that knowledge in itself may be insufficient to influence the complex behaviours that drive STI transmission. Similarly, Nyenke *et al.* (2023) reported that while knowledge of T. vaginalis was statistically associated with infection ($p = 0.012$), general STI knowledge was not ($p = 0.865$), and infections still occurred among knowledgeable individuals. These findings underscore the importance of coupling awareness with behavioural interventions to effectively reduce the risk of trichomoniasis.

Multiple sexual partners and unprotected sex were the only predictors of *Trichomonas vaginalis* infection that were statistically significant ($p < 0.05$) in this study, whereas demographic factors and awareness-related variables were not. These findings underscore the critical importance of behavioural interventions, in combination with education, for effective prevention of infection.

Conclusion

This study reveals an overall prevalence of Trichomonas vaginalis infection of 4.4% among female patients attending selected health facilities in parts of Southern Taraba State,

Nigeria, with significant variation across locations. The highest infection burden was observed among women aged 30-41 years, widowed individuals, and those with no formal education. Behavioural factors played a decisive role: multiple sexual partnerships and inconsistent or absent condom use were strongly associated with higher infection rates.

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