



Research Article

Prevalence and Risk Factors of Trichomoniasis among Patients Attending Two Specialist Hospitals, Katsina State, Nigeria

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ABSTRACT

Trichomoniasis, caused by *Trichomonas vaginalis*, is the most common protozoan sexually transmitted infection worldwide, but data from Katsina State, Nigeria, remain limited. This study determined the prevalence, risk factors, and distribution of trichomoniasis among patients attending two specialist hospitals in the state. A cross-sectional study was conducted from July to August 2024 among 400 patients attending the National Obstetric Fistula Centre, Babbar Ruga ($n = 150$) and Turai Yar'adua Maternity and Children Hospital ($n = 250$). Urine and high vaginal swab samples were examined by wet mount microscopy and Giemsa staining. Data were analyzed using Chi-square/Fisher's exact tests and Firth's penalised logistic regression. Overall prevalence was 26.3% (105/400), with no significant difference between hospitals ($p = 0.747$). Prevalence was higher in females than males (31.7% vs 12.4%) and highest among those aged 24–33 years (42.9%). Among positive cases, 86.7% were female and 89.5% were aged 24–33 years. Female sex (adjusted odds ratio [aOR] = 3.45, $p = 0.007$), water-only douching (aOR = 41.2, $p < 0.001$), untreated partner (aOR = 153.9, $p < 0.001$), and shared pit latrine use (aOR = 192.8, $p < 0.001$) were independently associated with infection, while older age groups had lower odds. Trichomoniasis was highly prevalent at both hospitals, concentrated among young women, and associated with untreated partners and douching. Routine laboratory screening, simultaneous partner treatment, and education on vaginal douching should be considered.

Keywords: Katsina; Nigeria; Partner treatment; Prevalence; *Trichomonas vaginalis*; Trichomoniasis; Vaginal douching

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INTRODUCTION

Trichomoniasis, caused by the flagellated protozoan *Trichomonas vaginalis*, is the most common non-viral sexually transmitted infection (STI) worldwide (Van Gerwen *et al.*, 2023). The World Health Organization (WHO, 2025) estimated approximately 156 million new infections among people aged 15–49 years in 2020, with about one-third in the African region. Many infections are asymptomatic. Most infected adults were asymptomatic carriers in a Nigerian study (Obetta *et al.*, 2023), and 56.9% of infected women in low- and middle-income countries were

asymptomatic in a meta-analysis (Fortas *et al.*, 2024). As a result, many cases remain undiagnosed and untreated and continue to spread. In pregnancy, infection is associated with preterm birth, low birth weight, and premature rupture of membranes (Van Gerwen *et al.*, 2021). It is also linked to an approximately 1.5-fold higher risk of HIV acquisition (Masha *et al.*, 2019).

Recent evidence shows a substantial burden globally and in sub-Saharan Africa. Tian *et al.* (2025) estimated global prevalence at about 8% (country range 1–35%) and Nigerian prevalence at about 7% across 11

studies. Higher figures have been reported in some Nigerian health facilities, for example 45.0% among 300 adults in Enugu State, and 63.7% among the women (Obetta *et al.*, 2023). Also, Michalow *et al.* (2025) estimated 2020 prevalence in sub-Saharan Africa at 7.6% among females and 1.7% among males, which shows how much prevalence varies by sex, setting, and population.

Despite this burden, information on *T. vaginalis* infection in Katsina State remains limited, particularly among patients in general hospital settings, as well as evidence on the socio-demographic, behavioural, and hygiene-related factors associated with the infection. Local data are needed to improve the identification, prevention, diagnosis, and treatment of trichomoniasis, and to support the WHO global target of halving trichomoniasis incidence by 2030 (Michalow *et al.*, 2025).

This study therefore determined the prevalence, risk factors, and distribution of *T. vaginalis* infection among patients attending two specialist hospitals in Katsina State, Nigeria. It tested the null hypotheses that (i) infection is not significantly prevalent in the study population, (ii) socio-demographic, behavioural, and hygiene-related factors are not significantly associated with the infection, and (iii) the infection does not differ significantly by hospital, sex, or age group.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional, hospital-based study was conducted between July to August 2024 at two specialist hospitals in Katsina metropolis, Katsina State, North-Western Nigeria: the National Obstetric Fistula Centre, Babbar Ruga, and Turai Yar'adua Maternity and Children Hospital.

Participants and Sample Size

Consenting patients aged 14-60 years who were symptomatic for, or referred for screening for, sexually transmitted infections were eligible. Those who had taken antitrichomonal drugs or other antimicrobials in the previous two weeks were excluded. The minimum sample size was 246, calculated as $n = Z^2P(1 - P)/d^2$ (Naing *et al.*, 2022), assuming an expected prevalence of 20%, 95% confidence, and 5% precision. To allow for non-response and improve precision, 400 patients were enrolled (150 from Babbar Ruga and 250 from Turai Yar'adua).

Collection of Samples and Laboratory Analysis

Clean-catch mid-stream urine ($n = 250$) and high vaginal swabs in Stuart's Transport medium ($n = 150$)

were transported at ambient temperature to the Biological Sciences Laboratory, Federal University Dutsin-Ma, within two hours. Urine was centrifuged at $500 \times g$ for 10 minutes, and the sediment was examined by wet mount microscopy (10 $\times$ and 40 $\times$) for motile, pear-shaped, flagellated trophozoites with an undulating membrane as described by Cardoso *et al.* (2024). Vaginal smears were methanol-fixed, Giemsa-stained, and examined at 100 $\times$ oil immersion.

Questionnaire Administration

A pre-tested structured questionnaire was administered face to face. It recorded age, sex, partner treatment status, toilet type, shared or exclusive toilet use, and vaginal douching practice.

Statistical Analysis

Data were analysed with SPSS version 25.0 (IBM Corp., Armonk, NY, USA) and R version 4.2.2. Prevalence was calculated overall and by hospital, sex, and age group. Associations were tested with the Chi-square or Fisher's exact test. Variables were entered into a binary logistic regression model using Firth's penalised likelihood to handle separation (Puhr *et al.*, 2017). Model fit was assessed using the Hosmer–Lemeshow test and Nagelkerke R^2 . Results are reported as adjusted odds ratios (aOR) with 95% confidence intervals, and significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from Katsina state Government Ministry of Health, Katsina state, Nigeria with approval reference number MOH/ADM/SUB/1152/1074, dated: 14/01/2025. The collection of samples was monitored by Health Research Ethics Committee of each hospital. The study followed the Declaration of Helsinki (World Medical Association, 2025). Written informed consent was obtained from guardians for participants under 18 years, and codes replaced names to protect confidentiality.

RESULTS

Prevalence of Trichomoniasis among the Patients Examined

Of the 400 patients examined, 105 were positive for *T. vaginalis*, an overall prevalence of 26.3%. Prevalence did not differ significantly between Turai Yar'adua (26.8%, 67/250) and Babbar Ruga (25.3%, 38/150; $\chi^2 = 0.10$, $p = 0.747$). It was higher in females than in males (31.7% vs 12.4%; $\chi^2 = 15.63$, $p < 0.001$) and differed by age group ($p < 0.001$), peaking at 42.9% among those aged 24–33 years, with no cases at 54–60 years. Sanitation facility, hygiene practice,

and partner treatment status were significantly associated with infection ($p < 0.001$; Table 1).

Risk Factors Associated with Trichomoniasis among the Examined Patients

In the adjusted Firth model (Table 2), female sex (aOR = 3.45, 95% CI 1.38–9.67, $p = 0.007$), shared pit latrine use (aOR = 192.8, 95% CI 22.1–999, $p < 0.001$), water-only douching (aOR = 41.2, 95% CI 5.8–1834, $p < 0.001$), and untreated partner (aOR = 153.9, 95% CI 24.9–999, $p < 0.001$) were independently associated with infection. Older age groups had lower odds of

infection (44–53 years: aOR = 0.05, $p = 0.025$; 54–60 years: aOR = 0.01, $p = 0.003$). Hospital was not a significant predictor ($p = 0.613$).

Distribution of Positive cases among Patients Categories

Of the 105 positive patients, 86.7% were female and 89.5% were aged 24–33 years. In addition, 99.0% used shared pit latrines, 99.0% had untreated partners, and 82.9% practised water-only douching (Table 3). By hospital, 63.8% of positives were from Turai Yar’adua and 36.2% from Babbar Ruga.

Table 1: Prevalence of *Trichomonas vaginalis* Infection by Selected Characteristics of Patients (N = 400)

Variable	Category	Examined	Positive	Prev. (%)	Chi square	p-value
Hospital	Turai Yar’adua	250	67	26.8	$\chi^2 = 0.104$	0.747
	Babbar Ruga	150	38	25.3		
Sex	Male	113	14	12.4	$\chi^2 = 15.63$	<0.001
	Female	287	91	31.7		
Age group (years)	14 – 23	20	3	15.0	Fisher	<0.001
	24 – 33	219	94	42.9		
	34 – 43	97	7	7.2		
	44 – 53	38	1	2.6		
	54 – 60	26	0	0.0		
Sanitation facility	SPL	104	104	100.0	Fisher	<0.001
	SWC	139	0	0.0		
	EWC	157	1	0.6		
	EPL	0	0	0.0		
Hygiene	N	306	14	4.6	Fisher	<0.001
	DW	88	87	98.9		
	DH	3	3	100.0		
	DS	3	1	33.3		
Partner treatment	PT	296	1	0.3	Fisher	<0.001
	PNT	104	104	100.0		

Note Keys: Prev. = prevalence; Fisher = Fisher’s exact test. SPL = shared pit latrine; SWC = shared water closet, EWC = exclusive water closet, EPL = exclusive pit latrine, N = no douching, DW = douching with water only, DH = douching with herbal concoctions, DS = douching with soap, PT = partner treated, PNT = partner not treated.

Table 2: Adjusted Odds Ratios from Firth Logistic Regression for Factors Associated with *Trichomonas vaginalis* Infection

Variable	Category	aOR (CI at 95%)	p-value
Hospital	Turai Yar'adua	1.00 (Ref)	
	Babbar Ruga	1.23 (0.55 – 2.81)	0.613
Sex	Male	1.00 (Ref)	
	Female	3.45 (1.38 – 9.67)	0.007
Age group (years)	14 – 23	1.00 (Ref)	
	24 – 33	0.88 (0.15 – 5.02)	0.884
	34 – 43	0.23 (0.03 – 1.48)	0.127
	44 – 53	0.05 (0.00 – 0.67)	0.025
	54 – 60	0.01 (0.00 – 0.28)	0.003
Sanitation facility	SWC (Shared WC)	1.00 (Ref)	
	SPL (Shared Pit)	192.8 (22.1 – 999)	<0.001
	EWC (Exclusive WC)	0.31 (0.01 – 4.95)	0.422
Hygiene	N (None)	1.00 (Ref)	
	DW (Water only)	41.2 (5.8 – 1834)	<0.001
	DH (Herbal)	15.8 (0.9 – 1289)	0.059
	DS (Soap)	3.11 (0.1 – 53.1)	0.495
Partner treatment	PT (Treated)	1.00 (Ref)	
	PNT (Not treated)	153.9 (24.9 – 999)	<0.001

Note Keys: aOR = adjusted odds ratio, CI = confidence interval, Ref = reference category. Model fit: Hosmer–Lemeshow $\chi^2 = 1.02$, $df = 8$, $p = 0.998$, Nagelkerke $R^2 = 0.792$, classification accuracy = 95.8%. SPL = shared pit latrine, SWC = shared water closet, EWC = exclusive water closet, EPL = exclusive pit latrine, N = no douching, DW = douching with water only, DH = douching with herbal concoctions, DS = douching with soap, PT = partner treated, PNT = partner not treated.

Table 3: Distribution of *Trichomonas vaginalis*–Positive Patients by Selected Characteristics: (n = 105)

Characteristic			
Hospital	Turai Yar'adua	67	63.8
	Babbar Ruga	38	36.2
Sex	Male	14	13.3
	Female	91	86.7
Age group (years)	14 – 23	3	2.9
	24 – 33	94	89.5
	34 – 43	7	6.7
	44 – 53	1	1.0
	54 – 60	0	0.0
Sanitation facility	SPL	104	99.0
	SWC	0	0.0
	EWC	1	1.0
	EPL	0	0.0
Hygiene	N	14	13.3
	DW	87	82.9
	DH	3	2.9
	DS	1	1.0
Partner treatment	PT	1	1.0
	PNT	104	99.0

Note Keys: Percentages are column percentages of the 105 positive patients. SPL = shared pit latrine, SWC = shared water closet, EWC = exclusive water closet, EPL = exclusive pit latrine, N = no douching, DW = douching with water only, DH = douching with herbal concoctions, DS = douching with soap, PT = partner treated, PNT = partner not treated.

DISCUSSION

The high prevalence of trichomoniasis recorded indicates sustained transmission of the parasite among patients attending the two hospitals. It exceeded the pooled global 8% and African (12%) estimates (Tian *et al.*, 2025), the 7.6% estimated for women in the general population of sub-Saharan Africa (Michalow *et al.*, 2025), and the 7.4% and 7.7% reported among pregnant women in Lagos and southern Ethiopia (Husen *et al.*, 2023., Okunade *et al.*, 2024). It was also higher than the 13.8% reported among symptomatic women in Nepal using the same diagnostic methods (Chhetri *et al.*, 2025), but lower than the 45.0% reported in Enugu State (Obetta *et al.*, 2023). Lower figures in pregnant and general populations are expected, since patients attending for suspected sexually transmitted infections are more likely to be infected. The similar prevalence at both hospitals indicates that exposure is not specific to either facility.

The higher infection rate in females corresponds to the biology of the parasite, which colonises the female lower genital tract. In men it resides in the urethra and prostate, where infection is mostly asymptomatic (Kissinger, 2015) and harder to detect by microscopy (Cardoso *et al.*, 2024). The same female predominance has been reported across sub-Saharan Africa (Michalow *et al.*, 2025).

This study revealed that the infection was concentrated in the reproductive years, which is in keeping with a sexually-transmitted infection and with the age profile of patients attending maternity and fistula services. This differs from reports of peak prevalence in older women, in their mid-thirties to mid-forties, in Nigeria, Ethiopia, and Nepal (Etuketu *et al.*, 2015; Obetta *et al.*, 2023; Husen *et al.*, 2023; Chhetri *et al.*, 2025), and from a United States survey in which infection increased with age (Sutton *et al.*, 2007). The low prevalence in the oldest women agrees with Chhetri *et al.* (2025), who recorded no infections above 46 years.

The strong association with untreated partners in this study reflects the reinfection cycle typical of this parasite. Most male partners of infected women are themselves infected (Meites *et al.*, 2015) and, being largely asymptomatic, rarely seek treatment, so treated women are re-exposed. This supports current guidance to treat partners at the same time as the patient (Workowski *et al.*, 2021). Multiple sexual partners and partners that are not using condom have likewise been linked to infection based on the findings

of Ijasan *et al.*, (2018); Husen *et al.*, (2023) and Tian *et al.*, (2025).

The high association with water-only douching revealed in this study is consistent with a United States population-based study in which douching was independently associated with *T. vaginalis* infection (Sutton *et al.*, 2007). Douching alters the vaginal environment, and current guidelines advise against it because it might increase the risk of vaginal infections, including trichomoniasis (Workowski *et al.*, 2021). The association has not been universal, however. No significant relationship between douching and infection was found among pregnant women with HIV in Lagos (Ijasan *et al.*, 2018), which may reflect differences in the populations studied and in douching practices.

This study also show that shared pit latrine use was also strongly associated with the infection, this finding is in line with an Abeokuta study linking toilet type and shared toiletries to infection (Etuketu *et al.*, 2015). *Trichomonas vaginalis* spreads mainly through sexual contact, although indirect spread through contaminated surfaces has been proposed (Okunade *et al.*, 2024). Shared latrine use also marks socioeconomic disadvantage, which was associated with infection in a pooled analysis (Tian *et al.*, 2025), and women in manual occupations had higher odds in Nepal (Chhetri *et al.*, 2025).

Because most infected women have no symptoms (Fortas *et al.*, 2024), symptom-based case management leaves many infections untreated and sustains transmission. These findings support consideration of routine laboratory screening and simultaneous partner treatment among patients attending these hospitals.

CONCLUSION

Trichomonas vaginalis infection was highly prevalent among patients attending National Obstetric Fistula Centre, Babbar Ruga, and Turai Yar'adua Maternity and Children Hospital, and it was concentrated among young women with untreated partners who practised vaginal douching. These findings support consideration of routine laboratory screening, partner treatment, and health education on douching.

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