Prevalence and Risk Factors of *Trichomonas vaginalis* Infection among Female Students of Prince Abubakar Audu University, Nigeria

ABSTRACT

Objective: This study aimed to determine the prevalence rate and associated risk factors of *Trichomonas vaginalis* infection among undergraduate female students at Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria.**Method:** This cross-sectional and institutional-based study involved female students who consented to screening. A total of four hundred (400) high vaginal swab samples were randomly collected from consenting female students and analyzed by wet mount preparation. Demographic and clinical information about the participants was obtained using prepared questionnaires.**Result:** It was observed that the overall prevalence of T. vaginalis infection among the 400 female participants was 170 (42.5%). The age ranges 14–18 and 24-28 had the highest prevalence of 50%, while the age range 19–23 had the least prevalence of 41.2%. The Ebira tribe had the highest prevalence of 60%, while the lowest prevalence was 0.0% among Hausa and others. Islam had the highest prevalence of 66.7%, while Christianity had the lowest prevalence of 40.5%. Students at the 100 level had the highest prevalence of 50%, and those at the 200 level had the least prevalence of 38.5%. There was no significant association between T. vaginalis infection and predisposing factors such as douching, sanitation, and sexual habits. However, the study did find that females who did not use sanitary pads were at a significantly higher risk of infection, while females who did not douche their vagina with antiseptic or deodorant products had a slightly higher risk of infection.**Conclusion:** It is clear from the results of the present study that Prince Abubakar Audu University's undergraduate female students are at a high prevalence of 42.5% for *Trichomonas vaginalis* infection. The study offers crucial information about the incidence of *T. vaginalis* infection and the risk factors connected to it among female participants in the study area. The high prevalence of infection highlights the need for increased awareness and education about the infection and its prevention in the study area

Keywords: *Trichomonas vaginalis*, infection, prevalence, risk factors, female students, Nigeria

INTRODUCTION

Trichomonas vaginalis (*T. vaginalis*) is a common sexually transmitted infection (STI) caused by a flagellated protozoan parasite that affects both men and women. The World Health Organization (1) projects that approximately 90% of infections occur in areas with limited resources [1]. *T. vaginalis* infection is linked to various adverse health outcomes, including elevated risk of cervical cancer, pelvic inflammatory disease, increased vulnerability to human papillomavirus, and adverse pregnancy outcomes (2,3). *T. vaginalis* infection is extremely prevalent among female students, in university community (4). This elevated prevalence is a cause for concern, as it not only affects the health of the students but also has broader consequences for public health. These discoveries highlight the necessity for vital interventions to prevent and control *T. vaginalis* infection among female students. *T. vaginalis* principally infects the female

lower genital tract and the male urethra and prostate. The main mode of transmission is sexual contact, but infection can also happen via contaminated objects like towels, douche nozzles, toilet seats, specula, or swimming pool water (5, 6). *T. vaginalis* infection might be asymptomatic, with infected persons often unaware that they harbor the parasite. Though many infected males and half of infected females do not demonstrate symptoms, they can still spread the parasite to others. Asymptomatic trichomoniasis may give rise to disorders like postpartum endometritis, stillbirth, vaginal discharge, vulvar itching, vaginitis, urethritis, irritation, premature birth, low-birth-weight infants, and death (7). Asymptomatic trichomoniasis can also increase the risk of obtaining and transmitting HIV and herpes simplex virus type 2 infections (8,9). Though the global prevalence of trichomoniasis remains high, trichomoniasis is easy to diagnose and prevent. While there are well-known STI control programs for gonorrhea, syphilis, and HIV, there is presently no such program for trichomoniasis. As a result, there is a dearth of information concerning the prevalence and risk factors of *T. vaginalis* among female students in Nigeria. To fill this knowledge gap, the present study was designed to investigate the prevalence of *T. vaginalis* infection and identify associated risk factors among female undergraduate students at Prince Abubakar Audu University in Nigeria. The findings of this study will contribute to a better understanding of the burden of *T. vaginalis* infection among female students and inform the design of effective prevention and control strategies.

MATERIALS AND METHODS

Study Area

The study was carried out among undergraduate female students of Prince Abubakar Audu University Anyigba, located in Anyigba, Dekina local government area, Kogi state, north-central Nigeria. It is located at latitudes 70 27'–70 31’ North and longitudes 70 09'–70 12’ East of the

Equator of the Greenwich Meridian. Anyigba town is one of the most populated towns in Dekina local government area in Kogi state, with a population of 364000, with children below twenty years of age constituting about 65% of the population, according to the 2006 census. In the mornings, relative humidity generally rises to over 80% and falls between 50% and 70% in the afternoon during the wet season. The rainy season occurs between April and October, and the peak is September. Rainfall in Anyigba is seasonal, which means it is not all year round. In general, the rate of rainfall decreases inland from the southern part of the region. The mean monthly temperature ranges between 210 °C and 320C. The peak temperature ensues just before the rainy season starts.

Inclusion and exclusion criteria

The study was carried out between July and September 2022. Consenting students in the selected hostels were recruited for the study. Those with a history of antibiotic and anti-helminthic drug use in the preceding two weeks of the study were also excluded from the study.

Sample Size

Swab sticks, slides, and microscopes were used to collect samples and examine them, respectively. A total of 400 (four hundred) high vaginal swab (HVS) specimens were collected randomly from consenting female students in selected hostels within Prince Abubakar Audu University.

Specimen and Data Collection

Prior to specimen collection, demographic and clinical information about the participants was obtained using prepared questionnaires, which were later administered to the female participants. Each questionnaire had a unique Participant Identification Number (PIDN). Data and specimen collection were done simultaneously. The pre-test questionnaires were administered to the participants directly. The first part of the questionnaires contained the biodata of the participants, e.g., age, study level, religion, and tribe. The second part includes clinical data relating to personal hygiene and health care-seeking behavior. The study population was stratified by age, study level, religion, and tribe. All filled-out questionnaires were examined for completeness, and for reasons of privacy, only the Participant Identification Number (PIDN) was recorded on the laboratory forms, and all data were kept confidential in accordance with the World Medical Association (WMA).

Specimen Collection

Self-collected vaginal swabs were collected from each participant. Briefly, they were instructed to assume a lithotomy position, use one hand to separate the labia majora and minora of their vagina apart, and use the other hand to insert the sterile vaginal swab stick 1–2 inches into the vagina to swab the vagina walls and keep in the vagina for 20 seconds before removing in an aseptic manner and corking immediately. These samples were collected during the day and immediately kept in a transport medium at 25°C to prevent dying and loss of the parasite. The samples remained in the transport medium for about 1-2 hours. This is because of the time it took for the samples to be collected and transported to the laboratory, where they were processed immediately upon arrival.

Laboratory Analysis

After the collection of specimens from the students, they were taken to PAAU Laboratory Anyigba for laboratory examination. Wet saline mounts of specimens were immediately examined for motile *T. vaginalis* trophozoites under the 10X and 40X objectives of a light microscope.

Microscopic identification of parasite

The trophozoite of *Trichomonas vaginalis*, approximately 8–15 m long, looks round, ovoid or pear-like in shape. Speedy, jerky motility is done with the help of the organism's four flagella, all of which start from the anterior end. Only one of the flagella extends posteriorly. Ameboid forms of the parasite were observed under the microscope.

Management of Positive Patients

Participants who tested positive were encouraged to go to the hospital for the necessary care and treatment

Statistical Analysis

The data collected from the study were analyzed using IBM SPSS Statistics, version 21.0. Differences and associations between categorical variables were tested using Pearson's chi-square test and considered statistically significant at P-values 0.05. In addition, the odds ratios (ORs) and their corresponding 95% confidence intervals (CI) were also calculated. Multivariable analysis using a logistic regression model was also performed to identify independent predictors of *T. vaginalis* infection among female students. The risk factors associated with *T. vaginalis* infection among the participants were determined using a binary logistic regression model. A significant difference was kept at a 95% confidence interval with a probability value of 0.05 ($p < 0.05$). The resulting outputs were presented in figures and tables.

RESULTS

The overall prevalence of *T. vaginalis* infection among studied female participants is shown in Table 1. It was observed that the overall prevalence of *T. vaginalis* infection among the 400 female participants was 170 (42.5%).

Table 1: Overall prevalence of *T. vaginalis* infection among female participants

No. Examined	No. Infected	No. Uninfected
400	170	230
100%	42.5%	57.5%

Prevalence of *T. vaginalis* infection according to age, tribe, religion and study level

The prevalence of *T. vaginalis* infection among studied female participants according to their age range is presented in Table 2. The age ranges 14–18 and 24–28 had the highest prevalence of 50%, while the age range 19–23 had the least prevalence of 41.2%. It was observed that there was no significant difference in *T. vaginalis* infection according to their age range (2 = 0.162, *df* = 2, *p* = 0.922).

Table 3 shows the prevalence of *T. vaginalis* infection among the studied female participants according to their tribe. The Ebira tribe had the highest prevalence of 60%, while the least prevalence was 0.0% among Hausa and others. The prevalence differences did not vary significantly in relation to tribe (2 = 2.244, *df* = 5, *p* = 0.814).

The prevalence of *T. vaginalis* infection among studied female participants according to their religion is presented in Table 4. Islam had the highest prevalence of 66.7%, while Christianity had the lowest prevalence of 40.5%. It was observed that the prevalence of *T. vaginalis* infection was not dependent on the students' religion, as their differences were not significant (*p* = 0.379).

The prevalence of *T. vaginalis* infection among studied female participants according to their study level is shown in Table 5. Students at the 100 level had the highest prevalence of 50%, and those at the 200 level had the least prevalence of 38.5%. The observed differences in prevalence were not statistically significant (2 = 0.401, *df* = 3, *p* = 0.940).

Table 2: Prevalence of *T. vaginalis* infection according to their age range

Age Range	No. Examined	No. Infected	Prevalence (%)
14 – 18 years	20	10	50.0
19 – 23 years	340	140	41.2
24 – 28 years	40	20	50.0
Total	400	170	42.5

Significant difference at $p < 0.05^{*}$. $\chi 2 = 0.162$, df = 2, p = 0.922

Table 3: Prevalence of *T. vaginalis* according to their tribe

Tribe	No. Examined	No. Infected	Prevalence (%)
Igala	250	110	44.0
Yoruba	50	20	40.0
Ebira	50	30	60.0
Idoma	30	10	33.3
Hausa	10	0	0.0
Others	10	0	0.0
Total	400	170	42.5

Significant difference at $p < 0.05^{*}$.$\chi 2 = 2.244$, df = 5, p = 0.814

Table 4: Prevalence of *T. vaginalis* according to their religion

Religion	No. Examined	No. Infected	Prevalence (%)
Christianity	370	150	40.5
Islam	30	20	66.7
Total	400	170	42.5

Significant difference at $p < 0.05^{*}$. $\chi 2 = 0.775$, df = 1, p = 0.379

Table 5: Prevalence of *T. vaginalis* according to their study level

Study Level	No. Examined	No. Infected	Prevalence (%)
100	120	60	50.0
200	130	50	38.5
300	50	20	40.0
400	100	40	40.0
Total	400	170	42.5

Significant difference at $p < 0.05^{*}$.$\chi 2 = 0.401$, df = 3, p = 0.940

Risk Factors Associated with *T. vaginalis* Infection among Participants

Table 6 shows the risk factors associated with *T. vaginalis* infection among the studied female participants. From the results, out of 400 participants, 170 of the studied female participants had malaria, with 42.5% prevalence. The risk of exposure to *T. vaginalis* infection among the studied female participants showed a non-significant ($p< 0.05$) relation to the predisposing factors predicted to cause *T. vaginalis* infection, ranging from their douching, sanitation, and sexual habits. However, it was observed that females that do not douche their vagina with antiseptic or deodorant products had about twice the risk of exposure compared to those that douche with antiseptic or deodorant products ($p = 0.740$, OR = 1.524). Similarly, the use of sanitary pads reduced the risk of *T. vaginalis* infection, as those female participants who did not use sanitary pads were about 5 times more likely to get infected ($p = 0.198$, OR = 4.714). Those females that have not had sex before ($p = 0.483$, OR = 0.625) or changed sex partners recently ($p = 0.750$, OR = 0.714) present a lower likelihood of T. vaginalis infection with 0.625 and 0.714 odds ratios, respectively.

Table 6: Risk factors associated with *T. vaginalis* infection among studiedfemale participants

Risk Factors	Exposure			*df*	Odds Ratio (95% CI)	*p*-value
	N	*(+ve)*	*(-ve)*			
Douche with water only?						
Yes	33	16	17	1	0.177 (0.019 – 1.638)	0.127
No	7	1	6		1	
Douche with soap and water?						
Yes	14	6	8	1	0.978 (0.263 – 3.637	0.973
No	26	11	15		1	
Douche with antiseptics/deodorant products?						
Yes	3	1	2	1	1.524 (0.127 – 18.324)	0.740
No	37	16	21		1	
Douche with herbal concoctions?						
Yes	0	0	0	1	1.353 (0.0 – 0.0)	0.345
No	40	17	23		1	
Wear wet pant/underwear?						
Yes	5	2	3	1	1.125 (0.167 – 7.600)	0.904
No	35	15	20		1	
Share underwear and sanitary facilities with others?						
Yes	0	0	0	1	1.353 (0.0 – 0.0)	0.345
No	40	17	23		1	
Use sanitary pads?						
Yes	36	14	22	1	4.714 (0.445 – 49.943)	0.198
No	4	3	1		1	
Have had sex before?						
Yes	14	7	7	1	0.625 (0.168 – 2.321)	0.483
No	26	10	16		1	
Change sex partner recently?						
Yes	4	2	2	1	0.714 (0.090 – 5.655)	0.750
No	36	15	21		1	
Number of sex partners?						
None	26	9	17	2	0.265 (0.053 – 1.317)	0.104
1 – 2 persons	9	6	3		0.794 (0.112 – 5.656)	0.818
Undisclosed	5	2	3		1	

Significant difference at $p < 0.05^{*}$.

DISCUSSION

Trichomoniasis is stated to affect a projected 180 million people yearly, making it the most prevalent non-viral sexually transmitted pathogen globally [10]. Poor personal hygiene, illiteracy, and poverty are recognized risk factors for the acquisition of *T. vaginalis* infection [11], and these factors are predominant in Nigeria [12] as well as in Anyigba, the university host community. The results of this study showed a high prevalence of *T. vaginalis* infection among female participants in the study area, with 42.5% testing positive for the infection. This is higher than the 18.7% and 10.9% reported by other Nigerian studies, respectively [10, 11). It is also higher than the 3.3% and 0.0% reported elsewhere in Nigeria. [13, 14]. The observed disparity may be due to differences in diagnostic methods used, geographical location, and level of personal hygiene among study participants. Numerous sexual partners and sexual promiscuity are recognized risk factors for *T. vaginalis* infection, and this could as well be responsible for the observed differences [15]. The study also examined the prevalence of *T. vaginalis* infection according to age range and found that participants in the age ranges of 14–18 and 24-28 had the highest prevalence rates, while those in the age range of 19–23 had the lowest prevalence rate. However, the differences in prevalence rates between age ranges were not statistically significant. Similarly, in the prevalence of *T. vaginalis* infection according to tribe, it was found that the Ebira tribe had the highest prevalence rate, while the Hausa and other tribes had no cases of infection. However, the differences in prevalence rates between tribes were not statistically significant. Also, the prevalence of *T. vaginalis* infection according to religion showed that Muslim participants had the highest prevalence rate, while Christian participants had the lowest prevalence rate. The differences in prevalence rates between religious groups were not statistically significant. Further, the prevalence of *T. vaginalis* infection among studied female participants according to their study level showed that students on the 100 level had the highest prevalence of 50% and those on the 200 level had the

least prevalence of 38.5%. The observed differences in prevalence were not statistically significant. These findings were in line with the report of (4), who stated that the prevalence of *T. vaginalis* infection at Babcock University is not associated with the tribe, religion, or study level of the participants.

Finally, the study examined the risk factors associated with *T. vaginalis* infection among female participants. The results showed that there was no significant association between *T. vaginalis* infection and predisposing factors such as douching, sanitation, and sexual habits. However, the study did find that females who did not use sanitary pads were at a significantly higher risk of infection, while females who did not douche their vagina with antiseptic or deodorant products had a slightly higher risk of infection. These findings are consistent with previous studies (4). Lack of education has been described as being related to *T. vaginalis* infection in other research done in Nigeria [16]. Though access to health information in most areas of Nigeria is commonly meager, health education is a genuine instrument for disease prevention and control [17, 12]. Screening for *T. vaginalis* in a given population is crucial to the control and prevention of trichomoniasis. The current study can be regarded as an initial investigation into the prevalence of *T. vaginalis* infection among female undergraduate students of Prince Abubakar Audu University, despite the fact that it is constrained by the limitations of discharge examination using light microscopy, which may not detect minor infections.

CONCLUSION

It is clear from the results of the present study that Prince Abubakar Audu University's undergraduate female students are at a high prevalence of 42.5% for *Trichomonas vaginalis* infection. The study offers crucial information about the incidence of *T. vaginalis* infection and the risk factors connected to it among female participants in the study area. The high prevalence of

infection highlights the need for increased awareness and education about the infection and its prevention in the study area.

CONSENT

All authors declare that ‘written informed consent was obtained from the participants in the course of the conduct of this study.

ETHICAL APPROVAL

Ethical approval was obtained from the Prince Abubakar Audu University Research Ethics Committee

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