

TRICHOMONAS VAGINALIS INFECTION AMONG ASYMPTOMATIC UNDERGRADUATE STUDENTS IN A PRIVATE UNIVERSITY IN OGUN STATE, NIGERIA

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ABSTRACT

Background: *Trichomonas vaginalis* is one of the common non-viral sexually transmitted infections that infect both men and women worldwide. It is largely asymptomatic and its association with the risk of HIV transmission has made it a compelling public health concern. Therefore, this study aims to determine the prevalence and the risk factors associated with *T. vaginalis* among asymptomatic undergraduate students at Babcock University, Ilishan-Remo, Ogun state, Nigeria.

Materials and Methods: This is a descriptive cross-sectional study involving 246 asymptomatic students of Babcock University between February 2019 to April 2020. Information on socio-demographic and associated risk factors was obtained by structured-questionnaire in an interview-based manner. First-void urine was collected from each participant for the detection of *T. vaginalis* using the traditional wet prep method and TV in-pouch. The data were analyzed by SPSS Version 23.

Result: The overall prevalence of *T. vaginalis* among the participants was 12.2% (30/246). The use of wet-preparation showed 8.5% (21/246) while the use of TV in-pouch yielded 12.2% (30/246) prevalence of positive results. The results of the wet prep in comparison to the in-pouch technique was statistically significant among the study population. ($P < 0.001$). Sexual intercourse, use of hormonal contraceptives and practice of internet-based sex seeking behaviour were factors that had increase likelihood of *T. vaginalis* infection on multivariate analysis.

Conclusion: The occurrence of *T. vaginalis* and, its associated risk factors among the asymptomatic population in this study is very high. We advocate for the screening of young people.

Keywords: *Trichomonas vaginalis*, TV In-pouch, Asymptomatic, Undergraduate

INTRODUCTION

Trichomonas vaginalis, the commonest pathogen of non-viral sexually transmitted infection (STI) was estimated to 156 million incident cases worldwide in the year 2016.^{1,2} The epidemiology of *Trichomonas vaginalis* is not well understood since no concrete surveillance system and methods of diagnosis has been in place.³ The prevalence, however, varies by geographical location.³ It ranges from 5.0% among high-risk women to 3.0% among high-risk men.^{4,5} A review of STI in Papua New Guinea revealed the prevalence of *T. vaginalis* to be 39.3%.⁶

Though not a reportable infection, the high prevalence of *Trichomonas vaginalis* and its association with the risk of HIV transmission in both men and women has made it a compelling public health concern.⁷⁻¹⁰ *T. vaginalis* is a flagellated parasite that infects the urethra and prostate gland of males causing urethritis, prostatitis, balanoposthitis, and epididymitis.¹¹ In females, it infects the urethra and the vaginal mucosa causing vaginitis and urethritis.¹² However, trichomoniasis is largely asymptomatic in 85% of infected women, and 77% of the men.^{9,13} If the asymptomatic individuals are left untreated, it could lead to sequelae

such as ectopic pregnancy, low birth weight, preterm birth, pelvic inflammatory disease (PID), male infertility, female infertility and increased risk of HIV acquisition.¹⁴⁻¹⁵ Recent studies have associated *T. vaginalis* to cervical cancer in women and prostate cancer in men.¹⁶⁻¹⁷

Nearly 90% of *T. vaginalis* infections was reported to occur in resource-limited countries.² Individuals of African origin have increased rates of *T. vaginalis*, and this is proven by higher rates reported in the literature from Sub-Saharan Africa.^{9,18-19} In Nigeria, the prevalence of *T. vaginalis* ranges from 0% to 18.6% across a variety of populations.²⁰⁻²⁶ Increased age, concomitant STI, intravenous drug use, cigarette smoking are risk factors of *Trichomonas vaginalis*.^{5,27} High rates of *T. vaginalis* infection have been reported among African adolescents of which majority of them are students in higher institutions of learning.²⁷⁻³⁰ A study in Nigeria reported that 53% of those infected with *T. vaginalis* among the study population were university undergraduates.³¹

The most widely used diagnostic test for *T. vaginalis* is the direct microscopic examination of the vaginal fluid.¹² However, the culture of the parasite using specimens from the vagina is the current “gold standard.”⁸⁻⁹ Nevertheless, urine specimen can be used because it’s been proven that the organisms colonizing the urethral epithelium, are present in urine in adequate quantities to be relevant diagnostically.³² The in-Pouch system is a method that combines a wet preparation, and a culture method to detect *T. Vaginalis*.³³⁻³⁴ It can detect *T. vaginalis* from male or female urine samples. This makes TV in-Pouch system an appropriate diagnostic method for this study. Although Nucleic acid amplification tests (NAATS) is more sensitive, however, this option is not often used because it is not cost-effective in resource limited countries.³⁵

In Babcock University, a previous study on the prevalence of *T. vaginalis* among the undergraduate was carried out among the female population only, and majority of them were symptomatic.³⁶ Considering that *T. vaginalis* can infect males and females, majority of those infected are usually asymptomatic, additional population-based data will be helpful in understanding the burden of its infection. Thus, this research work aimed to determine the prevalence of *Trichomonas vaginalis* among asymptomatic male and female undergraduate students of Babcock University as well as to evaluate the associated risk factors.

MATERIALS AND METHODS

This was a descriptive cross-sectional study that was conducted at Babcock University between February 2019 and April 2020. It involves 246 males and females’ undergraduate students who were asymptomatic for *T. vaginalis* infection. The inclusion criteria were consenting undergraduate’s males and females students of Babcock University that were sexually active and did not have symptoms suggestive of *T. vaginalis* infection such as an abnormal vaginal discharge, dysuria, abnormal urethral discharge, abnormal menstrual bleeding, lower abdominal pain and postcoital bleeding. Other criteria included those that were ready to fill the questionnaire and provide early morning first void urine for *Trichomonas vaginalis*. The exclusion criteria were undergraduates’ students on antibiotics or had used antibiotics in the last six weeks and those that were unwilling to give consent.

The sample size of 246 was calculated based on the *Trichomonas vaginalis* prevalence of 18.7% reported in Zaria, Northern Nigeria²¹ to give a 95% confidence level and margin of error of $\pm 5\%$.

Multistage sampling method was used to recruit the participants. The study population was divided into two equal groups (male and female). Five halls each were selected with the simple random technique by balloting from male and female halls. Four blocks from each chosen hall were selected by a simple random technique by balloting. Students were selected by simple random technique from the rooms in the selected blocks until the sample size was reached.

Ethical approval was obtained from Babcock University Ethical review community before the commencement of the study. Written informed consent was signed voluntarily by all the participants, and semi-structured interviewers – based questionnaire was administered to all the participants to elicit their socio-demographic and risk factors that can predispose them to *T. vaginalis* infection.

Ten mls of the first void early morning urine was collected using the sterile universal bottle which was then centrifuged at room temperature for 10 min at 1,500 rpm. The supernatant was discarded, and the sediments were agitated using a vortex machine. A drop of the sediments was used for wet mount microscopy while two drops were inoculated into the in-Pouch TV system culture system (Biomed diagnostics, USA) (Figure 1) by following previously published procedure.³³ *Trichomonas vaginalis* was identified by its morphology and motility (Figure 2).

RESULT

Majority 136(55.3%) of them were within the age range of 15-20 years. The male to female ratio was 1:1. Most of the participants 229 (93.1%) were single. (Table 1)

The overall prevalence of *T. vaginalis* among the participants was 30/246 (12.2%). The prevalence with the use of wet-preparation was 21/246 (8.5%) while the prevalence with the use of in-pouch was 30/

Table 1: Socio-demographic and associated risk factors for *Trichomonas vaginalis* among the participants

Variables	<i>Trichomonas vaginalis</i>		X ²	P-value
	Yes(%)	No(%)		
Age				
15- 20	15(11.0)	121(89.0)	0.922	0.631
21-25	15(14.0)	92(85.9)		
26-30	0(0.0)	3(100)		
Sex				
Male	14(11.4)	109(88.6)	0.152	0.697
Female	16(13.0)	107(87.0)		
Marital status				
Single	27(65.9)	14(34.1)	0.507	0.476
Married	3(1.5)	202(98.5)		
Past history of STI				
Yes	2(28.6)	5(71.4)	1.805	0.179
No	28(11.7)	211(88.3)		
Use of condom				
Yes	7(25.9)	20(74.1)	5.340	0.021
No	23(10.5)	196(89.5)		
	6(54.5)	5(45.5)		
New sex partner				
Yes	4(44.4)	5(55.6)	9.073	0.003
No	26(11.0)	211(89.0)		
Life time sex partner				
1	24(10.3)	208(89.7)	19.583	
≥ 2	6(42.9)	8(57.1)		<0.001
Drinks alcohol				
Yes	10(34.5)	19(65.5)	15.251	<0.001
No	20(9.2)	197(90.8)		
Present number of sex partner				
0	5(5.0)	96(95.0)	36.656	0.004
≥1	25(17.2)	120(82.8)		
Use of hormonal contraceptive				
Yes	2(66.7)	1(33.3)	8.416	0.004
No	28(11.5)	215(88.5)		
Smokes cigarette				
Yes	5(100)	0(0)	36.747	<0.001
No	25(10.4)	216(89.6)		
Sex practice				
Vaginal	28(11.7)	212(88.3)	0.109	2.566
Oral	2(33.3)	4(66.7)		
Anal	0(0.0)	0(0.0)		
Sex partners in the last three months				
0	21(9.5)	202(90.5)	40.335	<0.001
≥1	9(0.0)	14(100.0)		
Last sex experience				
Less than a week	8(80.0)	2(20.0)	55.534	<0.001
A week	4(44.4)	5(55.6)		
Greater than a week	18(7.9)	209(92.1)		
New sex partner				
Yes	6 (50.0)	6(50.0)	16.838	<0.001
No	24	210		
Age at first intercourse				
< 18 years	12(8.7)	126(91.3)	0.058	3.595
≥ 18 years	18(16.7)	90(83.3)		
Use of sex toys				
Yes	5(100)	0(0)	36.747	<0.001
No	25(10.4)	216(89.6)		
Internet based sex				
Yes	3(75)	1(25)	14.978	<0.001
No	27(11.2)	215(88.8)		

P-value less than 0.05 is significant

246(12,2%). Nine positive results missed by the traditional wet mount were picked by the in-pouch. The results of the wet preparation in comparison to the in-pouch was statistically significant among the study population {(P- value = 0.00)(Table 2)}. The prevalence of *T. vaginalis* was slightly higher among the females 16(53.3%) as against 14(46.7%) in males.

The relationship between associated risk factors and *Trichomonas vaginalis* infection is described in Table 2.

Table 2: Comparison of the prevalence of *Trichomonas vaginalis* among the Participants by using In-pouch and Wet- prep.

Variables	In-pouch result		P-value
	Positive (%)	Negative (%)	
Wet preparation			
Positive	21(70)	0 (0)	<0.001
Negative	9(30)	216(100)	



Figure 1: TV In-pouch

However, on Multivariate regression analysis, sexual intercourse, hormonal contraceptives and internet-based sex seeking behaviour were statistically significant. Participants who had regular sexual

Table 3: Logistic regression analysis of sociodemographic and associated risk factors for trichomonas vaginalis among the participants

Variables	AOR (95% CI)	P value
Use of Condom		
*Yes	0.341(0.03- 3.25)	0.33
No		
New sex partner		
Yes	0.99 (0.05- 20.93)	0.994
*No		
Lifetime sex partner		
*1	0.59(0.06-5.79)	0.647
≥ 2		
Drinks alcohol		
Yes	0.31(0.09-1.06)	0.063
*No		
Present number of sex partner		
*0	2.15 (0.69-6.76)	0.189
≥ 1		
Use of hormonal contraceptive		
Yes	0.07 (0.006-0.742)	0.028
*No		
Sex partners in the last three months		
*0	0.91(0.05-15.77)	0.946
≥1		
Last sex experience		
* Less than a week	22.26(4.73-105.65)	<0.001
A week		
Greater than a week		
Internet based sex seeking behavior		
Yes		
*No	31.17(2.59-375.19)	0.007

P-value less than 0.05 is significant, * reference category

intercourse within a month were at higher risk of acquiring *Trichomonas vaginalis* while those who practiced internet-based sex behaviour were at greater risk of the infection. (Table 3).



Figure 2: Photomicrograph of *Trichomonas vaginalis* observed under the Microscope

DISCUSSION

Trichomonas vaginalis is a parasitic sexually transmitted pathogen that is mainly asymptomatic in most infected individuals and untreated infections can lead to adverse health outcomes. Therefore, the understanding of the burden and associated risk factor of the infection can help to develop strategic preventive mechanisms.

The overall prevalence of *Trichomonas vaginalis* was 12.2% in this study. This finding is similar to that of a previous studies in Anambra state, Nigeria (13.3%) and in Maryland, USA (12.16%)³⁷⁻³⁸ However, our study prevalence was higher than 9.7% reported in Ilorin, 2.8% in Ebonyi, 3.3% in Lagos, 2.8% in Benin, 2.7% in Jos, 6.17% and 4.48% in Kaduna and 0% were reported in Edo state, all in Nigeria.^{3, 20,22, 23,25,39-40} Other studies in Nigeria reported higher prevalence than what was observed in this index study, 17.7% was reported in Uyo, 20% in Abeokuta, 18.7% in Zaria, 15% in Benin and 21.5% in Nnewi.^{21,41-44} The rate also varies across different countries, Senegal (4.8%), Tanzania (16%), USA (New York - 46.9%), Bangladesh (1.4%), Tanzania (24.7%), Kenya (34%), South Africa (49.2%), United State (2.3%) by Miller *et al.* and India (8.5%).^{14, 45-52} The variations observed in all the studies could be due to geographical locations, study populations, sexual activities and habits, access to the health facilities and diagnostic tests used for the evaluation.³ However, these observations justified a previous report that the

prevalence of *Trichomonas vaginalis* varies markedly based on population and settings.²³

Most of the participants in this index study (12.2%) were sexually active and healthy young people. As much as it is expected that the incidence of sexually transmitted infection generally is high in this age group but the fact that these participants were infected and asymptomatic might pose some challenges to the control of this infection that is known to be associated with serious sequelae of which HIV infection is inclusive.⁵³ Hence, screening of this infection is advocated in our community especially among the young people because of the increase in sexual activity among these age groups.²⁴

The prevalence of *T. vaginalis* from this study is slightly higher in females than males. This finding is similar to that of previous studies by Madhivanam *et al.* and Miller *et al.*⁵¹⁻⁵² The reason for this findings might not be unconnected to some factors such as menstruation, pregnancy, bad anal hygiene that can transfer some anaerobes to the vaginal orifice because of its closeness to the anus, and vaginal douching. All these may increase the pH of the vagina and make the environment conducive for *T. vaginalis* to thrive.^{23,54}

T. vaginalis in-pouch culture system was able to detect nine participants with *T. vaginalis* which was missed by the wet-mount. The differential rate of these two methods was statistically significant (P-value <0.05). This showed that TV in-pouch was more sensitive than the traditional wet-mount method. This finding was like that of the previous study by Borchadict *et al* and Sema *et al.*^{34, 55}

Age, age at first intercourse and prior history of STI was not associated with *Trichomonas vaginalis* in this study as contrary to some other studies.^{52, 56} This finding is similar to that of a previous study.¹³ However the lack of significant association between prior history of STI, age at first intercourse and *T. vaginalis* in this study might be due to recall bias and should be interpreted with caution.

On multivariate analysis, use of hormonal contraceptives, sexual intercourse over a week but less than a month, and practicing internet-based sex seeking behaviour have increased likelihood of *T. vaginalis* infection. Associated risk factors reported from other studies such as having more than one-lifetime sex partner, low use of condom, alcohol intake lost their significance on multivariate analysis.^{35,57} Internet-based sex behaviour is a risk factor that has been reported to be high-risk sex behaviour, and it is generally associated with an increased risk of STI.⁵⁸⁻⁵⁹ This finding might

also suggest that *Trichomonas vaginalis* can be an indicator for high risk sexual behaviour among the young people in this community and sex education among the undergraduate could help to reduce the burden of *T. vaginalis* infection.

LIMITATION OF STUDY

The limitation of the study was the inability to make use of Polymerase Chain Reaction diagnostic method that is more sensitive and specific for the detection of *Trichomonas vaginalis*. The method was not adopted for the lack of funds. Also we did not screen our participants for HIV.

CONCLUSION

The overall prevalence of *Trichomonas vaginalis* from this study was 12.2%. TV in-pouch was observed be more sensitive than the traditional wet-prep and risk factors such as the use of hormonal contraceptives, sexual intercourse over a week but less than a month and practicing internet-based sex seeking behaviour have increased risk of *T. vaginalis* infection. Therefore, considering the prevalence among the asymptomatic population in this study, the associated risk factors and the known sequelae of *Trichomonas vaginalis*, screening of young individuals is advocated in our community.

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