



## PREVALENCE OF *TRICHOMONAS VAGINALIS* INFECTION AMONG UNDERGRADUATE FEMALE STUDENTS OF THE FEDERAL POLYTECHNIC ILARO,

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### Abstract

*Trichomonas vaginalis* is one of the most prevalent, curable sexually transmitted diseases (STDs) worldwide caused by a protozoan. Much attention is not concentrated on this common disease which makes it spread among the people. This present study examined the prevalence of *Trichomonas vaginalis* among the female undergraduate of the Federal Polytechnic Ilaro. A total of 50 (Fifty) high vaginal swab (HVS) specimens were collected randomly from the patients in the dorsolithotomy position using sterile single bivalve speculum inserted into the vagina without lubricant for wet count microscopy. Data were collected to analysed the following; respondents knowledge of the disease, action taken, relationship status, frequency of intercourse, period taken to notice symptoms, whether or not infection was treated, medication used, toilet facilities used by respondents and respondents perspectives on the severity. Result shows that all the respondents who contracted the infection experienced one or more symptoms of STD with 80.5% of respondents having itching as the most prevalent symptom. 70.7% of respondents treated the infection after contraction. 75% of respondents are in sexual relationship. 60.6% of respondents only have sex occasionally. Symptoms of infection were noticed after 2-days of contraction. Only 39.1% of respondents' partner treated the infection, while 73.1% of the respondents' partner never treated the infection. 23.1% respondents used drugs to treat infection. It was concluded that early exposure to sex and use of unhygienic toilet facilities are the predisposing factor to *T. vaginalis*. Therefore, public awareness is essential in mitigating the spread of *T. vaginalis* and other STDs.

**Key words:** *Trichomonas vaginalis*, Respondent, Sexually Transmitted Disease, Contraction

### Introduction

Sexually Transmitted Diseases (STDs) are amongst the commonest communicable diseases globally with more than one million new infections daily (World Health Organization Report, 2006). The burden of STDs largely occurs in developing countries (WHO, 2006); with the most vulnerable, disproportionately affected by other health and social economic issues. In developing countries, STDs are among the leading causes of Disability-Adjusted Life Years (DALYs) lost for women of reproductive age (Levine, 2009). Parasitic STDs include trichomoniasis, amoebiasis and giardiasis (Okwute, 2008). Infection with Sexually Transmitted Parasitic Diseases (STPDs) has resulted in debilitation or anatomic deformities that make sex impossible as a result of direct damage to the male and female reproductive organs including impairing fertility via the inhibition of gamete production (Okafor and Omudu, 2005). *Trichomonas vaginalis* is the most common STPDs in Nigeria; and studies on STPDs remain relatively scanty (Amadi, *et al*, 2013). In addition, knowledge about *T. vaginalis* and trichomoniasis is hugely lacking; and this identified gap may have impacted on the burden of infection.

This research work thus presents the prevalence and highlights the gaps in information regarding various aspects of the disease. Further, the implication of the relatively lack of awareness about *T. vaginalis* infection were noted and discussed.

This current study aims to investigate the status of *T. vaginalis* infection among undergraduate female students of The Federal Polytechnic Ilaro, provide a base line data and create awareness on its public health implication.

### Methodology

#### Study Area

The study was carried out among undergraduate female students of Federal Polytechnic Ilaro, located in Yewa south Local Government Area, Ogun state, South-Western region of Nigeria, coordinates: 6.8954° N, 3.0126° E. The study was conducted out in August, 2019.



### Sample Size Calculation

The minimum sample size (n) required was estimated using the single population proportion formula:

$$n = 4pq/d^2,$$

Where:

n = required sample size

P = 11.4% prevalence of *T. vaginalis* infection from previous study (Iwueze, *et al*, 2014),

q = 1-p and

d = 0.05, the degree of precision

### Sample Size

A total of 50 (Fifty) high vaginal swab (HVS) specimens were collected randomly from interested female students in selected hostels within Federal Polytechnic Ilaro.

### Collection of specimen.

Samples were collected from the patients in the dorsolithotomy position by using a sterile single use bivalve speculum which was inserted into the vagina without lubricant. The secretions from the vaginal canal were collected with a swab and a speculum. With the help of the spatula the sample was collected by rotating 360° around the circumference of the cervical, retaining the sample on the upper surface of the swab. The vaginal discharge was collected for wet mount microscopy.

### Wet Mount

A drop of saline was placed on a clean grease free slide. The sample was emulsified on it and a cover slip was placed over it. Microscopic observation was done under low power (10x) objective and later under high power (40x) objective. A positive wet mount was confirmed when pear shaped organisms with whip like motility were observed.

### Eligibility of Subjects

#### Inclusion criteria

Consenting Students in the selected hostels of Federal Polytechnic Ilaro were recruited for the study.

#### Data Collection

Prior to specimen collection, demographic and clinical information of the participants were obtained using prepared questionnaires which were administered to the female participants. Each questionnaire had a unique Participant Identification Number (PIDN). Data and specimen collection was done simultaneously. The pre-test questionnaires were administered to the participants directly. The questionnaires include clinical data relating to personal hygiene and health care seeking behaviour. All filled questionnaires were examined for completeness daily and stored securely in a locker. Data entry was done on the following day.

For reasons of privacy, only the PIDN was recorded on the laboratory forms (no names) and all data were kept confidential in accordance with World Medical Association declaration of Helsinki (WMA, 2008). All filled questionnaires were destroyed after data entry has been completed.

#### Laboratory Analysis

##### Wet mount preparation

Briefly, a drop of normal saline was placed on a clean grease-free slide and the swab stick was rolled in the normal saline on the slide to make a smear, it was covered with a cover slip and then viewed under the microscope using x10 and x40 objective lenses.

##### Microscopic identification of parasite

The trophozoite of *Trichomonas vaginalis* which is about 8-15µm long, appear ovoid round, or pear-like in shape. Rapid, jerky motility was observed with the aid of the organism's four flagella, all of which originate from the anterior end. Only one of the flagella extends posterior. Amoeboid forms of the parasite were also seen under the microscope.

### Management of Positive Patients

Participants that tested positive were advised to visit the hospital for proper treatment and management of the infection.

### Data Analysis

Data obtained were analysed using one way analysis of variance (ANOVA), using Statistical packages for social Scientists-version 18 (SPSS-18.0) to test for statistical differences between the distributions of *Trichomonas vaginalis*. P value <0.05 was considered significant.

## Results and Discussion

### Results

Table 1 shows the respondent knowledge of *Trichomonas vaginalis* symptoms. From the table, itching appeared to be the most common symptoms (80.50%) from infected patients followed by foul smell from the genitals (12.2%) while rashes were the least sign observed (7.3%). Out of 49 patients examined, 41 tested positive to the infection while 8 patients tested negative. From the 8 patients who tested negative, 6 (75%) experienced itching while 2 (25%) had foul smell emanating from their genitals. In total, cumulative (positive + negative) of 39 patients (79.61%) experienced itching in their genitals, 7 (14.3%) had smelling vagina while 3 (6.1%) experienced rashes.

**Table 1: Respondent knowledge of the disease symptoms**

Respondents status	Symptom (%)			
	Itching	Smelling	Rashes	Test
Yes	33 (80.50%)	5 (12.2%)	3 (7.3%)	$X^2 = 1.379$
No	6 (75.0)	2 (25.0)	0 (0.00)	df=2
<b>Total</b>	39 (79.61)	7 (14.3)	3(6.1)	$P=0.502$

Yes = Positive; No = Negative

Table 2 shows the history of the respondents about toilet diseases. Out of the 57 responses received, 41 attested to have contracted toilet infection in the past while 16 respondents never contacted toilet infection. 41 respondents have fore-knowledge about *T. vaginalis* while none of those who never contacted the disease have fore-knowledge of it.

**Table 2: Respondent responses to the fore- knowledge of toilet disease**

Contracted Before	Knowledge about the disease	
	Yes	No
Yes	41	0
No	16	0
<b>Total</b>	57	0

Yes = Positive; No = Negative

Presented in table 3 is the action taken by respondent after being diagnosed with *T. vaginalis*. Out of 41 respondents who contracted the disease, 29(70.7%) ensured the disease was treated, 10(24.4%) allow nature to take its course on the infection while 2(4.9%) respondents were not sure how the disease disappeared. 5(62.5%) of the respondents who never contracted the disease still went ahead for treatment so as to be on a safe side, 3(37.5%) never treated but allow



to go on its own if present. Out 49 responses from both positive and negative patients, 34(69.4%) treated the infection, 13(26.5%) allow nature to take its course while 2(4.1%) are not sure of the disease being treated or not.

**Table 3: Action taken by the respondent.**

Contracted Before	Treated	Allow to go on its own	Not sure	Test
<b>Yes</b>	29 (70.7%)	10 (24.4%)	2 (4.9%)	$X^2=0.889$
<b>No</b>	5 (62.5%)	3 (37.5%)	0 (0%)	df=2
<b>Total</b>	34 (69.4%)	13(26.5%)	2 (4.1%)	p=0.641

Yes = Positive; No = Negative

Table 4 represent the relationship status of the respondents. From the table, 30(75.0%) of the respondents are into relationship and also infected with *T. vaginalis*, 6(54.5%) are into relationship but never contracted the infection, 10(25.0%) are not in relationship but are down with the disease while 5(45.5%) are into relationship but never contracted the disease. In total, out of 49 respondents examined, 36(70.6%) respondents are in relationship likewise have contracted the disease while 15(29.4%) are not in any relationship and never contracted the disease.

**Table 4: Relationship status of the respondents**

Contracted Before	Relationship Status		Test
	Yes	No	
<b>Yes</b>	30(75.0%)	10(25.0%)	$X^2=1.739$
<b>No</b>	6(54.5%)	5(45.5%)	df=1
<b>Total</b>	36(70.6%)	15(29.4%)	P=0.187

Yes = Positive; No = Negative

Table 5 shows how frequent respondents often have sex with their partners. From the table, it is indicated that 10(30.30%) of the respondents who have contracted the infection have regular sex with their partner, 20(60.60%) who contracted the disease only have irregular intercourse (once a while) with their partner while 3(9.09%) of the respondents never have sex with partners but still contracted the disease. Only 1(20.0%) of the examined pupil who have regular sex with partner never contracted the disease. 4(80.0%) of those who occasionally have sex with partner never contracted the protozoan infection while those who experienced no intercourse with partner showed no symptoms of *T. vaginalis*.

**Table 5: How often respondents have sex with their partners**

Contracted Before	Regularly	Once a while	At all	Test
<b>Yes</b>	10 (30.30%)	20 (60.60%)	3 (9.09%)	$X^2 = 2.288$
<b>No</b>	1 (20.0%)	4 (80.0%)	0 (0 %)	df=2
<b>Total</b>	11 (50.30%)	24 (87.9%)	3 (9.09%)	p=0.319

Yes = Positive; No = Negative

Represented in table 6 is the period (duration) it takes each respondent to notice disease symptoms. Out of the 20 pupils who responded to this question, 5(31.3%) of those who contacted the infection noticed the symptoms within 2days, 2(12.5%) noticed within 4days of contraction, 5(31.3%) observed symptoms after a-week while 4(25.0%) noticed symptoms after two weeks of contraction. In other words, 1(25.0%) of those who never contracted the infection still experienced similar symptoms 2days after suspicion of been infected, none experienced any symptom at day 4, 2(50.0%) had symptoms at one week while 1(25.0%) respondents experienced symptoms at 2-weeks. Higher number of respondents observed various symptoms at day 7 while the least number of respondents observed their symptoms at day 4.



**Table 6: How long respondents noticed symptoms.**

Contracted Before	2 Days	4 Days	A Week	Two Weeks	Test
Yes	5(31.3%)	2(12.5%)	5(31.2%)	4(25.0%)	$X^2=0.863$
No	1(25.0%)	0(0.0%)	2(50.0%)	1(25.0%)	df=1
Total	6(30.0%)	2(10.0%)	7(35.0%)	5(25.0%)	P=0.262

Yes = Positive; No = Negative

Table 7 shows the decision taken by the partner of respondents after infection was detected. Results revealed that 9(39.1%) of the partners who are infected with treated the infection while 14(60.9%) never attempt treatment. A total of 11(33.3%) partners treated the infection while 22(66.7%) never attempt treatment.

**Table 7: Whether or not partner did treat infection.**

Contracted Before	Treated infection		Test
	Yes	No	
Yes	9 (39.1%)	14 (60.9%)	$X^2 =1.148$
No	2 (20.0%)	8 (80.0%)	df=1
Total	11 (33.3%)	22 (66.7%)	p=0.284

From table 8, it is shown that larger percentage (23.1%) of the respondents' partner used drugs either prescribed by doctors or procured by self-medication to combat the infection. Only few (3.8%) subscribed to herbs for the treatment. Several of the respondents' partners (19-73.1%) cannot say specifically what was used to treat the infection.

**Table 8: What the respondents' partner used in treating infection.**

Contracted Before	Drugs	Herbs	Don't know	Test
Yes	6 (23.1%)	1 (3.8%)	19 (73.1%)	$X^2 = 0.462$
No	2 (20.0%)	0 (0%)	8 (80.0%)	df=2
Total	8 (22.2%)	1(2.8%)	27 (75.0%)	p=0.794

Table 9 shows the various toilet facilities used by respondents in their various abode. Result shows that larger percentage-35(85.4%) of the respondents who are infected with *T. vaginalis* claimed to use water closet in their various homes while only few (9.8%) of the infected respondents admit to use pit latrines in their domestic homes. Others are not specific in their response.

**Table 9: Toilet facilities used by respondent at home**

Contracted Before	Water closet	Pit toilet	Not specific	Test
Yes	35 (85.4%)	4(9.8%)	2 (4.9%)	$X^2 = 1.609$
No	14 (93.3%)	0(0%)	1 (6.7%)	df=2
<b>Total</b>	49 (87.5%)	4 (7.1%)	3 (5.4%)	p=0.447

Presented in table 10 is the response of respondents on the severity of the infection. Larger percentage (50.0%) of the infected respondents attest that the infection was very severe and deadly. 15(37.5%) of the infected respondents attest that the infection was slightly serious. 4(10.0%) of respondents were not sure of the severity of the infection while only 1(2.5%) of the respondents confirmed the infection was not serious.

**Table 10: Perspective of respondent about infection**

Contracted Before	Very deadly	Slightly serious	Not serious	Not sured	Test
Yes	20 (50.0%)	15 (37.5%)	1 (2.5%)	4 (10.0%)	$X^2 = 0.552$
No	8 (57.1%)	5 (35.7%)	0 (0%)	1 (7.1%)	df= 3
<b>Total</b>	28 (51.9%)	20 (37.0%)	1 (1.9%)	5 (9.3%)	p=0.907

## Discussion

*T. vaginalis* is one of the most common sexually transmitted infection known but its prevalence varies in different parts of the world. This current study evaluated the prevalence of *T. vaginalis* among the female students of the Federal polytechnic, Ilaro. The epidemiological results as shown in table 1 and 2 revealed that respondents examined showed at least one sign of Sexually Transmitted Infection (STI). Further investigation on patients revealed that *T. vaginalis* is the predominant infection contacted by these patients. Although, other sexually transmitted infection may be present as most signs and symptoms (itching, smelly genitals and rashes) experienced by the respondents are also peculiar to other sexually transmitted infections or diseases such as syphilis, gonorrhea, Chlamydia as reported by earlier author (Aral *et al.*, 2006).

The signs and symptoms exhibited by many of the respondents corroborates the findings of Sutton *et al.*, 2007 who reported that women of reproductive age who have contracted *T. vaginalis* experienced severe itching, vaginal discharge and offensive smell. While many of the respondents are aware or have fore-knowledge of the disease, some respondents claimed to never hear of the infection. The disease is usually or sometimes asymptomatic in infected male while sensitive test is not readily available, therefore, presumptive treatments is usually given to the male partner of the positive female (Kissinger, 2015).

It was shown in table 3 that higher percentage of the respondents (70.7%) infected treated the infection by either doctor's prescription or self-medication. The method used by the infected respondents was not evaluated in this present study but as reported by authors (Wendel and Workowski, 2007), metronidazole is one of the most effective drugs used in combating *T. vaginalis*. Metronidazole have proved 95% success rate in combating *T. vaginalis* using a 2gm single dose as recommended by the World Health Organisation (WHO).

It was shown in table 4 that higher percentages (75%) of the respondents who have contracted the infection are in sexual relationship with their partners. This simply means that having regular or occasional contacts with an infected partner will result into re-infection even if the appropriate drug is administered. It was revealed in table 5 that higher percentage (60.60%) of respondents who contacted the infection only had occasional sex with their partners. This shows how contagious *T. vaginalis* could be and the frequency of intercourse does not determine the occurrence of *T.*



*vaginalis* in an individual. Early introduction (between 15-19years age) to sex has been reported to be one of the major predisposing factor for *T. vaginalis* (Luo *et al.*, 2016; Kaestleet *et al.*, 2005).

Symptoms of the infection started manifestation among respondents at 2days of contraction. Early manifestation could be due to the body sensitivity of the respective individual and other underlying sexually transmitted infections as the odd for *T. vaginalis* is said to increase in women co-infected with other reproductive tract infection (Klinger *et al.*, 2006; Lo and Reid, 2002; Haddow *et al.*, 2007; Garcia *et al.*, 2004). 60.9% of the respondents' partner never treated the infection and this is suspected to be one of the major causes of re-infection after effective treatment with metronidazole. While 23.1% and 3.8% of respondents' partner uses a type of drug and herb in treating the infection, 73.1% of the respondents' partner cannot say precisely how the disease disappear. The disappearance could be due to unintentional use of metronidazole, other antibiotics or herbs in treating other ailments or their body immune system or defense mechanism may ward off the causative agent of Trichomoniasis.

Despite the use of water closet as the predominant toilet facility by respondents, 85.4% of those examined tested positive to *T. vaginalis*. This indicated that, the disease is not only contracted through sex but also through the use of toilet facilities. Although, research shows that only few are contracted through use of toilet facilities or other public facilities while many is majorly through sex. This finding corroborate the work of Akinbo and Oronsaye, (2017) who reported that that the infection is common among females who are sexually active and who uses shared toilet facilities. In addition, the use of water closet does not limit contracting the infection as shown in this current study but those who uses pit toilet regarded as a poor and less hygienic facility showed the least contraction of the disease. Public awareness of toilet hygiene is very essential in limiting the spread of *T. vaginalis* among the people. 50% of the respondents testified that *T. vaginalis* is a deadly infection, 37.5% testified that the infection is slightly serious while only few (1.25%) said the infection is not serious, hence, the response of the individual depends on the severity of the infection.

### Conclusion

*T. vaginalis* has been an infection of significant importance among sexually active female individual causing various vaginal and reproductive discomfort. Due to the discomfort and menaces this infection could unleash, there is every need for healthy strategies aiming at enhancing public enlightenment of the disease and other sexually transmitted infections. Public orientation on health promotion, prevention measures, health education and improvement on personal hygiene by the government, non-governmental organization, religious groups and other corporate bodies will go a long way in curbing the spread of *T. vaginalis* and other sexually transmitted diseases among the adolescents and young youths.

### References

- Akinbo, F. O. & Oronsaye, I. S. (2017). Trichomonas vaginalis infection among adolescent girls in some secondaryschools in Benin City, Edo State, Nigeria. *African Journal of Clinical and Experimental Microbiology*,18(4):223-229
- Amadi, A. N. C. & Nwagbo, A. K. (2013). Trichomonas vaginalis among women in Ikwuano, Abia State, Nigeria. *Journal of Applied Science and Environmental Management*;17(3): 389-393.
- Aral, S. O., Over, M., Manhart, L. & Holmes, K. K. (2006). Sexually Transmitted Infection. The International Bank for Reconstruction and Development/ The World Bank, Washington DC; Oxford University Press, New York
- Arbabi, M., Delavari, M., Fakhrieh-Kashan, Z. & Hooshyar, H. (2018). "Review of trichomonas vaginalis in Iran, based on epidemiological situation," *Journal of Reproduction and Infertility*,19(2):82-88
- Forna, F. & Gulmezoglu, A. M. (2003). Interventions for treating trichomoniasis in women. *Cochrane Database System Revision*. 2:CD000218.
- Garcia, P. J., Chavez, S., Feringa, B., Chiappe, M, Li, W., Jansen, K. U, *et al.* Reproductive tract infections in rural women from the highlands, jungle, and coastal regions of Peru. *Bull World Health Organ*. 82:483-92.



- Haddow, L. J., Sullivan, E. A., Taylor, J., Abel, M., Cunningham, A.L., Tabrizi, S, *et al.* (2007). Herpes simplex virus type 2 (HSV-2) infection in women attending an antenatal clinic in the South Pacific island nation of Vanuatu. *Sexually Transmitted Diseases*, 34:258–61.
- Iwueze, M. O., Ezeanyanwu, L. N., Okafor, F. C., Nwaorgu, O. C. and Ukibe, S. C. (2014). Prevalence of *Trichomonas vaginalis* infection among women attending hospitals/health centres in Onitsha Community, Onitsha North Local Government area of Anambra State. *The Bioscientist Journal*, 2(1):54-64.
- Kaestle, C. E., Halpern, C. T., Miller, W. C. & Ford, C.A. (2005). Young age at first sexual intercourse and sexually transmitted infections in adolescents and young adults. *American Journal of Epidemiology*, 161(8):774–80.
- Kissinger, K. (2015). *Trichomonas vaginalis*: a review of epidemiologic, clinical and treatment issues. *Infectious Diseases*; 15:307
- Kissinger, P., Secor, W. E., Leichliter, J. S., Clark, R. A., Schmidt, N. Curtin E, *et al.* (2008). Early repeated infections with *Trichomonas vaginalis* among HIV-positive and HIV-negative women. *Clinical Infectious Disease*. 46(7):994–9.
- Kissinger, P., Schmidt, N., Mohammed, H., Leichliter, J. S., Gift, T. L., Meadors, B, *et al.* (2006). Patient-delivered partner treatment for *Trichomonas vaginalis* infection: a randomized controlled trial. *Sexually Transmitted Diseases*. 33(7):445–50
- Klinger, E. V., Kapiga, S. H., Sam, N. E., Aboud, S., Chen, C. Y., Ballard, R. C. *et al.* (2006). A Community-based study of risk factors for *Trichomonas vaginalis* infection among women and their male partners in Moshi urban district, northern Tanzania. *Sexually Transmitted Diseases*, 33:712–8.
- Krashin, J. W., Koumans, E. H., Bradshaw-Sydnor, A. C., Braxton, J. R., Evan Secor W., Sawyer, M. K. *et al.* *Trichomonas vaginalis* prevalence, incidence, risk factors and antibiotic-resistance in an adolescent population. *Sexually Transmitted Diseases*, 37(7):440–4
- Levine, G. I. (2009). Sexually transmitted parasitic diseases. *Primary Care*; 18: 101-128
- Lo, M. & Reid, M. (2002). Epidemiological features of women with trichomoniasis in Auckland sexual health clinics: 1998–99. *New Zealand Medical Journal*, (115):119.
- Luo, L, Reilly, K. H., Xu, J. J., Wang, G. X., Ding, G.W., Wang, N. & Wang, H.B. (2016). Prevalence and correlates of *Trichomonas vaginalis* infection among female sex workers in a city in Yunnan Province, China. *International Journal of STD AIDS*. 27(6):469– 75.
- Okafor, C. F. & Omudu, A. E. (2005) Parasitic diseases and sexual disability: A critical review of some parasitic diseases with serious repercussions. *Animal Research International*; 2:255-260.
- Okwute, L. O. (2008). A review of sexually transmitted diseases (STDs) of parasitic origin: *The case of giardiasis*, 7:4979-4981.
- Spence, M. R., Harwell, T. S., Davies, M. C. & Smith, J. L. (1997). The minimum single oral metronidazole dose for treating trichomoniasis: a randomized, blinded study. *Obstetrician Gynecology*. 89(5):699–703.
- Sutton, M., Sternberg, M., Koumans, E. H., McQuillan, G., Berman, S. and Markowitz, L. (2007). The Prevalence of *Trichomonas vaginalis* Infection among Reproductive-Age Women in the United States, 2001–2004. *Clinical Infectious Diseases*; 45:1319–26
- Ugwu, O. M. (2012) knowledge and attitude of secondary school students towards sexually transmitted diseases in NSUKKA Education Zone. University of Nigeria Virtual Library, 50
- Wendel, K. A. & Workowski, K. A. (2007). Trichomoniasis: challenges to appropriate management. *Clinical Infectious Diseases*. ;44(3): 123–129.
- World Health Organization. (2006). Global prevalence and incidence of selected curable sexually transmitted infections: overview and estimates. *World Health Organization Geneva*