



Trichomonas vaginalis and Associated Health Risk Factors among Prison Inmates in Umuahia, Abia State, Southeastern Nigeria



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ABSTRACT

Background: This study was conducted to investigate the prevalence and risk factors of Trichomonas vaginalis infections among prison inmates in Umuahia, Abia State. Methods: Approximately 350 inmates aged 18 to 61 participated in the study. 70 high vaginal swabs of female participants and 350 urine samples from both male and females were examined using direct wet mount methods. Questionnaire was used to obtain socio-demographic and behavioral factors of the participants. Results: In total, the overall prevalence of T. vaginalis infections was 43.4%. Chi-square analysis showed a significant difference (P < 0.05) in the prevalence of T. vaginalis infection among the men (33.6%) and women (82.8%). Furthermore, the prevalence of T. vaginalis was 11.0% and 22.8%, respectively, in individuals between 31-40 years. No infection was noted among men between 18-20 years of age. Moreover, examination of urine and vaginal swabs combinations revealed high infection in women. Questionnaire analysis indicated no significant relationship between multiple sexual partners and unprotected sex with T. vaginalis infection (P > 0.05). It was also found that, inmates showed symptoms, such as light burning after urination and itching/rashes at the private part while some infected cases were asymptomatic. Conclusion: The findings highlight the need for adequate and improved health care for prison inmates as well as their treatment before release.

1. Introduction

Human trichomoniasis is caused by T. vaginalis and is a widely distributed sexually transmitted infection. The parasite is a free-living protozoan which colonizes epithelia mucosal surface [1]. T. vaginalis is likely the most common non-viral sexually transmitted infection (STI) and is also among the major challenges in public health as it imposes a lot of health threat to the entire population worldwide especially in the developing countries like Nigeria [2], primarily due to low level of income, poor environmental

and personal hygiene. According to an estimate by WHO, the prevalence of T. vaginalis based on the data from 2009 to 2016 was 156.0 million cases [3]. The parasite resides in human vagina, prostrate and urinary tract of both male and females. The distribution of T. vaginalis ranges from 2% to more than 50% depending on the region, country, gender, and environment of the study populations as well as the procedures used for the diagnosis in various studies [1].

Some signs of the infection in symptomatic women include greenish or yellowish vaginal discharge, strawberry



cervix (punctuate hemorrhagic lesions), vulva irritation and inflammation. In males the infection is usually mild or asymptomatic; however, there may be an itching and discomfort inside the penile urethra mostly during urination [4]. Asymptomatic carriers can serve as vector for the diseases making it important to treat in male partners [5]. Other symptoms may include dysuria, pruritus, dyspareunia, and pain at the lower abdominal region [6]. *T. vaginalis* infection at its severe stage may lead to serious child bearing complications such as premature rupture of the placental membranes, premature labor, low birth weight in pregnant women [6], infertility, and likelihood of predisposition to immunodeficiency virus (HIV) transmission [7]. Women with *Trichomonas vaginalis* infections were 1.4% times more likely to have a complication during child birth than those who do not have it [8].

The exact accurate history of *T. vaginalis* infection in either men or women is not known yet; however, it appears to be multifactorial depending on the parasite virulence and the host factor [4]. Some researchers reported that poor hygiene practices and knowledge about the infection are the major risk factors predisposing patients to infection [9]. Other risk factors include low socioeconomic status, lack of condom use, multiple sex partners, history of sexually transmitted diseases [10], and low educational status.

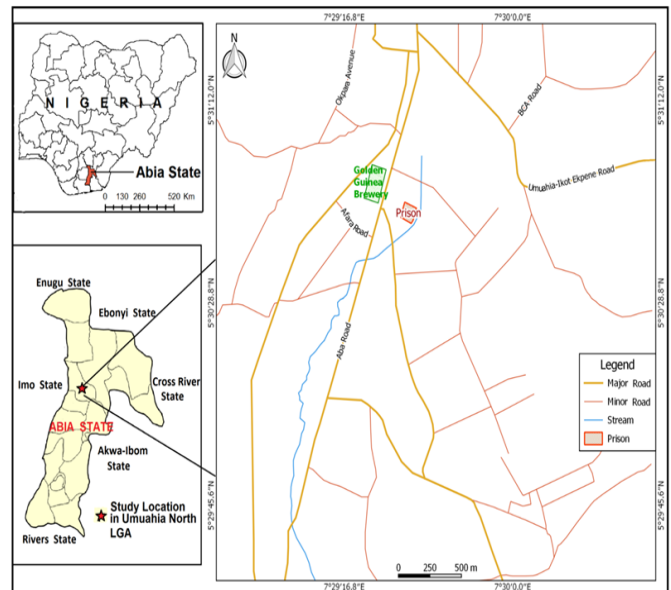
Treatment of *T. vaginalis* infection is usually provided by giving 250 mg of oral antibiotic called metronidazole (Flagyl) three times in a day. Furthermore, 100 mg of Clotrimazole is recommended to pregnant patients for seven days in a row [5]. To reduce the risk of *trichomoniasis* infection, comprehensive sex education, especially for adolescent and youths should be offered [11]. Using condoms during sex, sexual abstinence, and limited sexual partners are also advocated as well as improved personal hygiene [12].

This study aimed to determine the prevalence and risk factors of *Trichomonas vaginalis* infection among prison inmates in Umuahia, Abia State, Nigeria.

## 2. Materials and Methods

### 2.1. Study Design

A cross-sectional study was adopted for the purpose of this study which lasted between February and May 2017. The study was carried out in Umuahia Prison located at Aba road, Afara in Umuahia the capital of Abia state, Southeastern Nigeria (Figure. 1). The study area is located on latitude 5° 31'12.0"N and longitude 7° 29'16.8"E in Nigeria. Nigeria has average annual rainfall of 133.7mm and temperature of 74°C. The study area is within the tropical rainforest of eastern Nigerian states (within the ecological zones of Enugu, Akwa Ibom, Cross River, Ebonyi, Imo and Rivers States). The parasitological analyses of the samples collected from the inmates were examined in Zoology and Environmental Biology (ZEB) postgraduate laboratory, Michael Okpara University of Agriculture Umudike (MOUUAU).



**Figure 1:** Map of Umuahia showing the location of the Study Area (Prison), Aba Road, and Umuahia

### 2.2. Ethical Approval and Consent

Permission was sought and obtained from the ethical board of authorities of Nigerian prison service Umuahia, Abia State (Ref No: ABS/ SHQ/C.37/VOL.111/907), Ethical Research Committee, Ministry of Health, Abia State (Ref No: AB/MH/E&HR/1/17/04) and Ethical Research committee, College of Natural Sciences, Michael Okpara University of Agriculture Umudike (Ref No: CREEC/004/18). In addition, informed consent was gained from the inmates by educating them on the need and relevance of the study.

### 2.3. Sample Collection and Examination

A total number of 350 urine samples (from both male and females) and 70 high vaginal swabs HVS (from female only) aged 18-61 years were collected. Each morning (sampling day) a sterile capped bottle (25 mL) was given to each participant. Their names and age were labeled on the bottles. A copy of a questionnaire were distributed among them to obtain their demographics. Long plastic sterile swab sticks were used by the prison health workers to collect exudates from the lower genital tract of female participants. In order to screen the samples, they were immediately transported to Department of Zoology and Environmental Biology Postgraduate Laboratory, Michael Okpara University of Agriculture, Umudike, using Isenberge and Henry method [13, 14]. Moreover, 5 mL of urine samples were transferred into centrifuge tubes, centrifuged for 8 min at 1500 rpm and the supernatant fluid was decanted. The sediment was well-mixed and a drop of the mixture placed on a microscopic slide, covered with cover slide. The slide was observed microscopically using x10 and x40 objectives [13].

Two drops of normal saline were added to each container of the vaginal swab and mixed well by shaking. Subsequently, a drop of the mixture was placed on a slide, covered with cover slide, and examined under a microscope using x10 and x40 objectives [14].

#### 2.4. Data Analysis

Chi-square analysis was used to find the associations between demographics, behavioral factors and prevalence of *T. vaginalis* infection. The association was considered significant as the *P*-value was < 0.05. PAST Statistical Software (V. 3.1) was used for the statistical analysis [15].

### 3. Results and Discussion

#### 3.1. Results

As indicated in Table 1, the overall prevalence rate for *T. vaginalis* infection was 43.4%. In addition, the result of Chi-square analysis showed a significant difference ( $P < 0.05$ ) in the prevalence of *T. vaginalis* infection among the men and women that indicates high infection rate in women (82.8%) compared to men (33.6%).

Analysis of *T. vaginalis* distribution by age group indicated that, the highest frequency of *T. vaginalis* prevalence was seen in males over 50 years of age (83.3%). In addition, *T. vaginalis* prevalence was at (39.7%), (34.3%), and (11.2%) respectively, among individuals with an age range between 31 to 40 years, 41 to 50 years, and 21 to 30 years. On the other hand, no infection was reported in individuals aged 18-20 years (Table 2). Moreover, among women aged  $\geq 41$ , a prevalence of 100% was noted, while it was at 80% among women with an age between 21-40 years old. Furthermore, the infection rate was recorded 33.3% in the 10 to 20 age group. (Table 2). Chi-square analysis showed a significant association between age group of the inmates and the infection prevalence ( $P < 0.05$ ).

Out of the 58 examined female inmates, 12 of them were found with *T. vaginalis* in their urine providing a prevalence of (20.7%), while 21 of the cases (36.20%) had the infection in their vaginal swabs. Overall, 25 (43.1%) had *T. vaginalis* in both urine samples and vaginal swabs.

**Table 1:** Overall prevalence of *Trichomonas vaginalis* infection among inmates in Umuahia Prisons, Abia State

Sex	No Examined	No infected	%	<i>P</i> value
Male	280	94	33.6	< 0.05
Female	70	58	82.8	
<b>Total</b>	<b>350</b>	<b>152</b>	<b>43.4</b>	

$\chi^2 = 18.3935$ ,  $df = 1$ ,  $P$  value < 0.05

Chi-square showed no significant difference ( $P > 0.05$ ) between urine samples and vaginal swabs sampling (Table 3).

Out of the 220 respondents who completed and returned their questionnaires, 105 cases (47.7%) were identified with *T. vaginalis*. About 44.9% cases were aware of risky sexual behavior and its implication, while 50.0% reported 'Not aware' and 52.6% reported 'No idea' (Table 4). With respect to sexual behavior, those who practice unprotected sex recorded lower prevalence (45.8%) than those who practiced it (48.8%). Furthermore, those who had multiple sexual partners recorded lower prevalence (36.3%) than those who do not have (45.8%) (Table 4).

The study went further to identify some symptoms of sexually transmitted diseases among the inmates. About 57(60.6%) of *T. vaginalis* positive male inmates were asymptomatic; however, some infected ones reported symptoms like light burning after urination (12, 12.8%), mild discharge from the private part (9, 9.6%), and rashes at the private part (16, 15.9%), although it was not statistically significant difference ( $P > 0.05$ ) (Table 5). In addition, 19 (32.8%) infected female inmates were asymptomatic. On the other hand, among the symptomatic participants ((67.2%), symptoms like itching/rashes at the private part (18, 31.0%), hot feeling sensation (12, 20.7%), and painful urination (9, 15.5%) were reported that was statistically significant ( $P < 0.05$ ) in the symptomatic group (Table 6).

#### 3.2. Discussions

*Trichomonas vaginalis* is among the sexually transmitted infections that is being neglected or even forgotten since they are not being reported like other infectious diseases. The overall prevalence rate recorded in the present study was high compared to other related studies: (21%) in Ibadan,

**Table 2:** Overall prevalence of *Trichomonas vaginalis* infection in relation to age groups and gender among inmates in Umuahia Prisons, Abia State

Age group	Male No examined	No infected	%	Female No examined	No Infected	%	Total No examined	No Infected	%
18-20	4	0	0	9	3	33.3	13	3	23.0
21-30	98	11	11.2	10	8	80.0	108	19	17.5
31-40	78	31	39.7	20	16	80.0	98	47	47.9
41-50	64	22	34.3	16	16	100.0	80	38	47.5
51-60	30	25	83.3	10	10	100.0	40	35	87.5
61 >	6	5	83.3	5	5	100.0	11	10	90.0
<b>Total</b>	<b>280</b>	<b>94</b>	<b>33.5</b>	<b>70</b>	<b>58</b>	<b>82.3</b>	<b>350</b>	<b>152</b>	<b>43.5</b>

$\chi^2 = 29.576$ ,  $df = 5$ ,  $P$  value < 0.05

**Table 3:** Prevalence of *Trichomonas vaginalis* infection in relation to the specimen type among the female inmates in Umuahia prisons, Abia State

Age group	Total No examined	Total No infected	Urine only	HVS only	(%) Both urine &HVS	Pvalue
18-20	9	3	0 (0.0)	2 (66.7)	1 (33.3)	> 0.05
21-30	10	8	2 (25.0)	3 (37.5)	3 (37.5)	
31-40	20	16	4 (25.0)	5 (31.3)	7 (43.8)	
41-50	16	16	3 (18.8)	4 (25.0)	9 (56.3)	
51-60	10	10	2 (20.0)	3 (30.0)	5 (50.0)	
61 >	5	5	1 (20.0)	4 (80.0)	0 (0.0)	
<b>Total</b>	<b>70</b>	<b>58 (82.8)</b>	<b>12(20.7%)</b>	<b>21(36.20%)</b>	<b>25 (43.1)</b>	

$\chi^2= 2.5642, df =1, Pvalue= > 0.05$

Nigeria, (8.5%) in U.S. Federal Prison and (4.2%) in rural District of Malawi [16-18]. The prevalence rate was equally higher than studies carried outside prison facilities [1, 9, 19, 20]. Variations in the results may be contributed to difference in study population, study location, etc. However, the prevailing condition in the present prison was related to inadequate sanitation and poor personal hygiene practices. In a related study, it was revealed that an increased risk of *T. vaginalis* infection in individuals is associated with poor hygiene and low socioeconomic status [2]. These behaviors may have been a contributing factor to an increase in *T. vaginalis* infection transmission as observed among the prison inmates in the present study. Therefore, the population of the present study was at high risk for *T. vaginalis* and other possible STDs infections since the subjects were confined.

In the current study, a significant association between *T. vaginalis* infection and gender of the inmates was found. Gender related prevalence revealed that female inmates were more infected (82.8%) than the males (33.5%). Moreover, the rate of *T. vaginalis* infection was higher compared to previous similar studies conducted by Amadi and Nwagbo (2013) in Ikwuano Abia State, Kanu in Aba, Abia State and Okoh and Igbaka in Makurdi, Benue State all in Nigeria [11, 21, 22].

Notably, Women are usually prone to sexually transmitted infection due to the nature of their anatomical disposition which exposes them to the infection. Additionally, some

authors have suggested that certain feminine hygiene practices such as douching and powder use in the genitals were significantly associated to *T. vaginalis* transmission [23]. These hygiene practices may have a significant effect on the vaginal microflora negatively and increase the risk of *T. vaginalis* infection [23]. However, we cannot draw inference from the report as our study does not include such relationship.

For more accurate and reliable results, a combination of urine samples and high vaginal swab for identification of *T. vaginalis* in female inmates was employed. The recorded prevalence obtained from combined method of urine and high vaginal swab was higher than urine or high vaginal swab alone. Furthermore, the prevalence was also significantly high compared to the result recorded by Amadi and Nwagbo (2013) using combined method [11]. Since the highest positive cases were detected using both urine and vaginal swab samples, two or more methods should be employed for effective and accurate diagnosis. The infection could also be better detected by using Giemsa stain and PCR [24].

Moreover, there was an association between age groups of the inmates and the prevalence of the infection. In the present study, the prevalence of the infection among age groups of 51 – 61 years and above were higher compared to the findings of Amadi and Nwagbo (2013), Kanu *et al.* (2015) Okoh and Igbaka (2017), that reported a highest prevalence in the 21 to30, 19 to 20, and 21 to 26 age groups respectively [11, 21, 22].

However, Etuketu reported the highest prevalence of *T. vaginalis* infection among older age groups (40-44 years) [9]. Since *T. vaginalis* prevalence is relatively high in sexually active women, the highest prevalence of infection could be observed in the current study among individuals aged  $\geq 51$  due to their active sexual desire [5]. Poor personal hygiene practice among this group or persistence of earlier infection in asymptomatic patients may also be a contributing factor to the transmission of the infection. Since *T. vaginalis* is transmitted mainly through sexual intercourse and through contaminated object (though rare), the mentioned group may likely have been infected through sexual intercourse as they are among the sexual active group. The present study have suggested that *T. vaginalis* is more prevalent in women; however the infection in both men and women of all age groups especially sexually active groups can be observed. Furthermore, no infection noted in young males between 18 and 20.

**Table 4:** Risk factors of *Trichomonas vaginalis* infection among the inmates in Umuahia Prisons, Abia State

Variables	NO of respondents (N=220)	NO infected (%)	Pvalue
Do you practice unprotected sex			
Yes	85	39 (45.8)	> 0.05
No	135	66(48.8)	
<b>Total</b>	<b>220</b>	<b>105(47.7)</b>	
Do you have multiple sexual partner			
Yes	135	49 (36.3)	> 0.05
No	85	39 (45.8)	
<b>Total</b>	<b>220</b>	<b>105(47.7)</b>	
Are you aware these activities could expose one to the infection			
Yes	109	49 (44.9)	> 0.05
No	92	46 (50.0)	
No idea	19	10 (52.6)	
<b>Total</b>	<b>220</b>	<b>105(47.7)</b>	

**Table 5:** Symptoms associated with *Trichomonas vaginalis* infection among male Prison inmates in Umuahia, Abia State

NO examined	Total No infected (%)	Total No with symptoms (%)	Total No without symptoms (%)	Characteristic symptoms		
				Light burning after urination (%)	Mild discharge (%)	Rashes at the private part (%)
280	94 (33.5)	37(39.4)	57 (60.6)	12 (12.8)	9(9.6)	16 (15.9)

$\chi^2 = 2.8512$ ,  $df = 1$ ,  $P$ value = > 0.05

**Table 6:** Symptoms associated *Trichomonas vaginalis* infection among female prison inmates in Umuahia, Abia State

NO examined	Total No infected (%)	Total No with symptoms (%)	Total No without symptoms (%)	Characteristic symptoms		
				Itching/rashes (%)	Hot feeling sensation (%)	Painful urination (%)
70	58 (82.5)	39(67.2)	19 (32.8)	18 (31.0)	12 (20.7)	9 (15.5)

$\chi^2 = 4.6593$ ,  $df = 1$ ,  $P$ value = > 0.05

Even though multiple sexual partners and unprotected sex seem to be the major factors contributing to *T. vaginalis* transmission, our findings revealed that these were not significant risk factors for *T. vaginalis* infection. This is in contrast with related studies that reported a strong significant relationship between having multiple sexual partners, unprotected sex, and transmission of *T. vaginalis* besides HIV infection [19, 20, 25].

Symptomatic male inmates showed signs like light burning sensation after urination, mild discharge, and rashes at the private part while a greater percentage were asymptomatic. No significant relationship was found between the symptoms and transmission of the infection. In addition, female inmates reported symptoms like itching/rashes at the private part, hot feeling sensation, and painful urination with a few asymptomatic cases. Several researchers reported that a good deal of infected women had symptoms like itching, genital sore, hot feeling sensation, vaginal discharge, vulva ulceration, and pain during urination [11, 18, 19, 26]. *T. vaginalis* is associated with the condition known as strawberry cervix and inflammatory reaction that can mimic the cervical motion tenderness associated with pelvic Inflammatory Disease (PID) [27].

There was significant difference between the observed symptoms and prevalence of *T. vaginalis* infection among female inmates. According to the findings, male inmates were more asymptomatic than females. Men with *T. vaginalis* infection are predominantly asymptomatic and also rarely experience consequences of untreated infection [28].

#### 4. Conclusion

*Trichomonas vaginalis* is a common sexually transmitted infection. In the current study its prevalence was confirmed among prison inmates of Umuahia, Abia State. According to the findings, it was revealed that women are at higher risk of contacting the infection. Simple personal hygiene habits and having one sex partner could reduce the infection transmission. Moreover, men are usually asymptomatic to *T. vaginalis* infection. Adequate treatment, prevention, and prophylactic guidance should be ensured in all the prisons so

that inmates may not remain indefinitely infected with *T. vaginalis* during their prison stay. Adequate and improved health care are also recommended in the prisons as well as receiving treatment before release to reduce the transmission risk to their family members and others in the society. The study highlight a need to create a constant awareness in the prison on the basic factors that predisposes individuals to the infection, the implication and the importance of using condom as a preventive measure for the disease.

#### Authors' Contributions

Q. O. L., designed and drafted the work and was a major contributor in the writing of the manuscript. Author C.O., participated in the study design and data analysis. All authors read and approved the final manuscript.

#### Conflicts of Interest

The Authors declare that there is no conflict of interests.

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