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ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

Asian Journal of Science and Technology
Vol. 12, Issue, 05, pp.11692-11697, May, 2021

RESEARCH ARTICLE

PREVALENCE OF *TRICHOMONAS VAGINALIS* IN FEMALE STUDENTS OF BENUE STATE UNIVERSITY, MAKURDI

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ARTICLE INFO

Article History:
Received 14th February, 2021
Received in revised form
18th March, 2021
Accepted 07th April, 2021
Published online 23rd May, 2021

Key words:
Parasite,
Trichomonas Vaginalis.

ABSTRACT

This study was conducted to investigate the prevalence of *Trichomonas vaginalis* infection amongst female students of Benue State University, Makurdi. A total of 138 swab samples were collected using sterile swab sticks which were examined microscopically. Out of 138 samples, 39(28.3%) were positive for the parasite. According to age groups, 26-30years had the highest infection rate (6(54.5%)). With respect to marital status, married students had a higher infection rate (6(66.7%)) than single students. Pit latrine users had (13(86.7%)) and sexually active students had 13(46.4%). There was no significant differences between prevalence in terms of location, level of education, sharing of underwears and age (P>0.05). On the other hand, type of toilet, complaint status and sexual activity and marital status were significant (P<0.05). *Trichomonas vaginalis* is prevalent in Benue State University and suggests that hygiene should be intensified. It is therefore recommended that students of Benue State University be enlightened on the existence of *Trichomonas vaginalis* since so as to help reduce its spread.

Citation: ***Musa Nanre Naomi, Maqual George Esther, Kyarshik Angela Silvanus, Diana Adar Dabo and Peter Sesugh Adaaku,*** **2021.** "Prevalence of *trichomonas vaginalis* in female students of benue state university, makurdi", *Asian Journal of Science and Technology*, 12, (05), 11692-11697.

INTRODUCTION

Trichomonas vaginalis, an anaerobic parasite, is the causative agent of trichomoniasis and is the most common pathogenic protozoan infection of humans in the industrialized countries. The flagellate was originally considered a commensal organism until the 1950s when the understanding of its role as a sexually transmitted infection (STI) began to evolve. Humans are the only known host with the trophozoite transmitted via fomites. Both males and females are infected but the majority of cases were reported among females who also present with symptomatic infection than males (2,3). In females, vaginitis is the most common manifestation of the infection. Complications include the infection of the adnexa, skin, endometrium, and Bartholin glands. The pregnant women infected with this parasite may be at risk of an adverse birth out comes like post abortion or post hysterectomy infection, as well as infertility and enhanced predisposition to neoplastic transformation in cervical tissues (6).

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Trichomonas vaginalis is a sexually transmitted parasitic protozoan known to be responsible for an estimated 180 million new infections per year, making it the most prevalent non-viral sexually transmitted pathogen worldwide. It can also be transmitted to neonates during passage through an infected birth canal, but the infection is usually asymptomatic. *Trichomonas vaginalis* infection is frequently asymptomatic in adults; it can cause urethritis in men. Symptomatic women with trichomoniasis usually complain of vaginal discharge, vulvovaginal soreness, and/or irritation. Complications of trichomonal vaginitis that have been reported to include premature rupture of membranes, premature labour, low birth weight (7), (20). A major compelling public health concern about *T vaginalis* infection worldwide is the consistence with which it occurs with other Sexually Transmitted Infections (STIs). It increases the risk of HIV transmission in both male and female (9). Trichomoniasis is also associated within fertility, postoperative infections, and cervical neoplasia (20). It has not been isolated from oral sites, and rectal prevalence appears to be low in men who have sex with men (10). *Trichomonas vaginalis* is detectable in vaginal, prostatic or urethral secretions, semen and urine of infected individuals.

The most commonly employed diagnostic methods are: direct microscopic examinations of wet mount preparations

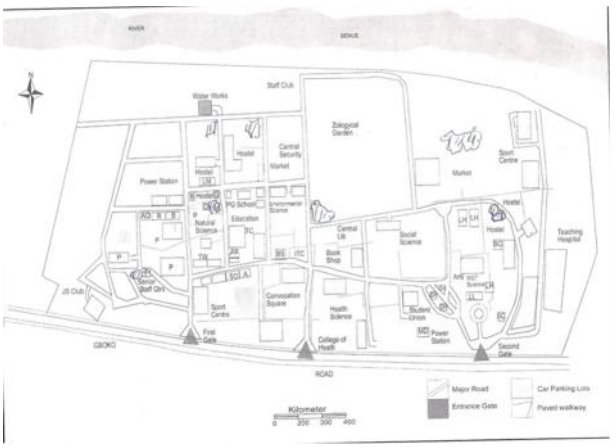
(sensitivity of microscopic observations varies from 38% - 82%), and culture techniques. Other methods include antigen detection methods, plastic envelope method, in-pouch system, cell culture, staining techniques, serological and DNA techniques (14). *Trichomonas vaginalis* is one of the commonest sexually transmitted pathogens in the world. The control of trichomoniasis infection has led to a significant success in developed countries because of the steady contact with health care, whereas the reverse is the case in developing countries. Without a large investment and commitment in medical facilities success in controlling trichomoniasis is most likely to be short-lived because Trichomoniasis is considered to be generally under-diagnosed owing to a number of factors such as deficiency in routine testing and self-diagnosis, treatment by practitioners without adequate laboratory testing contribute to its misdiagnosis. Periodic or routine screening and treatment is the only alternative step towards controlling the incidence of trichomoniasis. It is against this background this study is premised (10).

Trichomoniasis is often asymptomatic in men, however more than half of the infected women manifests vaginitis, cervicitis, urethritis, and irritation with frothy malodorous discharge. Negative outcomes of this infection are especially significant during pregnancy. *T. vaginalis* can lead to urogenital tract infection. The incidence of vaginal trichomoniasis has noticeably risen especially in developing countries and in populations with high-risk behaviors such as poor sexual activity hygiene and multiple sexual partners (17). Reports have implicated *Trichomonas vaginalis* in upper reproductive tract post-surgical infections, reversible infertility, low birth weight, preterm labour, neonatal morbidity and mortality. Neonatal trichomoniasis can be acquired during passage through an infected birth canal. It is estimated that 2 to 17% of female babies acquire trichomoniasis through direct vulvo-vaginal contamination. It has also been incriminated as a cofactor in the transmission of HIV (11).

It has been reported that *Trichomonas vaginalis* causes discomfort and psychosocial distress in infected patients. Trichomoniasis is also reported to be a major cause of pathology in obsterics and gynaecology. The disease is primarily transmitted through sexual contact, but contaminated formites such as towels and clothing have been implicated in the transmission(1). The incidence of trichomoniasis depends on the population screened/examined. Certain factors such as poor personal hygiene, multiple sex partners, low socio-economic status and underdevelopment are associated with high incidence of infection. Considering the harm caused by *Trichomonas vaginalis* as well as the vast array of options available for its transmission, it is important that the prevalence of *Trichomonas vaginalis* amongst female students of Benue State University be examined. The aim of this study is to investigate the prevalence of *Trichomonas vagirnalis* amongst female Students of Benue State University, Makurdi.

MATERIALS AND METHOD

Study Area: This study was carried out in Benue State University which situated in Makurdi, the capital of Benue state, Nigeria. The city is located in central Nigeria along the Benue River, on latitude $07^0$43'N and Longitude $08^0$35'E.



Map of Benue State University

Figure 1. Source: Benue State University Physical Planning Committee

The climatic condition in Makurdi is influenced by two air masses: the warm, moist south westerly air mass, and the warm, dry north-easterly air mass. The mean annual rainfall in Makurdi is about 1,290mm. Temperature in Makurdi is however, generally high throughout the year, with February and March as the hottest months. Temperature in Makurdi varies from a daily of 40^0C and a maximum of 22.5^0C. Benue State University is one of the first state Universities in North Central Nigeria and the only state-owned University in Benue State. It is located along Gboko-Makurdi road and is close to the famous Tactical Headquarters of the Nigerian Airforce Base in Makurdi. The University offers a host of courses and awards degrees ranging from Diploma to Doctor of Philosophy Degrees (PhD).

Sample Size determination: A total of 138 high vaginal swab samples were randomly collected from students at the First campus, second campus and Medical school of the University. This sample size was determined using the formula below as stated by Niang*et al* (2006).

$$n = \frac{z^2 \mathrm{p}(1-\mathrm{p})}{d^2}$$

Where

n = sample size
z = statistic for a level of confidence, in this case the level of confidence was 95% (1.96)
p = prevalence (10% according to John *et al.*, 2017).
d = precision at 5% (0.05)
Thus,

$$n = \frac{1.96^2 \mathrm{x} 0.10(1-0.10)}{0.05^2}$$

$$n = \frac{3.84 \mathrm{x} 0.10(0.90)}{0.05^2}$$

$$n = 138$$

Ethical Clearance and Subject Consent: Ethical clearance was obtained from the Ministry of Heath, Benue State as a requirement for conducting research on human subjects. Also, verbal consent was obtained from the students involved in the study and samples were collected from those who consented to

the study. Furthermore, demographic information relating to the individuals involved in the study were obtained using a well structured but brief questionnaire. Information pertaining to the health and livelihood of the students were also obtained using the questionnaire. This was done to ease correlation of data obtained with possible risk factors responsible for infection.

Collection of Samples: High vaginal swabs were collected for examination. The soft tip of the sterile swab stick was carefully inserted into the lower third of the vagina or about 2 inches past the introitus (the entrance into the vaginal) and rotated for 10-30 seconds, making sure the swab touches the walls of the vaginal so that it absorbs the vagina fluid or moisture. The swab was withdrawn without touching the skin and immediately placed into the swab tube. Care was taken that the soft tip was not touched and the swab placed in the tube in a manner to avoid contamination and the cap was afterwards tightened.

Examination of Samples: Microscopic examination was carried out by suspending small portion of the discharge in one drop of 0.85% of physiological saline. This was covered with a clean grease free cover slip and observed under x10 and x40 objective lens for motile flagellate with the condenser iris closed sufficiently to give good contrast (Ogomaka *et al.*, 2018).

Identification of the Parasite: identification of the organism was done according to the descriptions of Mahmoud *et al.*, (2015) using the darting motility and characteristic morphology of *Trichomonas vaginalis*.

Data Analysis: The prevalence (%) was calculated. Analysis of the results were done using chi-square (χ^2) to determine the relationship between prevalence of infection and risk factors such as sex, age and location. A p-value less than 0.05 ($p<0.05$) was considered statistically significant.

RESULTS AND DISCUSSION

This study revealed an overall prevalence of 28.3% with 39 students positive for the infection out of 138 students involved in the study. Results obtained from this study showed that age group of 26-30years recorded the highest prevalence of infection with *Trichomonas vaginalis* (6(54.5) while age group of 21-25 had the least prevalence of infection (13(24.5%)). The overall prevalence of infection was however 28.3%. There was no significant difference between age and prevalence of infection with *Trichomonas vaginalis* (P=0.12) (Table 1).

Table 1. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Age

Age	Number Examined	Number positive	Prevalence
15-20	74	20	27.0%
21-25	53	13	24.5%
26-30	11	6	54.5%
Total	138	39	28.3%

χ^2= 4.17; df=2 ; p=0.12

Rate of infection differed with married students having a higher prevalence of infection (6(66.7%)) than single students (33(25.6%)).

Statistical analysis however shoed that there was a significant association between marital status and rate of infection (P=0.008) (Table 2).

Table 2. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Marital Status

Marital Status	Number Examined	Number positive	Prevalence
Single	129	33	25.6%
Married	9	6	66.7%
Total	138	39	28.3%

χ^2= 7.00; df=1 ; P=0.008

Medical school of Benue State University, Makurdi recorded the highest prevalence of infections with a prevalence of 33.3%, followed by West Wing 23(32.9%) and East Wing having the least prevalence of infection 13(22.0%). Statistical analysis however showed that there was no relationship between location and prevalence of infection (P=0.37) (Table 3).

Table 3. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Location

Location	Number Examined	Number positive	Prevalence
East Wing	59	13	22.0%
West Wing	70	23	32.9%
Medical School	9	3	33.3%
Total	138	39	28.3%

χ^2= 1.97; df=2 ; p=0.37

Level of students and prevalence of infection differed in this study with 500 level students recording the highest prevalence of infection (66.7%) and 100 level recording the least prevalence of infection (19.6%). Statistical analysis showed that there was no significant association between prevalence rates in the various levels (P>0.05) (Table 4).

Table 4: Rate of Infection with *Trichomonas vaginalis* in Female Students based on Level

Level	Number Examined	Number positive	Prevalence
100	46	9	19.6%
200	28	11	39.3%
300	31	9	29.0%
400	30	8	26.7%
500	3	2	66.7%
Total	138	39	28.3%

χ^2= 5.62; df=4 ; p=0.229

Results presented in table 5 shows that there was a significant relationship between type of toilet and prevalence of *Trichomonas Vaginalis* infection (P<0.05). Students who used pit latrine recorded highest prevalence of infection (86.7%) while those who practice open defaecation recorded lowest prevalence of infection (0.0%) (Table 5).

Table 5. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Type of Toilet

Type of toilet	Number Examined	Number positive	Prevalence
Pit latrine	15	13	86.7%
Water Closet	74	18	24.3%
Bucket System	48	8	16.7%
Open Defaecation	1	0	0.0%
Total	138	39	28.3%

χ^2= 29.38; df=3; p=0.00

Table 6. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Complaint

Complaint	Number Examined	Number positive	Prevalence
Discharge	60	10	16.7%
Itching	55	23	41.8%
Burning sensations	23	6	26.1%
Total	138	39	28.3%

χ^2= 9.02; df=2 ; p=0.01

Table 7. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Sexual Activity

Sexually Active	Number Examined	Number positive	Prevalence
Yes	28	13	46.4%
No	110	26	23.6%
Total	138	39	28.3%

χ^2= 5.72; df=1 ; p=0.02

Table 8. Rate of Infection with *Trichomonas vaginalis* in Female Students based on Sharing of Underwears

Share Underwears	Number Examined	Number positive	Prevalence
Yes	3	0	0.0%
No	135	39	28.9%
Total	138	39	28.3%

χ^2= 1.21; df=1 ; p=0.27

Complaints significantly affected prevalence of infections in this study (P=0.01) with those having complaints of discharge recording a 10(16.7%) prevalence of infection while those with complaints of itching recorded a prevalence of 23(41.8%) and those with burning sensations recorded a prevalence of 6(26.1%) (Table 6). Sexual activity affected significantly prevalence of infection with Trichomonas vaginalis (P=0.02) with those who are sexually active recording a higher prevalence of infections 13(46.4%) than those who are sexually inactive 26(23.6%). This is as shown in table 7 below (Table 7). This study revealed that students who share underwears recorded a lower prevalence of infections (0.0%) than those who do not share underwears. There was however no relationship between prevalence of infections and sharing of underwears (P=0.27) (Table 8).

CONCLUSION AND RECOMMENDATION

The prevalence of *Trichomonas vaginalis* was investigated amongst Benue State University Students in this study. Out of 138 students examined, an overall prevalence of 39(28.3%) was recorded. This prevalence rate is higher than what was reported by (12) where rates of 26.0% and 14.0% were recorded. A prevalence of 28.3% recorded in this study is however lower than a 20.0% prevalence reported by (15) in their study on prevalence of *Trichomonas vaginalis* infection amongst pregnant women in Hospitals in Ilorin Metropolis. It was also higher than a 2.8% prevalence recorded by Frederick, (21). Benin City. The results obtained from this study is also higher than a 12.5% prevalence recorded by John *et al.*,(16) in their study on Prevalence of *Trichomonasvaginalis* infection and Associated Risk factors among Undergraduate Students of Babcock University, Ogun State, Nigeria. This study also recorded a prevalence rate lower higher than what was recorded by (21) where a rate of 23.0% was recorded aongst pregnant women attending antenatal clinic in Bauchi State. In this study, highest prevalence rates were recorded for married women (66.7%) than singles women (25.6%).

This observation is in agreement with the (13) who reported that women who are married had highest prevalence than single women. Higher prevalence of the infection amongst married women could be partly attributed to the sexually active nature of married women that renders them vulnerable to infection from various sources especially their spouse. This is possibly a reason why people who were sexually active recorded a higher prevalence rate (46.4%) than people who were not sexually active (23.6%) as shown in table 6. Chi-square analysis also shows that there was a significant relationship between prevalence of infection and marital status as well as sexual activeness as shown in table 2 and Table 6.

In terms of educational age, those within the age group of 26-30 had highest prevalence of infections compared to other age groups with 15-20years having a prevalence of 20(27.0%) and 21-25years having a prevalence of 13(24.5%). Highest prevalence recorded in this group is similar to the report of (13) who reported that age groups of 25-30years had predominantly higher prevalence of *Trichomonas vaginalis* infection. This age group having the highest prevalence of *Trichomonas vaginalis* infection is also similar to the report of (3) who reported age group 21-30 has having the highest prevalence of infections. The findings of this study in terms of age group however differs slightly from that of (6) where age group of 36-45 was the most predominant for Trichomonas vaginalis infection.

Prevalence of infections varied between locations with medical school of Benue State University having highest prevalence rates (33.3%) and First Campus having lowest prevalence rates (22.0%). 500 level students of the institution also had the highest prevalence of infection (66.7%). Highest prevalence recorded amongst this level could be as result of the state of people within this age group whom are mostly married, engaged or involved in one form of sexual activity as compared to other levels who are still reserved and sexually not active. Type of toilet facility also influenced the prevalence of *Trichomonas vaginalis* infection amongst students of Benue State University with students who use Pit latrine having highest prevalence of infection (86.7%) while those who defaecate in the open had lowest prevalence of infection (0.0%). Statistical analysis also showed that there was a significant association between type of toilet and prevalence of infection as P<0.05. Complaints of Students also determined the prevalence of infection with *Trichomonas* infection amongst students of Benue State Univeristy with those who complained of complaints of itching having highest prevalence of infection (26.1%) and those with discharge having lowest prevalence of infections (16.7%). This was statistically significant (P<0.05). Sharing of Underwears and Sanitary pads however had no significant association with prevalence of infections.

Conclusion

Undergraduate students of Benue State University, Makurdi have a prevalence of 28.3% for *Trichomonas vaginalis* infection. This prevalence rate is significantly associated with marital status, sexual activeness and type of toilet facility used. *Trichomonas vaginalis* infection is still prevalent in Makurdi and is higher than rates recorded in previous studies. This indicates a need for adequate preventive measures.

Recommendation

From this study, the following is recommended:

- Students of Benue State University should be enlightened on the existence of *Trichomonas vaginalis* since most of them might not be aware of the infection and might just feel it's a regular itching sensation posed by hygiene.
- Awareness campaigns should be organized at various levels of endevours so as to enlighten the general public on the health significance of *Trichomonas* infection.
- Adequate preventive measures should be made available to the government and pills for treating the infection should be given freely to females of Nigerian institutions so as to ease the rate of curtailing the spread of infections.

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APPENDIX

Plate 1. ***T. vaginalis***