Original Research Article

PREVALENCE AND CORRELATESOF *GARDNERELLA VAGINALIS* AND *TRICHOMONAS VAGINALIS* AMONG FEMALE STUDENTS IN BINGHAM UNIVERSITY.

ABSTRACT

Aim: To determine the prevalence of *Gardnerellavaginalis* and *Trichomonasvaginalis* among female students in Bingham University.

Place and Duration of Study: The study was carried out in the Department of Biological Sciences, Bingham University, Karubetween the months of March to June 2016.

Study design: A cross-sectional study design was utilized.

Methodology: Low vaginal swabs were collected from 200 female students. *G.vaginalis was identified* using wet mount, whiff test and culture in chocolate media. *Trichomonasvaginalis*was identified by making wet mounts of vagina swabs and viewing for viable organism under x10 and x40 objectives of the light microscope.

Results: The results from this study reveals a prevalence rate of 39.0% comprising of 34.5% for *G. vaginalis* infection and 4.5% for *T. vaginalis.*Coinfection rate of (4.5%) was also recorded. Age,symptoms and predisposing factors were significantly associated with G. *vaginalis* infection ($p<0.05$).Bivariate analysis using correlation coefficient of 0.2065, 0.5863 and 0.4086for age, symptoms and predisposing factors shows a moderate positive correlation between these factors considered and the pathogens under study. Similarly, age was significantly associated with *T.vaginalis* ($p<0.05$). However,symptoms and predisposing factorsshowed no significant relationship($p>0.05$) with *T.vaginalis.*A prevalence rate of (24.5%) and (4.0%) was recorded in the age group 15-20yrs for *G.vaginalis* and *T.vaginalis* infection respectively.

Conclusion: The findings of the entire study revealsthat the prevalence of *T. vaginalis*is quite low however; the prevalence of 34.5%for *G. vaginalis* is quite alarming. These infections are associated with adverse pregnancy outcomes therefore; there is a need for increased provision of health information concerning *G.vaginalis*and *T.vaginalis* in the school peripheral. Screening and treatment of these infections will go a long way to eradicate these infections among female students in the University.

Keywords: Bacterial vaginosis, *Gardnerellavaginalis*, *Trichomonasvaginalis,* Prevalence.

1. INTRODUCTION

Bacterial vaginosis (BV) is a vaginal infection that occurs when the equilibrium of the natural flora in the vagina is altered. It is the most common cause of abnormal vaginal discharge [1,2] affecting millions of women of reproductive age annually.

Thevaginal flora are the microorganisms that colonize the vagina. The amount and type of bacteria present have significant implications for a woman's overall health. The primary colonizing bacteria of a healthy individual are of the genus *Lactobacillus* e.g. *Lactobacillus crispatus* [3].It is generally accepted that the production of lactic acid by these bacteria protect females against infection by pathogenic species [4,5,6].

Approximately, 95% of vaginitis is caused by one of the three organisms; *Candida albicans*, *Trichomonasvaginalis* and *Gardnerellavaginalis*[7] and these organisms are among the leading infectious agents causing vaginitis among young women in urban communities in Nigeria [8].

The key player in the pathogenesis of Bacterial vaginosis and the development of a biofilm is *Gardnerellavaginalis*. It was shown in a study of microbiota on the epithelial surfaces of vaginal biopsy specimens from women with bacterial vaginosis, that a biofilm adhered to parts of the epithelium and *Gardnerellavaginalis* comprised 90% of bacteria in that biofilm [9]. *Gardnerellavaginalis* is a gram-variable facultative anaerobe characterized by fastidious, beta-hemolytic growth. It is non-motile and un-encapsulated in nature. The bacilli produces a pore forming toxin, vaginolysin which affects only human cells and has been demonstrated by many studies to have a relationship with other bacteria such as *Lactobacillus* species, *Prevotella*, and anaerobes like*Mobiluncus* and*Bacteroides* [10].

Common symptoms associated with vaginosis in women, caused by *G vaginalis* include increased foul smelling (usually smells like fish) vaginal discharge. The discharge is often white or grey in colour. The smell is particularly noticeable after intercourse. Semen is alkaline and it reacts with the bacteria thereby causing the release of chemicals, hence the fishy smell. There may be burning sensation with urination [11].

*Trichomonasvaginalis*is an anaerobic, parasitic, flagellate protozoan. It is also a member of the Parabasalia, and is the causative agent of trichomoniasis [12].*Tvaginalis*, principally infects the squamous epithelium in the urogenital tract: vagina, urethra, and paraurethral glands [13]. Other less common sites include the cervix, bladder, Bartholin glands, and prostate. Humans are the only known host with the trophozoite transmitted principally via vaginal sexual intercourse, and rarely via fomites [14].

T. vaginalis which is the causative agent of trichomoniasis, can cause vaginitis, cervicitis, urethritis and is the most prevalent non-viral sexually transmitted infection worldwide [12], with an estimated 180 million infection acquired annually worldwide [15]. Coexistence of *T vaginalis* and bacterial vaginosis pathogens is common, with coinfection rates of 60 to 80 percent [16].

Bacterial vaginosis and trichomoniasis are responsible for different infections and have been linked to premature labour, preterm delivery, low birth weight, increase prenatal mortality in pregnant women. They also predispose their patients to HIV/AIDS [17]. Some recent studies also provide evidence that trichomoniasis predispose many to certain malignant disease such as prostate and cervical cancer [18].

Nearly half of all women with *G. vaginalis* and *T. vaginalis*are asymptomatic [19, 20] and they may not be aware that they have the infection. It is important that more effective and safe diagnosis and therapeutics be made to ensure that *G vaginalis* which could be present as a normal microflora in some women, does not exceed its number or be found in other sites as it is not just confined to the lower genital tract in bacterial vaginosis [21].

2. METHODOLOGY

2.1 STUDY AREA

The study was carried out in Bingham University, Karu, Nasarawa state. The school is located in AutaBalefi; a community situated in the middle belt of Nigeria at Longitude 8°32ˈN 8°18ˈE and Latitude 8.533°N 8.300° E. It is characterized by a tropical sub-humid climate with two distinct seasons; wet and dry seasons. Monthly temperature ranges from 20ºC to 34ºC and annual rainfall ranging from 1100 mm to about 2000 m [22]. It occupies a land mass of over 200 square meters, and it is 23 kilometers away from Abuja [23].

2.2 STUDY POPULATION

Two hundred female students of Bingham University between the age group of 15-35 years were randomly recruited for the study.

2.3 EXCLUSION CRITERIA

Students who were currently on their period at the time of the study were excluded from the study.

2.4 ETHICAL APPROVAL

Ethical approval was obtainedfrom the ethical committee of Bingham University.

2.5 SAMPLE COLLECTION

Vaginal swabs were collected from 200 female students. They students were enlightened on the causative agents of the diseases,and the appropriated method of collecting the required sample was demonstrated by the nurses.Sterile cotton tipped swab was inserted into the exterior vaginal fornix and low vaginal swabs (LVS) was taken.

2.6 LABORATORY IDENTIFICATION OF MICROORGANISMS

Whiff-amine test was used to test for the production of a fishy smell as described by Amselet al [24]. Microscopic examination was carried out to determine the presence of clue cells using X40 objective.A swab containing vaginal discharge was inoculated on Chocolate agar and incubated at 33℃ in a 5-10% CO_2 incubator. The plates were examined macroscopically for *Gardnerellavaginalis*.Biochemical tests (Catalase and Indole tests) were carried out.Antibiotic sensitivity testwas carried out using 5mg metronidazole as control.
*Trichomonasvaginalis*was identified by making wet mounts of vagina swabs and viewing for viable organism under x10 and x40 objectives of the light microscope.*Trichomonasvaginalis*was identified by its characteristic pear shape [25].

2.7 STATISTICAL ANALYSIS

The data obtained was subjected to bivariate analysis using correlation coefficient.A confidence interval of 75% was also used and Chi square test was used to determine if there is a significant relationship between the infections and the factors considered.

3. RESULTS

Two hundred female students were screened for *Gardnerellavaginalis* and *Trichomonasvaginalis* infection.There were 69 positive samples for *G.vaginalis* and 9 positive samples *for T.vaginalis,* thus, constituting a prevalence rate of 34.5% and 4.5% respectively as shown on Table 1.The prevalence in this study is 39.0% at 75% confidence index.

Table 2 shows the age distribution of *G. vaginalis*and *T.vaginalis.* A high prevalence rate was recorded within the age group of 15-20yrs (24.50%), (4.0%) for *G. vaginalis* and *T. vaginalis* respectively. Similarly, a low prevalence rate was recorded at 26-30yrs for *G. vaginalis* (1.0%) and 21-25yrs for *T. vaginalis* (0.5%). Statistical analysis shows that prevalence of *G. vaginalis*and *T.vaginalis* infection is associated with the age of the participants ($p<0.05$).

Table 3 shows the prevalence rate of *G. vaginalis* and *T.vaginalis*with respect to presence of symptoms. 73 of the participants in this study were symptomatic, 127 were asymptomatic. The peak of the infection in symptomatic individuals with G. *vaginalis* was recorded with those who had discharge alone; 12(16.43%) and those who had itching alone had the least prevalence of 5.47%. With respect to *T. vaginalis*, the prevalence was similar (1.36%) for those who had Itching alone, discharge alone and discharge with itching.

Table 4 shows the prevalence rate of *G.vaginalis* and *T.vaginalis*with respect to predisposing factors that may enhance the infection transmission. Those that douched had a higher prevalence (20.8%) of *G. vaginalis*followed by those that were sexually active (4.69%). For *T.vaginalis*, prevalence (0.67%) was similar for all the risk factors.

Table 5 shows the coinfection rate of *G. vaginalis* with *T. vaginalis* on the basis of age. A coinfection rate of 4.5% was recorded. Coinfection was greater among the age group 15-20yrs; 4.0%.

Table 6 shows the results of bivariate analysis using correlation coefficient. Tables 7 and 8 represents the Chi square values for *Gardnerellavaginalis and Trichomonasvaginalis*with respect to age, symptoms and risk factors.

Table 1.Prevalence of *Gardnerellavaginalis* and *Trichomonasvaginalis.*

Organisms	No. screened	No. of positive	No. of negative	Prevalence (%)
Gardnerellavaginalis	200	69	131	34.50
Trichomonasvaginalis	200	9	191	04.50
Total	**200**	**78**	**322**	**39.0**

Table 2 Prevalence of *G.vaginalis* and *T.vaginalis* on the basis of the age of the students.

	Gardnerellavaginalis			***Trichomonasvaginalis***	
Age (yrs)	**No. screened**	**No. of positive**	**Prevalence (%)**	**No. of positive**	**Prevalence (%)**
15-20	124	49	24.50	8	04.00
21-25	70	18	09.00	1	00.50
26-30	6	2	01.00	-	-
31-35	-	-	-	-	-
Total	**200**	**69**	**34.5**	**9**	**4.5**

Table 3.Prevalence of *G.vaginalis* and *T.vaginalis* on the basis of symptoms acquisition.

	Gardnerellavaginalis			***Trichomonasvaginalis***	
Symptoms	**No. indicated**	**No. of positive**	**Prevalence (%)**	**No. of positive**	**Prevalence (%)**
Itching only	9	4	05.47	1	01.36
Itching + Discharge	21	10	13.69	1	01.36

Discharge only	43	12	16.43	1	01.36
Total	**73**	**26**	**35.61**	**3**	**4.10**

Table 4.Prevalence of *G. vaginalis* and *T. vaginalis* on the basis of predisposing factors that may enhance the infections.

	GardnerellavaginalisTrichomonasvaginalis				
Risk factors	**No. indicated**	**No. of positive**	**Prevalence (%)**	**No. of positive**	**Prevalence (%)**
Douching	109	31	20.80	1	0.67
Smoking	4	2	01.34	1	0.67
STI acquisition	8	2	01.34	-	-
Sexual activity	28	7	04.69	1	0.67
Total	**149**	**42**	**28.18**	**3**	**2.01**

Table 5.Coinfection rate of *G. vaginalis* and *T. vaginalis* with respect to age.

Age (yrs)	No. screened	Coinfection of *G. vaginalis* and *T. vaginalis*	Prevalence (%)
15- 20	124	8	4.00
21-25	70	1	0.50
26-30	6	-	-
31-35	-	-	-
Total	**200**	**9**	**4.5**

Table 6.Bivariate analysis showing correlation coefficient results

Factors considered	**Calculated correlation coefficient**
Age	0.2065
Symptoms	0.5863
Risk Factors	0.4086

Table 7. Chi square values for *Gardnerellavaginalis*with respect to age, symptoms and risk factors.

Factors considered	**Chi square value (χ^2)**	**P Values**
Age	89.193	0.00001
Symptoms	4.002	0.28569

Risk Factors	54.949	0.00001

Table 8.Chi square values for *Trichomonasvaginalis*with respect to age, symptoms and risk factors.

Factors considered	Chi square value (χ^2)	P Values
Age	19.888	0.000139
Symptoms	0	0.5
Risk Factors	0.999	1.95708

4. DISCUSSION

The prevalence of *G.vaginalis* in the vaginal swab samples collected and examined in this study is 34.5%. The high prevalence in this study may be related to the physiology and abnormal changes that occur in women of reproductive age at some point in their lifetime. It could also be, probably due to improper hygienic conditions that range from the use of medicated and highly caustic soap to wash the vagina and use of sanitary pads for long period of time during menstruation which could increase the risk of acquiring the infection. The prevalence of *G.vaginalis*in this study is higher than the findings ofIsiaka-Lawalet al[26], Okonko et al[27] and Usanga et al[28] who recorded prevalence rates of 9.7%, 10.5% and 0.9% in three states of Nigeria viz.Illorin, Ibadan and Calabar respectively. However, the prevalence is slightly lower than the findings of [29,30, 31]who recorded prevalence rates of 41.0%, 53.0% and 41.3% in Cameroon, Nigeria and Rhode Island, USA respectively.

A high prevalence of 24.50% was recorded amongst female students between the ages of 15-20yrs. This prevalence rate correlates with [32] who also recorded a high prevalence of 26.0% among pregnant women between the ages of 16-20yrs. The high prevalence among these young ladies is perhaps due to sexually activities or probably due to little or inadequate knowledge on how their vagina environment should be, hence a higher incidence of *G.vaginalis* infection. This supports the report by[33]that those in the age group of 15-30yrs were the most infected (100%) by one STD or the other.

Although *G.vaginalis* is not necessarily called a sexually transmitted infection, it cannot be disputed that sexual activity can enhance its acquisition. Prevalence of positive individuals 35.61% symptomatic for *G.vaginalis*was higher than those asymptomatic 33.92%. This supports the general consensus that higher isolation rate of G. *vaginalis* occurs in symptomatic compared to asymptomatic women as reported by [32].

Certain risk factors could enhance the rate at which *G. vaginalis* is transmitted or acquired. A high prevalence rate of 50.0% was recorded for those that smoke than those that douche. Although the number of those that douched was more than those that smoked, the high prevalence rate obtained from those that smoked backs up report by [34]that smoking increases the risk of acquiring bacterial vaginosis. The report by [35]which statesthat vaginal douching could disrupt vaginal environment and increase the number of anaerobic bacteria there, thereby giving way for opportunistic infections cannot be annulled.

The prevalence of *T.vaginalis* obtained in this study is 4.5%. This prevalence agrees with the separate findings of [36,26,37]who reported prevalence rates of 5.0%, 5.6%, 4.98% in Egypt, Nigeria and Ethiopia respectively.However, other studies in Nigeria demonstrated a higher prevalence of13.67%, 17.5% in Zaria and Onitshaby [38,39]recorded a lower prevalence of 1.2% in Yaounde, Cameroon [29] The low prevalence of *T. vaginalis* infection observed in this study when compared to other studies may be partly explained by the difference in sensitivity of methods of diagnosis; microscopy rather than culture which

has a comparatively high sensitivity and is considered as the gold standard. It may also be due to the difference in study population and hygienic practices as supported by[40].

A prevalence rate of 4.0% for *T.vaginalis* was recorded among female students within the age group of 15-20 years. This supports the high prevalence of 71.4% reportedamong pregnant women between the age group of 15-20yrs in a study conducted by [41]. However, [36,39]recorded high prevalence rates in ages 21-40yrs and 30-39yrs respectively.

In this study, symptoms acquisition was not significantly associated with *T. vaginalis*infection.

A prevalence rate of 0.67% was recorded for those that douched, smoked, and had one sexually transmitted infection and those that were sexually active. This supports the finding of [19] which states that smoking and sexual activity increases the risk of acquiring *T. vaginalis.*

The coinfection of *Gardnerellavaginalis* and *Trichomonasvaginalis* in this study is 4.5%. This corresponds to the prevalence obtained for *Trichomonasvaginalis* alone. All the individuals that tested positive for *T.vaginalis* had G. *vaginalis*. This supports the findings of [42] who reported that *G.vaginalis*was more frequent in women infected with *T. vaginalis.*

Bivariate analysis showing correlation coefficient results on Table 6 reveals that the factors considered in this study (age, symptoms and predisposing factors) had the following correlation coefficients 0.2065, 0.5863 and 0.4086 respectively. This result suggests that the factors considered have a moderate positive correlation as the Pearson's correlation coefficient ranges from -1 to 1.

4.2 CONCLUSION

The result of this study reveals that the prevalence of *G. vaginalis* is relatively high compared to that of *T. vaginalis.* This supports the factthe replacement of vaginal lactobacilli with*Gardnerellavaginalis* is associated with bacterial vaginosis. On the other hand, *T. vaginalis*is a sexually transmitted disease which is acquired during unprotected sex. These infections can be eradicated or reduced by improved personal hygiene, abstinence from sex before marriage and adequate treatment.If left untreated these infections may cause untold damage to young ladies during pregnancy.

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