RESEARCH ARTICLE

PREVALENCE PATTERN AND PREDICTORS OF INFECTIVE VAGINITIS AMONG FEMALE STUDENTS ATTENDING FEDERAL UNIVERSITY OF TECHNOLOGY MEDICAL CENTRE OWERRI NIGERIA

[1,2]*Onoh Charles Chukwuemeka, [2]Akalonu George Ifeanyichukwu, [2]Nwankwo Grace, [2]Idawarifa Frank Cookey-Gam and [1]Ugo Ihuoma Chiamaka

[1]Department of Public Health, Federal University of Technology, Owerri, Nigeria
[2]Centre for Occupational Health, Safety & Environment, University of Portharcourt, Nigeria

ARTICLE INFO

ABSTRACT

Bacterial vaginosis (BV), Vulvovaginal candidiasis (VVC) and Trichomoniasis are collectively known as Infective Vaginitis (IV). It is as a result of the disruption of the healthy microbiota and represents the most common gynaecologic condition encountered in the clinic. This study was aimed at determining the prevalence of BV, VVC, Trichomoniasis, microbiological patterns and predictors of infective vaginitis among female students attending Federal University of Technology, Medical Centre, Owerri. This was a cross-sectional study carried out on 150 female students of Federal University of Technology, Owerri between May 2015 and October, 2015. A self-administered structured questionnaire was used to generate data on the sociodemographic variables and predictors of Infective vaginitis. Vaginal swabs were collected and subjected to wet mount microscopy and gram staining. Sabouraud dextrose agar (SDA) was used as a growth medium for the isolation of Candida species and Germ tube test was used for the identification and confirmation of Candida albicans. All bacterial isolates were characterized on the basis of colony, cellular morphology and reaction to Gram's staining. Data were analysed using Epi INFO version 7 Software. The prevalence of BV, VVC and Trichomoniasis were reported as 22%, 36%, 0% respectively. The microbiological and morphological pattern showed some mixed bacterial and fungal infections between Escherichia coli and Candida albicans of 4%. The predictors of Infective vaginitis were found to be correct wiping pattern of front to back and first Infective vaginitis at an early age. This study helps Primary care physicians in making accurate empirical prescriptions in the treatment of Infective vaginitis, reducing the emergence of drug resistance and out-of-pocket spending.

Citation: Onoh Charles Chukwuemeka, Akalonu George Ifeanyichukwu, Nwankwo Grace, Idawarifa Frank Cookey-Gam and Ugo Ihuoma Chiamaka, 2016. "Prevalence pattern and predictors of infective Vaginitis among female students attending federal university of technology medical centre Owerri Nigeria", *International Journal of Current Research*, 8, (07), 34599-34605.

INTRODUCTION

Vaginitis is an inflammation of the vagina that can result in discharge, itching and pain. The cause is usually a change in the normal balance of vaginal bacteria or an infection. Vaginitis can also result from reduced oestrogen levels after menopause (Gor, 2015).

The most common types of Vaginitis are:

i) Bacterial Vaginosis (BV) which results from overgrowth of one of several organisms normally present in the vagina.

*Corresponding author: Onoh Charles Chukwuemeka,
Department of Public Health, Federal University of Technology, Owerri, Nigeria.

i) Vulvovaginal Candidiasis (VVC), which are yeast infections caused by a naturally occurring fungus called Candida albicans and usually associated with cottage cheese like vaginal discharge (Olugbenga *et al.*, 2014).

ii) Trichomoniasis which is commonly caused by a parasite Trichomoniasisvaginalis and could be transmitted by sexual intercourse.

iii) Atrophic vaginitis is associated with hypoestrogenism whose symptoms include dyspareunia, pruritus, and abnormal bleeding. This is common after menopause

iv) Aerobic vaginitis which affects about 5 to 10% of women (Donders, 2002).

Bacterial Vaginosis, Vulvovaginal candidiasis and Trichomoniasis are collectively known as Infective Vaginitis.

Approximately 75% of the female population suffers at least one episode during their lives (Olugbenga *et al.,* 2014). Infective vaginitis is as a result of the disruption of the healthy vaginal microbiota. The vaginal microbiota consists of those organisms which generally do not cause symptoms, infestations and dominated mainly by lactobacillus species (Petrova *et al.,* 2015). The disruptions of the normal microbiota can cause a vaginal yeast infection. Vaginal yeast infection can affect women of all ages and is very common. The commonest signs and symptoms of Infective Vaginitis include dysuria, discharge, redness, inflammation, foul vaginal odour and dyspareunia (Egan and Lipsky, 2000). Vaginitis is the most common gynaecologic condition encountered in the office. It is a diagnosis based on the presence of symptoms of abnormal discharge, vulvovaginal discomfort or both (Sobel, 2005; Gor, 2015). The normal postmenarchal and premenopausal pH is 3.8 – 4.2. At this pH, growth of pathogenic organisms usually is inhibited. Disturbance of the normal vaginal pH can alter the vaginal flora, leading to overgrowth of pathogens. The following factors may alter the vaginal environment: feminine hygiene products, contraceptives, vaginal medications, antibiotics, sexually transmitted diseases (STDs), sexual intercourse, stress, wiping pattern (Sobel, 2007). Atrophic vaginitis is associated with hypoestrogenism, and symptoms include dysparunia, dryness, pruritus and abnormal bleeding (Gor, 2015). The age of the patient affects the anatomy and physiology of the vagina. Postpubertal children have a more alkaline vaginal pH than do the pubertal adolescent women (Gor, 2015). The vaginal wall is columnar epithelium, mucous glands are absent, the normal vagina flora is similar to that of the postmenopausal women, the labia are thin with a thin hymen. Pubertal and post pubertal adolescent women have a more acidic vaginal pH, a stratified squamous vagina, vaginal flora dominated by lactobacilli, thick labia, hypertrophied hymens and vaginal walls. Loss of vaginal lactobacilli appears to be the primary factor in the changes leading to bacterial vaginosis. Reoccurrences of vaginitis are associated with a failure in developing microflora dominated by lactobacilli (Sobel, 2007).

MATERIALS AND METHODS

Study Area

This study was carried out in Owerri, the capital of Imo State of Nigeria. It is situated at 5.48° north latitude, 7.03° east longitude and 159 meters above sea level land. The population is about 400,000 as at 2006 and covers over 100km^2 in area (AAS, 2010). Owerri is bordered by the Otamiri River to the east and the Nworie River to the South (Onoh & Nwaogazie, 2015). Its environment have witnessed an upsurge in the number of banks, hotels, markets, industries, food restaurants, night and social lifestyles (Onoh, 2014). Important educational institutions in Owerri include Imo State University, Federal University of Technology, African Institute of Science and Technology, Federal Polytechnic Nekede, Alvan Ikoku Federal College of Education and so many Secondary schools.

Study Site

The study site was at Federal University of Technology, Owerri (FUTO). FUTO is bounded by four communities of

Eziobodo, Okolocha, Ihiagwa and Obinze, Imo State, Nigeria. It is made up of six colleges comprising of : School of Engineering and Engineering Technology (SEET), School of Physical Sciences (SOPS), School of Biological Sciences (SOBS), School of Management Technology (SMAT), School of Health Technology (SOHT), and School of Environmental Technology (SOET). The University is known for its technical strength graduates, evidenced by large number of its alumni currently in oil and gas industries in Nigeria. The largest percentage of engineers in most oil companies in Nigeria are FUTO alumni (Fig. 1).
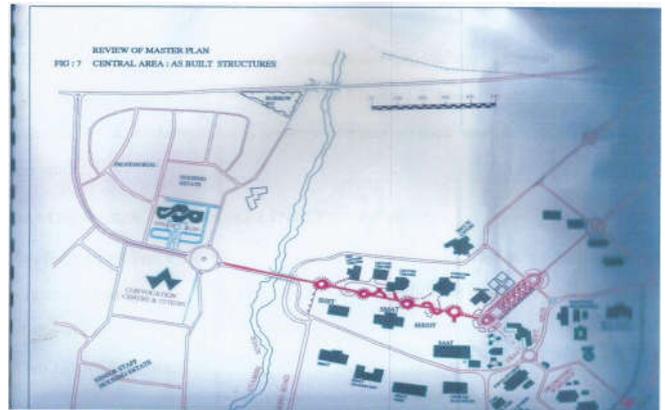
Fig. 1. FUTO Master Plan. Source: FUTO Library

Study Population

The study population comprised of all concerting female students of Federal University of Technology, Owerri. The Class lists of the various Departments were used to determine the population/sampling frame. A total of one hundred and fifty female students of Federal University of Technology, Owerri were enrolled for the study. The study was conducted over a period of six months starting from April, 2015 to October, 2015 by recruiting consenting female students attending Federal University of Technology, Medical Centre, Owerri.

Inclusion and Exclusion Criteria

The inclusion criteria were registered female students of Federal University of Technology Owerri who gave informed written consent for the study. The exclusion criteria were critically ill-student and students who are pregnant.

Sample Size Determination

Sample Size Estimation

The sample size was determined using the prevalence formula:

$$N = \frac{Z^2 P(1 \quad P)}{T^2}$$

where Z = 1.96, that is the level of significance (standard normal deviate) which corresponds to 95% confidence level; P = prevalence from a previous study (Olawuji, 2011); T = tolerance error (0.05)

Using Equation (1), we have:

$$N = \frac{1.96^2 0.08(1\quad 0.08)}{0.05^2} = 113.096$$

The sample size was determined to be 113. Allowance for 10% attrition rate gave a sample of 124 workers. However, a total of 156 students were recruited and 150 responded for this study giving a response rate of 96.2%.

Sample Technique

To obtain a representative of the sample based on the inclusive criteria a Stratified random method was used. Each department in the school was regarded as a Stratum.

Methods of Data Collection

Questionnaire

The questionnaire design is of two parts. The first part addresses the background information in form of sociodemographic variables of the participants with respect to age, gender, department, School (Faculty) and Level of study. Part 2 of the questionnaire is of six questions designed to assess the risk facors and predictors of Infective Vaginitis. The questionnaire is self-administered. Pretesting of the questionnaire was done externally at the Centre for Occupational Health, Safety & Environment, University of Port Harcourt, Rivers State (COHSE) and internally at the Department of Health Services, Federal University of Technology, Owerri. Five staff of the Department of Health Services, and ten students of Federal University of Technology, were randomly used for pretesting of the questionnaire. The pretesting was done to assess the applicability of the Questionnaire tool internally and externally. All the participants used for pretesting of the questionnaire instrument gave valid and reliable responses, confirming the clarity and applicability of the questionnaire tool, and questions were interpreted with the same meaning as intended. The basic demographic variables of age, gender, level of study and behavioural practices were documented.

Specimen Collection, Wet Preparation, Culture Isolation and Identification

Samples of high vaginal swabs (HVS) specimens were collected under aseptic condition using a speculum. The specimens were immediately sent to the hospital laboratory for microbial analysis. All the specimens were sent immediately to the hospital laboratory for primary culture and isolation of the microorganisms. A sample of the exudate was transferred to a microscope. A drop of sterile physiological saline was added and mixed. It was covered with a cover glass and examined under the microscope. Gram stain was performed on smears made on another slide. The high vaginal swabs were inoculated into Sabouraud dextrose agar (SDA), Chocolate, MacConkey agar plates were incubated aerobically at 37°C for 48 hours. *Candida species* were checked for in SDA plates. Germ tube test were performed on yeast isolates to confirm *Candida albicans*. Biochemical characterizations were also performed

(Cheesebrough, 2006). All bacterial isolates were characterized on the basis of colony, cellular morphology, and reaction to Grams staining (Fawole and Oso, 1998).

Data analysis

Data were entered into Microsoft Excel Spreadsheet version 2010 and transferred to Epi INFO 7 Software. The results of the analysis are presented in tables (frequency and percentage) and charts for descriptive statistics. On the other hand, inferences are drawn from chi-square and P-values. The prevalence, patterns and predictors of Infective vaginitis were facilitated with the use of EPI INFO 7 Software and level of significance was determined at $p>0.05$.

RESULTS

A total of one hundred and fifty female students were seen at the Federal University of Technology, Medical Centre, Owerri during the period under review. Majority of the students are in 500 level and they represent 30% of the respondents (Fig 2). Students in 400 Level were least represented with approximately 4%. The 400 Level students were on Internship and Industrial Attachment at various industries outside the University during the period of this study. The Departments of the students cut across 25 of which Biochemistry (BCH), Biotechnology (BTC), Industrial Microbiology (IMB) and Public Health (PUH) are mostly presented with 8%, 8%, 12% and 18% of the students respectively. PUH tops the least with 18%. The relatively high response rate noted among PUH students could be attributed to the fact that they have higher awareness of the medical condition and are more likely to seek medical attention.
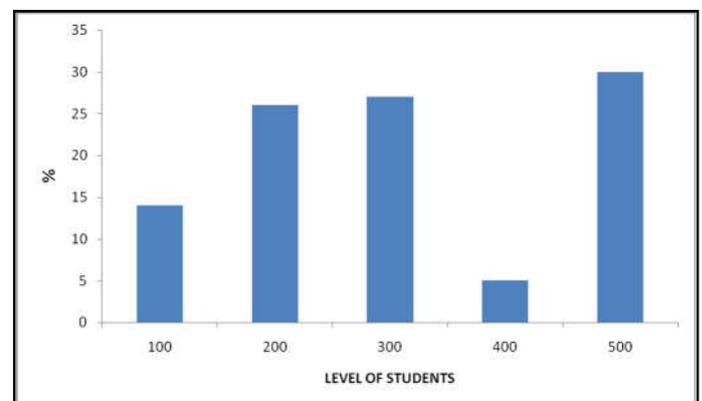

Fig. 2. Distribution of Respondents according to the Level of Study

The age group of the students ranges from 19 to 25 years. Age groups 20 – 22 and 23 – 25 are high and represent 48% and 34% of the respondents respectively. The mean age of the students is 21.8 ± 0.16 years (Fig 3).

The Microbiological Pattern of High Vaginal Swab, specimen shows that *Candida albicans* was responsible for 54 infection representing 36% of the students, this is the commonest microorganism that was isolated. Ninety three representing 62% of the respondents have significant isolates while 57

representing 38% showed no microbiological growth. This shows that the prevalence of Vulvovaginal candidiasis is 36% (Table 2), *Escherichia coli* 12 (8%), *Escherichia coli + Candida albicans 6(4%), Klebsiella pneumoniae 3(2%) and Staphylococcus aureus 18 (12%). So the prevalence of Bacterial Vaginosis is 22%. No Trichomonas species were isolated.*
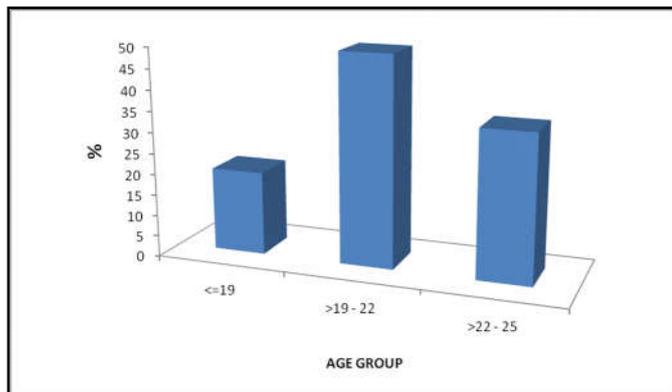

Figure 3. Age distribution of the respondents

Table 1. Microorganisms Isolated

| Variable	Frequency	Percent (%)
Microorganisms (n=150)		
Candida albicans	54	36.00
E.coli	12	8.00
E.coli + Candida albicans	6	4.00
Klebsiella pneumoniae	3	2.00
None	57	38.00
Staphylococcus aureus	18	12.00
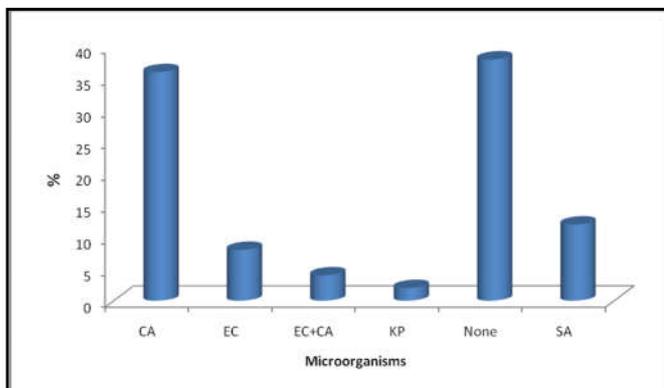
Figure 4. Distribution of Respondents by Microorganism Isolated

The risk factors for vulvovaginal candidiasis were analyzed. Table 2 showed that 28% had multiple sexual partners, 8% wore wet pants or shared inner wears, 20% had their first urinary tract infection at early age, 8% had maternal history of urinary tract infection, 4% practice douching and 90% claimed that the correct wiping pattern is front to back, while the remaining respondents (10%) claimed back to front.

Hypothesis I

H_0: there is no significant relationship between female students that have first Infective vaginitis at early age and

Microorganisms isolated. H_1: there is significant relationship between female students that have first Infective vaginitis at early age and Microorganisms isolated.

Table 2. Predictors

Variables	Frequency	Percent %
Do you have a sex partner? (n=150)		
No	108	72.00
Yes	42	28.00
Do you wear pants or share inner wears? (n=150)		
No	138	92.00
Yes	12	8.00
Did you have your first IV at early age? (n= 150)		
No	147	98.00
Yes	3	2.00
Do you have a maternal history of UTI? (n=150)		
No	138	92.00
Yes	12	8.00
Do you do douching? (n=150)		
No	144	96.00
Yes	6	4.00
The correct wiping is (n= 150)		
(a) Front to back	135	90.00
(b) Back to front	15	10.00

From Table 3, the Value of χ^2 = 24.4898 and (p=0.0002) prove that there is significant relationship between female students that have first Infective Vaginitis at early age and microorganism isolated since the p<0.05 (level of significance).

Hypothesis II

H_0: There is no significant relationship between female students' correct wiping pattern and microorganism isolated.

H_1: There is significant relationship between female students' correct wiping pattern and microorganism isolated.

The value of χ^2 = 14.165 and (p = 0.0146) from Table 4 proves that there is significant relationship between female students' correct wiping pattern and microorganism isolated since the p<0.05 (level of significance). Participants with positive culture for candida were diagnosed as having vulvovaginal candidiasis if they reported vaginal itching or discharge and had vaginal erythema or discharge observed on clinical examination.

The prevalence of vulvovaginal candidiasis is reported in frequencies and percentages. We did not find strong evidence for associations between sociodemographic characteristics and the prevalence of Infective vaginitis. Moreso no significance was also found on having multiple sexual partners, wearing or sharing of wet pants, vaginal douching or having a maternal history of Infective vaginitis. However, there was significant association between the prevalence of Infective vaginitis and the correct wiping pattern of front to back. There was also significant association on the first Infective vaginitis at early stage.

Table 3. Predictors and Microorganisms Isolated (First IV at early age)

| First IV at early age | Micro Organisms Isolated | | | | | | | χ^2 (p) |
	CA	EC	EC+CA	KP	None	SA	Total	
No	54	12	3	3	57	18	147	χ^2 = 24.4898
Row%	36.73%	8.16%	2.04%	2.04%	38.78%	12.24%	100.00%	**(p = 0.0002)**
Col%	100.00%	100.00%	50.00%	100.00%	100.00%	100.00%	98.00%	
Yes	0	0	3	0	0	0	3	
Row%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	
Col%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	2.00%	
TOTAL	54	12	6	3	57	18	150	
Row%	36.00%	8.00%	4.00%	2.00%	38.00%	12.00%	100.00%	
Col%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	

Table 4. Predictors and microorganisms isolated (Correct wiping pattern)

| Correct wiping pattern | Micro Organisms Isolated | | | | | | Total | χ^2 (p) |
	CA	EC	EC+CA	KP	None	SA		
Front to back	51	12	6	0	54	12	135	χ^2 = 14.165
Row%	37.78%	8.89%	4.44%	0.00%	40.00%	8.89%	100.00%	**(p = 0.0146)**
Col%	94.44%	100.00%	100.00%	0.00%	94.74%	66.67%	90.00%	
Back to front	3	0	0	3	3	6	15	
Row%	20.00%	0.00%	0.00%	20.00%	20.00%	40.00%	100.00%	
Col%	5.56%	0.00%	0.00%	100.00%	5.26%	33.33%	10.00%	
TOTAL	54	12	6	3	57	18	150	
Row%	36.00%	8.00%	4.00%	2.00%	38.00%	12.00%	100.00%	
Col%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	

DISCUSSION

In this study we examined the prevalence, microbiological pattern of the isolates and predictors among female students attending Federal University of Technology, Medical Centre, Owerri. This study demonstrated that the prevalence of vulvovaginal candidiasis (VVC) is 36% in the study population. This is the burden and magnitude of Candida albicans colonizing and infecting the genital tracts of female students at Federal University of Technology, Medical Centre, Owerri. A lower burden was reported in a study carried out in Ibadan. The prevalence of Candida albicans was found to be 24.4% in Ibadan (Akingbede *et al.* 2013). Similarly at Nnewi, another low prevalence rate of 30% was reported by Okonkwo *et al* (2010). However, a study carried out in a rural community in Enugu, the prevalence of Vulvovaginal candidiasis in pregnancy was found to be 62.2% (Akah *et al.,* 2010). This is a very high magnitude only second to the one reported in FUTO. The possible pathophysiological explanation to this is that pregnancy together with other risk factors might have contributed to the high prevalence of Vulvovaginal candidiasis. The result of this study is consistent with previous reports and had demonstrated that *Candida albicans* is the commonest organism colonizing and infecting the vulvovaginal region of the female genital tracts (Donbraye-Emmanuel, 2010; Alli *et al.,* 2011; Aka *et al.,* 2010). Findings in the morphological studies of the isolates also demonstrate that *Candida albicans* is the commonest isolates, followed by *Staphyloccocus aureus,* 12% and *Escherichia coli* 8% and lastly *Klebsiella pneumoniae* 3%. We did not find strong evidence for predictors between multiple sexual partners, those who wear wet pants, maternal history of Infective Vaginitis, vaginal douching and the prevalence of vulvovaginal candidiasis. However, there was significant relationship between female students' correct wiping pattern and the microorganisms isolated. There is also significant relationship between the first Infective Vaginitis at early age and microorganisms isolated.

Study Implications

The problems, risks, and behavioural predictive factors that are associated with Infective vaginitis coupled with frequent reoccurrence of Vulvovaginal candidiasis present difficulties to the Primary care physicians in the office. The constellation of these factors made this condition one of the commonest gynaecological presentations in primary care setting. A good understanding of the anatomy and physiology of the female genital system is paramount to proper management of Infective vaginitis. Age of the patient is very important determinant in the management of this condition. The age of the patient determines the anatomy and physiology of the vagina and thus the predisposing factors that affect or favour Infective candidiasis. Postpubertal children have a more alkaline vagina pH than do the pubertal adolescent women. At this stage, the vaginal wall is columnar epithelium and mucous glands are absent, the labia are thin with a thin hymen. At pubertal and post pubertal adolescent, women have a more acidic vaginal pH, a stratified squamous vagina, and vaginal flora dominated by lactobacilli, thick labia and hypertrophied hymen and vaginal walls. In this age group, loss of vaginal lactobacilli appears to be the primary factor in the changes leading to Infective vaginitis whereas reoccurences of vaginitis are associated with a failure in developing microflora dominated by lactobacilli (Sobel and Faro; 1998). Use of probiotics in the management of Infective vaginitis is not the only issue. Complexity of this condition demands a good understanding of the place of age in the management of Infective vaginitis in our community. The management of Infective vaginitis is not simple and straight forward as it looks. One must put into consideration, all the constellation of risk factors that are bound in this condition especially, using age to assume the

anatomical, biochemical and physiological conditions of the vagina. This is very important in making the diagnosis and in considering the various differential diagnosis thus determining the type of Infective vaginitis. Toilet techniques, especially using the correct wiping pattern of front to back, practising optimal feminine hygiene must be considered. One paramount and outstanding clinical application of this study is that it helps Primary Care Clinicians in making accurate emperical prescriptions in the treatment of Infective vaginitis among this cohort of students in our environment. The prevalence of Trichomoniasis was found to be zero. No Trichomoniasis species were isolated in the study. In our environment as found in this cohort where laboratory investigations may not always be feasible, the Primary care physicians can treat empirically for Vulvovaginal candidiasis and Bacterial vaginosis. This helps in reducing drug resistance which could have arisen from prescribing drugs that were not indicated. It also reduces out-of- pocket spending from their meagre resources.

Conclusion

This study has demonstrated a relatively high prevalence of Vulvovaginal candidiasis (VVC) of 36% among these female students of Federal University of Technology, Owerri. It was also demonstrated that the microbiological pattern of isolates have *Candida albicans* being the commonest organism that colonizes and infects the genital tract followed by *Staphylococcus aureus*, *Escherichia coli* and Klebsiella pneumoniae thus signifying a prevalence of Bacterial vaginosis (BV) of 22% in this population. The bacteria commonly isolated is Staphylococcus aureus. A mixed bacterial and fungal infection was found to be 4%. Furthermore, no Trichomoniasis species were isolated. The predictors of Infective vaginitis were found to be the current wiping pattern of front to back and stands as a significant behavioural predictor of Vulvovaginal candidiasis. The first Infective vaginitis at early stage was also found to be a predictor.

Ethical Approval

Ethical approval was granted by the Acting Medical Director and the Chairman of the Research & Ethics Committee, Department of Health Services, Federal University of Technology, Owerri. All information shared during the research were strictly confidential and protected by the law of confidentiality. The identity, privacy, and confidentiality of all who consented to participate were protected.

Recommendation

Based on the findings of this study, the following recommendations are made:

i) Awareness should be created in the University community on optimal feminine hygiene practices and toilet techniques emphasizing on the correct wiping pattern of front-to-back.
ii) Sexual discipline should be advocated as early as possible so that the rate of getting infected is reduced.
iii) Adequate water supply should be made a priority in the University as much could not be done without water.

REFERENCES

Akah, P.A; Nnamani, C.E; Nnamani, P.O 2010. Prevalence and Treatment outcome of vulvovaginal candidiasis in Pregnancy in rural. *J. Med & Med Sci.*, Vol. 1(10): 447 – 452.

Akingbade, O.A; Akinjinmi, A.A; Awodera, O.B; Okerentugba, P.O; Okonko, I.O. 2013. Prevalence of Candida albicans among women attending health centres in Abeokuta, Ogun State, Nigeria. *N.Y Sc J.*, 6(9): 53 – 59.

Alli J.A.O; Okonta, J.O; Odu, N.N; Kolade, A.F; Nwanze, J.C. 2011. Detection and Prevalence of Candida isolates among patients in Ibadan, South-western, Nigeria. *Journal of Microbiology & Biotechnology Research*, 1(3): 176 – 184.

Annual Abstract of Statistics 2010. National Bureau of Statistics. Federal Government of Nigeria.

Cheesebrough, M. 2006. District Laboratory Practices in tropical countries. Part 2. Cambridge University Press, pp: 434.

Donders, G.G. 2002. Definition of a type of abnormal vaginal flora that is distinct from bacterial vaginosis: aerobic vaginitis. *Br J Obstet Gynecol.*, 109: 1- 10.

Dombraye-Emmanuel, O.O.B 2000. Isolation and Characterization of Group B Streptococci and other pathogens among pregnant women attending Adeoyo Maternity Hospital in Ibadan, Southwestern nigeria. AIMLT Thesis; University College Hospital, Ibadan.

Egan, M. E. and Lipsky, M. S. 2002. Diagnosis of Vaginitis. *Am Fam Physician*, 62(5):1095- 104.

Falagas, M.E; Betsi, G.I. 2006. Probiotics for prevention of recurrent vulvovaginal candidiasis: a review. *J Antimicrob Chemother.*, 58(2): 266 – 272.

Gor, H. B. 2015. Vaginitis. Available at http://www.emedicine. com/article/257141:medscape. Accessed 23/05/2016.

Okonkwo, N.J; Umeanaeto, P.U. 2010. Prevalence of Vaginal candidiasis among pregnant women in Nnewi town of Anambra State, Nigeria. *African Research Review*, Vol. 4(4) Serial No. 17: 39 -548.

Olawuji, O. 2011. The Prevalence of Bacterial vaginosis among women in urban areas in Nigeria and its major risk factors. Sexually Transmitted Infections; 87(1): A299-A300.

Onoh, C. C. 2014. Workplace Assessment of Diabetes and Hypertension in Some Selected Manufacturing Industries in Owerri, South-Eastern Nigeria; M.Sc. Thesis, University of Port Harcourt, Nigeria.

Onoh, C. C; Nwaogazie, I. L. 2015. Assessment of Diabetes: Prevalence and prediction of risk of development in a manufacturing industry in Owerri, Nigeria. *International Journal of Current Advanced Research*, 4(8): 341- 346.

Petrova, M. I; Lievens, E; Malik, S; Imhole, N; Labeer, S. 2015. Lactobacillus species as biomarkers and agents that can promote various aspects of vaginal health. *Frontiers in Physiology*, 6.

Olugbenga, A.O; Olufunmilola, B.M; Olewe R; Danie,l A.A. 2014. Prevalence of Vulvovaginal Candidiasis and Bacterial vaginosis among pregnant women receiving antenatal care in Southwestern, Nigeria.

Sobel, J.D. and Faro, S. 1998. Vulvovaginal candidiasis: epidermiologic, diagnostic and therapeutic considerations.

American Journal of Obstetrics & Gynecology, 178(2): 203 -211.

Sobel, J.D 2007. Vulvovaginal candidiasis. *Lancet*; 369 (9577): 1961 -71.

Sobel, J.D. 2005. Genital Candidiasis. *Medicine*; 33(10): 62 -65.

Tansarli, G. S; Kostaras, E, K; Anthanas, S; Falagas, M. E. 2013. Prevalence and treatment of Aerobic vaginitis among non- pregnant women: evaluation of the evidence for an Underestimated clinical entity. *European Journal of Clinical Microbiology & Infectious Diseases*, 32(8): 977- 84.

****