**“Prevalence Of Vulvovaginal Candidiasis Among Female Students in Abia State University Teaching Hospital Aba, Nigeria”**

**ABSTRACT**

**Aim:** This study was aimed to investigate the prevalence of vulvovaginal candidiasis among female students in Abia State University Teaching Hospital Abayi, Aba.

**Study Design:** A cross-sectional study design was incorporated, utilizing a structured questionnaire to acquire the demographic information of the participants.

**Methodology:**100 High vaginal samples (HVS) and/or vaginal samples (VS) were taken from the study participants. These samples were analyzed with standard microbiology techniques. The swabs were cultured in Sabrouaud Dextrose Agar (SDA) and incubated at 37oC for 48hours. A wet mount was microscopically observed to identify the presence of yeast cells and Gram staining was subsequently conducted. Germ tube test was carried out for the differentiation of *Candida albicans* from other species of *Candida*. Biochemical tests were also carried out for further identification.

**Result:** Out of the 100 samples analyzed, a distribution rate of 28% vulvovaginal candidiasis was obtained from this study. Out of the 28 positive samples 20(71.4%) were *Candida albicans* while 8(28.6%) were *Candida tropicalis*. The age distribution of vulvovaginal candidiasis among female subjects age range of 22-26 years had the highest distribution of 14(50.0%) while age between 27-31 showed the least distribution of 5(17.9%) Out of 7 students who wore very tight underwear 5(17.9%) tested positive. The distribution of vulvovaginal candidiasis in relation to vaginal discharge /discomfort was 21(75.0%). In relation to the number of sexual partners had the highest distribution of 19(67.9%).

**Conclusion:** These findings indicate a notably high prevalence of vulvovaginal candidiasis among female students at Abia State University Teaching Hospital, Aba, highlighting the need for enhanced personal hygiene practices and improved hostel sanitation.

**Keywords**: prevalence, vulvovaginal candidiasis, *Candida albicans*, *Candida tropicalis*, germ tube.

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1. **INTRODUCTION**

Candidiasis generally, is an opportunistic infection caused by a fungus, *Candida*. The Fungi are endogenous in man, occurring as part of the harmless commensals of the genital, gastrointestinal and respiratory tracts, human oral and other surfaces. Establishing *Candida* as the cause of vaginitis can be a difficult task, for the fact that, as many as 50% of asymptomatic women do have *Candida* as part of their endogenous vaginal flora; hence limitations of signs and symptoms in the diagnosis of vaginal infection has been recognized (Akinbiyi *et al*., 2008).

Vulvovaginal candidiasis (VVC) is a superficial yeast infection of the female lower genital tract, the vulva, and the vagina (Emeribe *et al*., 2015) and it is characterized by curd-like vaginal discharge, itching, and erythema, (Achkar *et al*., 2010). It can be referred to as Candidiasis or Moniliasis. It is mostly caused by an overgrowth of the commensal pathogen *Candida* species. *Candida albicans* was known to be the primary pathogen responsible for the infection, however, an epidemiological shift toward non-*Candida albicans* (NCA) is now observed across the globe. Other species such as *Candida glabrata,* *Candida krusei*, *Candida tropicalis*, *Candida akabanensis*, and *Candida parapsilosis* are emerging causative agents (Sobel, 2005) and in some clinical settings in a higher proportion than *Candida albicans*. Alarmingly, co-infection of *Candida albicans* and non-*Candida albicans* species (NCA) has been also reported. *Candida albicans* is the causative agent in most cases (El Ahmed *et al*., 2012). Under normal circumstances, the *Candida* Species are held in check by normal body defenses together with other members of the normal flora. For instance, the acidity of the vagina is maintained at pH 4.0-4.5 (Nyirjesy *et al*., 2008). This acidity level prevents some vaginal pathogens from establishing. However, physiological changes in the balance of the body system would affect both beneficial and harmful yeasts, bacteria and other organisms in the body. This accordingly would alter the acidity of the vagina reducing it to pH 5.0-6.5, thereby giving room for the establishment of pathogenic organisms such as *Candida* (Akinbiyi *et al*., 2008). Vaginal pH may increase with age, phase of menstrual cycle, sexual activity, contraception choice, pregnancy, presence of necrotic tissue or foreign bodies, and use of hygienic products or antibiotics (Nyirjesy *et al*., 2008).

Vulvovaginal Candidiasis (VVC) is classified by the World Health Organization (WHO), as a pathological condition that affects millions of women annually, it causes significant discomfort, interferes with sexual and intimate relationships, impairs work performance, and it is considered a major global public health concern. Vulvovaginal candidiasis is asymptomatic in about 20 to 50% of healthy women (Ali, 2011). Vulvovaginal candidiasis sometimes referred to as Vulvovaginitis can be recurrent or relapsing and its prevalence has been observed to be on the increase. Approximately 75% of the female population suffers at least one episode during their lives (El Ahmed *et al*., 2012; Emeribe *et al*., 2015). They added that most healthy women have at least 1-2 episodes of Vulvovaginal candidiasis during their reproductive years (Ferris *et al*., 2002). Similarly, Eckert *et al*. (2004); Emeribe *et al*. (2015) proposed that about 50% of university female students will by the age 24-25 years have had at least one episode of Vulvovaginal candidiasis investigated by a physician. This increase has been suggested to be due to multiple interacting risk factors for the infection. Extended use of broad-spectrum antibiotics, pregnancy and underlying diseases such as poorly managed diabetes mellitus and HIV/AIDs, contraceptives, tightfitting clothing, poor female hygiene as well as the use of tampons and vaginal douching have been observed by researchers as risk factors or socio-economic factors associated with vaginal candidiasis. Poorly associated risk factors including the use of intrauterine devices (IUDS), diaphragms, sponge, oral-genital sex, condoms, intercourse and diet with high glucose content has been mentioned (Akingbade *et al*., 2013).

This study also reported that only women already colonized with *Candida* are at risk of Vulvovaginal candidiasis following antibiotic treatment. It is thought that the association of vulvovaginal candidiasis and antibiotics is due to the fact that antibiotic use leads to the depletion of the vaginal bacterial microflora, which represents the dominant vaginal defense mechanism against *Candida*. The vaginal microbiota of healthy premenopausal woman is predominantly populated by *Lactobacillus* species (Cribby *et al*., 2008). In fact, *lactobacilli* are thought to be involved in several defense mechanisms against *Candida*. One proposed mechanism is that *Lactobacillus* species compete with *Candida* species for nutrients; however, a ‘‘shoulder-to shoulder’’ survival for *lactobacilli* and *Candida* has been shown on an experimental basis, proving that this is not the most effective mechanism. More importantly, lactobacilli compete with *Candida* cells for adhesion sites, such as epithelial receptors, to which *Lactobacillus* has higher affinity (Barbe, 2006). Some studies have found a decreased adhesion of *Candida albicans* to vaginal epithelial cells when *Lactobacillus* is present in comparison with the adhesion observed when only *Candida* is present (Boris and Barbe’s, 1998). *Lactobacilli* secrete biosurfactants that physically decrease *Candida* binding.

Some habits of feminine hygiene and clothing have been proposed as potential behavioral factors that predispose to vulvovaginal candidiasis and recurrent vulvovaginal candidiasis. The use of tight or poorly ventilated clothing and/or use of synthetic underwear have been associated with Vulvovaginal Candidiasis development by some authors. A Brazilian study found higher incidence of vulvovaginal candidiasis in women who use tight and/or synthetic underwear (65.8%) than in women who not use those type of clothing (39.1%) (Holanda *et al*., 2007). Furthermore, an Italian study found a more common use of synthetic underwear in Recurrent Vulvovaginal Candidiasis patients (36.8%) than in patients with no recent history of Vulvovaginal Candidiasis (26.0%) (Corsello *et al*., 2003). Thus, some authors propose that the use of well-ventilated and cotton underwear could be of value in preventing vulvovaginal candidiasis.

1. **MATERIALS AND METHODS**

This study was carried out in Medical Microbiology Laboratory, Abia State University Teaching Hospital, Aba, Nigeria. A total of 100 High vaginal samples (HVS) and/or Vaginal samples (VS) were taken from the study participants, utilizing a structured questionnaire to acquire their demographic information. These samples were analyzed with standard microbiology techniques. The swabs were cultured in Sabrouaud Dextrose Agar (SDA) and incubated at 37oC for 48hours. A wet mount was microscopically observed to identify the presence of yeast cells and Gram staining was subsequently conducted. Germ tube test was carried out for the differentiation of *Candida albicans* from other species of *Candida*. Biochemical tests were also carried out for further identification.

1. **RESULTS**

Table 1 shows the isolation and characterization of *Candida* species involved in the infection. Out of 9 positive samples from female study subjects aged 17-21 screened for vaginal candidiasis, 7(35.0%) were *Candida albicans* while 2(25.0%) were *Candida tropicalis*. The age range 22-26 years, out of 14 positive samples, 11(55.0%) were *Candida albicans* while 3(37.5%) were *Candida tropicalis*. Furthermore, in 5 positive samples from female study subjects aged 27-31 screened for vaginal candidiasis, 2(10.0%) were *Candida albicans* while 3(37.5%) were *Candida tropicalis.* Out of 100 high vaginal swab (HVS) samples from female study subjects aged 17-31 with mean age of 24.1 screened for vulvovaginal candidiasis, 28(28.0%) gave positive culture. The age distribution of vulvovaginal candidiasis among female subjects screened showed that the age range 22-26 years had the highest distribution of 14(50.0%). This was closely followed by subjects aged 27-31 years showed the distribution of 5(17.9%).

Yeast isolates gotten from positives cultures were identical using Gram staining method and the isolates were further identified using biochemical tests. Table 2 shows the morphological and biochemical characteristics of yeast isolates from High Vaginal Swab (HVS) of female students in Abia State University Teaching Hospital, Aba.

Table 3 shows the distribution of vulvovaginal candidiasis based on underwear tightness. Those who wore very tight under wears showed the highest distribution of 5(17.9%) positive, followed by those who wore tight under wears 16(57.1%) and then loosed ones 7(25.0%).

Table 4 shows the distribution of vulvovaginal candidiasis in relation to vaginal discharge/ discomfort. Based on the data collected, it was shown that 69 out of the 100 female students had vaginal discharge/ discomfort, while 31 had none. Out of the 69 students that had vaginal discharge/ discomfort, 21 tested positive and had the highest distribution of 75.0%.

**Table 1. Isolation and characterization of the *Candida* species involved in the infection and its distribution in relation to age of the study subjects**

|  |
| --- |
| **Age (years) No. Examined No. Positive *Candida albicans Candida tropicalis*** |

17-21 31 9(32.1%) 7(35.0%) 2(25.0%)

22-26 43 14(50.0%) 11(55.0%) 3(37.5%)

27-31 26 5(17.9%) 2(10.0%) 3(37.5%)

TOTAL 100 28(28.0%) 20(71.4%) 8(28.6%)

X2 =16.523, *P*-value =0.001, Significant at *P*<0.05

**Table 2. Morphology and Biochemical characteristics of yeast isolates**

|  |
| --- |
| **Morphology Sugar Assimilation Sugar Fermentation Other Reactions** |

G M L S G M L S U GT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Candida albicans* | 4-6 micrometer, white, smooth, creamy, hyphae, Pseuodohyphae, and spherical budding. | + + - + | AG AG - A\* | * + |
| *Candida tropicalis* | 4-8 micrometer, white, creamy texture, with slightly wrinkled edge, Pseudohyphae, and spherical budding. | + + - + | AG AG - AG | + + |

Keys: + =Positive, - =Negative, \* =Strain variation, G =Glucose, M =Maltose, L =Lactose, S =Sucrose, U =Urease, GT =Germ tube, AG =Acid and Gas.

**Table 3. Distribution of Vulvovaginal Candidiasis in Relation to the type of Under wear**

|  |  |  |  |
| --- | --- | --- | --- |
| **Under wear used** | **No. Examined** | **No. Positive** | **No. Negative** |
| Very tight | 7 | 5(17.9%) | 2(2.8%) |
| Tight | 65 | 16(57.1%) | 49(68.1%) |
| Loosed | 28 | 7(25.0%) | 21(29.1%) |
| TOTAL | 100 | 28(28.0%) | 72(72.0%) |

X2 =7.99, *P*-value=0.02, Significant at *P*<0.05

**Table 4. Distribution of Vulvovaginal Candidiasis in Relation to Vaginal Discharge/Discomfort**

|  |  |  |  |
| --- | --- | --- | --- |
| **Vaginal discharge/discomfort** | **No. Examined** | **No. Positive** | **No. Negative** |
| Yes | 69 | 21(75.0%) | 48(66.7%) |
| No | 31 | 7(25.0%) | 24(33.3%) |
| TOTAL | 100 | 28(28.0%) | 72(72.0%) |
|  |  |  |  |

**Table 5. Distribution of Vulvovaginal Candidiasis in Relation to the Number of Sexual Partners**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Age(years)** | **No. Examined** | **No. Positive** | **0** | **1** | **2** | **3** | **>3** |
| 17-21 | 31 | 9 | 3 | 5 | 1 | 0 | 0 |
| 22-26 | 43 | 14 | 4 | 10 | 0 | 0 | 0 |
| 27-31 | 26 | 5 | 0 | 4 | 0 | 1 | 0 |
| TOTAL | 100 | 28(28.0%) | 7(25.0%) | 19(67.9%) | 1(3.6%) | 1(3.6%) | 0(0.0%) |

Keys: 0=participants who admitted not having any sexual partner, 1=participants who admitted having one sexual partner, 2=participants who admitted having two sexual partners, 3=participants who admitted having three sexual partners, >3=participants who admitted having more than three sexual partners

Table 5 shows the distribution of vulvovaginal candidiasis in relation to the number of sexual partners. A further analysis of the distribution of vaginal candidiasis according to sexual partners showed that those who admitted to having one sexual partner had the highest distribution 19(67.9%) of vulvovaginal candidiasis, followed by those who admitted not having any sexual partner. Those who admitted to having two sexual partners recorded a distribution of 3.6% (1/28), those who had three sexual partners recorded a distribution of 3.6% (1/28). While there was no student who admitted of having more than three sexual partners.

**4. DISCUSSION**

This study investigated the prevalence of vulvovaginal candidiasis among female students in Abia State University Teaching Hospital, Aba, Nigeria. The study was performed based on various parameters which included subjects age, type of underwear, clinical symptoms of vaginal discomfort/ discharge, and the number of sexual partners. The results of this study have established the existence of vaginal candidiasis among female students in Abia State University Teaching Hospital, Aba, Nigeria at(*P*<0.05) among different age groups. As observed by Sobel *et al*. (2005), Vulovaginal candidiasis is a yeast infection that affects so many women of reproductive age. Similarly, Brande *et al*. (2006) estimated that 75% of all women will experience at least one symptomatic yeast infection during their lifetimes. From this study, it can be seen that up to 20.0% of women examined are infected with vaginal candidiasis. This finding is however lower than the estimated (Brande *et al*., 2006).

Based on the results of isolation and characterization of *Candida* species, the study showed that *Candida albicans* had the highest occurrence 71.4% compared to *Candida tropicalis* which had 28.6% occurrence lower than *Candida albicans*. Previous diagnosed cases showed that *Candida albicans* infection occurred in the vast majority of the patients while infections with *Candida tropicalis* occurred less frequently (Ezeigbo *et al*., 2015; Faraji *et al*., 2012). This is mostly due to the fact that a *Candida albicans* infection stems from the commensal population of the organism in the human microflora (Guzel *et al.,* 2006). Vulvovaginal candidiasis is caused by the abnormal growth of *Candida albicans* which is usually due to an imbalance in the vagina. Events that can spark an imbalance may include antibiotics use, which can decrease the amount of *Lactobacillus* bacteria which in turn decreases the acidic products and the pH of the vagina (Nwadioha *et al*., 2010). Other events are pregnancy, uncontrolled diabetes, impaired immune system and vaginal irritation (Nyirjesy *et al*., 2008). *Candida albicans* are able to take advantage of the conditions and out-complete the normal microflora resulting in candidiasis or yeast infection.

Based on the age group of the subjects, it was observed that those between the ages of 22-26 had the highest distribution of 50.0% of vaginal candidiasis, followed closely by those between the ages of 17-21 with a distribution of 32.1% and the least was observed among ages of 27-31 (17.9%). There was statistically significant of relationship between the prevalence of vulvovaginal candidiasis with Age (*P*<0.05). High sexual activity with this age group may be responsible for the high distribution recorded (Emeribe *et al*., 2015). This is also a pointer that sexual activity is a risk factor for Vulvovaginal candidiasis even though it is not a sexually transmitted disease. This study revealed that students who are at the peak of their reproductive age are more vulnerable to infections. This observation is consistent with the reports of (Muller, 2003; Emeribe *et al*., 2015; Ezeigbo *et al*., 2015) who revealed that women in their reproductive years were more prone to vaginal candidiasis compared to other age groups. This according to them is because estrogen which induces the lining of the vagina to mature contain glycogen; a substrate on which *Candida albicans* thrives. Thus, the lack of estrogen production in younger and older women makes vulvovaginal candidiasis much less common in these age groups, but in contrast to (Alo *et al*., 2012), who reported 36-40 years old women as highest vulvovaginal candidiasis prevalent age group.

This study revealed the prevalence of Candida species from the High Vaginal Swab samples of female students. The yeast isolates include *Candida albicans* and *Candida tropicalis*. The result gotten revealed 71.4% *Candida albicans* which showed colonial and morphological characterization on Sabouraud Dextrose Agar while 28.6% were *Candida tropicalis*. These results are in consistent with the reports of Nelson *et al*. (2013) and Emeribe *et al*. (2015). They revealed that about 90% of this infection is caused by *Candida albicans* and 10% by non-*Candida* species. Since *Candida albicans* is the most causative pathogen for vulvovaginal candidiasis, the isolation of non-*Candida albicans* species from High vaginal swab is rare (Makanjuola *et al*., 2018). Detection of *Candida albicans* is somewhat easier and could be done using wet preparation and germ tube, however, confirming non-*Candida albicans* isolates requires extra diagnostic techniques such as Sugar assimilation, Sugar fermentation and Urease tests (Leaw *et al*., 2007). The higher prevalence was reported in Uganda (45%) (Mukasa *et al*., 2013)) and interestingly this study adopted Sugar assimilation, Sugar fermentation and Urease tests. This can be compared to a lower prevalence reported in Kenya (25%) in which wet preparation was used to identify Vulvovaginal candidiasis (Nelson *et al*., 2013).

Our results shown a higher distribution of 17.9% was recorded for the use of very tight under wears. The use of very tight under wears reduce airflow which may increase moisture and warmth status of vagina thereby encouraging yeast infections (Ferrer, 2000). These conditions have been observed to support and promote the growth of *Candida albicans* in the vagina, resulting in infections (Akingade *et al*., 2013). Tight garments can also reduce healthy blood circulation. This agrees with the findings made by (Nwadioha *et al*., 2010) on the etiologic agents of abnormal vaginal discharge among females of reproductive age in Kano, Nigeria.

Our study showed high percentage rate of vaginal discomfort/discharge 75.0% than those with no vaginal discomfort/discharge 25.0%. This report is in agreement with the findings of Jumbo *et al*. (2010). It is reason to say that young women consult health care centers more often than women without such symptoms (Jumbo et al., 2010). Fule *et al*. (2015) found this to be the major symptom in 52.4% of their subjects of Vulvovaginal candidiasis and Ugwa (2015) found this to be the most common symptom in 47.4% of their cases. *Candida* positivity in female students presenting vaginal discharge was 30.4% which is similar to a report by Fule *et al*. (2015). Significant relationship between vulvovaginal candidiasis and vaginal discomfort/discharge (*P*<0.05) was observed.

A distribution rate of 67.9% was observed in those that admitted to having just one partner. The high distribution of vulvovaginal candidiasis among those with only one sexual partner observed in this study may be due to the fact that the majority of the sampled participants admitted having only one sexual partner. However, the reason for the low distribution among females with multiple sexual partners is not clear and warrant additional investigation.

**4. CONCLUSION**

This report revealed the prevalence of vulvovaginal candidiasis among female students in Abia State University Teaching Hospital, Aba to be 28.0%; 28 out of 100, which was considerably higher than that of non-candidiasis (72 out of 100). 28% prevalence obtained in this study is high. Number of sexual partners, tight under wears, age, ignorance as well as poor personal hygiene, have been implicated as possible risk factors which has influenced the high rates observed in this study. Not only is it a life-threatening infection in its complicated form, it poses a lot of discomfort and embarrassment to infected women. Prevention of vaginal candidiasis may include avoiding risk factors which influence the development of this infection. Therefore, effective prevention and control measures should be promptly designed to reduce the rate of female students exposed to these risk factors and favorably, minimize the rate of vulvovaginal candidiasis generally in women.

**CONSENT AND ETHICAL APPROVAL**

An introductory letter was obtained from Abia State University Teaching Hospital Research Ethical Committee. Privacy and confidentiality were observed at all stages of this study.

**COMPETING INTERESTS**

Authors have affirmed that no competing interests exist.

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