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Research Article

Prevalence of Vulvovaginal Candidiasis Amongst Undergraduate Female Students of a Southwest University in Nigeria

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Abstract

One of the infection that affects women of reproductive age which is difficult to hide based on the discomfort presented is vaginal candidiasis. This study was conducted to investigate the level of vaginal discharge causing fungal infection among undergraduate female students of the university. High vaginal swab (HVS) were collected from 150 female students of the Federal university of Technology Akure. Ondo State, Nigeria. between September 2024 to May 2025, aged 16 – 30 years that visited the University Health Centre with complaints and symptoms viz a viz; discomfort, painful urination, discharge and intense itching in the vagina, etc. Laboratory analysis was conducted, HVS samples were processed, identified microscopically, culturally and biochemically using standard procedure. The prevalence of vaginal candidiasis among female undergraduate students diagnosed was 32 (21.3%) of the 150 participants. Out of the 32 positive samples 28 (87.5%) were *Candida albicans* while 4 (12.5%) were *Candida tropicalis*. In the age distribution of the study, 16-18 years was 8 (25%), 19 -24 years was 18 (56.25%) and 25 -30 years was 6 (18.75%). The most highest distribution of the study were within 19 – 24 years which accounted for 56.25% (18) while age 25 - 30 years accounted for 6 (18.75%) which indicated the least distribution. The findings indicate low prevalence of vulvovaginal candidiasis among female students of the Federal university of Technology, Akure. Nigeria. However, though the prevalence was low but significant, therefore efforts to enhance and improve hostel sanitation, personal hygiene and minimize use of tight pants are better approach to reduce it occurrence thereby curtail the risk of the fungal infection.

Keywords

Undergraduate Female Students, Prevalence, Vulvovaginal Candidiasis, Discharge, Infection

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1. Introduction

Vulvovaginal candidiasis also known as a yeast infection is a fungal infection primarily caused by *Candida* yeasts. ln healthy. Vulvovaginal candidiasis commonly known as a vaginal yeast infection of the vagina and vulva caused by an overgrowth of *Candida* yeast. Vulvovaginal candidiasis (VVC) is one of the most common causes of vulvovaginalis affecting approximately 70 -75% of women at some point or multiple times during their lifetime [5]. lt is the most common vagina infection affecting women of reproductive age, which was caused by the fungus *Candida albicans* while non- albicans species account for the remaining 10%. Epidemiological data indicate that up to 75% of women experience at least one episode of vulvovaginal candidiasis with 5 -10% developing recurrent vulvovaginal candidiasis [7]. *Candida albicans* cause human disease and holding growing clinical significance. These organisms pose multiple challenges, including difficulty in clinical and microbiologic differentiation from *Candida albicans* reduced susceptibility to commonly prescribed antifungal agents and an increasing prevalence worldwide [3, 22]. Over 200 species of *Candida* have been identified with approximately 20 known to cause human infections [18]. Vulvovaginal candidiasis can occur due to hormonal changes e.g. pregnancy, oral contraceptive use and menopause as well as the treatment of infections (e.g. bacterial vaginosis and trichomoniasis), which disrupts the microbiome in the vagina, allowing for *Candida* to overgrow vulvovaginal *Candida* infection. *Candida albicans* is the etiology of approximately 40% to 90% of the cases with the remainder due to species other than *Candida albicans* [8]. The use of products e.g. vaginal sprays, spermicides, and douches can also increase the risk of vulvovaginanitis, as well as wearing tight- fitting, wet or perspiration –soaked clothing [21]. Symptomatic vulvovaginal candidiasis is also more common among women with HIV infection. lt correlate well with the severity of immunodeficiency, with the most common cause of vulvovaginal candidiasis in these patients being *Candida albicans* [20]. Vulvovaginal candidiasis is classified by World Health Organization (WHO) as a pathological condition that affects million of women annually. lt causes significant discomfort, interferes with sexual and initimate 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 [4]. Poorly associated risk factors including the use of intrauterine devices (lUDS), diaphragms, sponge, oral-genital sex, condom, intercourse and diet with high glucose content has been mentioned [2]. *Candida albicans* is mostly caused by the overabundance of an opportunistic pathogenic yeast. *Candida albican*s (approximately 90%), which is a common member of the vagina flora. [10, 13]. reported that “only women already colonized with *Candida* are at risk of vulvovaginal candidiasis following antibiotic treatment. lt is thought that the association of vulvocandidiasis and antibiotics is due to the fact that antibiotic use leads to the depletion of the vaginal bacterial microflora, which represents the dominant vaginal defence mechanism against *Candida”*.

Candida vulvovaginal likely occurs from the migration of yeast from the rectum to the perineal region with subsequent vaginal colonization. Progression from asymptomatic colonization to symptomatic infection reflects a combination of factors, including organism overgrowth, penetration of the superficial epithelium, host inflammatory responses and *Candida* virulence factors [19].

2. Methods

2.1. Study Population

In this study, the sampling of female undergraduate students was conducted between September 2024 to April 2025. A total number of 150 suspected subjects of 16-30 years with signs and symptoms that visited the University Health Centre for consultation with the Clinicians. Requests were made to conduct the High vaginal swab test for culture.

2.2. Sampling Collection

High vaginal swabs (HVS) were collected aseptically with sterile cotton- tipped swab from female students aided by Medical laboratory Scientist. Thereafter, vaginal swabs were conveyed to the Microbiology laboratory, without delay where they were analyzed, identified, characterized and culture using standard laboratory techniques.

2.3. Laboratory Preparation for Examination and Culture

The swabs were cultured on Sabouraud Dextrose Agar (SDA) media. lt appeared opaque, pasty and pale coloured colonies. Wet preparation was made in 0.85% saline on grease free slides and examine microscopically to identify the presence of yeast cells.

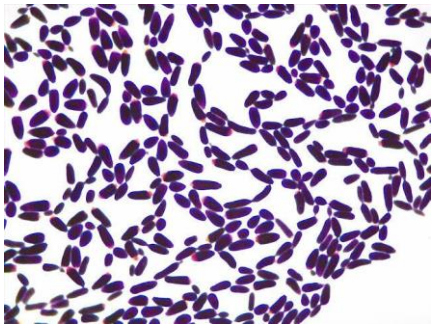

Figure 1. *Monograph showing gram stained positive coccibacilli of Candida albicans. (X1000).*

A single colony was picked using sterile inoculating wire to make smear on each of grease free slides and allowed to air dry. The Bursen burner was used to heat-fixed and stained properly. The slides were allowed to dry. A drop of oil emmersion was placed on the slides and examine microscopically using by X100 objective in the microscope.

2.4. Germ Tube Test (GTT)

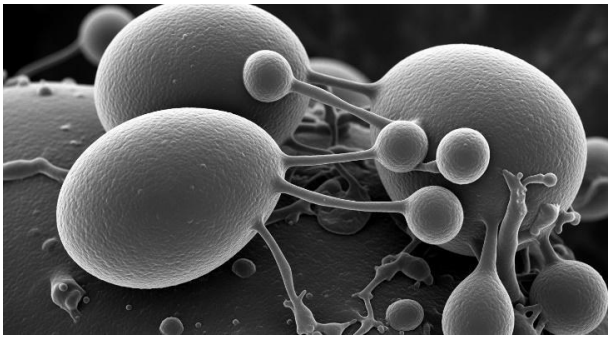

Figure 2. *Monograph showing germ tube test and hyphae (X1000).*

Germ tube test was carried out to distinguish the *Candida albicans* from other variants of Candida. 0.5mls of human serum was placed in a bijou bottle and inoculated with a yeast colony from cultured plate and incubated at 37°C for 2 hours. A drop of serum culture incubated was put on a grease free slide, cover with cover slip and examine microscopically with X10 and X40 objective respectively. Sprouting yeast cell revealed as germ tube was observed in *Candida albicans*.

2.5. Sugar Fermentation Test

Sugar fermentation test indicates the process whereby carbohydrate is fermented anaerobically by yeasts to produce ethanol and carbon dioxide. The fermentation is indicated by the production of acid and gas. Four set of labelled test tubes were arranged in a rack containing 5mls of 5% glucose, lactose, maltose and sucrose. The four tubes were inoculated by the yeast isolates in which inverted tubes were placed and incubated at 37°C for 24 hours. There was colour change from pink to stare yellow indicating fermentation of the sugars. Production of gas was trapped in the Durham's tubes.

2.6. Urease Test

Urease test was carried out to identify those organisms that are capable of hydrolyzing urea to produce ammonia and carbon dioxide. Yeast isolates were inoculated into Christensens Urea Agar. The media were incubated at 30°C for five days. And examined daily for a color change to pink which indicates the hydrolysis of urea.

2.7. Sugar Assimilation Test

Sugar assimilation test indicates the utilization of carbon source in the presence of oxygen. Yeast cell suspension to be identified was prepared in distilled water to a density equivalent to McFarland Standard NO. The surface of the Yeast Nitrogen Base Agar (YNBA) was covered with the yeast cell suspension. The excess suspension was aspirated using sterile Pasteur pipette and the agar surface was allowed to dry for 5 minutes. Sterile forceps was used to place the disc of the selected carbohydrates unto the agar surface, about 30mm apart from each other and the plate was inoculated at 30°C for 24 hours. The presence of growth was observed around each disc which indicates that a particular carbohydrate (glucose, lactose, sucrose maltose) has been assimilated by the yeast.

3. Results

ln the process of this study, vaginal swab samples were analyzed. Out of which 32 (21.3%) were diagnosed with vaginal candidiasis. Female students with the highest prevalence rate were in the age group of 19-24 years which was 18 (56.25%) next to it was in category of 16 -18 years 8 (25%) and the least prevalence rate was in age group of 25-30 years 6 (18.25%).

Table 1. *Age distribution and rate of Candida infection.*

Age (years)	No Analyzed	No Positive	*Candida albicans*	*Candida tropicalis*
16 -18	48	8 (25%)	7	1
19 -24	66	18 (56.25%)	15	3
25 -30	36	6 (18.75)	6	--
Total	150	32 (21.3%)	28 (87.5%)	4 (12.5%)

Out of the 150 undergraduate female screened 28 (87.5%) were diagnosed as *Candida albicans* while 4 (12.5%) was *Candida tropicalis.* Their identification features i.e. morphology, and biochemical characteristics were represented in.

Table 2. Morphology and biochemical characteristics of yeast isolates.

	Morpholeogy	Sugar Fermentation				Sugar Assimilation				Other reactions	
		G	M	L	S	G	M	L	S	U	GT
Candida albicans	4-6um white, smooth, creamy hyphae spherical budding	AG	AG	_	A*	+	+	_	+	-	+
Candida tropicalis	4-8um, white creamy, slightly wrinkled edge, pseudohyphae and spherical budding	AG	AG	_	AG	+	+	_	+	+	+

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

Table 3. Distribution of vaginal candidiasis in relation to vaginal discharge/ discomfort among the age of the subjects.

Ages	Vaginal discharge	Discomfort	Total
16 -18	30	15	45
19 -25	44	26	70
26 -30	23	12	35
Total	97 (65%)	53 (35%)	150

Table 3 illustrated the subjects that experienced vaginal discharge / discomfort. There was more subjects that encountered discharge which was greater within the age bracket of 19 -25 years accounting for 44 (45%) followed by 16-18 was 30 while 26 -30 was 23 (24%).

4. Discussion

Vulvovaginal candidiasis happened to be one of the common infections affecting young women in the higher institutions. Evidence of research according to [5, 23] supported this assertion indicating that 70 -75% of women at some point or multiple times during their lifetime encounter this infection.

From this study, it has revealed that 23.1% of women examined were infected with vaginal candidiasis among undergraduate female students of the Federal university of Technology, Akure, Nigeria. The prevalence rate of women varies between countries ranging from 12 -72%, the result of 23.1% align with the previous studies. [14, 18] Based on the result of identification and characterization of *Candida* species, the study showed that *Candida albicans* had the highest occurrence of 87.5% compared to *Candida tropicalis* which had 12.5% [19] opined that *Candida albicans* occur more frequently in patients than *Candida tropicalis* which occurred quite less. Since *Candida albicans* is the most causative pathogen for vulvovaginal candidiasis the isolation of non- candida albican species from high vaginal swab is rare. [15].

Based on the age group of the subjects it was observed that those between the age of 19-25 years had the highest distribution of vulvovaginal candidiasis 18 (56.25%) followed by 16-18 years with a distribution of 8 (25%) and the least was observed among ages of 26-30 years 6 (18.75%). There was statistically significant relationship between the prevalence of vulvovaginal candidiasis with age ($p < 0.05$). Similar lower prevalence rate as indicated by our study was also reflected and and reported by other researchers in Greece (12.1%) [9] United Arab Emirate (UAE) 13.88% [11]. lndia (20%) [17] Gabon (28.52%) [6] and Ghana (36.5%) [13]. The result of this study was low when compared with similar study of other female university students from another institution in Nigeria which was high. [16]. Similar studies that also reported lower prevalence of vulvovaginal candidiasis among non pregnant reproductive aged woman was in Yemen [1]. The study showed higher percentage rate of vaginal discharge 97 (65%) while those with discomfort was 53 (35%). This report agreed to the findings [12] that young women consult health care centre more often than women without such symptoms., whom were novice to knowledge of the infection thus prompted visitation for proper care and treatment in the clinic.

5. Conclusion

The reflection of the prevalence of vaginal candidiasis among female students of the university from the study was low nevertheless, it was significant able to cause severe infection if not properly treated, lt is imperative that more novel studies and knowledge of the incidence of vaginal candidiasis be undertaken as it is a global occurrence in reproductive age women.

Abbreviations

VVC	Vulvovaginal Candidiasis
GTT	Germ Tube Test
G	Glucose
L	Lactose
M	Maltose
S	Sucrose

A & G	Acid and Gas
U	Urease
HVS	High Vaginal Swab
HIV	Human Immunodeficiency Virus

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Author Contributions

Abiodun Akeem Akindele: Data curation, Formal Analysis
Bosede Rachel Oyedeji: Methodology, Investigation
Tokunbo Tinuade Adebolu: Conceptualization, Visualization, Writing – review & editing

Conflicts of Interest

The Authors declare that they have no competing interests.

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