Faculty of Natural and Applied Sciences Journal of Health, Sports Science and Recreation
Print ISSN: 3026-9644 e-ISSN: 3043-6346
www.fnasjournals.com
Volume 2; Issue 4; December 2025; Page No. 58-63.
DOI https://doi.org/10.63561/jhssr.v2i4.1110

Occurrence of Candida Species in Female Residents of Stella Hostel and Their Antifungal Susceptibility Patterns

***Hanson, A.H., Amadi-Ikpa, C.N., & Dike, B.C.**
Department of Microbiology, Faculty of Natural and Applied Sciences, Ignatius Ajuru University of Education, Rumuolomeni, Port Harcourt, Nigeria.

***Corresponding author email**: asikiya.hanson@iaue.edu.ng

Abstract
Candidiasis is a yeast infection which occurs as a result of overgrowth of Candida yeast especially Candida albicans due to weekened immune system and change in the pH of the female vagina. The pathogenesis of C. albicans depends on successful secretion of virulent factors. The production of these virulent factors triggers the change from a non-pathogenic C. albicans to a disease-causing organism which makes it possible for the pathogen to to thrive, survive within the host cell and cause infection as opportunity arises. The aim of this study is to determine the occurrence of Candida spp amongst female students of a tertiary institution in one of the Hostels. A total of 50 high vaginal swab samples were collected using sterile swab sticks with the aid of a speculum and inoculated on Sabouraud Dextrose Agar (SDA) plates and incubated at 370C for up tp 72 hours. Wet preparations were also made from colonies of SDA plates inserted into 1ml of normal saline and examined with X10 and X40 objectives. Occurrence of Candia spp from the study population was 80% with subjects between 20-24 years having the highest occurrence. The findings from study calls for a more targeted health education, improved personal hygiene practices and minimizing antifungal/antibiotic abuse.

Keywords: Candida albicans, Sabouraud Dextrose Agar, Vagina, Female

Introduction

Candidiasis is one of the most common mucosal fungal infections affecting women of reproductive age and is a frequent cause of genital discomfort, pruritus, dyspareunia and repeated healthcare visits (Nyirjesy, 2022). Surveillance studies and systematic reviews indicate that while *Candida albicans* remains the predominant species in many settings, *non-Candida albicans* constitute a substantial and growing proportion of vaginal isolates, a shift with important therapeutic implications because *non-Candida albicans* species often show reduced susceptibility to commonly used azoles (Yano et al. 2019). *Candida* yeasts are normal flora of the female genital organ but they are held in check by normal body defenses together with other members of the normal flora. However, candidiasis could result when certain predisposing conditions are established (Wemedo & Duke, 2020). The pathogenicity of *C. albicans* depends on successful secretion of virulence factors. The production of these virulence factors triggers the change from a non-pathogenic *C. albicans* to a disease-causing organism, which makes it possible for the pathogen to thrive, survive within the host cell and cause infection as the opportunity arises (Rossoni et al., 2013). Furthermore, according to Rossoni et al. (2013), the generation of virulence factors helps *Candida albicans* adhere to oral tissues, colonize, and avoid host defenses. The number of fungal infections brought on by yeast has skyrocketed over the last few decades (Sim, 2015). Among these, imperfect yeast, *Candida albicans,* and a number of related *Candida* species are crucial opportunistic pathogens in immune-compromised hosts that can result in potentially fatal infections (Sim, 2015). Okwelle and Bara-Hart (2020) examined the prevalence of vaginal candidiasis among female students at Ignatius Ajuru University of Education, Port Harcourt and noted out of the 150 female students who were sampled, an overall prevalence of 38 (25.3%) was found. With 18 (36%) of the 50 girls selected from each of the three hostels, Hostel A had the highest frequency, followed by Stella Hostel with 12 (24%), and Salvation Hostel with 8 (6%). According to the findings, students between the ages of 21 and 24 had a higher prevalence of yeast infection (18;

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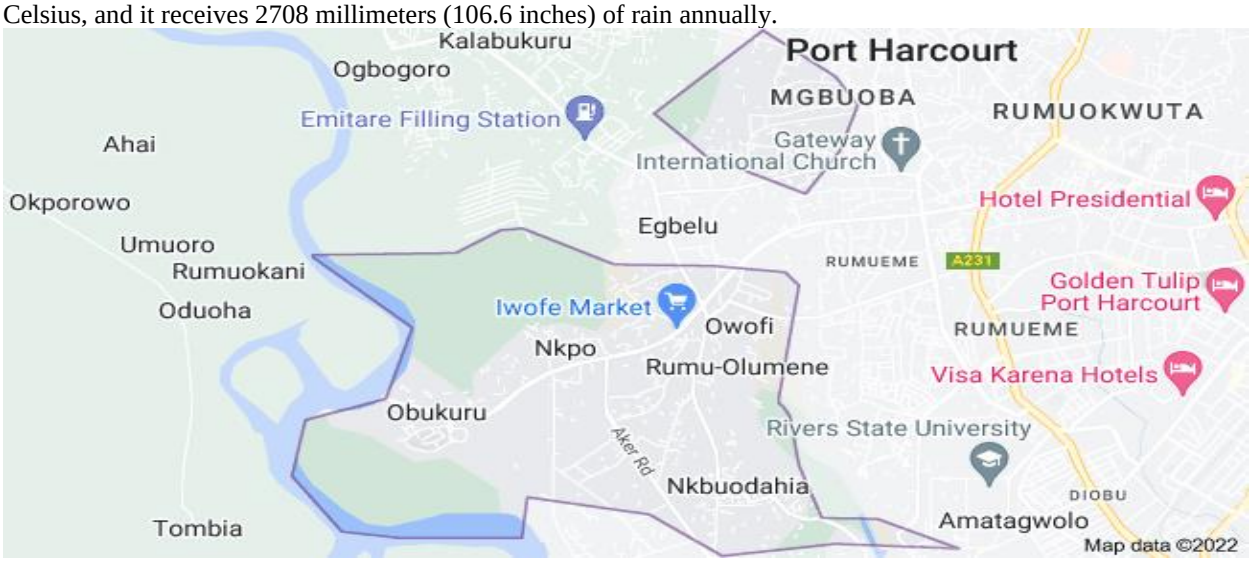
36%), but students between the ages of 17 and 20 and 25 and 28 had the same prevalence (20%). In yet another circumstance, Wemedo and Duke (2020) investigated the incidence of candidiasis amongst female students of a tertiary institution in Rivers State and they noted that that the yeast counts of Campus Hostels ranged from1.2 × 105 CFU/ml to 7.2 × 105 CFU/ml while counts of the control ranged from 1.9 - 6.2×105 CFU/ml. with Mean ± SD and percentage incidences of 4.9 ± 1.86 (25%), 3.4 ± 1.37 (18%), 4.6 ± 1.22 (24%), 2.7 ± 1.19 (14%) and 3.5 ± 1.48 (20%) for A, B, C, D, and control respectively. Incidence of *Candida* species during this study showed that of the 28 *Candida* species isolated, *Candida albicans* were 18 (64%) while other *Candida* species were 10 (25%). In a study conducted by Mushi et al. (2022) A total of 41 studies including 15 723 participants were included in the meta-analyses. The pooled prevalence of VVC was 33% (95% Confidence Interval (CI): 28-38%, I2 = 98%, P < 0.001). Pregnant women had 6% higher odds of having VVC compared to non-pregnant women Odds Ratio (OR): 1.06, 95% CI: 0.99-1.13, P = 0.107). The odds of diagnosing VVC were 40% higher in symptomatic patients than general study population (OR: 1.4, 95% CI: 1.3-1.5, P < 0.0001). In 17 studies, a total of 2112 isolates of *Candida* species were reported: 1514 (71.7%) *Candida albicans*, 510 (24.1%) *non-Candida albicans* species and 88 (4.2%) unidentified *Candida* spp. Of the *non-Candida albicans* species detected, *Candida glabrata* (40.9%, n = 209), *Candida krusei* (21.2%, n = 108), and *Candida tropicalis* (22.7%, n = 116) were the most common. Resistance to fluconazole in *Candida albicans* using disc diffusion methods ranged from 6.8% in Cameroon to 53.7% in Ethiopia. One-third of women in SSA have VVC, mainly caused by *C. albicans*. Data on the susceptibility of the *Candida* isolates to commonly used antifungal agents is limited and warrants further research. Antifungal susceptibility patterns among vaginal *Candida* isolates shows concerning trends. Large single-site and multicentre reports have documented emergence of fluconazole-resistant *C. albicans* strains and reduced azole susceptibility among several *non-Candida albicans* species; conversely, polyenes and echinocandins retain activity against many isolates but are less practicable for routine outpatient VVC management due to formulation, toxicity or cost considerations.

Materials and Methods

Study Area

Ignatius Ajuru University of Education is located between latitudes 4048'59.238"N and longitudes 6057'16.866"E. Stella Hostel was selected to represent the female hostels. The study area's temperature ranges from 21 to 33 degrees Celsius, and it receives 2708 millimeters (106.6 inches) of rain annually.



Sample Collection

Fifty female students of Ignatius Ajuru University of Education (Stella Hostel) were chosen at random. For this study, interested females between the ages of 20 and 44 were chosen at random. High vaginal swabs were taken from the vagina and rolled to collect vaginal discharge after each participant had received counseling and given their informed consent. After being appropriately labeled and packaged, the samples were sent right away to the research lab for microbiological examination.

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Culture Media Preparation
SDA medium was prepared according to the manufacturer's instructions for cultivation of the organisms. The diluent used was normal saline. To prepare, 8.5g sodium chloride (Nacl) was added to 1 liter of distilled water.

Cultivation of *Candidia albicans*
This involved streaking High vaginal swab sticks on Saboraud Dextrose Agar (SDA) medium and incubated at 370C for up to 72 hours (Ndukwu et al., 2016). To establish a pure culture, suspected *Candidia* species were subcultured onto brand-new, sterile SDA plates. On SDA, colonies were found to be smooth, shiny, and cream in color.

Direct Smear Examination
The criteria for candidiasis diagnosis were based on the presence of pus cells with budding yeast cells and pseudo-hyphae in direct gram-stained smear using the X100 objective. The smear was fixed with alcohol to avoid other absorption of stains by candida hyphae. Colonies from SDA plate were examined microscopically (wet mount preparation) with X10 and X40 objective.

Result

Candidiasis percentage occurrence among the study population
A total of 50 high vaginal swab (HVS) samples were collected and analyzed for candidiasis comprising fifty (50) female students. 40 (80%) were infected with candidiasis.
Table 1: candida percentage occurrence among students

No. examined	No. infected	Percentage occurrence (%)
50	40	80

Species occurrence of Candidiasis among the study population
From this study, two species of *candida* (*Candida albincans and Candida tropicalis*) were identified. *Candida albincans* had a percentage occurrence of 87.5% while *Candida tropicalis* had a percentage of prevalence of 12.5%. *Candida albincans* was the predominant species causing candidiasis.
Table 2: Species occurrence of Candidiasis among the study population

No. examined	*Candida* spp	No. isolated (%)
50	*Candida albicans*	35 (87.5%)
	Candida tropicalis	5 (12.5%)

Age related occurrence of Candidiasis
Age range 20-24 years had the highest percentage occurrence.
Table 3: Age related occurrence of Candidiasis

Age (years)	No. infected	Percentage occurrence
20-40	20	50
25-29	13	32.5
30-34	5	12.5
35-39	1	2.5
40-44	1	2.5

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Antifungal susceptibility pattern of isolated *candida* species
Fluconazole had the highest susceptibility pattern closely followed by Nystatin
Table 4: Antifungal susceptibility pattern of isolated candida species

Antifungal agent	Susceptibility pattern	No. susceptible	Percentage (%)
Fluconazole	+++	30	75
	++	9	22.5
	+	1	2.5
Voriconazole	+++	24	60
	++	14	35
	+	2	5
Nystatin	+++	29	72.5
	++	6	15.0
	++	5	12.5

Table 5: Candidiasis status in relation to symptoms

Total no. examined 50	Symptoms	Positive	Percentage (%)
	Genital itching	32	80
	Pain	28	70
	Vaginal discharge	30	75

Structured questionnaires were distributed to consenting female subjects to investigate the correlation between candidiasis and associated symptoms. It was discovered from the study that 80% of those infected with *candida* had genital itching while 75% had vaginal discharge. From the study, there was a correlation between candida and infection and symptoms.

Discussion
An overall prevalence of 80% was observed, which is markedly higher than values reported in several earlier studies among student populations in Nigeria and elsewhere. Okwelle and Bara-Hart (2020) reported a prevalence of 25.3% among female students in the same institution across three hostels, while Wemedo and Duke (2020) documented an incidence of 24%–25% in different hostels in Rivers State. Similarly, a meta-analysis by Mushi et al. (2022) estimated the pooled prevalence of vulvovaginal candidiasis (VVC) in sub-Saharan Africa at 33%. However, Kwame et al. (2023) reported a higher prevalence of 97.1% in females in a study carried out in University of Cape Coast region of Ghana, also Smart et al. (2020) in their findings had a *Candida albicans* prevalence of 61.8%. The significantly higher prevalence observed in the current study may reflect hostel-specific risk factors such as hygiene practices, shared facilities, self-medication, contraceptive use, and antibiotic exposure (Ishaku et al., 2016, Mtibaa et al., 2017).With respect to species distribution, *Candida albicans* was the predominant isolate (87.5%), while *C. tropicalis* accounted for 12.5%. This finding is consistent with the global pattern in which *C. albicans* remains the dominant species causing VVC (Mushi et al., 2022; Nyirjesy, 2022, Smart et al., 2020). However, the detection of *C. tropicalis* underscores the emerging role of non *Candida albicans* species in vaginal infections. The presence of non *Candida albicans* species is clinically important because of their association with reduced susceptibility to commonly prescribed azole antifungals (Sobel, 2023). Age-related analysis revealed that infection was most prevalent among women aged 20–24

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years (50%). Denning et al. (2018) aligns with previous studies indicating higher prevalence among young adults, possibly due to increased sexual activity and other outdoor activities as they relate or associate with one another , hormonal fluctuations, overcrowding in most of the settlements, poor standard of living and use of contraceptives (Okwelle & Bara-Hart, 2020; Wemedo & Duke, 2020). The findings of this study were in agreement with the reports of, Nwachukwu et al., 2009, Smart et al., 2020 and Uzoewulu et al., 2014 who also reported a higher prevalence within age group 21-40 years. Lower prevalence in older women could be attributed to hormonal decline and changes in vaginal ecology with age. Antifungal susceptibility testing revealed that fluconazole exhibited the highest susceptibility (75%), followed by nystatin (72.5%) and voriconazole (60%). Mtibaa et al. (2017) is in agreement with earlier reports highlighting fluconazole as an effective first-line therapy for VVC, though increasing resistance trends have been documented in sub-Saharan Africa (Mushi et al., 2022; Sobel, 2023). Other studies by Smart et al. (2020) revealed that Voriconazoie had a higher susceptibility pattern closely followed by Fluconazole and then Nystatin which aiso agrees with t youhe study conducted by Pappas et al. (2004) and Lovacheva et al. (2005) which revealed that oral or parenteralazoles are frequently used for fungal infections and preferred to intravenous Amphotericin B. The relatively lower susceptibility to voriconazole in this study contrasts with some reports of high in vitro activity of newer triazoles against *Candida* spp., and may reflect local resistance dynamics (Donbraye-Emmanuel et al.,2010). These findings underscore the need for periodic antifungal susceptibility surveillance to guide empirical therapy and avoid treatment failures (Alli et al., 2011). The clinical correlation between candidiasis and symptoms in this study further strengthens diagnostic reliability. Most infected participants reported genital itching (80%), vaginal discharge (75%), and pain (70%), as characteristic features of VVC (Nyirjesy, 2022).

Conclusion

Overall, this study highlights an alarmingly high prevalence of vaginal candidiasis among Stella Hostel residents, with *C. albicans* as the predominant etiological agent, significant age-related distribution, and variable antifungal susceptibility patterns. The findings call for targeted health education, improved personal hygiene practices, judicious use of antibiotics, and routine local antifungal resistance monitoring in hostel populations.

Recommendation

The study therefore recommends that due to the evolving resistance landscape, therefore there is need for periodic, local susceptibility monitoring to inform empirical therapy and stewardship. Hence aid in tailoring local clinical guidance. The study in addition emphasized the importance of laboratory confirmation before treatment initiation

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