ORIGINAL RESEARCH REPORT

Candida species causing vulvovaginitis among patients in Babcock University Teaching Hospital, Ilishan-Remo, Ogun State: A retrospective cross-sectional study

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ABSTRACT

Background: Vulvovaginal candidiasis (VVC) is one of the most common infections in females. In recent decades, reports of incidence of non-albicans candida species causing VVC is increasing, and this has led to a lot of therapeutic failures. Thus, this study aimed to detect *Candida* species among women who presented with VVC in Babcock University Teaching Hospital (BUTH), Ogun State. **Methods:** This was a cross-sectional retrospective hospital-based study carried out in BUTH. *Candida* isolates from high vaginal swab of 82 women who presented with VVC at the gynecology and family medicine clinics of the hospital were retrieved for a period of 2 years, January 2019 till December 2020. The isolates were analyzed by standard medical microbiology technique. Information on sociodemographic and behavioral factors were retrieved from clinical case notes. The data were analyzed by IBM SPSS Statistics version 26. **Results:** The 82 isolates analyzed yielded 87 species of *Candida*. Out of the 87 isolates of *Candida*, the albicans species were 50 (57.5%) while the non-albicans were 37 (42.5%). Among the non-albicans species, 16 (43.2%) *Candida krusei* had the highest frequency while 7 (19.0%) *Candida tropicalis* had the least and the other isolates that are unidentified by CHROMagaar accounted for 14 (37.8%). *Candida albicans* was predominant among 12/18 (66.7%) participants with present multiple sex partners. *C. albicans* was significantly associated with hormonal contraceptives and *C. krusei* with wearing of tight and nylon underwear, respectively, on bivariate analysis ($P < 0.05$). **Conclusion:** *C. albicans* was the predominant identified species from this study; however, the prevalence of the non-albicans candida species was still high.

Key words: *Candida albicans*, *Candida krusei*, CHROMagar, non-albicans candida, vulvovaginal candidiasis

INTRODUCTION

Candida species are fungi that may cause opportunistic infections under various circumstances that compromise host immunity.[1] However, vulvovaginal candidiasis (VVC) is one of the most common infections seen both in immunocompetent and immunosuppressed women. Asymptomatic colonization has been attributed to the high incidence of VVC in women.[2]

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VVC is a common infection reported to affect 75% of women of childbearing ages while 5% experience recurrent vulvovaginitis in their lifetimes.[3] Although pregnancy increases the severity and duration of VVC in women, it is also an infection of all ethnicities and social classes.[4] In Nigeria, an estimated 44.8% of VVCs have been reported among nonpregnant women.[5] VVC causes discomfort in most women because of the presence of curd-like vaginal discharge, itching, and erythema.[6,7] VVC has been associated with enhanced susceptibility to human immunodeficiency virus infection and poor socioeconomic life and is being investigated for a potential relationship with preterm birth.[8-10] VVC has been reported to account for many gynecological visits worldwide.[1]

Candida albicans is the most prevalent cause of VVC worldwide, but in recent times, other species of *Candida* such as *Candida glabrata, Candida tropicalis,* and *Candida parapsilosis* have emerged.[11] The incidence of non-albicans VVC has been reported to be increasing over the past decades.[12-14] The emergence of non-albicans species is a serious global health problem for women because it has led to an increased rate of resistant strains of *Candida* agents of vulvovaginitis.[11,15] Therefore, knowledge of patterns of genital *Candida* species is important for clinicians, as non-albicans species often fail first-line treatment.[16] Therefore, this study aims at the detection of the *Candida* species causing vulvovaginitis among patients attending the gynecology and family medicine clinics of Babcock University Teaching Hospital (BUTH) in Ogun State.

METHODS

This was a cross-sectional retrospective hospital-based study carried out in BUTH. High vaginal swab *Candida* isolates of 82 women who presented with VVC at the gynecology and family medicine clinics of BUTH were retrieved for a period of 2 years, January 2019 till December 2020. Ethical approval was obtained from BUTH before the commencement of the study. Information on sociodemographic and behavioral factors were retrieved from clinical case notes. Furthermore, participants whose isolates were retrieved were contacted by phone for consent and additional information.

The isolates were subcultured on Sabouraud dextrose agar, and presumptive identification was done by Gram staining and germ tube test. *C. albicans* (American Type Culture Collection 90028, SC5314) was used as the control strain. The species were identified by putting the isolates on CHROMagar (Biocell Laboratory Ltd, Zhengzhou, China) plates and incubated for 24–48 h at 37°C [Figure 1]. The result was interpreted based on the manufacturer's instruction and previously described methodology and previous literature.[17]

All the data were analyzed by SPSS version 23 (IBM Inc., Chicago, Illinois, USA). Standard deviations and means were used for quantitative variables analysis while proportions were derived for qualitative variables. Association between categorical variables association was determined using Chi-square test at a statistical significance level of 0.05.

RESULTS

Out of the 82 patients whose isolates were recruited for the study, 46 (56.1%) were married, 44 (53.7%) had tertiary education, and 4 (4.9%) had recurrent candidiasis. The age of the patients ranged from 15 to 45 years while the mean age was 29 years [Table 1].

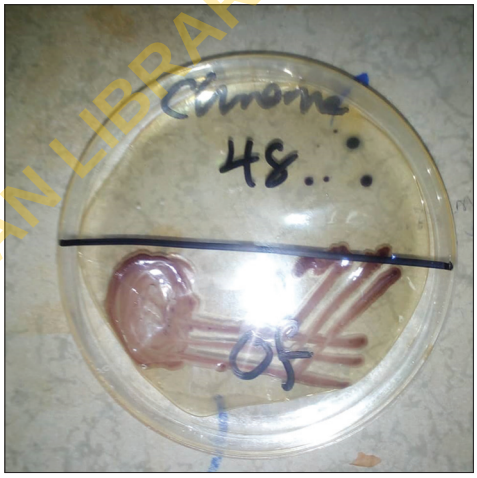

Figure 1: *Candida* isolates on CHROMagar

Table 1: Sociodemographic characteristics of the participants

Variables	*n* (%)
Age	
15–20	12 (14.6)
21–25	15 (18.3)
26–30	26 (31.7)
31–35	22 (26.9)
36–40	6 (7.3)
41–45	1 (1.2)
Marital status	
Single	36 (43.9)
Married	46 (56.1)
Level of education	
No education	1 (1.2)
Primary	2 (2.4)
Secondary	35 (42.7)
Tertiary	44 (53.7)
Income per month	
<18,000	14 (17.1)
18,000	17 (20.7)
>18,000	51 (62.2)
Recurrent *Candida*	4 (4.9)

The 82 isolates of *Candida* processed yielded 87 species of the fungi, and the prevalence of the mixed growth was 5 (6.1%). From the 87 species, the albicans species were 50 (57.5%) while the non-albicans were 37 (42.5%). Among the non-albicans species, 16 (43.2%) *Candida krusei* had the highest frequency while 7 (19.0%) *Candida tropicalis* had the least and others (unidentified by CHROMagar) accounted for 14 (37.8%) [Table 2]. Recurrent vulvovaginitis was observed in 4 (4.9%) patients, and the species responsible were 2/4 (50.0%) *C. albicans* and 2 (50.0) *Candida glabrata,* respectively.

Ages 25–30 had the highest incidence of 26 (29.9) *Candida* species, followed by ages 22 (25.3), and the least 1 (1.1) *Candida* species was seen in ages 41–45. The other sociodemographic and risk factors in relation to the in relation to the analysis of the number of *Candida* isolates are shown in Table 3.

C. albicans was predominant among participants taking multiple antibiotics 16/23 (69.6%) and with multiple sex partners 12/18 (66.7%). *C. albicans* was significantly associated with taking hormonal contraceptives while *C. krusei* was associated with wearing of tight and nylon underwear, respectively, on bivariate analysis ($P < 0.05$) [Table 4].

Table 2: Frequency of *Candida* species among the participants

Candida species	Frequency, *n* (%)	Description on CHROMagar
Candida albicans	50 (57.5)	Green
Candida tropicalis	7 (8.0)	Metallic blue
Candida krusei	16 (18.4)	Fuzzy pink
Others	14 (16.1)	White, purple, and grayish pink
Total	87 (100)	

Table 3: Associated risk factors and *Candida* isolate analysis of the participant (*n*=87)

Variables	*Candida* isolates, *n* (%)
Age	
15–20	12 (13.8)
21–24	20 (22.9)
25–30	26 (29.9)
31–35	22 (25.3)
36–40	6 (6.9)
41–45	1 (1.1)
Marital status	
Single	46 (52.9)
Married	41 (47.1)
Level of education	
No education	6 (6.9)
Primary	2 (2.3)
Secondary	35 (40.2)
Tertiary	44 (50.6)
Income per month	
<18,000	19 (21.8)
18,000	17 (20.9)
>18,000	51 (58.6)
Hormonal contraceptives	8 (9.2)
Vaginal douching	15 (17.2)
Multiple antibiotics intake	23 (26.4)
Lifetime sex partner	
None	4 (4.6)
1	17 (19.5)
2	33 (37.9)
>2	33 (37.9)
Present multiple sex partners	18 (20.7)
Tight underwear	38 (46.3)
Nylon underwear	44 (50.6)

DISCUSSION

This local study aimed to detect species of *Candida* causing vulvovaginitis in our environment. Routine speciation of *Candida* is not done because of cost. However, data on the distribution of *Candida* species are important because new *Candida* species, other than *C. albicans,* are emerging and information on this will help in the effective management of vulvovaginitis.[18]

In this study, three species of *Candida* were isolated and the others were left unidentified because of the limitation of CHROMagar. This finding is in tandem with what Malik *et al.* reported.[19] Numerous studies have described more than three *Candida* species of vulvovaginitis because they used diagnostic methods such as analytic profile index (API) *Candida* and polymerase chain reaction (PCR) which have higher sensitivity than CHROMagar used in this current study.[20-23] However, previous observations from Waikhom *et al*., Okungbowa *et al*., and Deorukhkar *et al*., respectively, showed that non-albicans were the predominant species.[24-26] Hygiene, social factors, immune status, health conditions, and diagnostic methods employed have been described as factors that determine the number and types of *Candida* species causing vulvovaginitis in an environment.[27]

C. albicans (57.5%) is the most predominant species in this present study. This report is similar to previous studies in Nigeria such as Nurat *et al.* (60%), Onuorah *et al.* (66.7%), and Oyewole *et al.* (53.3%).[21,28,29] Earlier literature from Ethiopia, Kenya, Saudi Arabia, and Kuwait that reported the predominance of *C. albicans* by 56.25%, 63.83%, 59%, and 73.9%, respectively, were also in agreement with our study.[30-33]

Although many studies have described *C. albicans* as the most common species seen in vulvovaginitis, the prevalence of non-albicans species is increasing all over the world. This is evident from this current study as non-albicans species recovered is 32.5% and other earlier studies reported 39.7% in Egypt, 33.3% in Nigeria, 24% in the USA, and 21% from Australia.[16,18,28,34] In Ogun State, Nigeria, where this study was carried out, previous studies have reported 25.1% and 27% of non-albicans species,

Table 4: Bivariate analysis of *Candida* species and associated risk factors of vulvovaginal candidiasis

Variables	*Candida albicans* (*n*=50), *n* (%)	*Candida tropicalis* (*n*=7), *n* (%)	*Candida krusei* (*n*=16), *n* (%)	Others (*n*=14), *n* (%)
Age				
15–20	5 (10.0)	4 (57.1)	2 (12.5)	1 (7.1)
21–25	11 (22.0)	1 (14.3)	4 (25.0)	4 (28.6)
25–30	20 (40.0)	1 (14.3)	2 (12.5)	3 (21.4)
31–35	12 (24.0)	1 (14.3)	7 (43.8)	2 (14.3)
36–40	2 (4.0)	0	0	4 (28.6)
41–45	0	0	1 (6.3)	0
χ^2	8.16	11.35	10.57	13.80
Df	5	5	5	5
P	0.158	0.45	0.61	0.17
Marital status				
Single	21 (42.0)	2 (28.6)	6 (37.5)	9 (64.3)
Married	29 (58.0)	5 (71.4)	10 (62.5)	5 (35.7)
χ^2	1.24	2.36	2.79	0.46
Df	1	1	1	1
P	0.265	0.125	0.095	0.498
Hormonal contraceptives	8 (16.0)	0	0	0
χ^2	6.52	0.29	0.76	0.64
Df	1	1	1	1
P	0.011	0.590	0.385	0.423
Vaginal douching	11 (22.0)	1 (14.3)	3 (18.8)	0
χ^2	1.87	0.031	0.79	2.35
Df	1	1	1	1
P	0.172	0.860	0.372	0.126
Multiple antibiotics intake	16 (32.0)	0	4 (25.0)	3 (21.4)
χ^2	1.87	2.15	0.11	0.003
Df	1	1	1	1
P	0.171	0.142	0.43	0.959
Lifetime sex partner				
None	2 (4.0)	1 (14.3)	0	1 (7.1)
1	9 (18)	3 (42.9)	2 (12.5)	3 (14.3)
2	17 (34)	2	7 (43.8)	7 (50.0)
>2	22 (44)	1	7 (43.8)	3 (21.4)
χ^2	1.56	5.52	3.33	1.41
Df	4	4	4	4
P	0.816	0.340	0.504	0.843
Present multiple sex partners	12 (44.0)	0	4 (25.5)	2 (14.3)
χ^2	3.10	1.44	3.59	8.45
Df	3	3	3	3
P	0.376	0.696	0.308	0.038
Tight underwear	18 (36.0)	2 (28.6)	11 (68.8)	7 (50.0)
χ^2	0.55	0.97	4.02	0.09
Df	1	1	3	1
P	0.458	0.324	0.045	0.763
Nylon underwear	23 (46.0)	2 (28.6)	11 (68.9)	8 (57.1)
χ^2	0.98	1.11	3.58	0.62
Df	1	1	1	1
P	0.321	0.293	0.059	0.430

P<0.05 is significant

respectively.[35,36] The comparison of the previous study to this index one also showed that non-albicans species is also rising in the area.

The increasing occurrence of non-albicans species in VVC is suggesting that they are becoming pathogens of significance for VVC and ignoring their existence might result in a lot of therapeutic failures. The increasing prevalence could probably be attributed to indiscriminate use of antifungals, lack of local data to know the available species of *Candida* causing VVC, and prolonged treatment of patients, especially those with recurrent VVC.[31] The most prevalent non-albicans species in this study is *C. krusei,* and this is consistent with earlier observation by Tsega *et al*. but in contrast to *C. tropicalis* reported by Akortha *et al*.[26,30] Furthermore, many studies have reported *Candida glabrata*

as the most predominant non-albicans species.[18,28,29,37,38] *C. tropicalis* should be interpreted with caution as the least *Candida* species in our study because we have 14 (37.8%) unidentified *Candida* species.

The prevalence of recurrent VVC (RVVC) in this study is 4.9%. This is slightly lower than overall 9% reported by Foxman *et al.*[39] However, our report is in tandem with previous literature stating that ≥ 5% of women will experience RVVC in their lifetime.[40] However, other reports have stated that the true rate of VVC is still unknown.[41,42] Our result on the prevalence of recurrence should be elucidated with caution because of recall bias from the participants. Therefore, more work by researchers on RVVC is suggested.

VVC was found more in participants between ages 25 and 30 in this study, and this is in agreement with previous studies by Akortha *et al*. and Okungbuwa *et al*., respectively, in Nigeria.[23,26] The highest frequency of VVC in this age group might be linked to increased sexual activity at this period of life; however, the association of VVC with sexual activity is still controversial.[43] Participants who were douching, having multiple sex partners, taking hormonal contraceptives, and taking multiple antibiotics had more frequency of *C. albicans* in them. Similarly, Ahmad *et al.* reported more *C. albicans* in participants taking hormonal contraceptives while Pirrotal *et al*. and Jasim *et al*., respectively, reported more *C. albicans* in patients taking multiple antibiotics.[35,37,44] Although this study observed that *C. krusei* was significantly associated with wearing of tight and nylon underwear, many authors have generally linked VVC to them but not to any species. Therefore, more research is needed on the association of risk factors with species of *Candida* causing vulvovaginitis. The limitation of this study includes nonusage of API and PCR which are more accurate methods for species identification. These are not used because of lack of funds. Furthermore, the number of isolates that were retrieved within the 2 years was few. More isolates could have increased the power of the study.

CONCLUSION

C. albicans is the predominant species identified in this study; however, the prevalence of non-albicans species observed is high. This suggests that clinicians in our environment should also look out for non-albicans species causing vulvovaginitis.

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Conflicts of interest
There are no conflicts of interest.

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