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Original Research Article

Candiduria in high-risk patients and its antifungal susceptibility testing

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ABSTRACT

Background: Candida is part of the natural microbiota of an individual's mouth cavity, gastrointestinal system, and vagina. Candida species are of clinical importance because they are the most common cause of nosocomial urinary tract infections (UTIs), oral candidiasis, and genitourinary candidiasis. The presence of budding yeast cells in urine can be a sign of extensive candidiasis, urinary tract infections, or sample contamination. It is necessary to confirm the presence of yeast cells in a fresh urine sample to differentiate contamination from colonization or infection. Numerous antifungals are available to treat candida infections. Over the last few decades, there has been an increase in antifungal resistance, especially against non-albican species.

Methods: A hospital-based retrospective observation study was conducted over 12 months, from January 2023 to December 2023 in department of microbiology at Government Medical College and Hospital Aurangabad (Chhatrapati Sambhajinagar), Maharashtra. A total of 2434 samples were received and processed according to standard operating procedures.

Results: A total of 38 (26.76%) *C. albicans* and 104 (73.23%) non-albicans species were isolated from 142 urine samples. *C. tropicalis* was the most frequently isolated *Candida* species (52.11%) from urine cultures, followed by *C. albicans* (26.76%), *C. glabarata* (8.45%), *C. parapsillosis* (7.04%), *C. krusei* (2.8%), and *C. guilliermondii* (2.8%). All Candida species were maximally susceptible to fluconazole, itraconazole, caspofungin, and voriconazole as compared to amphotericin B and ketoconazole.

Conclusions: The finding of candiduria in a patient with or without symptoms should be neither neglected nor hastily managed but requires a careful evaluation that should proceed in a logical manner.

Keywords: Antifungal susceptibility, Candida species, Candiduria, Non-albicans

INTRODUCTION

Candida species are naturally present on the skin, gut, and genital tract. It can cause several infections. The presence of yeast cells in the urine is referred to as candiduria.[1,2]

Urinary candidiasis is one of the most challenging forms of candidiasis because distinguishing between colonization and true infection is difficult. Candiduria may also indicate candidemia or invasive renal candidiasis.[1,3]

Candiduria is linked to many predisposing factors, including the use of indwelling urinary catheters, diabetes, antibiotic use, immunosuppressive medication, impaired kidney function, extremes of age, and female gender.[1,2,4-6] Candiduria, when not appropriately detected and treated, has caused morbidity and mortality while inappropriate management leads to overtreatment which causes the development of drug resistance.[2,6,7]

So, the current study was conducted to know the incidence of candida species causing UTIs and their antifungal susceptibility pattern in a tertiary care hospital.

METHODS

A hospital-based retrospective study was conducted over 12 months, from January 2023 to December 2023 in Department of Microbiology at Government Medical College and Hospital Aurangabad (Chhatrapati Sambhajinagar), Maharashtra. A total of 2434 aseptically collected urine samples were received in tertiary care hospital. Data analysis was done by statical method with statistical software SPSS ver.2022. Since this was a retrospective study ethical approval was not needed.

Inclusion criteria

Urine samples showing yeast cells or pseudo hyphae on wet mount examination. Pure growth of yeast isolates showing a significant colony count >105 CFU/ml in non-catheterized patients and >103 in catheterized patients. Patients with associated risk factors such as age, gender, diabetes, hospital stay, kidney diseases, use of broad-spectrum antibiotics, and indwelling urinary tract catheters were also considered.

Exclusion criteria

Sample showing mixed growth of microorganisms on culture.

Procedure methodology

The urine samples were centrifuged, and the sediment was analyzed using microscopy, Gram staining, and culture. A wet-mount examination of the urine sample was performed to look for pus cells, RBCs, budding yeast cells, pseudo hyphae, cast, crystals, etc.

Urine samples were cultured on cysteine lactose electrolyte deficient (CLED) agar by using a calibrated loop as per the standard protocol of urine culture. On the same day, samples showing yeast cells or pseudo hyphae on microscopy were cultured on Sabouraud dextrose agar (SDA) with chloramphenicol (0.05 mg/ml). The inoculated culture plates were incubated at 37°C for 24-48 hours.[2]

Samples showing significant colony count and pure growth of yeast cells on culture were processed according to standard operating procedures.

The identification process involved observing colony morphology on SDA, performing Gram stain and germ tube tests, using CHROM agar, carrying out Dalmau culture on corn meal agar, and utilizing VITEK-2 cards (ID cards).

Candiduria was confirmed by the presence of budding yeast cells, pseudo hyphae on wet mount examination, and pure growth of yeast cells on culture with a significant colony count.

Antifungal susceptibility test (AFST)

Candida isolates were subjected to AFST using the disc diffusion method on Mueller Hinton agar containing 2% glucose and 0.5 µg/ml of methylene blue, according to CLSI standards (M-44A2).

The plates were incubated aerobically at 37°C for 24-48 48 hours. The zone of inhibition was measured according to the standard protocol.

The antifungal susceptibility test was performed using commercially available antifungal discs (Hi-media). fluconazole (25µg), itraconazole (10 µg), ketoconazole (10 µg), amphotericin B (20 µg), caspofungin (5 µg), voriconazole (1µg).

Quality control

The sterility of each batch of media prepared was checked by incubating at 37°C for 24 hours. *Candida albicans* American type culture collection (ATCC) 90028 was used as a quality control strain for the antifungal susceptibility testing.

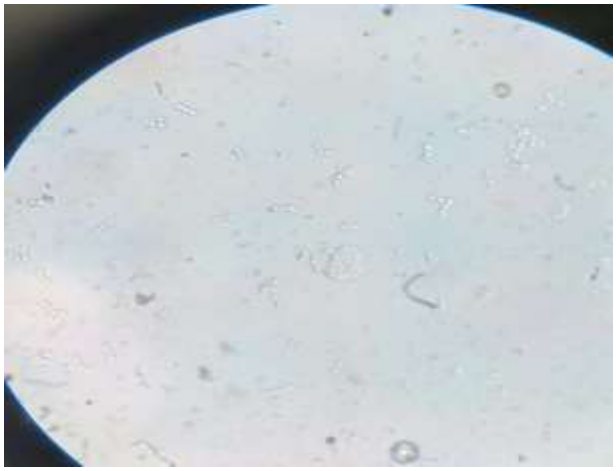

Figure 1: Urine wet mount showing budding yeast cells.

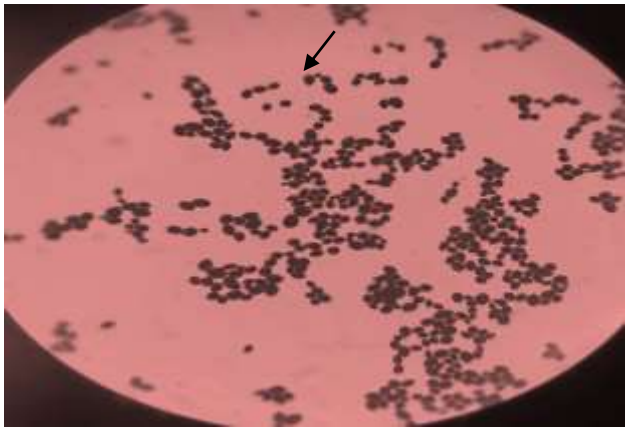

Figure 2: Gram stain showing gram positive budding yeast cells.

Figure 3: Candida species on hichrome.

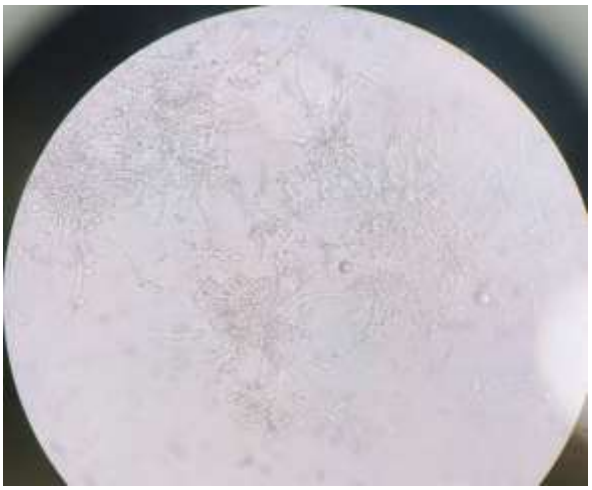

Figure 4: Dalmau technique on corn meal agar.

RESULTS

A total of 2434 urine samples were received in tertiary care hospitals. Out of which, 236 samples showed budding yeast cells on wet-mount examination (Figure 1). 142/236 urine samples showed pure growth of yeast cells on culture media with a significant colony count.

A total of 104 (73.23%) non-albicans and 38 (26.76%) *C. albicans* species were isolated from 142 culture-positive urine samples. *C. tropicalis* (52.11%) was the most frequently isolated Candida species from urine cultures, followed by *C. albicans* (26.76%), *C. glabrata* (8.45%), *C. parapsillosis* (7.04%), *C. krusei* (2.8%), and *C. guilliermondii* (2.8%) (Figure 7).

Table 1: Risk factors associated with candiduria.

Risk factor	No. of cases
Male	58
Female	84
Age >45 years	82
Antibiotic therapy	98
Catheterization	93
Diabetes mellitus	68
Prolonged hospital stay	90

When we looked at the risk factors associated with urinary candidiasis, we observed that antibiotic medication (69%) and catheterization (65.4%) were the most common risk factors for UTIs caused by Candida infection (Table 1).

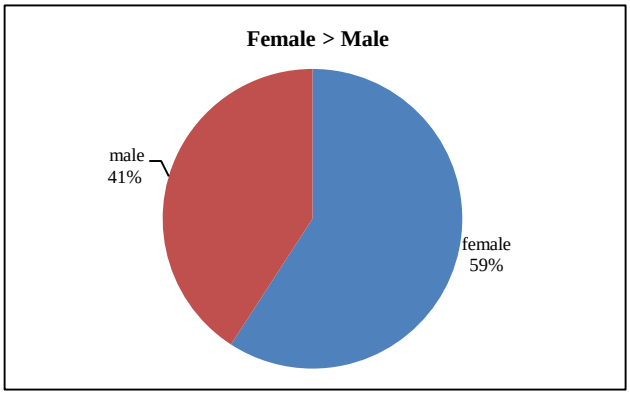

Figure 5: Male female ratio.

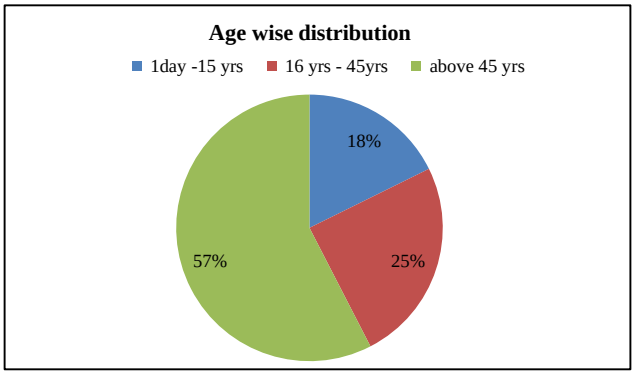

Figure 6: Age-wise distribution of candida isolates.

Candida isolation rates were more in female (Figure 5) and more common in the age group over 45 years (Figure 6).

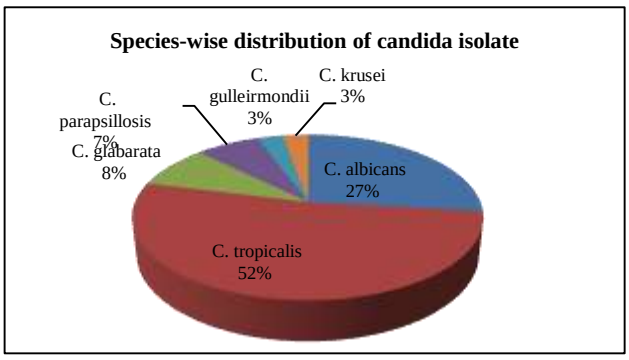

Figure 7: Species-wise distribution of Candida isolates.

Candida albicans were maximally susceptible to caspofungin (92.10%), and voriconazole (92.10%) as compared to amphotericin B (68.42%) and ketoconazole (39.47%) (Figure 8).

Similarly, also non-albicans were maximally susceptible to caspofungin (91.25%), and voriconazole (89.58%) as compared to amphotericin B (72.76%) and ketoconazole (49.04%) as shown in Figure 9.

Increase in resistance to fluconazole (11.2%) was also noticed among non-albicans candida than *C. albicans* (6.26%).

AFST profile of C. albicans

Figure 8 shows percentage of antifungal susceptibility of *C. albicans*. *C. albicans* were highly susceptible to voriconazole and caspofungin but less susceptible to ketoconazole and amphotericin B.

AFST profile for Non-albicans candida

Figure 9 shows percentage of antifungal susceptibility of non-albicans. Non-albicans were highly susceptible to voriconazole and caspofungin but less susceptible to ketoconazole and amphotericin B.

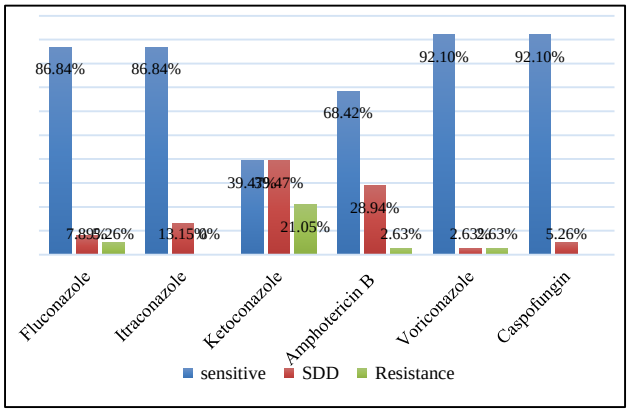

Figure 8: Susceptibility pattern in *C. albicans.*

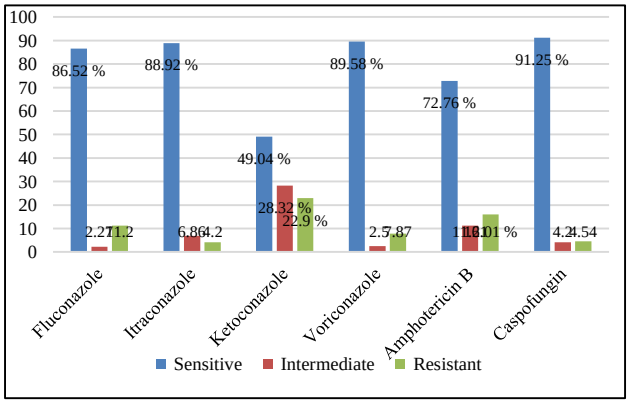

Figure 9: Susceptibility pattern in non- albicans candida.

DISCUSSION

Nosocomial candidial UTI is rapidly gaining importance in tertiary care facilities. Identifying whether candiduria is due to urinary tract infections, bladder colonization, or contamination is a common clinical issue.[1] Most cases of candiduria are considered benign asymptomatic infections but may be associated with candidemia and renal infection. Candiduria could result in pyelonephritis or disseminated infection.[3,8]

In the present study, the isolation rate of Candida species from urine samples was 5.8%, which is slightly higher than the observations of the Agrawal et al study (3.51%) but similar to the study by Goel et al (5.77%) Mahajan et al (5.4%).[4,9,10] The candida isolation rate was slightly higher in a study by Shrestha et al (7.7%).[11] The study suggests the most frequent yeasts isolated from urine cultures were non-albicans. Among the non-albicans, *C. tropicalis* was the most commonly isolated species, which was a similar finding to the study by Gupta et al.[12] In this study, the most common risk factors associated with candiduria were catheterization and antibiotic therapy, which was similar to the Manisha et al study.[5] The present study had a slight female preponderance, which was a similar finding to the study of Abhishek et al and Ekpo et al.[2,3] In this study, antifungal fluconazole, itraconazole, and voriconazole were all equally effective against all Candida species, which was a similar finding to the study by Singh et al.[13]

The study limitation was the lack of genomic characterization of isolates. The study also lacks an assessment of the virulence factors of different candida species.

CONCLUSION

In this study, non-albicans were among the most often isolated yeasts. Non-albican Candida are more resistant to antifungal agents than *C. albicans*. So, before starting antifungal treatment, it is essential to know the candida species. (For example, *C. krusei* is intrinsically resistant to fluconazole and *C. lusitaniae* to amphotericin B).

In the conducted study, we have gained a clear understanding of the predisposing factors of candiduria, the common species of Candida isolated, and their susceptibility to commonly used antifungal drugs.

The diagnosis of candiduria in a patient with or without symptoms should be neither neglected nor hastily managed but requires a careful evaluation that should proceed logically.

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Ethical approval: Not required

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