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Antifungal Susceptibility Pattern of Candida Isolates from Various Clinical Specimen at a Tertiary Care Hospital

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ABSTRACT

Background: *Candida* is yeast like fungus and a normal commensal flora of human body but may be associated with superficial and deep seated fungal infections. *C. albicans* is the most common causative agent of candidiasis; the frequency of other *Non-Albicans Candida* (NAC) species is increasing.**Objective:** To identify the predominant *Candida* species causing clinical infection and determine their antifungal susceptibility pattern. **Materials and method:** Samples were processed and identified by standard microbiological methods and Candida species were isolated from various clinical. Species level identification and Antifungal susceptibility testing was done by using VITEK 2 compact system. **Results:** A total of 141 Candida isolates were isolated from urine (74%), blood (10%), sputum (5%), secretion (3%), High vaginal swab (3%), Pus (2%), & other samples (3%) as shown in Figure 1. Gender wise distribution showed that 60% Candida isolates were from males and 40% from females, The maximum isolates (34.05%) obtained were from age group >70 years, followed by 21.28% from age group 60-70 years, 17.02% from 50-60 years age group. Amongst the NAC spp., C. tropicalis (12.06%) was the commonest isolate followed by C. parapsilosis (5.67%), C. guillermondii (4.96%), C. auris (3.55%), C. glabrata (2.13%), C. krusei (2.13%), C. norwegensis (0.71%). The different species of Candida reported from various specimens in our study. Overall, antifungal susceptibility profile of Candida species to fluconazole was found to be 75.39% susceptible (S), 4.61% susceptible dose dependent (SDD), 20% resistant (R). In similar way, antifungal profile (S, R) to voriconazole was (91.04%, 8.96.67% resp.), to caspofungin (84.13%, 15.87% resp.), to micafungin (79.85%, 20.15% resp.), Amphotericin B (79.10%, 20.90% resp.), & to flucytosine (86.05%, 13.95% resp.) **Conclusion:** In conclusion, over the past few decades, the number of infections caused by Candida species has increased. Concern has been raised by the change in the main etiological agent toward Non-Albicans Candida. The current study shows a rise in fungal infection cases in older and immunocompromised people, as well as a rise in resistance to widely used antifungals. The rise in fungal infections over the past few decades has presented significant challenges for medical personnel. .

1. INTRODUCTION:

Candida is a yeast, belonging to phylum Ascomycota, an asexual, diploid, fungus, It is among the most common human fungal pathogens and are responsible for both superficial (mucosal and cutaneous) and systemic infection.[1]

Candida species belong to the normal microbiota of an individual's mucosal oral cavity, gastrointestinal tract and vagina, These yeasts are commensal in

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healthy humans and may cause systemic infection in immunocompromised situations due to their great adaptability to different host niches.[2]

The five species most commonly associated with candidiasis are *Candida albicans*, *Candida glabrata*, *Candida tropicalis*, *C. parapsilosis*, and *Candida krusei*.[3]

The *Candida* species can cause superficial, vaginal, and oral mucosa infections and invasive candidiasis, such as deep tissue infections and bloodstream infections.[4]

The pathogenicity of *Candida* species is attributed to certain virulence factors, such as the ability to evade host defences, adherence, biofilm formation (on host tissue and on medical devices) and the production of tissue-damaging hydrolytic enzymes such as proteases, phospholipases and haemolysin.[2] With an increase in the number of invasive medical procedures and with an extending population of immunocompromised patients, *Candida* spp. infections are becoming more and more frequent. *C. albicans* remains a major fungal pathogen, although there is a progressive shift to non-albicans *Candida* spp. (NAC), especially *C. glabrata* and *C. parapsilosis.*[5]

Thus isolation, identification, characterization and susceptibility testing of Candida species in clinical specimens have become increasingly important for management of fungal infections.[6] The present study was designed to identify the spectrum of Candida species in clinical infections and to identify their susceptibility pattern to available antifungal agents.

Methodology:
A hospital based retrospective observational was conducted for two years (May 2023 to May 2025) by Department of Microbiology, in a tertiary care hospital. A total of 141 isolates of *Candida* from various clinical samples were collected. Commensal *Candida* from clinical specimen were excluded. The initial diagnosis of specimens was performed by wet mount and gram stain. The suspected specimens were inoculated on Sabouraud Dextrose Agar (SDA) slope and any visible growth on SDA was further processed for identification by Gram stain and Germ tube test. Species identification and Antifungal susceptibility testing was done by VITEK 2 Compact (Biomereiux, France) using ID-YST and AST-YS08 cards respectively according to manufacturer's instructions. A total of six antifungal drugs were tested which included Fluconazole, Voriconazole, Caspofungin, Micafungin, Amphotericin B, Flucytosine.

Results:
A total of 141 *Candida* isolates were isolated from urine (74%), blood (10%), sputum (5%), secretion (3%), High vaginal swab (3%), Pus (2%), & other samples (3%) as shown in Figure 1. Gender wise distribution showed that 60% *Candida* isolates were from males and 40% from females. Figure 2

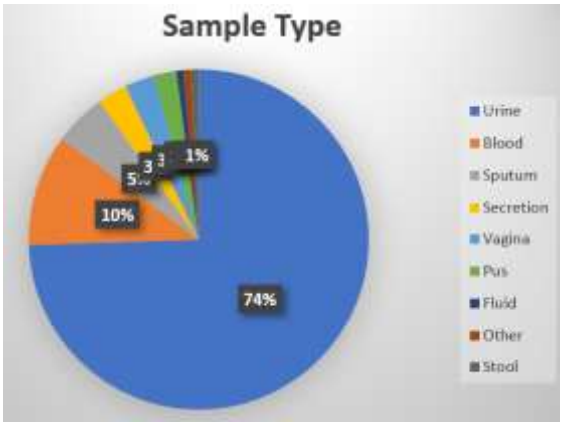

Figure 1: Distribution of *Candida* species in various clinical samples

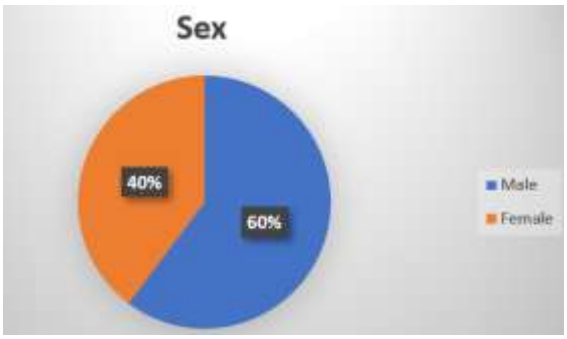

Figure 2: Gender wise distribution of *Candida* isolates

The maximum isolates (34.05%) obtained were from age group >70 years, followed by 21.28% from age group 60-70 years, 17.02% from 50-60 years age group. (Table 1)

Table 1: Distribution of study patients according to age

Age group	Candida isolates	Percentage
Under 18	4	2.84
18-21	1	0.70
21-30	5	3.55
30-40	14	9.92
40-50	15	10.64
50-60	24	17.02
60-70	30	21.28
70-80	36	25.53
80+	12	8.52
Total	141	100

Based on VITEK-2, five types of *Candida* species were differentiated. C. albicans (68.79%) was the most frequently encountered species & maximum number of isolates were from urine & blood (74% and 10% respectively).

Amongst the NAC spp., *C. tropicalis* (12.06%) was

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the commonest isolate followed by *C. parapsilosis* (5.67%), *C. guillermondii* (4.96%), *C. auris* (3.55%), *C. glabrata* (2.13%), *C. krusei* (2.13%), *C. norwege*nsis (0.71%). The different species of *Candida* reported from various specimens in our study is shown in Figure 1.

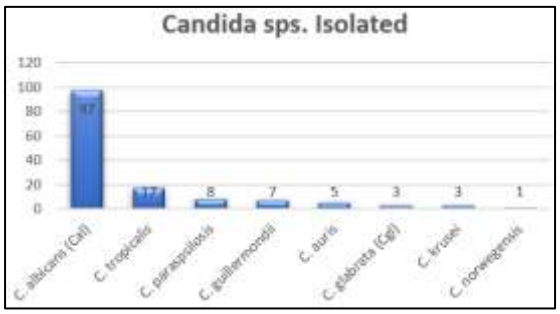

Figure 3: Distribution of frequency of Candida species

Overall, antifungal susceptibility profile of *Candida* species to fluconazole was found to be 75.39% susceptible (S), 4.61% susceptible dose dependent (SDD), 20% resistant (R). In similar way, antifungal profile (S, R) to voriconazole was (91.04%, 8.96.67% resp.), to caspofungin (84.13%, 15.87% resp.), to micafungin (79.85%, 20.15% resp.), Amphotericin B (79.10%, 20.90% resp.), & to flucytosine (86.05%, 13.95% resp.) as depicted in Figure 2.

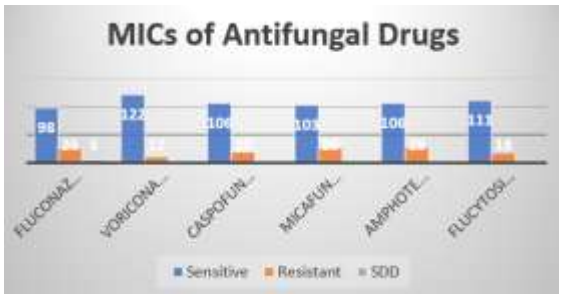

Figure 4: Antifungal susceptibility testing of various Antifungals

DISCUSSION:

Candida spp. are the most common cause of invasive yeast infections. At least 15 distinct species of Candida cause human diseases, although more than 90% of infections are caused by the five most common pathogens, *C. albicans*, *C. glabrata*, *C. tropicalis*, *C. parapsilosis*, and *C. krusei*.[1] Majority of the isolates in this study were obtained from urine(74%) followed by blood (10%).

In this study, *C. albicans* (68.79%) was the predominant species isolated followed by *C. tropicalis* (12.06%) similar to other studies in literature.[7] Non albicans Candida (NAC) were isolated at a lower rate (31.21%) than *C. albicans* in our study which is in concordance with different studies from India where authors in their studies also observed a significant predominance of *C. albicans* over NAC spp.[8, 9]

When demographically distributed about 60% of isolates were from male patients and 34.05% of *Candida* were isolated from age group of >70 years. Predominance of Candida species in elderly group in current study might be due to presence of significant co-morbid conditions like diabetes, prolonged antibiotic therapy due to increasing infections due to increasing age. Similar findings were observed by Dekkers where they found Candida infections are a growing problem in elderly patients, with significant mortality in this group.[10]

In our study resistance of *Candida* against fluconazole was more (75.39%) in comparison to other antifungals used in this study. Different studies have also reported higher resistance to fluconazole.[11, 12]. Indiscriminate use of fluconazole & intrinsic resistance of few NAC species contribute to fluconazole resistance.

In our study, voriconazole was found to be susceptible to 91.04% *Candida* isolates. The susceptibility pattern of *Candida* to voriconazole in present study was in contrast with Patil D et al [1] who reported 92% susceptibility to voriconazole by disk diffusion method.

CONCLUSION:

In conclusion, over the past few decades, the number of infections caused by *Candida* species has increased. Concern has been raised by the change in the main etiological agent toward Non-Albicans Candida. The current study shows a rise in fungal infection cases in older and immunocompromised people, as well as a rise in resistance to widely used antifungals. The rise in fungal infections over the past few decades has presented significant challenges for medical personnel. The most frequent species that infects people is *Candida albicans*. Given the growing use of strong, broad-spectrum antibacterial drugs in Indian hospitals, it is critical to keep an eye on the distribution and resistance patterns of *Candida spp*. It is necessary to create local treatment guidelines based on the epidemiology of illness. To record changes in the epidemiological characteristics of candidiasis and antifungal susceptibilities, ongoing surveillance will be crucial. Consequently, the species-level identification of *Candida* infections and the regular antifungal susceptibility testing of *Candida* isolates in clinical microbiology labs aid in the prudent administration of antifungal medications to patients and thereby aid in the prevention of resistance.

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