Prevalence of Candidiasis Infection & Antifungal Susceptibility Pattern at Tertiary Care Hospital, Jaipur

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Authors' contributions

This work was carried out in collaboration among all authors. Author FS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors VPM and ERS managed the analyses of the study. Author RS managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: *Candida* species are among the most common fungal pathogens. They are ubiquitous yeasts found on plants and form the microbiota of the alimentary tract of mammals and the mucocutaneous membranes in humans.
Methods: A total of 90 clinical samples were collected from Mahatma Gandhi Medical College & Hospital, Jaipur over a period of one year. Primary identification is done by the direct smear examination by Gram's staining and KOH mount and then further sub-cultured on SDA media.
Results: Out of 90 clinical specimens collected, most common form of Candidiasis seen was Candiduria type followed by blood cultures, swab, Endotracheal tube, sputum and Bronchialveolar lavage. The maximum number of patients were found in the age group of 21-30 years, followed by 51-60 years. Out of 90 patients, 48 (53.3%) were males and 42 (46.6%) were females. *C. tropicalis* (44.4%) was the predominant species followed by *C. albicans* and other species of *Candida*.

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Among 90 samples, 32% were *Candida albicans* and remaining 68% were Non albicans Candida species.

Conclusion: The study found that *C. tropicalis* was sensitive against Micafungin & Caspofungin, showing a 100% sensitivity. *Candida albicans* showed 100% sensitivity against Flucytosine.

1. INTRODUCTION

In the last few years, the incidence of mycotic infections has progressively increased [1]. During the last three decades Candidiasis has become the most commonly diagnosed yeast-related infection worldwide. *Candida* species are members of the microbiota under specific circumstances they have the ability to turn themselves into pathogenic fungi causing superficial, cutaneous or systemic infections. In most cases *Candida* species are responsible for nosocomial infections. The major risk factors for opportunistic fungal infections are the prolonged hospitalization, the extended use of antibiotics, use of intravenous catheters and the low birth weight in case of premature neonates [2].

Candidiasis is a fungal infection due to any type of *Candida* species. The most common species implicated was *C. albicans* recently, while the incidence of non-albicans *Candida* species (NAC) has risen dramatically [3]. In recent decades, several countries around the world have witnessed a change in the epidemiology of Candida infections, characterized by a progressive shift from a predominance of *C. albicans* to NAC species [4]. New antifungal agents with low toxicity and broad-spectrum fungicidal activities are needed for effective management of the infections.

2. MATERIALS AND METHODS

2.1 Collection of Specimens

A total of 90 clinically suspected cases of Candidiasis patients attending the various departments of MGMC&H, Jaipur for a period of one year were included in this study. Various types of clinical specimens such as Blood, urine, Sputum, Oral swabs, stool, high vaginal swab, catheter tips, pus wound swabs, central line tips, endotracheal tube tips, Sterile body fluids, bronchioalveolar lavage, CSF were collected from OPD, ICU's and other wards of MGMC&H, Jaipur. The clinical samples collected were transported to microbiology lab as soon as possible.

2.2 Processing of Specimen

Primary identification is done by direct smear examination by Gram's staining and KOH mount. Samples were collected using aseptic precautions and inoculated on Sabouraud's Dextrose Agar SDA (Hi media) screw caped bottles and incubated at 37°C for 48-72 hours. After growth, species identification done by germ tube test, CHROMagar media (Hi media), carbohydrate fermentation test and sugar assimilation test [5].

2.3 Antifungal Susceptibility Testing

Antifungal susceptibility testing of antifungal drugs was done by VITEK-2.

3. RESULTS

The present study was conducted in 1 year from June 2018 to May 2019 in Mahatma Gandhi Medical College & Hospital Jaipur. A total of 90 samples were collected for isolation, speciation and characterization of *Candida* species. Clinical samples were taken from the inpatients and outpatients, that attended various clinical departments. Out of 90 clinical specimens collected, the most common form of candidiasis seen was candiduria type (48cases) followed by blood cultures (19 cases), swab (11 cases), endotracheal tube (9cases), sputum (02 cases) and bronchioalveolar lavage (BAL) (01 case) (Table 1 & Fig. 1). Out of 90 patients, 50% of the cases were from other wards, 42.22% were from ICU's and 7.77% were outdoor patients and out of 90 patients 48 (53.3%) were males and 42 (46.6%) were females (Table 2 & Fig. 2). The age of the patients ranged from minimum of <10 years to maximum of 80 years. Most of the patients belonged to 21-30 years of age group, followed by 51-60 years (Table 3). Out of 90 isolates, *C. tropicalis* (44.4%) was the most common species followed by *C. albicans* (32.2%), *C. famata* (6.6%), *C. glabrata* (6.6%), *C. parapsilosis* (3.3%), *C. lipolytica* (2.2%), *C. dubliniesis* (1.1%), *C. krusei* (1.1%) (Table 4) and among the samples 32.2% *Candida* isolates were found to be germ tube positive while 67.7%

were negative. Out of 90 samples 32% were *C. albicans* and remaining 68% were Non *Candida albicans* spp. Depending on the cornmeal agar morphology, 44.4% of isolates were identified as *C. tropicalis* followed by 32.2% as *C. albicans*, 6.6% as *C. glabrata*, 6.6% as *C. famata*, 3.3% as *C. parapsilosis*. 2.2 as *C. lipolytica*, 2.2% as *C. lusitaniae*, 1.1% as *C. dubliniesis* and 1.1% as *C. krusei*. *C. tropicalis* (44.4%) fermented glucose, maltose and sucrose, *C. albicans* (32.2%) fermented glucose and maltose, and other species of *Candida*

(24.4%) fermented only glucose producing acid and gas.

The most prevalent species was *Candida tropicalis* (44.4%). Among these, 95% showed sensitivity against fluconazole, 97% showed sensitivity against voriconazole, 97% showed sensitivity against amphotericin-B, 97% showed sensitivity against flucytosine. Among these, *C.tropicalis* was found to be 100% sensitive against Micafungin and Caspofungin.

Table 1. Sample wise ditribution according to sites

S. NO	Specimen	Number	Percentage
1	URINE	48	53.33%
2	BLOOD	19	21.11%
3	SWAB	11	12.22%
4	ET	09	10.00%
5	SPUTUM	02	2.22%
6	BAL	01	1.11%
	TOTAL	90	100%

Table 2. Sex distribution of cases

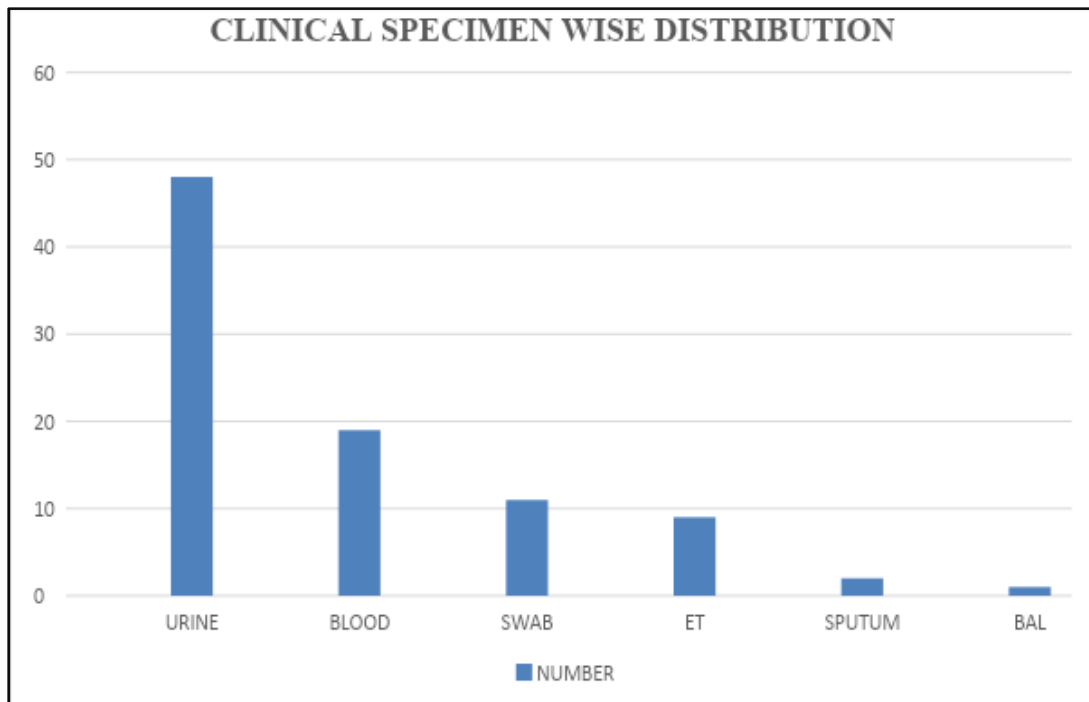| S. No	Gender	Total no. of patients	Percentage
1	MALE	48	53.33%
2	FEMALE	42	46.66%
	TOTAL CASES	90	100%

Fig. 1. Clinical specimen wise distribution

Table 3. Age range distribution

S. No	Age group (in years)	Total no. of patients	Percentage
1	0-10	03	3.33%
2	11-20	09	9.99%
3	21-30	23	25.55%
4	31-40	11	12.22%
5	41-50	10	11.11%
6	51-60	16	17.77%
7	61-70	11	12.22%
8	71-80	07	7.77%
	TOTAL	90	100%

Table 4. Frequency of isolated *Candida* species

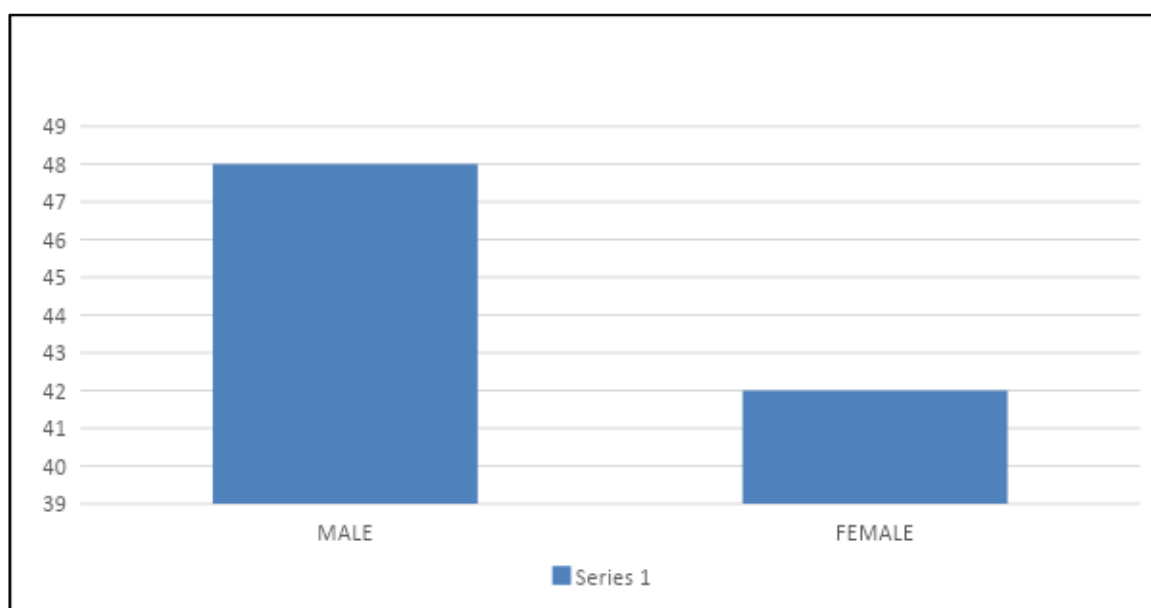| Isolated Candida species	Number of isolates	Percentage
Candida tropicalis	40	44.4%
Candida albicans	29	32.2%
Candida famata	6	6.66%
Candida glabrata	6	6.66%
Candida parapsilosis	3	3.33%
Candida lipolytica	2	2.22%
Candida lusitaniae	2	2.22%
Candida dubliniesis	1	1.11%
Candida krusei	1	1.11%
Total	90	100%

Fig. 2. Gender wise distribution of cases

Candida albicans (32.2%), 93% showed sensitivity against fluconazole, 89% showed sensitivity against micafungin, 93% showed sensitivity against caspofungin, 93% showed sensitivity against amphotericin-B, 96% showed sensitivity against voriconazole and flucytosine showed 100% sensitivity against *C. albicans*.

4. DISCUSSION

In this study, we have shown the potential clinical importance of species level identification as *Candida* species and its antifungal susceptibility. The most common clinical sample was urine in 48 (53.3%) patients. Our observations were

similar with the studies of Deorukhkar et al. [6] where urine samples were in majority (34.6%). Studies which were done earlier by Pfaller et al [7], who reported *Candida* species as the seventh most common nosocomial pathogen and as that which caused 25% of all urinary tract infections. In this study out of total 90 cases from various clinical isolates, 48 patients (53.3) were males and 42 were female patients (46.6%) and maximum number of patients was reported in the age group of 21-30 years of age. The present study coincides with the [8] reported the male predominance in his study with *Candida* infections more common in the age groups of 51-60 years. The present study coincides with the [9] who reported the most common isolated species was *Candida tropicalis* (44.4%) followed by *Candida albicans* (32.2%). The present study is in agreement with the study of [10] who also found *C.tropicalis* to be the most frequent isolate from various specimen. Mohamed et al. [11] who also found *C.tropicalis* was the most common (28.9%) followed by *C. albicans* (26.2%) and other species of *Candida.* In the present study Non-albicans *Candida* were isolated at a higher rate (58%) than *Candida albicans* (42%) which in agreement with the findings of the studies by Mokaddas et al. [12] which also showed the Non albicans *Candida* incidence (60.5%) to be higher than that of *Candida albicans* (39.5). The similar findings also matched with the study by [13] where Non Candida albicans species were 64.2% and *C.albicans* was 36%.

Antifungal resistance among *Candida* is useful because apart from tracking and detection of resistance, it also gives clues to emerging threats of new resistance strains. This helps in assessing empirical treatment recommendation. Among these, most prevalent species was *Candida tropicalis* (44.4%). Out of 40 cases of *C.tropicalis*, 5% showed resistance against fluconazole, 1 showed foriconazole resistance, 2.5% showed resistance against amphotericin-B and 2.5% showed Flucytosine resistance. These results coincides with the [14] who found in this study that fluconazole was the most resistant antifungal drug against *Candida* isolates. Similar findings were in agreement with [15] who also reported Fluconazole resistance among the hospitalized patients.

C. tropicalis was found to be 100% sensitive against Micafungin and Caspofungin. Similar results from [11] who also reported 100% micafungin sensitivity and caspofungin sensitivity against *C.tropicalis*. Therefore, we can consider that the best antifungal drugs could be micafungin & caspofungin.

In case of *Candida albicans* (32.2%) 29 cases, out of which 6.8% showed Fluconazole resistance, 6.8% showed micafungin resistance & 3.4% showed caspofungin resistance. In our study, Amphotericin-B showed resistance against *C. albicans* (6.8%). Our results are in agreement with the [16] who concluded in his study 3 isolates resistant against Amphotericin-B & 9 isolates against Fluconazole. Voriconazole and Flucytosine showed 100% sensitivity. The present work is in accordance with the [16] who reported Voriconazole (91.1%) sensitive against *C. albicans.*

5. CONCLUSION

In this study, *C. tropicalis* was found to be the predominant Candida species from various specimen followed by *C.albicans*. Finally, this study concludes that *C.tropicalis* was found to be 100% sensitive against Micafungin and Caspofungin. Flucytosine showed 100% sensitivity against *Candida albicans*. Therefore, this study suggests that we can consider that the best antifungal drugs could be micafungin & caspofungin for the treatment of Candidiasis infection.

CONSENT AND ETHICAL APPROVAL

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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