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Original Research Article

# The Prevalence of Candida Spp. In Blood Stream Infection and Their Antifungal Susceptibility Testing From Blood Culture of Patients from Tertiery Care Hospital in Western India

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## Abstract

Fungal infections from the *Candida* have significant cause of blood stream infection. This is troublesome among those who have been hospitalized with serious underlying diseases or those who are immunocompromised. To know the prevalence and types of *Candida* species in blood stream infection and their antifungal susceptibility pattern. The study was carried out in the Department of Microbiology, PDU Medical College, Rajkot from September 2015 to August 2016. Total number of samples are 207. Blood culture specimens were collected and processed for, culture on SDA and HCDA, Slide culture, Gram stain, Germ tube. Antifungal susceptibility testing was performed by modified Kirby Bauer method as per the CLSI guidelines. 58 (28.01%) *Candida spp.* [*C. tropicalis* (18), *C. glabrata*(14), *C. gullermondii*(12), *C. parapsilosis*(10), *C. albicans*(4)] were isolated from 207 specimens. Out of these, 203 (98.06%) from NICU/PICU and 4 (1.93%) from Skin ward, predominantly Males (57.97%). The isolates sensitivite to Voriconazole (100%), Fluconazole (98.88%), followed by Ketoconazole (73.03%) and Clotrimazole (68.62%). Maximum resistance observed to Amphotericin B, Nystatin, Miconazole, Itraconazole. Candidemia is major cause of mortality due to lack of antifungal therapy. Blood stream infections by Candida species have shown highest rates of inappropriate therapy among all BSIs. Strategies are needed to rapidly identify cases of candidemia who are already suffering from serious underlying disease and develop rapid diagnostic technology that widely available and cost effective. By knowing Antifungal susceptibility pattern, patients who are at increased risk for developing nosocomial candidemia should be treated early with empiric therapy that reduced unnecessary patient mortality.

**Keywords**: BSI, Candidiasis, Candida spp., Candida albicans, Non albicans candida, Immunocompromised**,** candidemia.



## INTRODUCTION

Over the past 20 years, fungal infections from the genus Candida have been a significant cause of human disease with dramatically increasing incidence.Fungal infections from the Candida have significant cause of blood stream infection. Nosocomial candidiasis is gaining significance worldwide. Among the causes of bloodstream infection, Candida ranks fourth in the United States and seventh in Europe. Candida blood stream infections (BSI) are associated with a very high crude mortality of over 60 per cent, while the attributable mortality may be as high as 49 percent. Until recently, C. albicans was by far the predominant species in most countries, causing up to two thirds of all cases of invasive candidiasis. During recent decades, there has been a change in the epidemiology of Candida infections, characterized by a progressive shift from a predominance of Candida albicans to non-albicans Candida species. Numerous factors have contributed to this increasing frequency of Candida blood stream infections (CLABSI), probably the most relevant is the ever expanding population of immunocompromised patients that is associated with underlying disease states such as AIDS, cancer or diabetes mellitus [1-3]. Other causes include the use of immunosuppressive drugs for chronic medical conditions or organ transplants, the use of central venous catheters, broad spectrum antimicrobial therapy and the extremes of age. With the recent emergence of candidemia as a significant cause of mortality in our health care system, clinicians must identify methods to minimize the sequelae of infection. This is troublesome among those who have been hospitalized with serious underlying diseases or those who are immunocompromised. Nosocomial candidemia is a treatable condition. Appropriate antifungal therapy is

typically defined as the use of a systemic antifungal drug which is active *in vitro* against a Candida isolate obtained from the patient and is dosed according the CLSI guidelines. Despite the many advances and wide availability of systemically active antifungal agents, still failure to receive any initial treatment, which is the most common cause of inappropriate empiric antifungal therapy [3-9].

## OBJECTIVE

To know the prevalence and types of Candida species in blood stream infection. To know the antifungal susceptibility pattern of Candida isolates.

## MATERIAL AND METHOD

The study was carried out in the Department of Microbiology, PDU Medical College, Rajkot from September 2015 to August 2016. Total number of samples are 207. All cases of having candidemia in patients admitted in critical care units, who presented with clinical history suggestive of blood stream infection were included in this study. All clinical information was collected for each patient by history and examination at the time of admission in hospital were noted. Signs and symptoms suggestive of candidemia were noted. From all patients who had clinical features suggestive of blood stream infection, blood was collected for culture and sensitivity before initating antibiotic treatment.

**Entire study is devided into three parts:**
**Sample Collection**
**Mycological Processing and Identification**
**Antibiogram**

In this study, the blood culture medium used was Brain Heart Infusion Broth. The specimen was collected and processed as per the guidelines[10]. Blood culture specimens were collected in Brain Heart Infusion Broth. After inoculation, the blood culture bottles were incubated at 37°C under aerobic conditions in the incubator for 7 days. The first subculture was done after 24 hours of incubation, the second on third day and a final on the seventh day on SDA. Bottles were examined macroscopically for growth in the morning and afternoon on the 1st day of incubation and in the morning of each day thereafter. After that, colony from SDA was inoculated on HCDA to differentiate Cndida spp. and processed for, Slide culture on Corn Meal Agar (CMA), Gram stain, Germ tube test. Antifungal susceptibility testing was performed by modified Kirby Bauer method as per the CLSI guidelines. Tested Antifungal drugs was Voriconazole, Fluconazole, Ketoconazole, Clotrimazole, Amphotericin B, Nystatin, Miconazole, Itraconazole [11-14].

## RESULT

58 (28.01%) Candida spp. [C. tropicalis (18) (Figure-1), C. glabrata (14) (Figure:4), C. gullermondii (12) (Figure-3), C. parapsilosis (10) (Figure-2), C. albicans (4) (Figure-5)] were isolated from 207 specimens (Table-1). The rate of change in candidaemia in the ICU over the study period was 28.01 percent which was significant. Males are predominantly affected (57.97%) (Figure-6). Out of these, 203 (98.06%) from NICU/PICU and 4 (1.93%) from Skin ward (Figure-7). The isolates sensitivite to Voriconazole (100%), Fluconazole (98.88%), followed by Ketoconazole (73.03%) and Clotrimazole(68.62%). Maximum resistance observed to Amphotericin B, Nystatin, Miconazole, Itraconazole (Table-2) [11-13].

**Fig-1: C.tropicalis**

**Fig-2: C.parapsilosis**

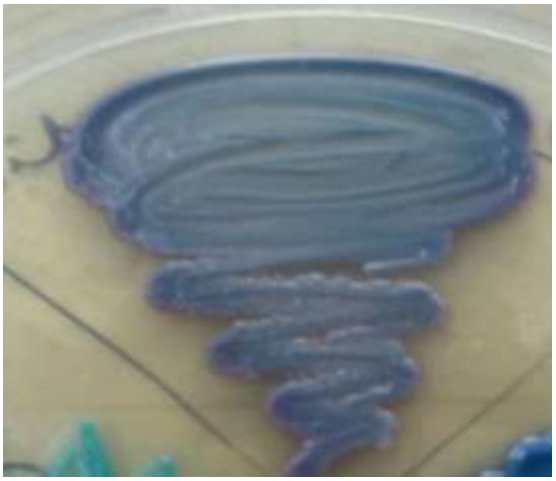

**Fig-3: C.gullermondi**

**Fig-4: C.glabrata**

**Fig-5: C.albicans**

**Table-1: Showing diff C.spp. from blood culture of patients**

| Species(58) | |
|---|---|
| C. tropicalis (18) | 31.03 % |
| C. glabrata (14) | 24.13 % |
| C.gulermondii(12) | 20.68 % |
| C. parapsilosis(10) | 17.24 % |
| C. albicans (4) | 06.89 % |

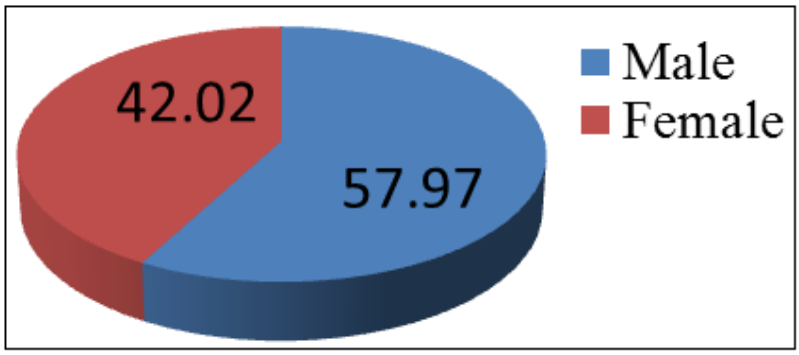


**Fig-6: Showing Gender wise distribution of samples**

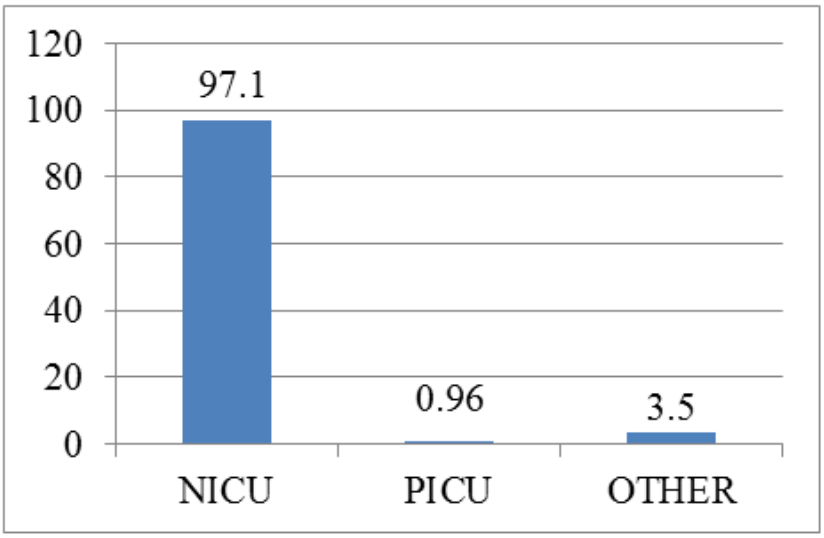


**Fig-7: Showing ward wise distribution of samples**

**Table-2: Antibiotic Susceptibility Pattern of Positive samples**

| Candida spp. | DRUGS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | VRC | FLC | KT | CC | IT | MIC | NS | AP |
| C. tropicalis | 100 | 94.44 | 61.11 | 83.33 | 38.88 | 55.55 | 50 | 5.55 |
| C. glabrata | 100 | 100 | 85.71 | 71.42 | 64.28 | 71.42 | 78.57 | 0 |
| C.gulermondii | 100 | 100 | 83.33 | 58.33 | 33.33 | 25 | 58.33 | 25 |
| C.parapsilosis | 100 | 100 | 60 | 80 | 30 | 60 | 20 | 0 |
| C. albicans | 100 | 100 | 75 | 50 | 50 | 25 | 75 | 25 |

## DISCUSSION

The current retrospective analysis of candidemia over a 1-yr period revealed an increase in candidemia cases at our centre. Data on nosocomial BSIs has also shown up to increase in incidence in the United States [15]. However, Chakarbarti *et al.*, [16] in a retrospective evaluation of candidemia in an Indian teaching hospital have observed even higher rates of incidence [17]. These studies suggested wide variations in the prevalence of candidemia in different hospitals in India. The observed increase in candidemia cases in our study was probably due to the greater use of invasive devices, broad-spectrum antibacterial agents, more extensive surgical procedures and use of advance life support on various transplant patients. We observed a significant increase in rate of antibacterial drug consumption in our institution which has doubled increase the risk. The observed increase in candidemia was significant in ICU settings. There has been a major increase in the prescription of antifungal drugs over the last two decades. In the present study, the overall antifungal use increased 13- fold. As reported by others [16, 19], fluconazole was the most frequently prescribed antifungal agent. In the change to non-*albicans Candida* species from candida spp. has responsible by widespread use of azole. In the present study, there was a statistically significant correlation between yearly fluconazole use and increase in isolation of non *albicans Candida* species, even though the antifungal susceptibility patterns revealed that the most common species *C. tropicalis* showed high sensitivity to voriconazole followed by fluconazole. Our susceptibility data showed that susceptibility to fluconazole was same in *C.glabrata* and *C. parapsilosis*. *C. parapsilosis* has usually been reported to be sensitive to azoles. Still, Sarvikivi *et al.*, [20] have been reported that treatment with fluconazole as a prophylaxis leads to the appearance of subclone of *C. parapsilosis* in susceptible isolates which responsible for BSI in neonatal ICU. Also, *C. parapsilosis* is known to form extensive biofilms on bioprosthetic materials such as central venous catheters (CVCs), which can confer relative resistance to antifungal agents. Cross-resistance between fluconazole and voriconazole has been frequently reported in many species [21] and development of voriconazole resistance after fluconazole exposure without any known prior exposure to voriconazole has also been documente [18]. In our study, cross-resistance or reduced susceptibility to both fluconazole and voriconazole was observed. These findings coupled with high azole consumption at our hospital may preclude the use of voriconazole as initial therapy in unstable patients with invasive candidiasis. In conclusion, there has been a rise in the occurrence of candidemia cases in our tertiary care hospital. Non-*albicans Candida* species was noticed significantly. The high usage of fluconazole appeared to have played a role in this shift, however, it may be recognised that other events like patient specific risk factors might have also contributed in selection of different species. Despite *C. tropicalis* being the commonest isolate, maximum resistance observed to Amphotericin B, Nystatin, Miconazole, and Itraconazole.

## CONCLUSION

Candidemia is major cause of mortality due to lack of early detection of infection and inappropriate antifungal therapy. Blood stream infections by Candida species have shown highest rates of inappropriate therapy among all BSIs. Strategies are needed to rapidly identify cases of candidemia who are already suffering from serious underlying disease and develop rapid diagnostic technology that widely available and cost effective. By knowing Antifungal susceptibility pattern, patients who are at increased risk for developing nosocomial candidemia should be treated early with empiric therapy that reduced unnecessary patient mortality. In most clinical settings, this is typically all that is needed in order to provide the patient an antifungal that is required to minimize the spread of an infecting organism from the site of infection. Candida albicans is the most common cause of nosocomial candidemia, but the epidemiology of species causing candidemia is changing. Candida tropicalis is the most common cause of candidemia in hospitals. Clearly, early identification and treatment of candidemia is important in order to facilitate positive outcomes for hospitalized patients in regards to overall mortality and keeping health care associated costs down.

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