



Original Research Article

Prevalence and Risk Factors of *Candida* blood Stream Infections in a Tertiary Care Hospital

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ABSTRACT

To study the prevalence and antimicrobial susceptibility profiles of candida species isolated from blood for a period of 5 months. Only a few studies from India have reported candidaemia rates of 6-18 per cent and an increase in isolation of non-*albicans* *Candida* species from blood samples. But speciation and susceptibility testing of *Candida* is still not routinely being done at most of the centres. The short term study was conducted in the Department of Microbiology, JNMCH, AMU, Aligarh between May, 2014 and September, 2014. A total of 1753 samples were received during 5 months for blood culture in brain heart infusion broth. Cultures showing growth of gram positive budding yeast like cells were identified to the species level and antifungal susceptibility was performed against fluconazole, ketoconazole, itraconazole, clotrimazole, amphotericin B, nystatin. Clinical history and history of risk factors was taken from the patients on the basis of predesigned proforma. Out of 1753 specimens, 254 (14.5%) showed growth on culture. *Klebsiella* species 90 (35.4%) was the most common isolate followed by *Coagulase negative Staphylococcus* species 31 (12.2%), *Staphylococcus aureus* 31 (12.2%), *Pseudomonas aeruginosa* 28 (11.0%), *Acinetobacter* 21 (8.3%), *Citrobacter* 18 (7.1%), *Escherichia coli* 11 (4.3%), *Alcaligenes faecalis* 3 (1.2%), *Corynebacterium* 3 (1.2%), *Serratia* 2 (0.8%), *Salmonella* species 2 (0.8%), *Proteus* 1 (0.4%), *Streptococcus* species 1 (0.4%). A total of 12 (4.7%) samples showed fungal growth. Most of the patients were in paediatric age group, usually infants. Most common pathogen isolated was *Candida albicans* (10), followed by *Candida parapsilopsis* (1) and *Trichosporon* species (1). On antimicrobial susceptibility testing, all the 12 fungi showed 100 percent sensitivity to all the 6 drugs. Out of 12 patients, 2 had low birth weight, 2 were prematurely born, 2 had history of respiratory distress syndrome. Candidemia is a life-threatening fungal infection associated with a mortality rate of 38%. Rapid changes in the rate of infection, potential risk factors, and emergence of non-*albicans* *Candida* demand continued surveillance of this serious bloodstream fungal infection.

Keywords

Candidemia,
Candida albicans,
Non-*albicans*
Candida,
Antifungal
susceptibility

Introduction

Fungi have emerged as an increasingly frequent cause of nosocomial infections worldwide. *Candida* species are the fourth most common cause of bloodstream infections and are the leading cause of invasive fungal infections among hospitalized patients (Zaoutis *et al.*, 2005). *Candida* blood stream infections (BSI) are associated with a very high morbidity and mortality. They are of particular concern for patients who are immunocompromised, admitted in intensive care settings, with central lines, receiving parenteral nutrition or on prolonged broad-spectrum antibiotics (Saad *et al.*, 2013). Until recently, *C. albicans* was by far the predominant species in most countries, causing up to two thirds of all cases of invasive candidiasis. However, during 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 *Candida albicans* to non-*albicans* *Candida* species (Krcmery *et al.*, 2002). It is imperative to perform both speciation and antifungal susceptibility testing of all yeast fungi isolated from bloodstream.

Only a few studies from India have reported candidaemia rates of 6–18 per cent (Xess *et al.*, 2007) and an increase in isolation of non-*albicans* *Candida* species from blood samples (Shivaprakasha *et al.*, 2007). But speciation and susceptibility testing of *Candida* is still not routinely being done at most of the centres. The diagnosis of systemic candidiasis is difficult because clinical signs are nonspecific. Isolation of *Candida* species from a single blood culture is now considered to be sufficient evidence for the immediate initiation of systemic antifungal therapy (Edwards *et al.*, 1997). The present study was conducted to study the prevalence and antimicrobial

susceptibility profiles of *Candida* species isolated from blood for a period of 5 months

Material and Methods

This study was conducted in the Department of Microbiology, Jawaharlal Nehru Medical College, AMU, Aligarh between May, 2014 to September, 2014. Samples were collected using strict aseptic precautions and inoculated immediately in BHI broth and were plated on 5–10% sheep blood agar and teepol lactose agar after 24 and 48 hours of incubation. The negative result was followed-up by examining the broth daily and doing a final subculture at seventh day. A total of 1753 samples were received during 5 months for blood culture in brain heart infusion broth.

The culture bottles that tested positive for yeasts were subcultured on Sabouraud dextrose agar and the yeasts were identified by standard mycological techniques, namely germ-tube test, morphology on cornmeal agar, color and colony characteristics on CHROM Agar *Candida* medium (Hi-Media Laboratories, Mumbai, India), carbohydrate assimilation and fermentation tests (Discs, media procured from Hi-Media Laboratories, Pvt. Ltd. Mumbai, India).

The antifungal susceptibility pattern of the isolates was evaluated by the Disc diffusion test for amphotericin B, fluconazole, ketoconazole, itraconazole, clotrimazole, nystatin on Mueller-Hinton agar supplemented with 2% glucose. The zone diameter endpoints were read at the complete inhibition for amphotericin B. In the case of azoles, the inhibition zone usually has a diffuse zone edge; therefore, the reading was taken at a point showing significant inhibition or marked decrease in growth intensity, usually corresponding with about 80% inhibition of growth. The

standard strains used were *C. parapsilosis* ATCC 22019 (Hi-Media Laboratories, Mumbai, India) and *C. albicans* ATCC 90028 (Hi-Media Laboratories, Mumbai, India).

Clinical data of all candidemia patients were recorded on preformed questionnaire and analyzed. Medical history and probable risk factors such as duration of stay following admission, aspiration pneumonia or ARDS, presence of prosthetic material and results of culture from any of these sites like vascular catheter, urinary catheter, cardiac pacers, orthopaedic implant and presence of immunosuppressed state, complicated labour, peritoneal dialysis, surgery, previous antibiotic therapy were also recorded.

Result and Discussion

The spectrum of candidemia has changed with the emergence of non-*albicans* *Candida* species and with acquired antifungal resistance assisted by an increase in the high-risk population. This study highlights the prevalence of candidemia along with correlation to the well-known risk factors.

During the study period, a total of 1753 samples were received of which 254 samples (14.5%) were culture positive. Similar results were found by Gohel *et al.*, (2014); China and Gupta, (2013).

Among these 254 isolates, 242 (95.3%) were aerobic bacterial pathogens and 12 (4.7%) showed fungal growth. Among aerobic bacterial pathogens, the most common pathogens isolated were *Klebsiella spp* (n=90, 37.2%), *Coagulase negative Staphylococcus species* (n=31, 12.2%), *Staphylococcus aureus* (n=31, 12.2%), *Pseudomonas aeruginosa* (n=28, 11.0%),

Acinetobacter spp (n=21, 8.3%), *Citrobacter spp* (n=18, 7.1%), *Escherichia coli* (n=11, 4.3%), *Alcaligenes faecalis* (n=3, 1.2%), *Corynebacterium spp* (n=3, 1.2%), *Serratia* (n=2, 0.8%), *Salmonella spp* (n=2, 0.8%), *Proteus spp* (n=1, 0.4%) and *Streptococcus spp* (n=1, 0.4%). Out of 12 fungal isolates, *C. albicans* was the most frequently isolated species (n=10, 83.33%) followed by *C. parapsilosis* (n=1, 8.33%) and *Trichosporon spp* (n=1, 8.33%).

Yeasts of the genus *Candida* are a major cause of systemic infection in hospitalized patients. In line with other published studies, *C. albicans* was the most common species isolated from BSI. In study by Chander *et al.* (2013), 94.20% were bacterial pathogens and 5.79% belonged to *Candida* species. *Candida albicans* comprised 43%, *Candida parapsilosis* (22%), *Candida glabrata* (15%) in study by Morii *et al.* (2014). Of the 171 patients, 89 had *Candida albicans* BSI and remaining 82 patients had infection due to non-*albicans* species (Nunes *et al.*, 2013). Barberino *et al.*, (2006) found *C. albicans* in 56% cases, *C. tropicalis* (16%) and non-*albicans* species in 12%.

Out of 12 patients with fungal isolates, 6 (50%) were found to have associated risk factors. Out of the 6 isolates 2 (16.7%) had low birth weight; 2 (16.7%) were prematurely born and 2 (16.7%) had history of respiratory distress syndrome. Chander *et al.* (2013) found hospitalization (88.9 %), placement of central venous catheters (81.4 %), and previous antimicrobial therapies (92.5%) as the main risk factors associated with development of candidemia.

In our study 8 (66.7%) patients were newborn and 3 (25%) were in the infant age group, and 1 (8.3%) was 11 year old.

Figure.1 Prevalence of various microorganisms isolated from blood culture

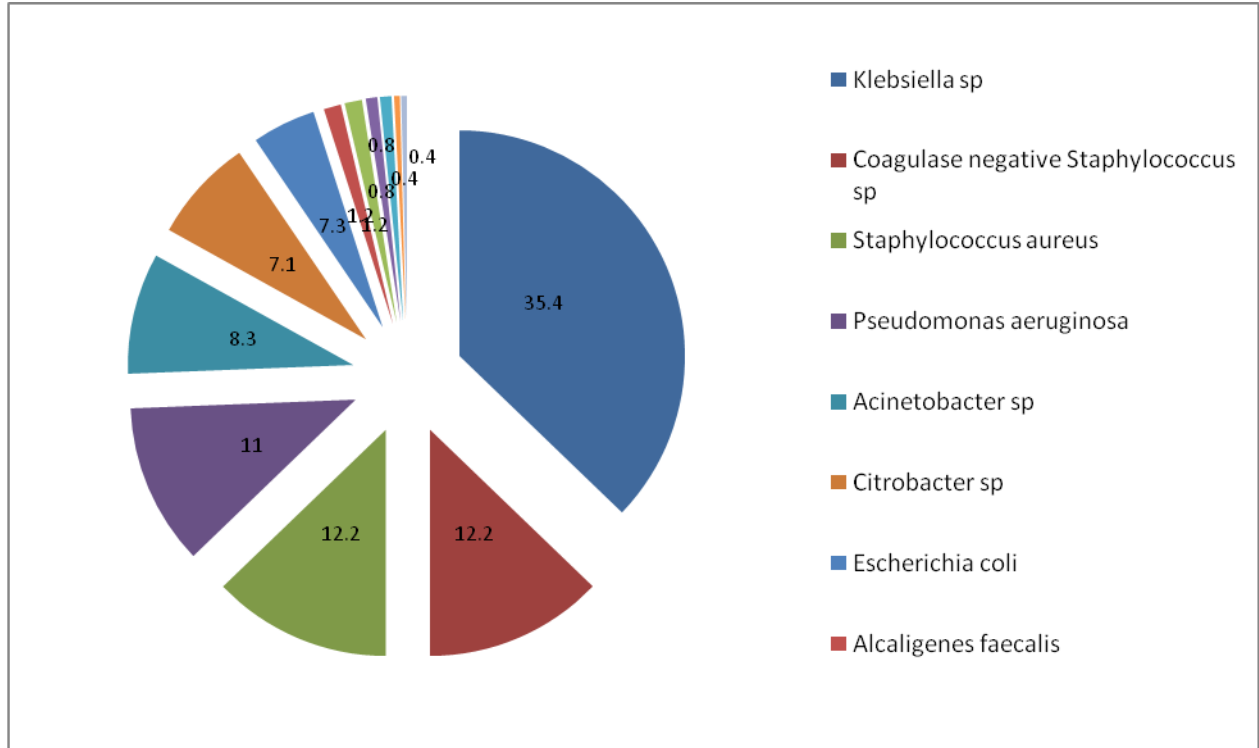


Figure.2 Age distribution of patients showing positive growth on blood culture

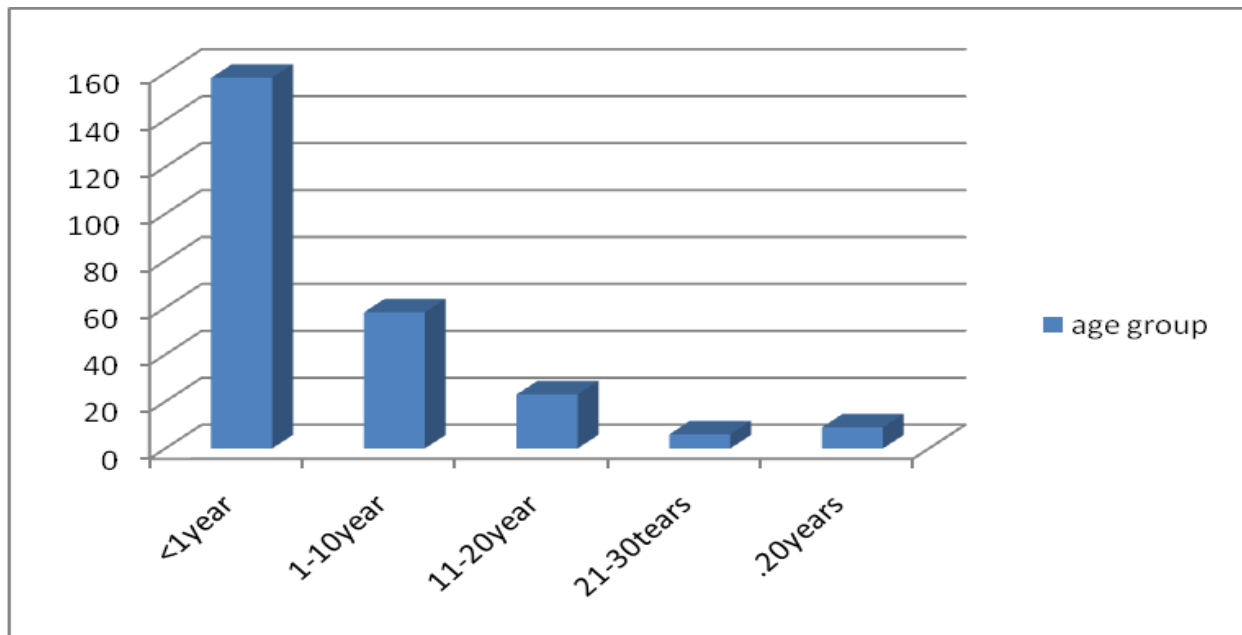
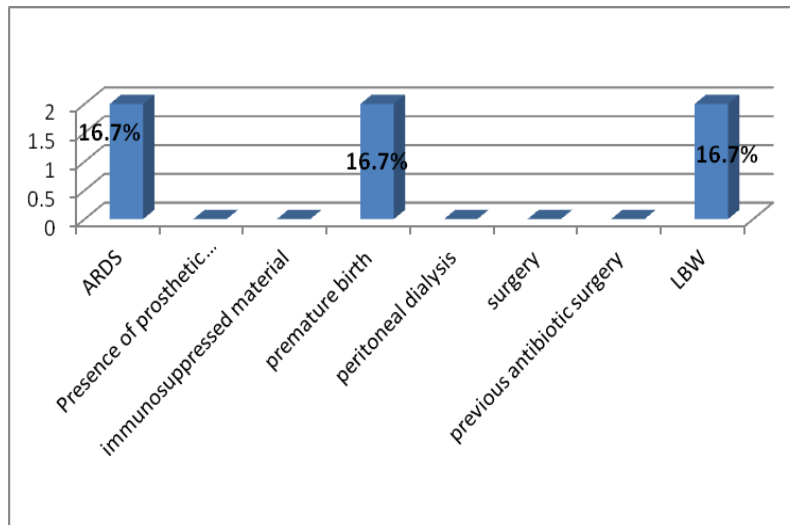


Figure.3 Risk factors associated with candidaemia



The condition of 10 patients improved after treatment and were discharged. However 2 (16.7%) patients expired during the course of treatment. The mortality was found to be 40.7%. Chander *et al.* (2013) reported nearly 40% mortality in patients with *Candida* infection. The low mortality rate in our study may be due to less number of patients included in the study.

On antimicrobial susceptibility testing, all the 12 fungal isolates showed 100 percent sensitivity to the 6 drugs tested (fluconazole, ketoconazole, itraconazole, clotrimazole, amphotericin B and nystatin). 85.3% of *Candida* isolates were susceptible to fluconazole and 62.5% were susceptible to itraconazole, in study by Tan *et al.*, (2008). Chander *et al.*, 2013 found all strains of *C.albicans* to be susceptible to amphotericin B and 62.5% were resistant to fluconazole.

Candidemia is a life-threatening fungal infection associated and *C. albicans* remains the predominant species isolated from *Candida* BSI. Rapid changes in the rate of infection, potential risk factors, and emergence of non-*albicans Candida* demand continued surveillance of this serious

bloodstream fungal infection. Routine screening of *Candida* isolates to the species level should be done followed by confirmation of resistant strains by antifungal susceptibility testing is essential.

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