DHR International Journal Of Medical Sciences (DHR-IJMS)
ISSN: 2278-831X, Vol. 5(2), 2014
Available online *http://www.doublehelixresearch.com/DHRIJMS*

Original article

Study of *Candida* Species in Various Clinical Samples in a Tertiary Care Hospital

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Abstract

Candida species have emerged as major causes of human disease, especially among the immunocompromised and those hospitalized with serious co-morbid conditions. The morbidity and mortality associated with these infections are significant and Candidal infections have emerged as important public health problems. Increasing use of broad-spectrum antibiotics, intravascular catheters, cytotoxic chemotherapies, invasive surgical procedures and long duration of hospital stay are few of the pre-disposing risk factors.

The aim of the study was to identify the various species of Candida from clinical specimens (urine, sputum, stool, pus, various body fluids, skin and corneal scrapings, medical implants and blood) suspected of Candidal infection.

A total of 125 Candida isolates from various clinical specimens were taken up for the study during a period of two years. They were further speciated by the germ tube test, chlamydospore formation on Corn Meal Agar and carbohydrate utilization patterns by Sugar Assimilation Tests.

Candida was mainly isolated from blood (42) and respiratory samples (25). The most common species of *Candida* isolated was *C. albicans* forming 44% of the total isolates. The non-albicans *candida* species form the remaining 56% of the total isolates, thus stressing their emergence as major fungal pathogens.

The species level identification of *Candida* is important due to variation in sensitivities of various species to different antifungals and also due to limited therapeutic options because of emergence of resistance to antifungals.

Keywords: Fungal infections; *Candida albicans*; non-albicans *Candida*

Introduction

Nosocomial infections with non-albicans *Candida* species have been on a significant rise over the past decade[1]. The genus *candida* includes several species implicated in human pathology. *Candida albicans* is by far the most common species causing infections in humans. The growing number of immunocompromised individuals as a result of the HIV pandemic and the use of long-term immunosuppressive therapy in cancer and organ transplant patients have all favored the increased incidence of non-albicans species among hospitalized and immunosuppressed patient[2]. Invasive medical procedures, un-sanitary hospital practices and long duration of hospital stay are becoming increasingly common[3].

Candida albicans and non-albicans species are closely related but differ from each other with respect to epidemiology, virulence characteristics, and antifungal susceptibility. All *candida spp.* cause diseases ranging from superficial infections such as oral thrush to invasive disease, yet they show differences in disease severity and susceptibility to different antifungal agents[2].

Candida spp. identification is therefore important for successful management. Speciation helps to understand the epidemiology of *candida spp.* particularly the source and mode of transmission. This in turn facilitates the development of effective measures to prevent and control transmission of resistant pathogens[2].

This study was undertaken to know the incidence and to speciate *Candida* obtained from various clinical samples and to determine age-wise & sex-wise distribution of candidiasis.

Materials and methods

A total of 125 *Candida* isolates from various clinical specimens (urine, sputum, stool, pus, various body fluids, skin and corneal scrapings, medical implants and blood) were taken up for the study during a period of two years. The various clinical specimens were collected and processed as per the standard microbiological procedures. They were further speciated by the germ tube test, chlamydospore formation on Corn Meal Agar and carbohydrate utilization patterns by Sugar Assimilation Tests.

Results

A total of 125 samples showing growth of *Candida* were included in the study. Candida was mainly isolated from blood (42) and respiratory samples (25). Other sources included medical implants (19), vaginal swabs (16), stool (13) and urine (10). [Table1]

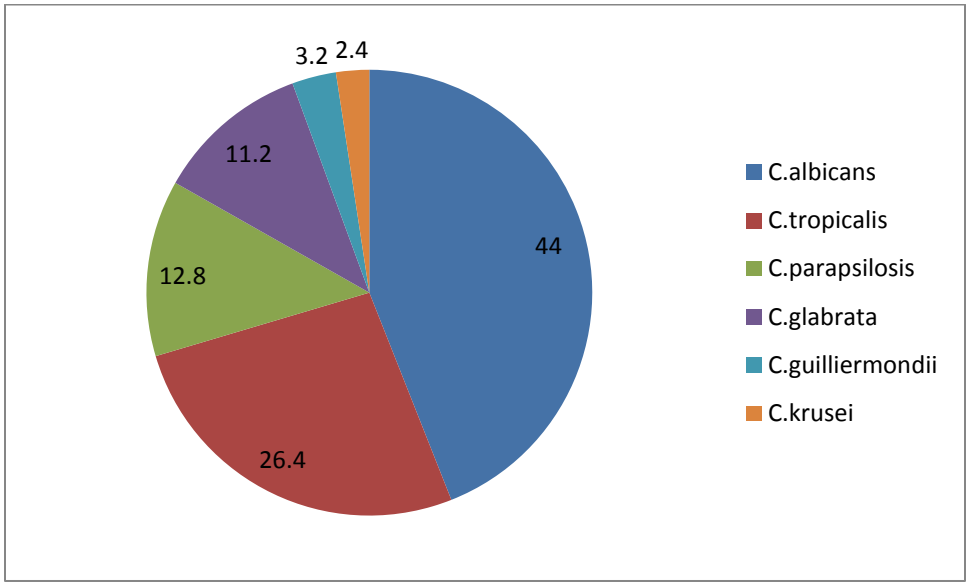
Table 1: Distribution of samples showing growth of Candida species

Samples	Number (%)
Blood cultures	42 (33.6)
Respiratory samples	25 (20)
Medical implants	19 (15.2)
Vaginal swabs	16 (12.8)
Stool samples	13 (10.4)
Urine samples	10 (8)
Total	125

The most common species of *Candida* isolated was *C. albicans* forming 44% of the total isolates. The non-albicans C*andida* species form the remaining 56% of the total isolates, thus stressing their emergence as important fungal pathogens.

Candida albicans was the most frequent isolate in our study (44%). *Candida tropicalis* (26.4%), *Candida parapsilosis* (12.8%), *Candida glabrata* (11.2%), *Candida krusei* (2.4%) and *Candida guilliermondii* (3.2%) were the other common species isolated [Figure 1].

Figure 1: Species of Candida isolated



Candidiasis was most common in the age group of greater than 18 years up to 50 years (40%), followed by the age group of greater than 60 years (35%). The rate of isolation of the *Candida* species was more in males than in females (55.2%).

Discussion

The frequency of invasive mycoses has increased dramatically during the past two decades owing to medical advances such as intensive cancer therapy, broad-spectrum antimicrobial therapy, invasive medical devices, organ transplantation, human immunodeficiency virus (HIV) disease epidemic and an expanding aging population.

125 patients were screened during a period of two years. *Candida* was mainly isolated from blood (33.6%) and respiratory samples (20%). Other sources included medical implants (15.2%), vaginal swabs (12.8), stool (10.4%) and urine (8%).

Candida albicans was the commonest species isolated causing 44% of the infections followed by *Candida tropicalis* & *Candida parapsilosis* causing 26.4% and 12.8% of the infections respectively. Our study reaffirms the shift towards non-albicans *Candida spp*.

Data from surveillance and control of pathogens of epidemiological importance (SCOPE) surveillance system confirms that *Candida* species have become the fourth leading cause of blood stream infections. A recent study (2007) by MN Chowta *et. al.,* shows that Candidemia is associated with increased cost and attributable mortality of 38%. Although *Candida albicans* is the most frequently encountered organism, a number of reports have documented non-albicans *Candida* species such as *C. tropicalis*, *C. glabrata*, *C. parapsilosis* and *C. krusei* and other filamentous fungi as emerging pathogens in recent years. Intravascular catheters, broad-spectrum antibiotics therapy, mucosal colonization, neutropenia, previous surgical procedures (particularly complicated abdominal surgery), total parenteral nutrition and concomitant bacteremia have been identified as significant risk factors for invasive candidal infection in various epidemiologic studies[4].

There are few Indian studies regarding the incidence and risk factors for candidemia. This study also throws light on the prevalence of candidemia and invasive candidiasis in a tertiary care hospital which is not only associated with a significant mortality but also extends the duration of hospital stay and cost of medical care[4].

Our study is in agreement with the studies conducted by Dastidher (72.8%), Gupta D (64%) and Mokaddas *et. al.,* (39.5%) which all found *C. albicans* to be the commonest isolate[5,6]. Various studies over the years have shown that there is a considerable shift towards the non-albicans *Candida* isolates. Our study showed that non-albicans Candida were isolated at a higher rate (56%) than *C. albicans* (44%),

which was in agreement with the findings of the studies by Mokaddas *et. al.,* which also showed the non-albicans *Candida* incidence (60.5%) to be higher than that of *C. albicans* (39.5%)[5,6]. A study by Chakrabati A also showed non-albicans *Candida* to have a higher incidence (75%) than *C. albicans* (25%). These findings seem to suggest that non-albicans *Candida* are emerging as important pathogens[5,7].

The speciation of *Candida* is important to identify the incidence and trends of Candidal infections in a given set-up of study. It is also essential for the choice of antifungals because of variation in the sensitivity of different species to different antifungals. The azoles being effective against *C. albicans* and *C. tropicalis*, are found to be ineffective against *C. krusei* and *C. glabrata* [8,9].

Though candidiasis can occur at all ages, studies by Dalal PJ and Kelkar SS at Mumbai showed the highest incidence of candidiasis to be in the age group of 21-40 years[10]. Our study also had similar findings with patients in the age group of >20 years up to <50 years showing the highest incidence of candidiasis.

Males were predominant in the study group (55.2%). A study conducted by Patel *et. al.,* recorded a male preponderance, with an overall male: female ratio being 2:1[11]. However, in a study by Kandhari KC *et. al.,* the incidence was found to be higher in females (61.2%) than in males (38.8%). Interestingly, candiduria was higher in females (80%) than in males. This incidence in females may reflect vaginal candidiasis. Yeasts may ascend from the genital tract to the urinary tract, explaining a higher candiduria incidence in women. This hypothesis was suggested by Febré *et. al.,* (1999), which found five of eight patients with positive vaginal secretions and later showed the presence of the same yeast species in their urine. *C. glabrata,* described as etiologic agent of vaginal candidiasis in several cases (Del Palacio *et. al.,* 2000), was recovered in our study in two patients, both of them being women.

Our study had a few limitations. The risk factors for candidiasis could not be evaluated. So patients with only colonization could not be differentiated from those with true infection. But all patients had a mean duration of stay of 10 ± 4 days in the hospital and had one or more of the various risk factors (Intravascular catheters, broad-spectrum antibiotics therapy, mucosal colonization, neutropenia, previous surgical procedures, total parenteral nutrition and concomitant bacteremia) in common.

To conclude, invasive candidiasis is the most frequent invasive mycosis in critically ill patients. Changing epidemiology with increased non-*albicans Candida* spp., nonspecific risk factors and clinical presentation, and late diagnosis with culture-based methods are major challenges in the management of invasive candidiasis.

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