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Isolation and identification of *candida* species from a tertiary care centre

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ABSTRACT

Introduction

Fungal infections by opportunistic pathogens such as *Candida*, and the resulting mortality in immune compromised patients are showing a steady uprise in the world. *Candida* is a yeast-like fungi, which is the most common cause of fungal infections. They are normal inhabitants (commensal) or endosymbiont commonly present on the skin and mucous membranes, in particular, the gastrointestinal tract. It turns pathogenic when the normal mucosal membrane is ruptured or the immune system is compromised, leading to an array of opportunistic infections. Candidiasis is an endogenous opportunistic infection of the skin, mucosa and rarely of the internal organs. Usually these infections are limited to the mouth, skin or genital area.

Aim

To isolate and identify *Candida* species from various clinical specimens from a tertiary care centre.

Materials And Method

This is a cross-sectional study conducted at the Department of Microbiology, Saveetha Medical College & Hospital, for six months from July 2018 until December 2018. The specimens of this study were collected from inpatients and outpatients of various departments of our hospital. A total of 10,750 samples of various specimens were collected, out of which, 4,690 showed various microbial growth patterns, of which 96 *Candida* strains were isolated. Speciation was done according to the standard protocol.

Result

In our study, the prevalence rate of Candidiasis is 2%. *Candida non albicans* species were isolated at higher rates (75%) than that of *albicans*. The age distribution of the isolated *Candida* spp., showed that the isolation rate was significantly higher in patients in their 60's. Men were mostly affected in their 60's, while their female counterparts were affected in the 40's. 14.2% of the specimens collected were from the ICU patients. 9.4% of the patients were diabetic and presented with its complications.

Conclusion

Candida albicans is the most commonly isolated species of the genus *Candida*. Candidiasis is an endogenous opportunistic infection of the skin, mucosa and rarely of the internal organs. Usually these infections are limited to the mouth, skin or genital area. However, in people with weakened immune system are not only susceptible to tropical infections, but are also most likely to end up experiencing a more severe internal infection.

Keywords: *Candida albicans*, Yeast-like fungi, Opportunistic infections

INTRODUCTION

Fungi were recognized earlier than bacteria as causative agents of human diseases. Fungi causing favus and thrush were described as early as 1839. Fungal infections caused by opportunistic pathogens such as *Candida*, are responsible for increase in mortality especially in immune compromised patients. However, most of fungi are saprophytes in the soil.

Fungi are eukaryotic Protista that differ from bacteria and other prokaryotes in many ways that they posses rigid cell wall, which is made up of chitin, mannan and polysaccharide and have a true nuclei with paired chromosomes.

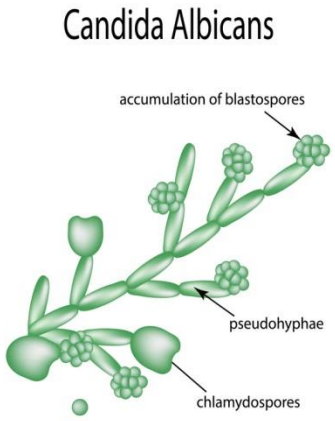


Fig. 1 Distribution of *Candida* spp. by age and gender

They are heterotrophs, secreting certain digestive enzymes, which helps them in acquiring food by absorbing dissolved molecules and not by photosynthesis. They reproduce either sexually or asexually, or by both.

Morphologically they can be classified as

- Yeast
- Yeast-like
- Mould and
- Dimorphic fungi.

Systematically, based on the spore formation, they can be classified as

- Lower fungi (phycomycetes)
- Higher fungi (ascomycetes, basidiomycetes, deuteromycetes).

Candida an yeast-like fungi are most commonly present on the skin and mucous membranes, in particular, the gastrointestinal tract, is the most common cause of fungal infections. They are normal inhabitants (commensal) or endosymbionts. It turns pathogenic when the normal mucosal membrane is ruptured or the immune system is compromised, leading to an array of opportunistic infections and it is the fourth common cause of nosocomial infections. The commonest predisposing factor of candidiasis is diabetes. Usually these infections are limited to the mouth, skin or genital area. However, in people with weakened immune system are susceptible to tropical infections. The various species of *Candida* are *C.albicans, C.glabarta, C.utilis, C.tropicalis* and *C.parapsilosis.*

It is an ovoid or spherical budding cell, which produces pseudomycelia in both tissue and in cultures. Candidiasis is an endogenous opportunistic infection of the skin, mucosa and rarely of the internal organs. Thrush is the common name for mouth infection caused by *Candida.* Moist surfaces around lips, inside the cheeks and on the tongue and palate. *Candida* can also cause esophagitis, cutaneous skin infections (diaper rash), vaginal infections and *Candida* sepsis (deep candidiasis).

MATERIALS AND METHODS

This is a cross-sectional study conducted at the Department of Microbiology, Saveetha Medical College & Hospital, for six months from July 2018 until December 2018 collected from inpatients and outpatients of various departments of our hospital. A total of 10,750 Blood, Urine, Exudate (high vaginal swab, wound swab, peritoneal fluid) Sputum specimens were collected. Of which, 4,690 were positive for bacterial growth and fungal growth, from which 96 strains of *Candida* were isolated.

These specimens were collected aseptically and were cultured on various media. Initially. A part of the culture was inoculated on Sabouraud dextrose agar at 35C. *C. albicans* or *C. dubliniensis* were identified by germ tube test. Based on the chlamydospore formation on cornmeal agar and the growth at 45C, *C. albicans* was identified. For final isolation of *Candida* species, the isolates were subjected for sugar assimilation test. Later, the *Candida spp.* were inoculated on CHROM agar and incubated at 37C for 24 hours. The species were identified on the basis of colour and type of colonies present on the CHROM agar. Studies have evaluated CHROM agar as a primary medium to identify yeasts directly from clinical specimens, including stool, urine, respiratory, vaginal, oropharyngeal, and esophageal sources [16,17].

RESULT

A total of 96 *Candida spp.* were isolated from various clinical specimens, in which *Candida nonalbicans* (75%) was most frequently isolated. Of the 96 Candida species isolated from various samples, Candidiasis was common among Non-ICU patients (85.4%) and non-pregnant women (64.2%), as compared to ICU patients (14.5%) and 35.8% in pregnant women.

Urine was the specimen from which *Candida* spp., were most prominently isolated, both in men and women. The age distribution of the isolated *Candida* spp., showed that the isolation rate was significantly higher in patients in their 60's.men were most affected than that of their female counterparts. For patients in between their 40's and 50's,showed that women were significantly affected than that of women in their 60's. On the whole, Candida was most commonly isolated from women (55%) as compared to men (45%).

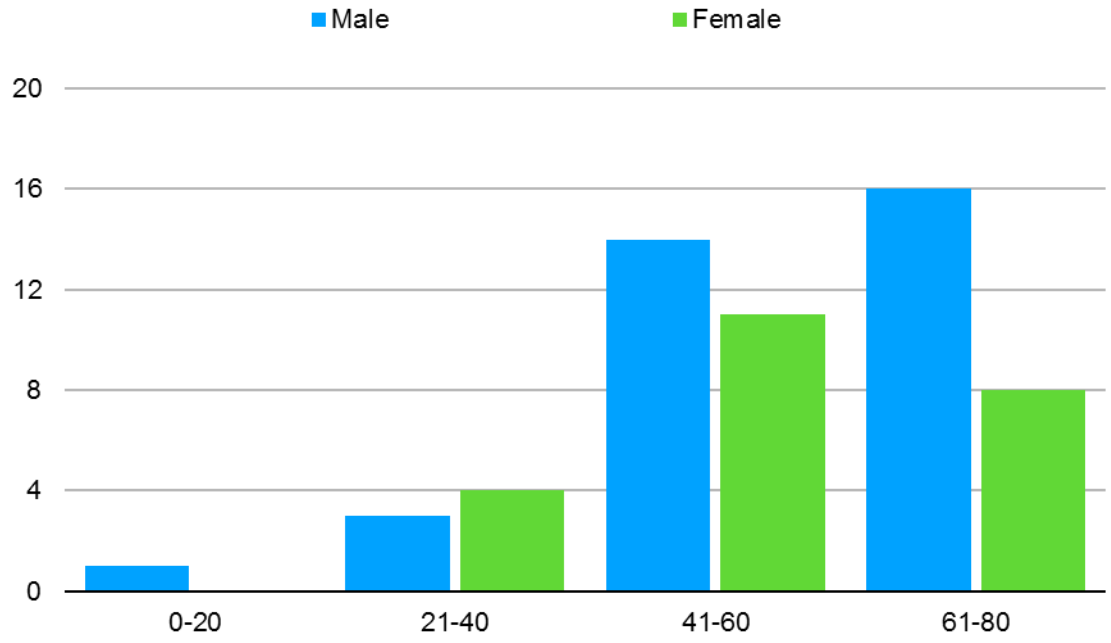
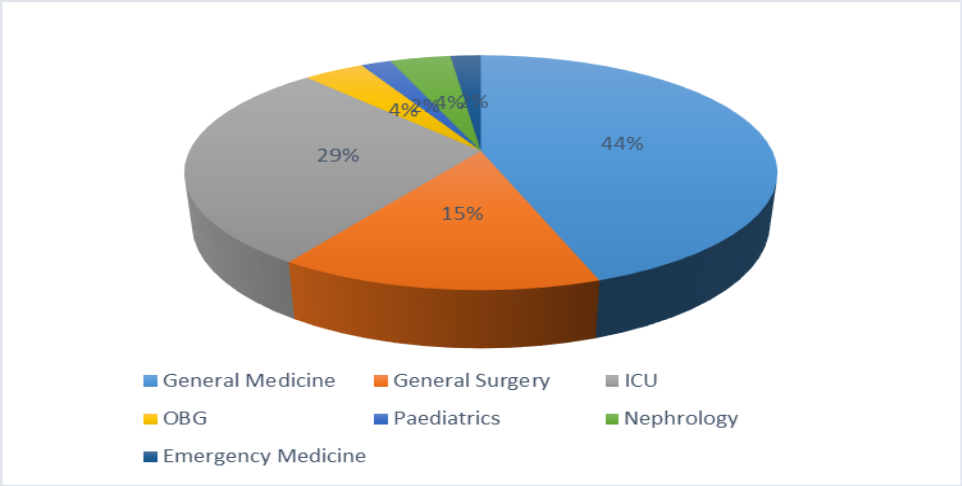


Fig 2 shows growth of Distribution of *Candida* spp. by department

Based on various departments the specimens were collected, *Candida* spp., were most commonly isolated from specimens of the department of General Medicine (45%), followed by patients in ICU (29%), General Surgery (15%), Emergency department, Nephrology, OBG and Paediatrics.



Looking into the isolation rate of *Candida spp.*, which were isolated from various clinical specimens, *Candida non albicans* was the most frequently isolated species from urine specimen (51.04%), followed by high vaginal swab (31.25%), wound swab (14.5%) and blood (02.08%). *Candida albicans* was found in large numbers in urine sample (51.6%), followed by high vaginal swab (29.03%)

Table-1 Showing Distribution of *Candida spp.* by various specimen

Specimen	*Candida albicans*	*Candida tropicalis*	*Candida krusei*	*Candida parapsilosis*	Total Candida specimens
Urine	**16**	**22**	**6**	**5**	**49**
Blood	**1**	**1**	**0**	**0**	**2**
High vaginal swab	**9**	**14**	**4**	**3**	**30**
Wound swab	**4**	**7**	**2**	**1**	**14**
Peritoneal fluid	**1**	**0**	**0**	**0**	**1**
TOTAL	**31**	**44**	**12**	**9**	**96**

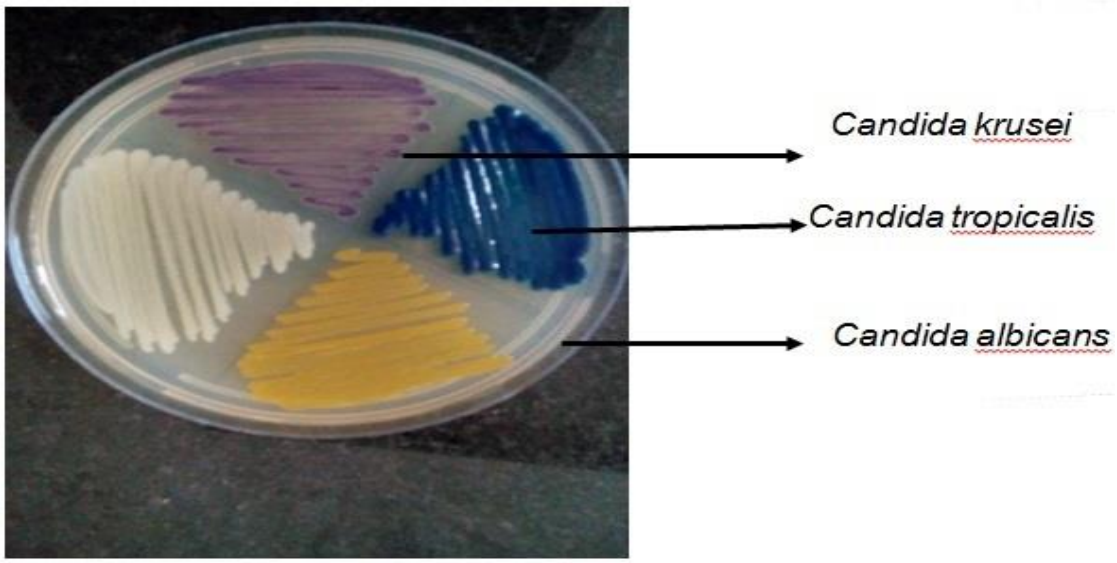


Fig. 4 shows growth of *Candida albicans* (white colony) and *Candida tropicalis* (navy blue olony)

DISCUSSION

This was a cross-sectional study conducted at the Department of Microbiology, Saveetha Medical College & Hospital, for six months from July 2018 until December 2018. A total of 10750 samples were collected, out of which, 4690 showed various microbial growth. 96 strains of *Candida* were isolated from this growth.

Candidiasis is an increasingly common problem in hospitalised patients, with various studies concluding that *Candida* spp. are now the fourth most common pathogen isolated from blood of these patients, and can cause serious life threatening systemic infections and chronic mucocutaneous infections in immunodeficient patients [1,4,7,15]. In this study, majority of isolates were from urine (51.04.7%), high vaginal swab (31.25%), wound swab (14.5%), blood (02.08%) and peritoneal fluid (1.04%). In recent years Non-*albicans Candida* (NAC) are considered as major pathogens causing severe infections [3,23,24]. This study shows that there is a higher incidence of NAC (75%) as compared to that of *Candida albicans (*25%). Higher incidence of NAC ranging from 54-75% have been observed in numerous studies. *Candida albicans* now accounts for less than 50% of all candidal isolates [15]. Jayalakshmi et al. showed that among the NAC species, *C.tropicalis* was the most prevalent [19], followed be *C.glabrata* and *C.krusei* [18]. Various studies conducted in different countries of Europe depicts similar findings [20-22]. Pregnant women have a two-fold increase in the prevalence of vaginal colonisation of *Candida* spp. compared to non-pregnant women. This association is influenced by increased levels of circulating estrogens, deposition of glycogen and other substrates in the vagina during pregnancy [2]. 19 (35.8%) out of 30 women who were found to have vaginal candidiasis, were pregnant. This study indicates they vaginal candidiasis is more commonly caused by *C.nonalbicans* (63.3%).

There is an evidence that eradication of *Candida* in pregnancy may reduce the risk of spontaneous preterm birth who were treated for vaginal candidiasis [8] though a study reported that vaginal candidiasis in pregnancy was not associated with preterm birth[9]. Diabetes mellitus is a predisposing factor to a variety of fungal infections. Patients with diabetes are prone to infections, candidiasis being more common [3]. This study reveals that *Candida albicans* accounts for about 40% of candidiasis caused in diabetic patients, whereas *Candida nonalbicans* were on the rise (60%) [2,5]. Certain studies reveal that *Candida* is more prevalent in the oral cavity of diabetics than that of non-diabetics [3, 10]. Jafari et al. observed that *Candida* was more prevalent in the oral cavity of Type 2 diabetics than that of type 1 diabetics. *Candida* spp. is frequently isolated from the respiratory secretions of mechanically ventilated patients [11,12]. This can cause invasive pneumonia in immunocompromised patients. Nevertheless, the presence of *Candida* spp. in respiratory secretions of patients with ventilator-acquired pneumonia (VAP) could be associated with prolonged stay, worse outcomes and longer mechanical ventilation[6,13]. This study shows that Candidiasis was common among Non-ICU patients (85.4%), as compared to ICU patients (14.5%). Risk factor analysis revealed intravenous catheterisation as the major predisposing factor, followed by prior therapy with broad-spectrum antibiotics, mechanical ventilation, urinary catheterisation, diabetes mellitus and steroid therapy. Basetti et al. (2007) reported that the incidence of candidemia within a one-year period of study was 13% among hospitalized patients in two teaching hospitals. Related studies have shown that there were increased disseminated Candida infections among bone marrow transplant patients and neutropenic patients by *Candida krusei* since a century ago (Wingard et al., 1991)

CONCLUSION

Candida is a genus of yeast and is the most common cause of fungal infections worldwide. Candida infections can be treated with antifungal medications. A proper diet which boost the immune system and contributes to a balanced intestinal and oral flora. Prognosis of Candida infections in healthy people with superficial candidiasis is good, whereas in people with chronic infection or weakened immune system, episodic attacks of candidiasis is common. 8% of all nosocomial bloodstream infections (BSI) are caused by Candida spp. The absolute number of cases of nosocomial Candidaemia range from 7,000 to 28,000 annually. If the crude mortality rate of Candida BSI is 40%, then 2,800 to 11,200 deaths each year may be associated with nosocomial

Candidaemia. These estimates are similar to those obtained from National Hospital Discharge Survey (NHDS) statistics.

Conflict of Interest

There is no conflict of interest.

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