# A Study on Isolation and Identification of Candida Species from Various Clinical Samples in a Tertiary Care Hospital

## Sangeetha C Patil[1], Krishna S[2], Haafiza Begum[3], Pushpalatha H[4]

[1]Assistant Professor, Department of Microbiology, VIMS, Ballari
[2]Assistant Professor, Department of Microbiology, VIMS, Ballari
[3]Post Graduate, Department of Microbiology, VIMS Ballari
[4]Associate Professor, Department of Microbiology, VIMS Ballari

**Abstract**

**Introduction:** Candida is a yeast-like fungus that is a common human commensal. As the host's resistance to infection is reduced, either locally or systemically, they become pathogens and cause illnesses. The present study was conducted to isolate, identify and characterize Candida species from various clinical samples at VIMS, Ballari.

**Materials and Methods:** This prospective Study was conducted in the department of Microbiology, VIMS Ballary from October 2022 to April 2023. A total of 6781 clinical samples were examined. Gram stain, germ tube test, and inoculation on commercially available CHROM agar were performed for these isolates.

**Results:** Candida isolates were found in 186 of the 6781 clinical specimens. Majority of isolates were from urine (47%) followed by sputum (30%), vaginal swab (16%), blood (4%), and pus (3%). *Candida albicans* (42%) was the most isolated species followed by *C. tropicalis* (25%), *C. grablata* (16%), *C.krusei* (13%), and *C. Parapsilosis* (4%).

**Conclusions:** Candida albicans was identified as a prevalent pathogenic yeast in our study. The capacity to identify inherently resistant organisms is aided by the ability to characterise Candida to the species level. CHROM agar is a rapid, easy, and low-cost method for identifying such species.

**Keywords:** Candida, Clinical Samples, Chrom Agar.

## Introduction

Yeast infections vary in severity, ranging from minor infections [1] to potentially fatal sepsis [2]. Candida is one of the most important yeast genera due to its significant morbidity and mortality. At least 15 Candida species have been linked to human illnesses [3]. The majority of Candida species are considered normal skin and mucous membrane residents. However, under certain conditions, these microorganisms have the potential to express virulence factors that render them pathogenic or opportunistic, particularly when the patient is suffering from a debilitating clinical condition [4,5], or when invasive devices are used [6,7], or when immunosuppression is present.

The most severe cases of candidiasis are nosocomial, and the source of infection might

be endogenous or external [8]. Candida albicans is the most commonly reported species causing human illness [9], however additional species such as C. glabrata, C. parapsilosis, C. tropicalis, and C. krusei have also been recorded [10]. The number of yeast infections appears to have grown dramatically in recent decades [11,12]. While Candida albicans is still responsible for the majority of yeast infections, non-albicans species appear to be on the rise [13,14].

The biggest significance of these recent alterations in the prevalence and epidemiology of severe Candida infections resides in the inherent disparities in sensitivity to antifungal therapy between each of these species [15]. In many circumstances, identifying Candida species allows one to forecast their sensitivity to antifungal drugs. The purpose of this prospective study is to isolate, identify, and characterise Candida SPP from diverse clinical samples at VIMS, Ballari.

## Materials and Methods

It is a prospective research conducted by the Microbiology department of VIMS Ballary between October 2022 and December 2023. All clinical samples suspected of fungal infection that were submitted to the microbiology laboratory throughout the research period were included.

## Exclusion criteria:

1. Samples that include typical flora

2. Contamination of culture plate and multimicrobial development

3. Patients receiving antifungal therapy

All clinical samples were obtained according to clinical and laboratory protocols. [16] Gram's stain was conducted on direct samples that were put into Sabouraud dextrose agar and incubated for 24 hours at 37 degrees Celsius. The positives were identified as either Candida albicans or Candida dubliniensis based on a germ tube test. C. albicans was further recognised by its growth at 45°C and the production of chlamydospores on agar containing cornmeal. All of the isolates were submitted to a sugar assimilation test for species verification. Candida spp. were simultaneously inoculated on CHROM agar (Hi-media, India) and incubated at 37°C for 24 hours. Species were identified based on the type and colour of colonies on CHROM agar medium, following manufacturer's instructions.

## Results

In the present study, a total of 6781 various specimens were collected, out of which 186 candida isolates were obtained. More isolates were obtained from Males than females and among the age group 31-40 years.

The highest number of isolates were obtained from urine (47%) followed by sputum (30%), vaginal swab (16%), blood (4%), and pus (3%). (Table 1)

### Table 1: Type of samples

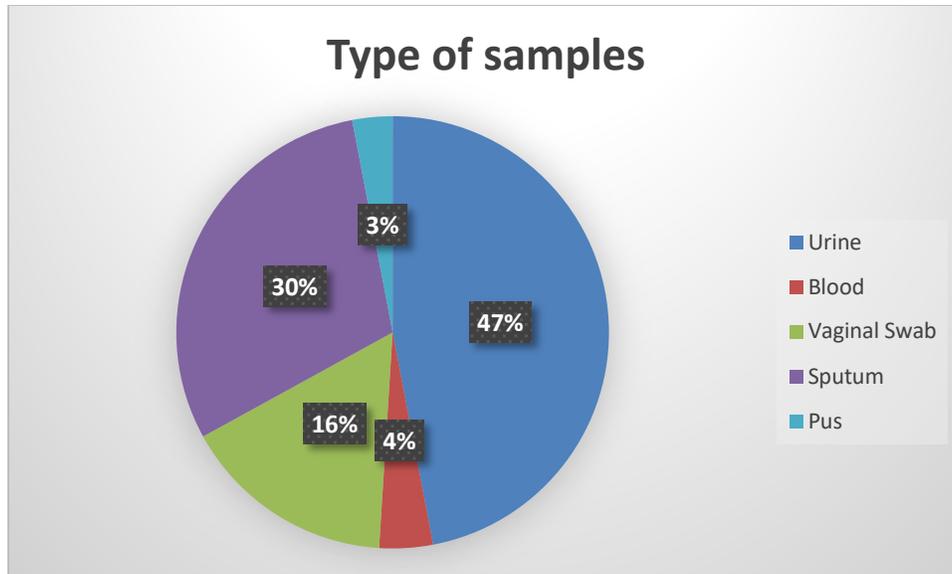| Specimen | Number of isolates | Percentage (%) |
|---|---|---|
| Urine | 87 | 47 |
| Blood | 8 | 4 |
| Vaginal Swab | 30 | 16 |
| Sputum | 55 | 30 |
| Pus | 6 | 3 |
| Total | 186 | 100 |

**Figure 1: Type of samples**

*Candida albicans* (42%) was the most isolated species followed by *C. tropicalis* (25%), *C. grablata* (16%), *C.krusei* (13%), and *C. Parapsilosis* (4%). (Table 2)

**Table 2: The distribution of different Candida species**

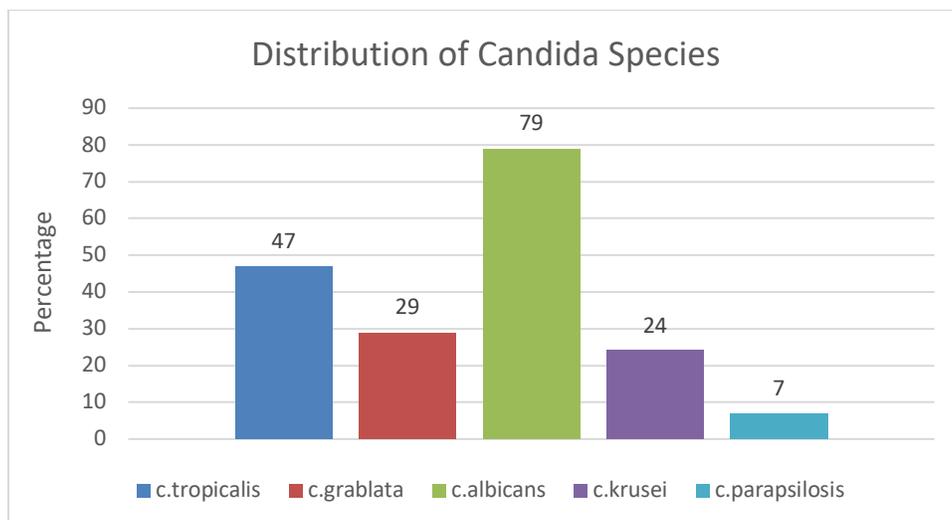| Candida species | Number of isolates | Percentage (%) |
|---|---|---|
| *C.tropicalis* | 47 | 25 |
| *C.grablata* | 29 | 16 |
| *C.albicans* | 79 | 42 |
| *C.krusei* | 24 | 13 |
| *C.parapsilosis* | 7 | 4 |
| Total | 186 | 100 |



**Figure 2: Distribution of Candida Species**

## Discussion

The percentage of *C. albicans* isolation in this investigation was 42%. According to Manjunath *et al*.[18] and Fasow *et al*.[17], *C.albicans* is the most common (51%) isolate. In this investigation, the highest percentage of Candida species were found in the samples of urine (47%), sputum (30%), vaginal swabs (16%), blood (4%) and pus (3%). According to Arasi's [19] study, the majority of candida species were found in urine (41.6%), sputum (20.4%), high vaginal swabs (14%) and pus (6%). Alvarez-Lerma *et al*. [20], Sankarankutty Jay and Vipparti Harita [21] found that more strains were identified from urine.

Chromogenic agar, which contains enzyme substrates coupled to chromogenic substances, is a more recent and quick way to speciate Candida. The chromogenic compounds emit colour when a certain enzyme breaks down the substrate. Certain yeasts can be presumed to be identified based on colour change caused by the activity of several enzymes generated by yeast species [22].

## Conclusion

Characterizing Candida to the species level enables the identification of the intrinsically resistant species. CHROM agar is a simple, affordable, and quick technique for identifying these species.

## References

1. Frias-De-Leon M.G., Martinez-Herrera E., Acosta-Altamirano G., Arenas R., Rodriguez-Cerdeira C. Superficial candidosis by Candida duobushaemulonii: An emerging microorganism. Infect. Genet. Evol. 2019; 75: 103960.
2. Santolaya M.E., Thompson L., Benadof D., Tapia C., Legarraga P., Cortes C., Rabello M., Valenzuela R., Rojas P., Rabagliati R. et al. A prospective, multi-center study of Candida bloodstream infections in Chile. PLoS ONE. 2019; 14: e0212924.
3. Yapar, N. Epidemiology and risk factors for invasive candidiasis. Ther. Clin. Risk Manag. 2014; 10: 95–105.
4. Durga C.S., Gupta N., Soneja M., Bhatt M., Xess I., Jorwal P., Singh G., Ray A., Nischal N., Ranjan P. et al. Invasive fungal infections in critically ill patients: A prospective study from a tertiary care hospital in India. Drug. Discov. Ther. 2018; 12:363–367.
5. Montagna M.T., Lovero G., Borghi E., Amato G., Andreoni S., Campion L., Lo Cascio G., Lombardi G., Luzzaro F., Manso E., et al. Candidemia in intensive care unit: A nationwide prospective observational survey (GISIA-3 study) and review of the European literature from 2000 through 2013. Eur. Rev. Med.Pharmacol. Sci. 2014; 18: 661–674.
6. Hashemi Fesharaki, S.; Aghili, S.R.; Shokohi, T.; Boroumand, M.A. Catheter-related candidemia and identification of causative Candida species in patients with cardiovascular disorder. Curr. Med. Mycol. 2018; 4: 7–13
7. Sims C.R., Ostrosky-Zeichner L., Rex J.H. Invasive candidiasis in immunocompromised hospitalized patients. Arch. Med. Res. 2005; 36: 660–671.
8. Suleyman G., Alangaden G.J. Nosocomial Fungal Infections: Epidemiology, Infection Control, and Prevention. Infect. Dis. Clin. N. Am. 2016; 30: 1023–1052.
9. Marol S. Yucesoy, M. Molecular epidemiology of Candida species isolated from clinical specimens of intensive care unit patients. Mycoses. 2008; 51: 40–49.
10. Pfaller M.A. Diekema, D.J. Epidemiology of invasive mycoses in

North America. Crit. Rev. Microbiol. 2010; 36: 1–53.

11. Tsai M.H., Hsu J.F., Yang L.Y., Pan Y.B., Lai M.Y., Chu S.M., Huang H.R., Chiang M.C., Fu R.H. Lu, J. J. Candidemia due to uncommon Candida species in children: New threat and impacts on outcomes. Sci. Rep. 2018; 8: 15239.

12. Bhattacharjee P. Epidemiology and antifungal susceptibility of Candida species in a tertiary care hospital, Kolkata, India. Curr. Med. Mycol. 2016: 2; 20–27.

13. Lewis, R.E. Overview of the changing epidemiology of candidemia. Curr. Med. Res. Opin. 2009; 25: 1732–1740.

14. Huttunen R., Attman E., Aittoniemi J., Outinen T., Syrjanen J., Karki T., Lyytikainen O. Nosocomial bloodstream infections in a Finnish tertiary care hospital: A retrospective cohort study of 2175 episodes during the years 1999–2001 and 2005–2010. Infect. Dis. 2015; 47: 20–26.

15. Lass-Florl, C. The changing face of epidemiology of invasive fungal disease in Europe. Mycoses. 2009; 52: 197–205.

16. Forbes BA, Sahm DF, Weissfeid AS, Bailey & Scotts. Diagnostic Micrbiology. 12th ed. St. Louis, Missouri. Mosby-Elsevier. 2007.

17. Easow, Kanna BV, Kumar GA, Swapna M, Joshy M. Isolation and identification of candida species from various clinical samples in a tertiary care hospital. Int J Res Med Sci. 2017; 5(8):3520–2.

18. Manjunath V, Vidya GS, Sharma A, Prakash MR, Murugesh N. Speciation of Candida by Hi-Chrom agar and sugar assimilation test in both HIV infected and non-infected patients. Int J Biol Med Res. 2012;3(2):1778–82.

19. Saikumar C, Samyuktha AA. Isolation, Identification and Speciation of Candida Species from Various Clinical Specimens in a Tertiary Care Hospital in Chennai. Sch J App Med Sci. 2017;5(8F):3460–8.

20. Alvarez Lerma F, Nolla-Salas J, Len C, Palomar M, Jord R, Carrasco N. Candiduria in critically ill patients admitted to intensive care medical units. Intensive Care Med. 2003;29(7):1069–76.

21. Jay S, Harita V. Candida Species Isolated from Various Clinical Samples and their Susceptibility Patterns to Antifungals. J Med Microbiol Infec Dis. 2013;1(1):22–6

22. Odds, F.C., Bernaerts, R. 1994. CHROM agar Candida, a new differential isolation medium for presumptive identification of clinically important Candida spp. J. Clin. Microbiol., 32(8): 1923–9.