

## An Overview of *Candida spp.* Profile and Antimicrobial Susceptibility Test Profile of a Catheter-Associated Urinary Tract Infection (CAUTI) Patient at the Intensive Care Unit of Saiful Anwar Hospital in Malang, Indonesia

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### Abstract

**Background:** *Candida spp.* is one of the pathogens causing an increase in CAUTI cases associated with catheter use in the ICU, with an incidence rate of 17.8%. This microorganism is considered the second major pathogen causing CAUTI cases in the ICU after *Escherichia coli* (Padawer et al., 2015).

**Aims:** To discover the candida profile of catheterized patients obtained during this year from ICU patients at General Hospital Dr.Saiful Anwar Malang and their antimicrobial susceptibility patterns.

**Method:** This study is a descriptive retrospective study using urine catheter specimens sent to the Microbiology Department of Dr. Saiful Anwar Hospital from January-December 2022. Fungi from culture were identified and susceptibility tests were performed using a VITEC 2 system standard and CLSI. The data is taken through WHONET software

**Result and Discussion:** The number of *Candida spp* isolated in this study was 41 from 283 positive samples isolated. Fungi that are isolated include *Candida albicans* 17 specimen (41.5%) and *Candida non albicans* 24 specimen (58.5%). *Candida albicans* are still sensitive to Fluconazole (100%), Voriconazole (100%) and Amphotericin B (100%). *Candida non albicans* are still sensitive to Fluconazole (87.5%), Voriconazole (100%) and Amphotericin B (100%)

**Conclusion :** *Candida non albicans* is the most common fungus isolated from specimens of CAUTI in January-December 2022 and the most sensitive antifungal for *Candida spp* are Voriconazole and Amphotericin B.

**Keyword :** *Candida spp*, CAUTI, Intensive Care Unit

### Introduction

Urinary tract infections (UTIs) are the fifth most common type of healthcare-associated infection.(Magill et al., 2018) Hospitalized patients with indwelling urinary catheters have 3%–7% increased risk of CAUTI.(KNHSS Kuwait National Healthcare-Associated Infections Surveillance System 1, 2015) In fungal infections, the urinary catheter is one of the causes of the entry of fungal microorganisms into the body, which then causes urinary tract infections and possibly causes candidemia in hospitalized patients.(Gajdács et al., 2019)

*Candida spp.* is one of the pathogens causing an increase in CAUTI cases associated with catheter use in the ICU, with an

incidence rate of 17.8%, and the second major pathogen causing CAUTI cases in the ICU after *Escherichia coli*.(Padawer et al., 2015).

While catheter-associated urinary tract infection (CAUTI) caused by *Candida spp.* has been widely reported in intensive care units, data from developing countries, particularly Indonesia, remain limited and fragmented. This study provides the first comprehensive overview from Saiful Anwar Hospital, Malang, integrating *Candida* species distribution with antimicrobial susceptibility testing (AST) profiles among ICU patients with catheter-associated infections. Unlike previous reports that primarily describe species prevalence, this research highlights the local epidemiological shift toward non-

*albicans* *Candida* species and their antifungal resistance patterns, offering clinically relevant insights for empirical therapy and antifungal stewardship. By generating institution-specific data, this study addresses a critical knowledge gap and supports evidence-based optimization of CAUTI management, infection prevention strategies, and antimicrobial stewardship programs in Indonesian ICU settings.

This study was to discover the candida profile of catheterized patients and their antimicrobial susceptibility patterns obtained during this year from ICU patients at General Hospital Dr.Saiful Anwar Malang.

**Materials and Methods**

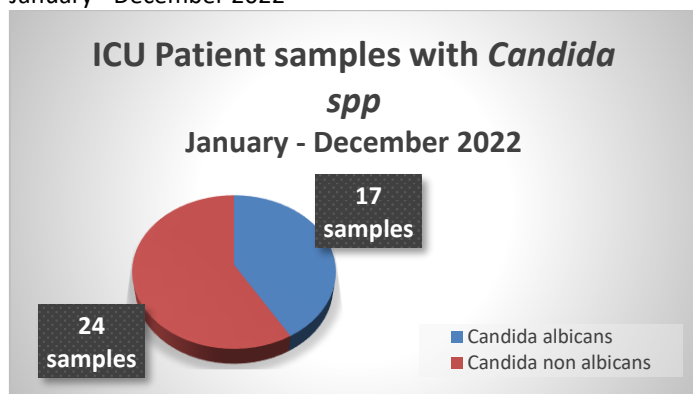
This descriptive retrospective study was conducted in the Clinical Microbiology Laboratory, Faculty of Medicine, Brawijaya University, and in the Intensive Care Unit (ICU) of Dr. Saiful Anwar General Hospital, Malang Indonesia, from January – December 2022. Urine catheter specimens from ICU patient were prospectively cultured on the Microbiology Department of Dr. Saiful Anwar Hospital from January-December 2022. Isolate were included from patient in regular ICU and incovit ICU who sent urine catheter specimen to the Microbiology Department of General hospital Dr. Saiful Anwar. Total sampling was applied; all isolates meeting the inclusion criteria during the study period were enrolled.

Urine specimens were processed using standard microbiological procedures. Direct Gram staining was performed on uncentrifuged urine samples. Semi-quantitative cultures were carried out using Sabouraud Dextrose Agar (SDA) and Nutrient Agar media. *Candida* spp. isolated from positive cultures were identified, and antifungal susceptibility testing was conducted using the VITEK® 2 automated system in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines.

**Results**

From January to December 2022, a total of 283 positive clinical isolates were obtained from patients admitted to the Intensive Care Unit (ICU) of Dr. Saiful Anwar General Hospital, Malang. Among these isolates, 41 specimens were identified as *Candida* spp. based on culture results. As illustrated in Figure 1, the distribution of *Candida* isolates showed that *Candida non-albicans* predominated, accounting for 24 specimens (58.5%), whereas *Candida albicans* was identified in 17 specimens (41.5%).

**Fig 1.** Distribution ICU Patient with positive *Candida* spp January - December 2022



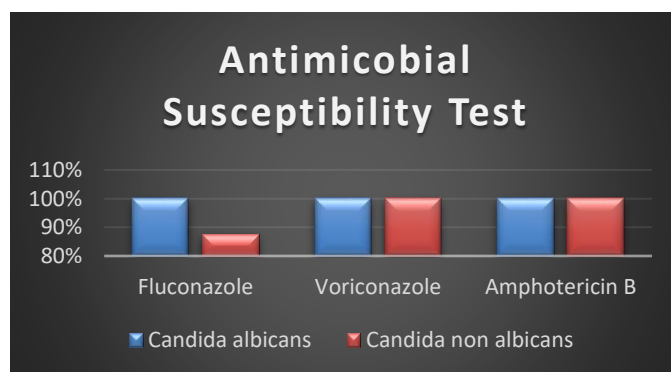
The fungal isolates comprised 17 specimens (41.5%) of *Candida albicans* and 24 specimens (58.5%) of non-*albicans* *Candida*. Further species-level analysis demonstrated that *C. albicans* accounted for 41.5% of the isolates, while *Candida tropicalis* was the most frequently identified non-*albicans* species (43.9%), followed by *Candida parapsilosis* (7.31%), *Candida glabrata* (4.87%), and *Candida krusei* (2.43%).

**Table 1.** Descriptive analysis of organism isolated at Intensive Care Unit

Organism isolated	Urine Catheter Specimens (n = 41)	Percentage (%)
<i>Candida albicans</i>	17	41.5
<i>Candida non albicans</i>		
<i>Candida glabrata</i>	2	4.87%
<i>Candida krusei</i>	1	2.43%
<i>Candida parapsilosis</i>	3	7.31%
<i>Candida tropicalis</i>	18	43.9%

Antifungal susceptibility testing demonstrated that *Candida albicans* isolates remained fully susceptible to fluconazole, voriconazole, and amphotericin B, with susceptibility rates of 100% for all three agents. Among *Candida non albicans* isolates, susceptibility to voriconazole and amphotericin B was also observed in 100% of specimens, while susceptibility to fluconazole was slightly lower, at 87.5%.

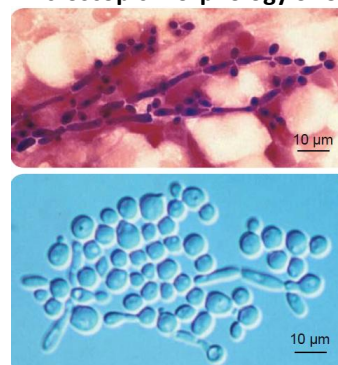
**Fig 2.** Antimicrobial Susceptibility Test profile for *Candida* spp at Intensive Care Unit



**Discussion**

*Candida* spp. are the most important agents of yeast infection. *Candida* species have been found associated with latex and silicone urinary catheters, with preference for latex material. (Rodrigues et al., 2019)

**Fig 2.** Microscopic morphology of *Candida* spp.



*Candida non-albicans* increasingly predominate in urinary tract colonization and infection among intensive care unit (ICU) patients with indwelling urinary catheters. The presence of urinary catheters facilitates disruption of the uroepithelial barrier and provides an optimal abiotic surface for fungal adhesion and biofilm formation, a characteristic strongly associated with non-albicans species such as *Candida glabrata*, *Candida krusei*, *Candida tropicalis*, and *Candida parapsilosis*. In addition, extensive exposure to broad-spectrum antibiotics and azole antifungals in ICU settings exerts selective pressure that suppresses susceptible *Candida albicans* strains while promoting the survival and overgrowth of intrinsically or relatively azole-resistant non-albicans species. Compromised host immunity, prolonged hospitalization, and frequent invasive procedures further contribute to the increased prevalence of *Candida non-albicans* in catheter-associated candiduria. These factors collectively explain the epidemiological shift toward non-albicans *Candida* species in urinary isolates from critically ill patients.

*C. albicans* adheres poorly to the bladder mucosa, and risk for *Candida* UTI increases sharply in the presence of an indwelling catheter. A recent ex vivo study showed that a *C. albicans* CAUTI isolate binds to urinary catheters via fibrinogen. (Singh et al., 2022)

*C. albicans* encodes a fibrinogen-binding protein, Mp58, which is expressed during candidiasis. In total, the wide distribution of diverse fibrinogen-binding adhesins among common uropathogens suggests that fibrinogen binding is a common theme in CAUTI pathogenesis. (Padawer et al., 2015)

The most prevalent device-associated nosocomial infection is catheter-associated urinary tract infection. The study included 283 positive samples isolated were collected from Intensive Care Unit patients at General Hospital Dr. Saiful Anwar, Malang and were monitored for the development of CAUTI. Only symptomatic CAUTI cases were included in this investigation.

In this investigation, 41 individuals out of 283 were found to have symptoms of CAUTI with positive *Candida spp.* culture results during their hospital stay. Among the candida species, *Candida non albicans*. contributed to 58.5% of the isolates and only 41.5% of isolates were *Candida albicans*.

Based on this identification, 5 different *Candida* species were confirmed. *Candida albicans* was found to be present in 41.5% and respectively 43.9% of *Candida tropicalis*, 7.31% of *Candida parapsilosis*, 4.87% of *Candida glabrata*, and 2.43% of *Candida krusei* in this investigation. Particularly, *Candida tropicalis* showed higher prevalence rates than other species.

All *Candida spp* still sensitive equally to the antifungal drugs voriconazole, and amphotericin B. Antifungal medications aren't used very regularly, which may be related to this.

## Conclusion

*Candida spp* is generally found in humans; however, when the host's immune system is compromised, the pathogen infects the host and become an opportunistic pathogen.

*Candida non albicans* is the most common fungus isolated from specimens of CAUTI in January-December 2022 with *Candida tropicalis* showed higher prevalence rates than other species

The most sensitive antifungal for *Candida spp* are Voriconazole and Amphotericin B.

## ADDITIONAL INFORMATION

### Data availability statement

All data generated or analyzed during this study are included in this published article.

### Conflict of Interest

The authors declare no conflict of interests.

### Author Contribution

Ronald A. Parubak contributed to conceptualization, methodology, data collection and investigation, formal data analysis, and writing of the original draft. Nurul Widyawati contributed to methodology, data collection and investigation, formal data analysis, and writing—review and editing. All authors have read and approved the final manuscript.

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and non Albicans with emphasis on biofilm formation and antifungal sensitivity pattern. *International Journal of Health Sciences*, 6(S2), 2356–2363. <https://doi.org/10.53730/ijhs.v6nS2.5544>