

(RESEARCH ARTICLE)



## Candidemia diagnosed within the Hassan II University Hospital in Fez

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### Abstract

**Introduction:** Candidemia are yeast infections of the candida type that are relatively common in intensive care and are burdened with a high mortality rate that has not decreased for decades.

The aim of this work is to determine the frequency of candidaemia and to identify the epidemiological profile of the Candida species most implicated in these infections.

**Materials and methods:** This is a descriptive retrospective study over a period of 5 years and 7 months, spanning from January 2017 to July 2022, and involving all blood cultures of patients hospitalized at the CHU Hassan II in Fez.

The samples were inoculated into Mycosis IC/F bottles and incubated for 7 days in the BD Bactec® automaton. 37°C.

The identification of yeasts was based on morphological, phenotypic, biochemical and sometimes immunological criteria. This identification is followed by the realization of an antifungigram.

**Results:** During the study period, 145 blood cultures were performed, 42 of which were positive for candida. 69% of patients were hospitalized in intensive care. The female sex (52.3%) was more affected than the male sex (47.6%) with an average age of 31 years.

The frequency of candidaemia is estimated at 28.9%. They were mainly caused by *Candida non albicans* (64.2%) including *Candida glabrata* 33.3%, *Candida tropicalis* 29.6%, *Candida parapsilosis* 20%, *Candida krusei* 18.5% and *Candida lusitanae* 3.7%. While *Candida albicans* was positive in 15 patients. Sensitivity to amphotericin B and fluconazole was 89% and 70% respectively.

**Conclusion:** Candidemia is a frequently fatal opportunistic infection. The proper use of antifungals is essential to better understand changes in the distribution of Candida species and limit the emergence of resistance.

**Keywords:** Candidemia; *Candida albicans*; *Candida glabrata*; *Candida kreusei*; Amphotericin B

### 1. Introduction

Candidemia are yeast infections of the *Candida* genus relatively common in intensive care and are burdened with high mortality which has not decreased for decades. The aim of this work is to determine the frequency of candidaemia and to identify the epidemiological profile of the Candida species most implicated in these infections.

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Systemic infections caused by *Candida spp.* have become a major concern in critical care medicine due to the increasing number of immunocompromised patients [1, 2].

Importantly, mortality was found to be significantly higher in patients with candidemia than in patients with gram-positive or gram-negative bacteremia [3, 4].

The proportion of candidemia caused by *Candida spp.* was 59.8% in an Italian multicenter survey [5]

## 2. Material and methods

This is a descriptive retrospective study over a period of 5 years and 7 months, spanning from January 2017 to July 2022, within the laboratory of parasitology and mycology at the CHU Hassan II in Fez.

This work is carried out using samples from patients hospitalized in the various departments of the Hassan II University Hospital in Fez and sent to the Laboratory of Parasitology\_Mycology of the same hospital, during this period. All patients with at least one blood culture positive for *Candida spp.* were included.

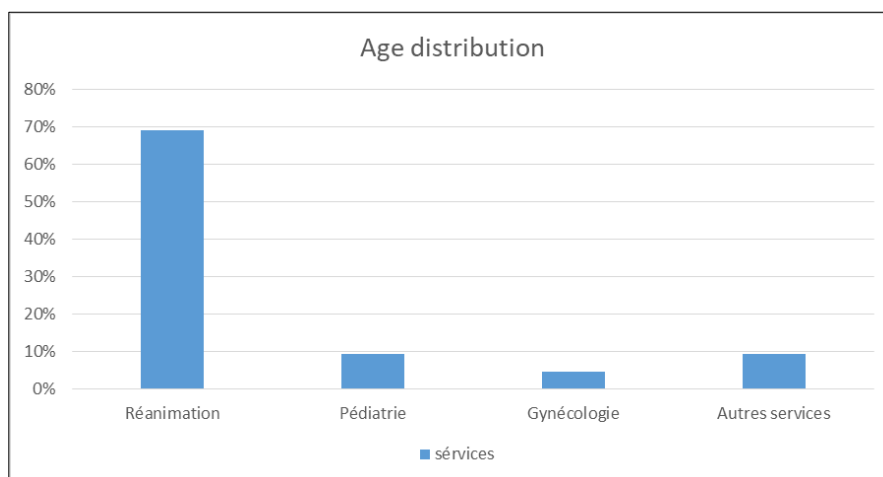
The samples were inoculated into Mycosis IC/F flasks and incubated for 7 days in the BD Bactec® automaton (9050 or FX40) from Becton Dickinson. If positive, and after achieving a fresh state, the broths are subcultured onto three simple Sabouraud, sabouraud-Chloramphenicol and sabouraud media supplemented with actidione, incubated at 37°C.

Yeast identification was based on morphological (macroscopic and microscopic appearance), phenotypic (filamentation test), biochemical (AUXACOLOR identification gallery, RTT glabrata) and sometimes immunological (krusei color, Bichrolatex albicans, etc.) criteria.

After identification of the species, an antifungigram is performed to assess yeast growth in liquid medium and in the presence of 6 antifungals (5-fluorocytosine, amphotericin B, miconazole, ketoconazole, itraconazole and fluconazole).

## 3. Results

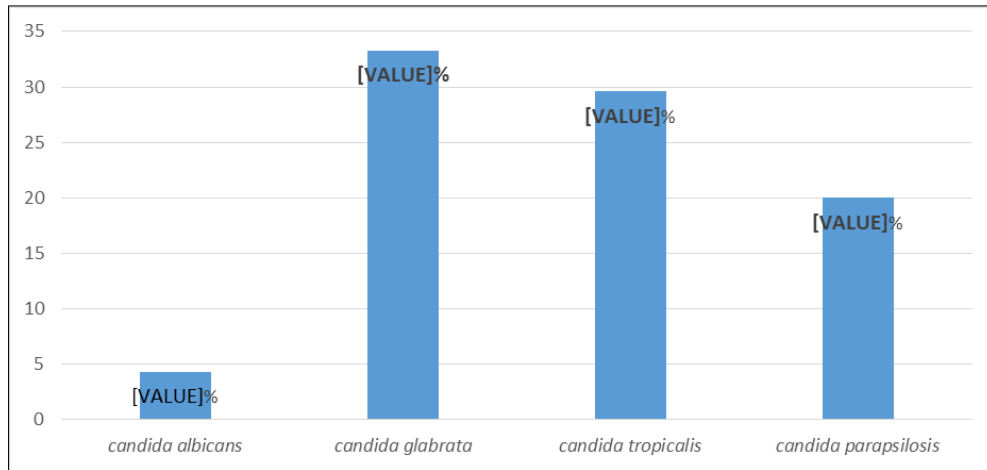
During the study period, 145 blood cultures were performed, 42 of which were positive for *Candida* a prevalence of 28.96%. 69% of patients were hospitalized in intensive care, while the others came from pediatric departments (9.5%), gynecology (4.7%) and other departments (9.5%). (Figure 1).



**Figure 1** Distribution of candidaemia cases by department

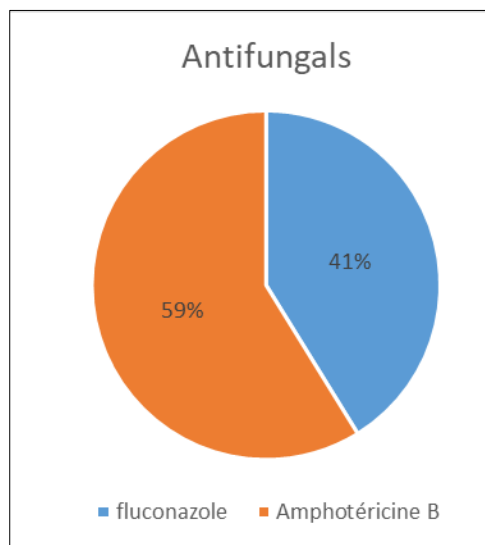
The female sex (52.3%) was more affected than the male sex (47.6%) with a sex ratio of 1.09, an average age of 31 years and extremes of 3 days at 80 years.

*Candida* species non albicans were the majority with a rate of 64.2%, *Candida glabrata* was the most widespread (33.3%), followed by *Candida tropicalis* 29.6%, *Candida parapsilosis* with a rate of 20% of cases, *Candida krusei* 18.5% and *C. lusitaniae* (3.7%). While *candida albicans* was positive in 15 patients.



**Figure 2** Distribution of species responsible for candidemia

Sensitivity to amphotericin B was 89%, and to fluconazole 70% (5 *C. krusei* and 8 *C. glabrata* were resistant).



**Figure 3** Sensitivity to different antifungals

#### 4. Discussion

Candidemia remains a hospital infection par excellence. Their frequency in this study is similar to that found in some European countries and has not changed over time [6].

The age and sex distribution in our study correlates with the observations of other researchers in India [7, 8].

Resuscitation services are the services most at risk, with in our study 69% of cases of candidemia diagnosed. This agrees with several studies [11].

In our study, candidaemias caused by non-albicans candida species were more frequent than those caused by *C. albicans*, which is consistent with studies from Paris and Belgium [12, 13]. However, other studies in Asia, Southern Europe, South America and the Indian subcontinent found *Candida albicans* to be the predominant species [9, 10].

*C. glabrata* was the most isolated species in our series, which is consistent with other Indian studies [14, 15, 16, 17, 18, 19]. It is an opportunistic fungus, and It is the second most commonly isolated yeast as part of the normal flora and its role as a pathogen has only been recognized for a few decades. Truc et al. [16] reported a remarkable increase in the incidence rate of *C. glabrata* isolation in patients with candidemia, and an increase in its resistance to azoles.

A rapid and precise mycological identification of the species in question is therefore essential for the management of candidaemia, because certain non albicans species, in particular *C. glabrata* and *C. parapsilosis* and other rare or emerging species, present profiles of decreased sensitivity to antifungals [20].

In this study, most isolates are still susceptible to fluconazole and amphotericin B. Nevertheless, the emergence of less azole-susceptible species, such as *C. glabrata* and *C. krusei*, has been noted in recent years and requires special vigilance.

In our study, the fluconazole sensitivity rate of *Candida spp.* was 70% which is in line with other Indian studies [21, 22]. Fluconazole is available in intravenous and oral formulations with high bioavailability and is more cost effective than other antifungal agents. Although Amphotericin B is effective against most strains of *Candida spp.*, it is not the first-line treatment for candidemia due to the nephron toxicity associated with it.

Western data has revealed that *Candida* species are reliably susceptible to polyenes, azoles and echinocandins, but Indian studies demonstrate very high resistance to Fluconazole for all *Candida* isolates although susceptibility to AMP is high [23], which is not consistent with our results.

Initial reports of susceptibility to fluconazole in *C. albicans* in Saudi Arabia were considered low at 74.2%.[24] This discrepancy between our study and older studies from Saudi Arabia may be explained by the improvement parasitological susceptibility testing and the adoption of new test methods such as Etest, broth microdilution and the VITEK® 2 system.

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## 5. Conclusion

Candidemia is a frequently fatal opportunistic infection. Diagnosis of antifungal-resistant *Candida* infections is critical to the successful management of patients with these infections. The implementation of programs for the proper use of antifungals through consultation between clinicians and mycologists is essential to better understand changes in the distribution of *Candida spp* species and limit the emergence of multi-resistance by reducing unnecessary antifungal treatments.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest.

### *Statement of ethical approval*

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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