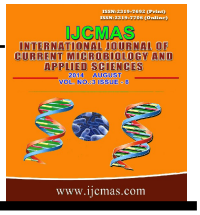
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Original Research Article

Prevalence of Candida species isolated from blood cultures of patients assisted in a Tertiary hospital

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Keywords

Nosocomial infection, fungal infection; candidemia, incidence and prevalence

A B S T R A C T

Increases in invasive infection by yeasts of the genus *Candida* constitute a serious public health issue. Worldwide, non-*C. albicans Candida* species have recently emerged as agents of candidemia. Given the relevance of the subject, the proposition of this study was to investigate the prevalence of candidemia and distribution of different species of *Candida* isolated from blood cultures obtained from patients admitted to a tertiary hospital, the Health Complex, UNICAMP, in the period between January 2008 to December 2009. 35,183 blood cultures were collected, and the blood culture was performed by the Microbiology laboratory using the equipment BacT / ALERT ® (bioMérieux, Inc., Durham, North Carolina) were collected. The identification of yeasts was performed by automated system VITEK II bioMerieux, Inc., Durham, North Carolina). *C. albicans* was the most frequently isolated species, representing 43.9% of the isolates. Among the non-albicans species, *C. tropicalis* was the most frequent, totaling 21.7%. There is a high infection in patients with bloodstream infection by *Candida*. The statistical analysis revealed a higher number of patients with *C. albicans* bloodstream infection than among those infected with non-*C. albicans Candida* species ($p \leq 0.05$).

Introduction

Over the past 20 years there has been significant increase in the incidence of systemic fungal infections caused primarily by *Candida* yeasts (Cleveland et al., 2012; Pfaller et al., 2011; Segireddy et al., 2009).

Opportunistic fungal infections, especially candidemia, a concept used to describe invasive candidiasis infection through the bloodstream are between the fourth and seventh cause of bloodstream infections in

large hospitals (Cruz & Piontelli, 2011; Flevari et al., 2013).

In the hospital setting, *Candida* infections account for 80% of all fungal infections, mainly including bloodstream infections (BSI), urinary tract and surgical site (Colombo et al., 2012).

Studies show that the incidence of invasive fungal infections has increased dramatically in hospitalized patients worldwide, and the genus *Candida* has emerged as a major cause of fungemia. *Candida albicans* is the main agent of candidemia, however, we observe the emergence of species other than *C. albicans* (Khorvash et al., 2014).

Although *C. albicans* remains the most frequently isolated species of candidemia episodes, there has been an increase in the number of infections caused by non-albicans species (Guimarães et al., 2012). The candidemia is a syndrome of high severity associated with high mortality ranging from 44.2% to 61% in different casuistry (Bassetti et al., 2011; Chen et al., 2012). These infections cause great concern the high morbidity and mortality as well as the direct impact it has on health care costs (Colombo et al, 2012).

The patients most affected by candidemia are those who make use of antibiotics, immunosuppressive therapy, parenteral nutrition, and premature burn patients as well as patients undergoing invasive medical procedures such as insertion of intravascular catheters, hemodialysis and abdominal surgery (Ramos et al., 2011). In this feeling the intensive care unit arouses great concern, since their patients have a high susceptibility to fungal infections due to increased increasingly aggressive medical procedures (Organ et al., 2005; Pfaller et al., 2007; Khorvash et al., 2014).

However, the growth of the elderly population is a factor of the utmost importance, and this group has specific physiological characteristics, making these patients more susceptible to colonization and subsequent infections due to *Candida* species (Cruz & Piontelli, 2011).

In Brazil, recent studies have reported that the main causes of candidemia species are *C. albicans*, *Candida parapsilosis* and *Candida tropicalis*. During the last 15 years, the prevalence of infections caused by *Candida* non-albicans increased exponentially. These organisms today represent more than 50% of episodes of fungemia in several studies (Colombo et al., 2012; Flevari et al., 2013).

In the study conducted in five hospitals in the Region of Valparaíso, Chile, by Candida mortality was 42.4%, the main agent was *C. albicans*, which has a high sensitivity of strains of *Candida* species to fluconazole and voriconazole (Cruz & Piontelli, 2011). Studies conducted in northeastern Brazil showed that Candida non-albicans was the main single agent and proves the importance of *C. tropicalis* in nosocomial fungal infections (Guimarães et al., 2012; Flevari et al., 2013).

In the United States of America (USA) the rate of sepsis due to fungal infection increased by 207% during 1979-2000 and more than 50% of cases of BSI were caused by *C. albicans* (Chen et al., 2012).

The identification of yeasts involved at the species level is necessary to know the prevalence of agents involved, as well as monitor, detect resistance and to help select the appropriate treatment (Colombo et al., 2006).

Considering the large variability observed in the epidemiology of candidemia in different medical services and the importance of knowledge of the microbiological profile of these infections to the definition of prevention, control and treatment, and the importance of the subject, the proposition of this study was to investigate the prevalence of candidemia and distribution of different species of *Candida* isolated from blood cultures obtained from patients admitted to a tertiary hospital, the Health Complex, UNICAMP, for the period from January 2008 to December 2009.

Casuistry and Methods

This study was conducted after approval by the Faculty of Medical Sciences, UNICAMP, protocol number 573/2010 and Research Ethics Committee following the Resolution 196/96 of CONEP. The study population included hospitalized patients and for whom blood cultures for routine examinations were collected during the years 2008 and 2009. During the study period, 35,183 blood cultures were taken, some of which were collected in duplicate or triplicate. Data were collected from blood culture results generated by the laboratory of Microbiology, Division of Clinical Pathology.

It was considered a likely candidemia the first isolation of any species of Candida from a culture of blood from a patient case. In cases of septicemia, bacteremia, pneumonia, meningitis, fever or 2 to clarify Blood samples were collected at different locations about 30 minutes before the peak fever. If the patient is catheterized, blood culture samples beyond sample was collected from the catheter. In cases of endocarditis or fever of unknown origin, the collection was recommended 2 - 3 samples at intervals of 30 to 60 minutes. The blood culture was performed by the Microbiology laboratory equipment using BacT / ALERT ® (bioMérieux, Inc., Durham, North Carolina). The flasks were incubated in the machine. The positive findings, the material was seeded on blood agar and Mac Conkey and has also prepared a slide for Gram staining. If the yeast staining were observed, the sample was immediately plated on Sabouraud Dextrose Agar (SDA) for subsequent isolation and identification of the etiologic agent. The ASD culture medium was incubated at 37 ° C for 24 - 72 hours in an oven aerobic. After this period, the identification of all positive cultures was performed. The identification of yeasts was performed using the VITEK II SYSTEM bioMérieux, Inc., Durham, North Carolina). The Vitek II is a semi-automated equipment for identification and susceptibility testing of microorganisms.

Results and Discussion

The dynamic change in the profile of hospitalized patients in tertiary hospitals and the constant introduction of new therapies and invasive procedures come bring new panorama for fungal infections involving emerging pathogens with different clinical presentations and therapeutic challenges. Figure 1 shows the total number of blood cultures collected in the years 2008 and 2009, the total number of blood cultures positive for yeast / bacteria and the total number of blood cultures positive for yeast only.

Although highly variable underlying diseases of the patients involved in this study, it was revealed that, in general, *C. albicans* was the most frequently isolated species, representing 43.9% of the isolates. Among the species not albicans, *C. tropicalis* was the most frequent, totaling 21.7%, as can be seen in Figure 2.

Figure.1 Total blood cultures, blood cultures positive for yeast / bacteria and the positive blood only for yeasts during the years 2008 and 2009

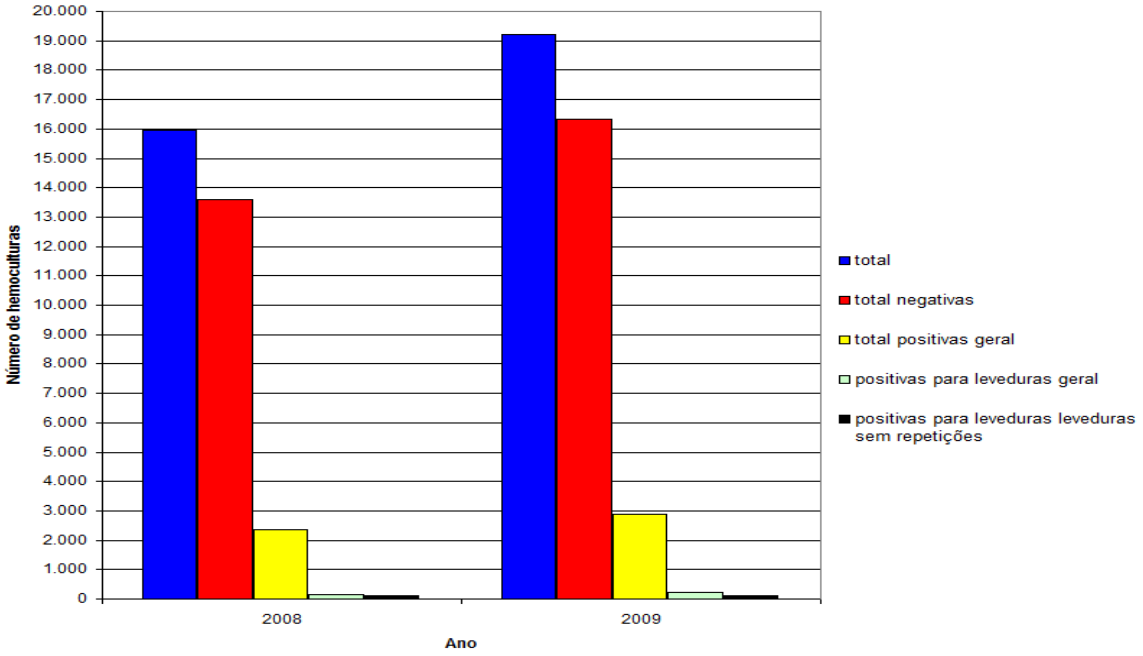


Figure.2 Percentage of isolation of species of microorganisms from blood cultures of patients

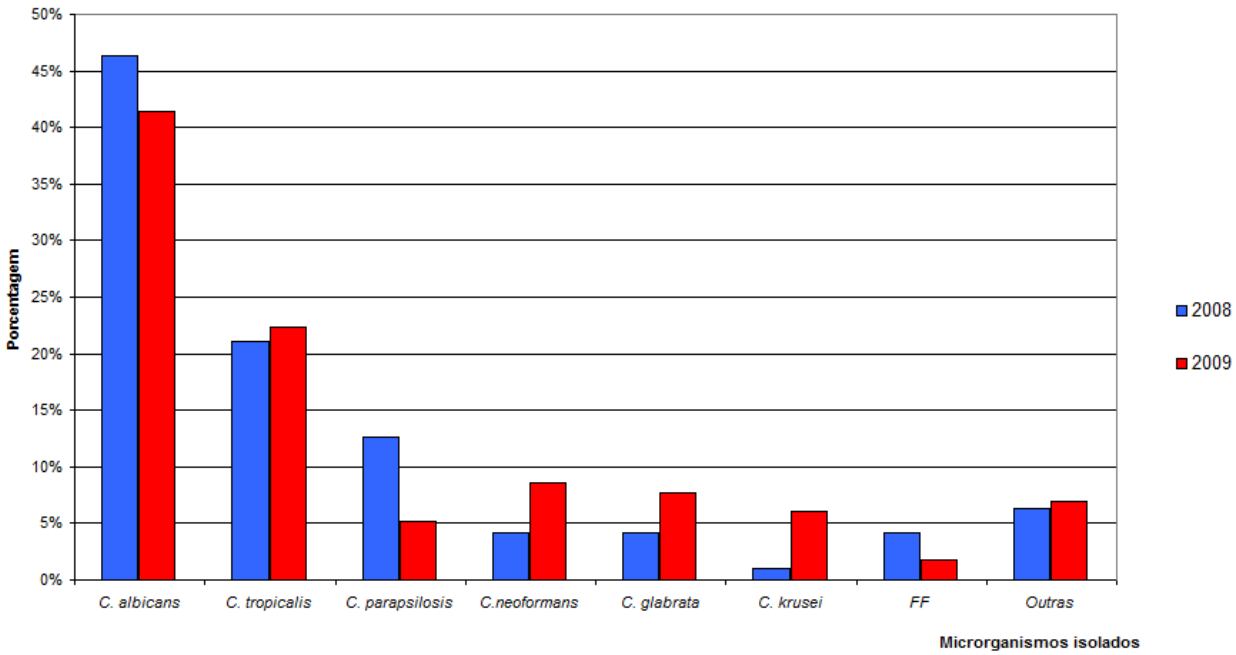
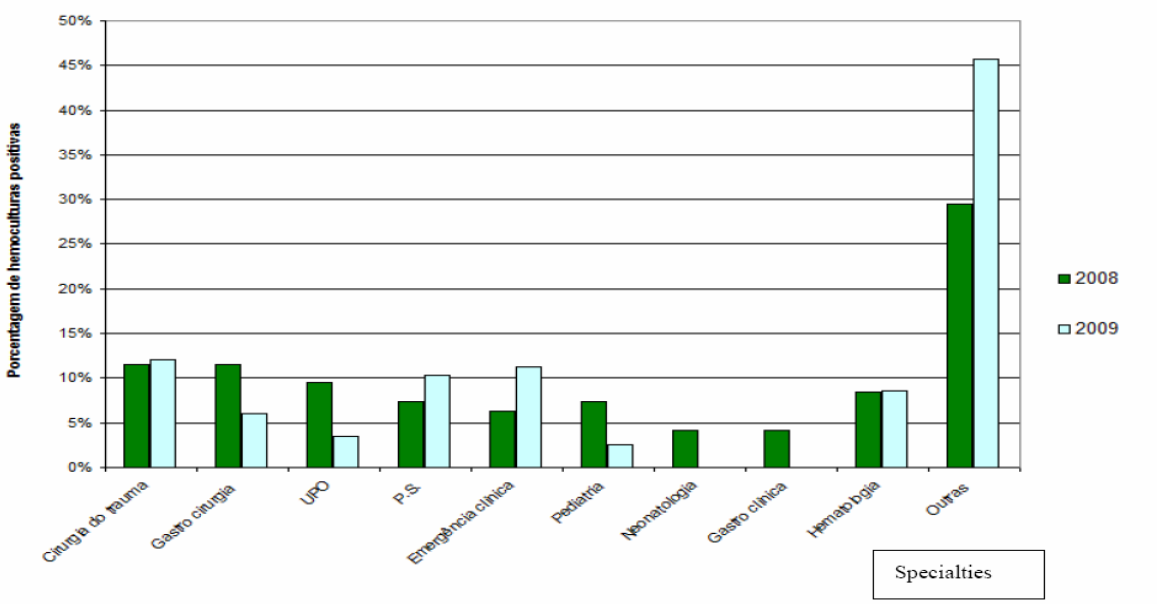


Figure.3 Distribution of strains of yeasts isolated from blood cultures of patients from different specialties



Between 2008 and 2009, 35,183 blood cultures were processed in the laboratory of Microbiology, Division of Clinical Pathology / Unicamp. Of these, 211 (0.6%) were positive for Candida spp. This prevalence is close to the patterns observed in several other studies. From retrospective studies, it was possible to evaluate the percentage of isolates of different *Candida* species among 211 strains isolated from blood cultures of patients treated by different medical specialties at the Hospital of Unicamp in both years. The results can be seen in figure 3.

Clinics that had higher numbers of isolation of strains of *Candida* from blood cultures of their patients were trauma surgery in both years, followed by the gastro surgery in 2008 and emergency clinic in 2009, and as a result, postoperative unit (POU) in 2008 and emergency department (ED) in 2009.

Literature data show that the epidemiology of candidemia has changed over the past three decades. Previous studies have shown emergence of non-*C. albicans Candida* as agents of systemic infections in all parts of the world both in public and private hospitals (Pfaller et al., 2011; Guimarães et al., 2012).

In U.S. hospitals has also been described an increase in the number of *Candida* species *C. albicans* not associated with hematogenous candidiasis (Pfaller, 2012). Prospective study in a Clinical Hospital of Barcelona through a blood culture surveillance program for a period of 18 years (1991-2008) revealed that although *C. albicans* being the species most commonly identified (48%), non-C. albicans Candida species were most representative (52%), including *C. parapsilosis, C. tropicalis, C. glabrata, C. krusei* among other (Ortega et al., 2011). In Brazilian hospitals, non-*C. albicans Candida* species were also held accountable for over 50% of cases of bloodstream infection (Hinrichsen et al., 2009; Sampaio Camargo et al., 2010).

We observe high infection in patients with bloodstream infection by Candida. Strains of *C. albicans* prevailed over the other species, although there are a large number of isolates of other species. The clinics trauma surgery, gastrointestinal surgery, emergency clinic, postoperative unit (POU) and emergency department (ED) were the most outstanding in the isolation of Candida species. The statistical analysis revealed a higher number of *C. albicans* present in patients with bloodstream infection than by non-*C. albicans* ($p \leq 0.05$).

References

Bassetti, M.; Taramasso, L.; Nicco, E.; Molinari, M. P.; Mussap, M.; Viscoli, C. 2011. Epidemiology, species distribution, antifungal susceptibility and outcome of nosocomial candidemia in a tertiary care hospital in Italy. Plos One. v. 6, n. 9, p. 24198.

Chen, L.-Y.; Kuo, S.-C.; Wu, H.-S.; Yang, S.-P., Chan, Y.-J.; Chen. L.-K., Wang, F.-D. 2012. Associated clinical characteristics of patients with candidemia among different *Candida* species. Journal of Microbiology, Immunology and Infection. 22 (12): 162-164.

Cleveland, A. A.; Farley, M. M.; Harrison, L. H.; Stein, B.; Hollick, R.; Lockhart, S. R.; Magill, S. S.; Derado, G.; Park, B. J.; Chiller, T. M. 2012. Changes in incidence and antifungal drug resistance in candidemia: results from population-based laboratory surveillance in Atlanta and Baltimore, 2008–2011. Clinical Infectious Diseases, n. 55, v. 10, p. 1352–61.3.

Colombo, A.L., Nucci, M., Park, B.J., Nouér, S.A., Arthington-Skaggs, B., Da Matta, D.A., et al. 2006. Epidemiology of candidemia in Brazil: a nationwide sentinel surveillance of candidemia in eleven medical centers. J Clin Microbiol. 44(8):2816-23.

Colombo, A. L.; Guimarães, T.; Camargo, L. F. A.; Richtmann, R.; Queiroz-Telles, F.; Salles, M. J. C.; Cunha, C. A.; Yasuda, M. A. S.; Moretti, M. L.; Nucci M. 2012. Tratamento das principais infecções causadas por *Candida spp.*: relato de reunião conjunta de três sociedades médicas. The Brazilian Journal of Infectious Diseases. v. 16, n. supl.1, p. 1-43.

Cruz, C. R.; Piontelli, L. E. 2011. Enfermidade fúngica invasora no pacientes de cinco hospitais da Região do Valparaíso, Chile: 2004 a 2009 *Rev Chilena Infectol.* 28(2): 123-12.

Flevari, A.; Theodorakopoulou, M.; Velegraki, A. et al. 2013. Treatment of invasive candidiasis in the elderly: a review. Journal Clinical Interventions in Aging.

Guimarães, T.; Nucci, M.; Mendonça, J. S.; Martinez, R.; Brito, L. R.; Silva, N.; Moretti, M. L.; Salomão, R.; Colombo, A. L. 2012. Epidemiology and predictors of a poor outcome in elderly patients with Candidemia. International Journal of Infectious Diseases. v. 16, p. 442–447.

Hinrichsen, S. L; Falcão, E; Vilella, T. A. S.; Rêgo, L; et al. 2009. Isolados de Candida em hospital terciário no nordeste do Brasil *Braz. j. microbiol. 40(2): 325-328.*

Khorvash, F.; Abbasi, S.; Meidani, M. et al. 2014. Prevalence and antimicrobial susceptibility pattern of isolated microorganisms from central venous catheters in ICU

patients. Journal Advanced Biomedical Research. 3:102-105.

Organ, J., Meltzer, N.I., Plikaytis, B.D., Sofair, A.N., Huie-White, S., Wilcox, S., et al. 2005. O excesso de mortalidade, permanência hospitalar e custos devido a candidemia: um estudo caso-controle utilizando dados de base populacional de vigilância candidemia. Infect Control Hosp Epidemiol. 26 (6): 540-7.

Ortega, M.; Marco, F.; Soriano, A.; Almela, M.; Martínez, J. A.; López, J.; Pitart, C.; Mensa, J. 2011. *Candida* species bloodstream infection: epidemiology and outcome in a single institution from 1991 to 2008. Journal of Hospital Infection. n. 77, p. 157-161.

Pfaller, M.A., Diekema,D.J. 2007. Epidemiology of invasive candidiasis: a persistent public health problem. Clin Microbiol Rev. 20(1):133-63. Pfaller, M. A.; Moet, G. J.; Messer, S. A.; Jones, R. N.; Castanheira, M. 2011. *Candida* bloodstream infections: comparison of species distributions and antifungal resistance patterns in community-onset and nosocomial isolates in the SENTRY antimicrobial surveillance program, 2008-2009. Antimicrobial Agents and Chemotherapy. v. 55, n. 2, p. 561–566.

Pfaller, M. A. 2012. Antifungal drug resistance: mechanisms, epidemiology, and consequences for treatment. The American Journal of Medicine. v. 125, n. 1A, p. S3-13.

Ramos, R. T.; Leite, G. M. L.; Martinez, H. V.; Sibin, K. C.; Germano, A.; Svidzinski, T. 2011. Características clínicas e epidemiológicas de doentes com cateter venoso central colonizado por leveduras. Acta Médica Portuguesa. v. 24, n. S2, p. 257-262.

Sampaio Camargo, T. Z.; Marra, A. R.; Silva, C. V.; Cardoso, M. F. S.; Martino, M. D. V.; Camargo, L. F. A.; Correa, L. 2010. Secular trends of candidemia in a tertiary care hospital. American Journal of Infection Control. v. 38, n. 7, p. 546-551.