



SIGNIFICANCE OF PATTERN OF CANDIDA SPP. DISTRIBUTION IN PEDIATRIC PATIENTS: A LABORATORY BASED DESCRIPTIVE OBSERVATIONAL STUDY

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ABSTRACT **Background:** Invasive candidiasis is a significant cause of healthcare-associated morbidity and mortality in pediatric populations. Recently, global trends have indicated a notable epidemiological shift from *Candida albicans* to non-*albicans Candida* (NAC) species, which often present challenges due to altered antifungal susceptibility profiles. **Objective:** To identify the demographic distribution, hospital ward allocation, species diversity, and associated risk factors of *Candida* infections among pediatric patients at a tertiary care hospital. **Materials and Methods:** This laboratory-based, descriptive observational study was conducted in the Department of Microbiology at G.R. Medical College and J.A. Group of Hospitals, Gwalior, from April 2016 to March 2017. Specimens from 47 pediatric patients were processed using standard mycological techniques, including KOH wet mounts, Gram staining, culture on sabouraud dextrose agar, germ tube tests, cornmeal agar morphology, and chrom agar. **Results:** The mean age of the cohort was 5.0 years, demonstrating a bimodal peak in school-aged children (10–14 years, 27.7%) and infants (1 month–1 year, 25.5%). Female patients predominated (57.4%; female-to-male ratio of 1.35:1). Critical care areas accounted for 61.7% of all isolates, distributed between the PICU (36.2%) and NICU (25.5%). A definitive shift toward NAC species was observed (84.8%), with *Candida glabrata* being the most prevalent isolate (34.8%), followed by *Candida guilliermondii* (19.6%), while *Candida albicans* accounted for only 15.2% of cases. **Conclusion:** The study highlights a major epidemiological shift toward non-*albicans Candida* species, particularly *C. glabrata*, within pediatric and neonatal intensive care units. Given the reduced azole susceptibility of these emerging species, mandatory species-level identification and antifungal susceptibility testing are crucial to guide effective empiric and targeted therapies in critically ill children.

KEYWORDS : Pediatric Candidiasis, Non-*albicans Candida*, *Candida glabrata*, Intensive Care Unit, Epidemiological Shift.

INTRODUCTION

Candidiasis itself acts as the umbrella term used for a spectrum of fungal infections caused by yeasts of the genus *Candida*. It represents the most common fungal infection and common commensal organisms within the normal mycobiome, a fungal community that inhabits the skin, mucosal surfaces and gastrointestinal tract. When the normal microbial flora gets disrupted or impairs host immune function allows *Candida* species to proliferate, invade host tissues and produce clinical disease. Prolonged antibiotic exposure like use for over 5 days significantly increases fungal colonization risk, advancement in medical care, compromised immune function and emergence of antifungal drug resistance also attributed to the risk. Neonatal incidence is strongly inversely correlated with gestational age and low birth weight. Extremely low-birthweight (ELBW) infants are at the highest risk. (1) In picu settings patients' risk being driven heavily by immunosuppression, surgery and prolonged mechanical ventilation. Few *candida* spp. is largely attributed to its ability to form biofilms on medical devices (e.g., central venous catheters, total parenteral nutrition lines) and its horizontal transmission via healthcare workers' hands. Nutritional support by using total parenteral nutrition (TPN) and prolonged amino acid infusion is also contributed to it. Underlying conditions: Severe sepsis, recent abdominal surgeries and prolonged ICU length of stay. All-cause mortality associated with pediatric candidiasis exceeds 15%. Pediatric candidemia is a life-threatening condition, healthcare-associated bloodstream infection caused by *Candida* fungi. Candidiasis disproportionately affects critically ill children. (2) Pediatric cohorts often show higher isolation rates of less common yeasts, such as *C. lusitanae*, when compared to adults. In hospitalized children, fungi are the second most common pathogen identified in the setting of sepsis and are the leading infectious cause of death in children with cancer or following an organ or hematopoietic stem cell transplant. (3, 4) pediatric cases associated with candidiasis are associated with risk like, who have an immature immune system and simultaneous external factors (air humidity, seasonality, air and people flow, use of particulate filters) and health professionals' hand hygiene. While aspects of pediatric and adult invasive candidiasis are similar, numerous studies have revealed critical differences in host factors, pharmacokinetics and outcomes in children that underscore the importance of dedicated pediatric studies. (5)

This study aims to identify and to summarize the best available evidence on the candidiasis infection in the indoor air of critical hospital areas with an emphasis on pediatric and neonatal settings including ICUs.

MATERIALS & METHODS

This was laboratory-based descriptive observational study and was carried out in the department of microbiology, G. R. Medical College, Gwalior. All specimens received from patients of the various

departments of J. A. A group of Hospitals from April 2016 to March 2017 were processed for isolation and identification of *Candida* species, according to the standard microbiological method. This work was executed after approval from the ethical committee of GRMC Gwalior. The medical history was taken from each patient; including age, gender and underlying chronic disease. All the samples were collected and transported under strict aseptic precautions in a sterile container. The various materials collected were initially spread onto a labelled slide for KOH wet mount and gram stain. Gram staining smears were examined for the presence of gram-positive budding yeast cells with pseudo hyphae and then samples were inoculated on sabouraud dextrose agar and blood agar. Media were incubated at 37° C for 24 hours and observed following the day but extended to week if no growth in 24 hours. Identification of fungal growth was finally based on its macroscopic and microscopic features. Isolated colonies were subjected to gram staining and germ tube test, corn meal agar inoculation (Dalmau culture plate technique) and chrome agar.

RESULT

The estimated mean age of this patient cohort is (5.0) years. Bimodal distribution (Table 1): The highest burdens are among school-aged children aged 10–14 years (27.7%) and infants aged 1 month–1 year (25.5%). Neonatal cases: The presence of 7 neonates (14.9%) strongly suggests a need to discuss vertical transmission (mother-to-child) of the infection.

Table 1: Age Wise Distribution of Patient

Age Group	No. of Patients	Percentage %
Neonate <1 month	7	14.9%
Infant 1 month–1 year	12	25.5%
1–5 years	9	19.1%
5–10 years	6	12.8%
10–14 years	13	27.7%
Total	47	100%

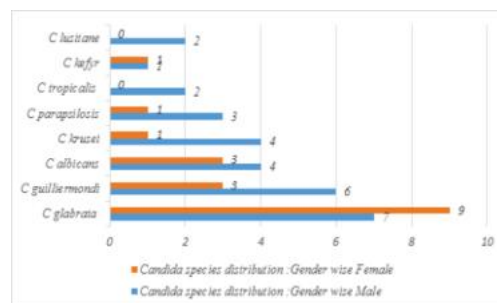


Figure 1: Gender Wise Distribution of *Candida* Isolate

Gender-wise stratification demonstrated (Figure 1) a higher overall prevalence among female patients (n = 27), (57.4%) and yielded a female-to-male ratio of 1.35:1. The relative risk—more accurately called the Prevalence Ratio in this cross-sectional data—is 1.35. Female Prevalence: 57.4% (27 out of 47) Male Prevalence: 42.6% (20 out of 47) Prevalence Ratio (Risk).

DISCUSSION

We often begin empiric therapy or therapy before antifungal susceptibility cases are known. Pediatric cohorts often show higher isolation rates of less common yeasts, such as *C. lusitanae*, when compared to adults. Total parenteral nutrition (TPN) acts as a strong risk factor, specifically driving the growth of *C. guilliermondii*.

- Demographic Pattern:** *Candida* infections were most common in neonates <1 month (27.7%), infants and children 10-14 years with a female predominance (57.4%) in the study population. It may be due to poor hygiene. (6)
- Hospital Distribution:** Majority of isolates were from critical care areas PICU (36.2%) and NICU (25.5%) this may be due to varying rate of unhygienic fluid infusion and of drug infusion and antimicrobial use is a reason for more during severity of infection indicating a higher burden in ICU settings compared to general wards and OPD. (7)
- Species Shift:** Non-albicans *Candida* species accounted for a maximum of 85.1% of all isolates, with *C. glabrata* 34.0% being the predominant species, followed by *C. guilliermondii* (19.1%). *C. albicans* was isolated in only 14.9% cases. This reflects a significant epidemiological shift away from *C. albicans* in pediatric patients. (8,9)
- Antifungal Implications:** The high prevalence of *C. glabrata* and *C. krusei* (10.9%) is clinically important as both show reduced susceptibility and intrinsic resistance to fluconazole, necessitating species identification and antifungal susceptibility testing before initiating therapy.
- Risk Factors:** Extreme prematurity (40.4%) emerged as the major associated risk factor, reinforcing the vulnerability of premature neonates to invasive candidiasis. (10)

This multi-parametric investigation outlines the clinical and mycological characteristics of pediatric candidiasis within the hospital. Cross-referencing patient demographics, ward locations and precise speciation records highlight key epidemiological vulnerabilities. This pattern matches international multi-centre neonatal surveillance reports. It shows that premature immune systems, combined with invasive life-support tools like central venous lines and mechanical ventilators in intensive care settings, significantly increase the risk of opportunistic fungal colonization (13,14,15). Non-albicans *Candida* species accounted for 85.1% (n=40) of all isolates, and this was led by *Candida glabrata*, which was the single most common cause of infection at 34.0% (n=16). (8,16,17,18) This overwhelming shift away from *C. albicans* aligns with recent epidemiological trends reported across major global healthcare networks. (19, 20) However, the widespread, prophylactic use of standard triazole drugs (like fluconazole) has changed this balance. It suppresses *C. albicans* but unintentionally creates an environment where more resilient, less sensitive non-albicans strains like *C. glabrata* and *C. krusei* can thrive. (21) The baseline data showed more male isolates (n=29, 61.7%) than female isolates (n=18, 38.3%), (table 4). However, looking closer at individual species reveals distinct biological trends:

- The Female Prevalence: Female patients made up only 38.3% of the overall cohort, but they accounted for the majority of *C. glabrata* infections (56.3%, 9 out of 16). (22, 23)
- The Male Prevalence: In contrast, male patients dominated almost all other isolated strains. This includes *C. guilliermondii* (66.7% male), *C. krusei* (80.0% male), *C. parapsilosis* (75.0% male), and both *C. tropicalis* (n=2) and *C. lusitanae* (n=2), which were found only in male patients. (24, 25)

Because *C. glabrata* and *C. krusei* are well-known for being less responsive or fully resistant to first-line azole treatments, these distinct variations emphasize the danger of using a single, uniform empirical treatment plan for all patients. (26, 27) Proactive Stewardship: Implement strict antifungal management programs in the PICU and NICU to limit the overuse of fluconazole, which drives the selection of resistant strains. In developed countries, general infection rates in neonatal units reach over 20% of neonates with low birth weight.

CONCLUSION

Non-albicans *Candida* species became increasingly prevalent, as

compared to *Candida albicans* and mortality significantly decreased, likely due to improved patient management. The results reinforced the need to monitor fungi more frequently and efficiently in paediatric settings of hospitals, especially in neonatal ICUs. Proactive environmental monitoring is essential to protect high-risk populations, particularly premature or immunocompromised infants, from severe fungal infection.

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