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Prevalence of Candiduria in Infants from a Tertiary Care Hospital

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SM and SS designed the study, prepared the manuscript and analyzed the study. Author KJ helped in analyzing data. Authors NJKB and CH managed literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Yeast related urinary tract infections are rare in healthy newborns. Study was conducted in the department of microbiology in a tertiary care hospital, New Delhi from June 2012 to June 2013. Only infants were included in the study. A total of three hundred and thirty three urine samples were received for fungal culture and microscopy. The isolation rate of *Candida* species amongst the 333 samples was found to be 21.62%. Amongst 333 samples received 37 (11.11%) were positive for *Candida albicans* while 35 (10.51%) were positive for non albicans *Candida* species. So, in this study among 72 isolates of

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Candida, *Candida albicans* was found in 51.39% while non-albicans *Candida* species was found to be in 48.61% of the *Candida* isloates. It is important that the specific species responsible for symptomatic infection is identified, given the differences in antimicrobial susceptibility among Candida species.

Keywords: Urinary tract infection; Candida albicans; non-albicans Candida.

1. INTRODUCTION

Yeast related urinary tract infections are rare in healthy newborns. In contrast, candiduria occur commonly in neonatal and pediatric ICUs (Intensive care unit) and particularly in premature infants. Spectrum of disease is varying from asymptomatic candiduria to clinical sepsis. UTI (urinary tract infection) in infants and young children present with recurrent fever, diarrhea, vomiting, abdominal pain and poor weight gain. UTI is an important cause for fever without a focus, especially in children less than 2 years old [1]. Several reports showed that the frequency of UTI due to yeasts has increased during the last few decades [1-4]. Risk factors commonly associated with *Candida* infection include prolonged hospitalisation, broad spectrum antibiotic therapy, use of catheter, total parenteral nutrition, renal and urinary tract malformations and prematurity. Although *C. albicans* is frequently reported as the most prevalent species infecting the urinary tract, non-albicans *Candida* species appear better adapted to the urinary tract environment with many studies reporting that >50% of urinary *Candida* isolates belong to non-albicans species. *C. tropicalis*, *C. glabrata*, *C. parapsilosis*, *C. lusitaniae*, *C. guilliermondii* and *C. krusei* are non-albicans species that cause candiduria [5]. In a study conducted in India, *Candida tropicalis* was more common than *Candida glabrata* and *C. albicans* [6]. It is important to know *Candida* spp. causing the UTI before initiating the treatment as many non-albicans *Candida* spp. are inherently resistant to treatment with fluconazole. The aim of the present study was to determine the prevalence of Candiduria in infants and to determine common *Candida* species associated with UTI in infants and assessment of risk factors which will help the clinicians in the better management of candiduria.

2. MATERIALS AND METHODS

This study was conducted in the department of Microbiology, Dr. Ram Manohar Lohia Hospital, New Delhi from June 2012 to June 2013. Only infants i.e. <1 year age children were included in the study. All urine samples from infants which were received in the microbiology laboratory during June 2012 to June 2013 were included in the study. The urine sample was collected as a clean catched midstream urine sample in males and using urine collection bag affixed to the perineum in females after thorough cleaning of genitals [7]. A total of three hundred and thirty three urine samples were received in the laboratory from admitted 333 symptomatic infants. All samples received from one patient were considered as a single sample. The prevalence of candiduria was calculated from the total number of samples received in our laboratory. Wet mount preparations were examined for visualization of pus cells, yeast cells and culture was performed on SDA (Sabouraud Dextrose agar) slants with and without antibiotics. Slants were incubated at 37ºC and 25ºC and were examined after 48 hours of incubation. Germ tube test was used to differentiate *Candida albicans* from other *Candida* species. All yeast colonies were identified based on colony morphology and colour appearance on CHROMagar *Candida* and on the basis of biochemical properties in sugar assimilation test. All *Candida* species were confirmed by

automated system- Microscan Walkaway 40plus system. *Candida* was considered significant and causing infection only when the infant was symptomatic and also the same isolate was present in two consecutive urine samples collected 24 hrs apart and presence of pus cells in the samples. All freshly prepared medias were tested using quality control strains ATCC 90028 (*Candida albicans*), ATCC 13803 (*C. tropicalis*), and ATCC 6258 (*C. krusei*). All the data were entered in the Microsoft excel sheet and processed for statistical analysis to calculate various percentage.

3. RESULTS

Distribution of *Candida* isolates in infants from ICU and wards is shown in (Table 1). The isolation rate of *Candida* species amongst the 333 samples was found to be 21.62%. Out of 333 samples received, 56.8% were males and 43.2% were females. Amongst 333 samples received, 72 (21.62%) samples grew *Candida* in pure culture and among them, 37 (11.1%) were *Candida albicans* while 35 (10.5%) were non albicans *Candida* species. 261 (78.4%) samples were negative for microscopic examination for budding yeast cells and had no fungal growth after 48 hours of incubation at 37ºC and 25ºC. 56.7% of the *Candida* isolates were from ICU while 43.3% isolates were from infants admitted in wards (Table 1). So, in this study among 72 isolates of *Candida*, *Candida albicans* was found in 51.39% while non albicans *Candida* species was found to be in 48.61% of the *Candida* isolates (Table 1). Out of 72 isolates of *Candida*, males (58.3%) were more commonly affected compared to females (41.7%). Among candiduria cases, 84.7% (61) received broad spectrum antibiotics for more than 7 days, 50% (36) were catheterized, and 16.7% (12) were low birth weight (i.e. birth weight < 2500 g). In ICUs out of 45 isolates, 93.3% (42) received prolonged antibiotic, 71.1% (32) were catheterized and 26.7% (12) were low birth weight as shown in (Table 2). Among non-albicans *Candida* most common species were *C. tropicalis* (27.77%) followed by *C. krusei* (12.5%) and *C. parapsilosis* (8.3%) as shown in (Table 3).

Table 1. Distribution of *Candida* isolates in infants from ICU and wards

Pediatric units	Total samples	Males (%)	Females (%)	No growth (%)	*Candida albicans* (%)	Non-albicans *Candida* species (%)
Pediatric ICU	97	56	41	64	15	18
Neonatal ICU	92	49	43	80	7	5
Neonatal ward	55	31	24	48	4	3
Pediatric ward	89	53	36	69	11	9
Total (n=333)	333	189(56.8%)	144(43.2%)	261(78.4%)	37(11.1%)	35 (10.5%)

Table 2. Assessment of risk factors in infants with candiduria

Risk factors	ICU (n=45) candiduria	Ward (n=27) candiduria	Candiduria (n=72)	No growth (n=261)
Antibiotic therapy (>7 days)	42 (93.3%)	19 (70.3%)	61 (84.7%)	159 (60.9%)
Catheterization	32 (71.1%)	4 (14.8%)	36(50%)	67 (25.7%)
Low birth weight (<2500g)	12 (26.7%)	Nil	12 (16.7%)	6 (2.2%)

Table 3. Distribution of various *Candida* species in urine samples

Etiological agents	Males (%)	Females (%)	No. of isolates	Percentage
C. albicans	22 (59.4%)	15 (40.6%)	37	51.39%
C. tropicalis	11 (55%)	9 (45%)	20	27.77%
C. krusei	6 (66.7%)	3 (33.3%)	9	12.5%
C. parapsilosis	3 (50%)	3 (50%)	6	8.3%
Total	42 (58.3%)	30 (41.7%)	72	-

4. DISCUSSION

Fungal UTI is one of the important factor for mortality and morbidity in hospitals and it incidence is increasing in all hospitalized patients (all areas of medical and surgical practice). Candiduria is rare in healthy people but relatively frequent in hospitalized patients [8]. Several investigators believed that *Candida* infections are an emerging problem in pediatrics [4]. *Candida* species accounted for 5.5% of UTIs in children less than 12 year. In a study conducted by *Seifi Z* et al. among children less than 14 yrs*,* most of the patients with candiduria (42.9%) was less than 1 year [9]. In our study, isolation rate of *Candida* species was found to be 21.62%. In other study, 16.5% of culture from sampled patients yielded different species of *Candida*. In a study in Brazil, 22% of urine samples from hospitalized patients were positive for *Candida* species [10]. In our study, *Candida* was isolated more commonly in males (58.3%) compared to females (41.7%). This result is comparable with other study conducted by *Seifi Z* et al*., where* 71.4% of *Candida* was isolated in males and 28.6% in females [9]. Many risk factors have been suggested to candiduria, such as broad spectrum antibiotics therapy, corticosteroids agents, immunosuppressive drugs, use indwelling catheters for urinary drainage, hematologic malignancies, urinary tract abnormalities and prematurity [4].

Nayman Alpat et al. [11] had believed that long duration of ICU and hospital stay increase the prevalence of candiduria in patients. In addition, candiduria in ICU patients is a marker for increased mortality. In our study, 56.7% of the *Candida* isolates were from ICU while 43.3% isolates were from infants admitted in wards. This is due to the fact that ICU patients are more critical and are mostly catheterised which are important risk factors for candiduria, leading further to candidaemia. Also the ICU patients receive multiple broad spectrum anti-microbial agents which further increase the prevalence of candiduria in ICUs [12]. The assessment of risk factors suggested that among candiduria cases 93.3% (42) received prolonged antibiotic, 71.1% (32) were catheterized and 26.7% (12) were low birth weight in ICUs (Neonatal ICU and Paediatric ICU) compared to 70.3% received prolonged antibiotic, 14.8% were catheterized and none were low birth weight in ward. Underlying risk factors were similar in other study by Kauffman et al. [13]. In addition, in a study conducted by Robinson et al. [14], mortality rate due to candiduria in infants in the neonatal intensive care unit was significant (30%). Candiduria may be a result of contamination of the urine samples, urinary tract colonization or indicative of invasive UTI. Contamination is common, especially if the specimen is suboptimal urine collection from a catheterized patient. Colonization is usually asymptomatic adherence and settlement of the *Candida spp* on the drainage catheters or foreign bodies in the urinary tract and, may result in high concentration of *Candida* colonies in urine cultures. Quantitative cultures with colony counts of > 100,000 cfu/ml of urine are associated with infection in patients without indwelling urinary catheters. However, renal candidiasis has been reported even with low colony counts of 1000 cfu/ml of urine [15]. Isolation of *Candida* on repeated samples is also important for the diagnosis of invasive candiduria and rules out contamination or colonisation. In our study, colony forming

units were not determined, but sample was considered positive only when two consecutive urine samples collected 24 hours apart grew the same *Candida* species. Also it is a well known fact that colonisation is an important risk factor for development of candidaemia, as most infections are endogenous and candidaemia has a high mortality rate of 46-80% compared with bacteraemia (38%) [16]. Also some studies emphasise that candiduria should never be ignored in septic patients, as it may be the first sign of a systemic *Candida* infection [17]. Hence, in high-risk patients, candiduria should be carefully evaluated for disseminated infection.

Distribution of *Candida* species in candiduria varies in different studies. *C. albicans* was considered to be the most common pathogen in neonate patients with candiduria followed by *C. parapsilosis* [18]. In our study, *Candida albicans* was found in 51.39% while among non albicans *Candida* species most common isolate was *C. tropicalis*, followed by *C. krusei* and *C.parapsilosis*. Non-*albicans* species accounted for 71% and 64.4% of isolates in Paul et al. [6] and Kobayashi et al. [10] reports, respectively. This suggests that there is a change in trend with shift toward non-albicans *Candida* spp. compared to *C. albicans* as the predominant pathogen causing hospital acquired UTI. These non-albicans *Candida* spp. are more difficult to treat as some of the strains are intrinsically resistant to Amphotericin B (*C. lusitaniae*). Also non-albicans *Candida* species like *C. tropicalis, C. krusei, C. glabrata* and *C. parapsilosis* are less susceptible to azoles particularly fluconazole compared to *C. albicans* [19]. Hence, identification of species should always be performed for appropriate management of such patients. Management of candiduria remains controversial. Some of the clinicians have believed that the presence of *Candida* spp. in urine samples is marked as harmless colonization, or lower tract infection. Clinically two important antifungals, amphotericin B and fluconazole were used for the treatment of candiduria in patients [13,20]. The limitation of this study is that antifungal susceptibility testing was not done in our isolates, which plays an important role in the management of such patients, especially infection with non-albicans *Candida* species. Since isolation of *Candida* is increasing from various samples received in the laboratory, it is recommended that such studies should be undertaken in different geographical areas at regular intervals for global comparison.

5. CONCLUSION

In conclusion, Candiduria is an increasingly difficult problem for clinicians to recognize and manage as infants do not present with typical symptoms of UTI. Candiduria may lead to disseminated candidiasis especially in hospitalized infants, as they are immunocompromised, catheterized and on prolonged antibiotics. It is important that the specific species responsible for symptomatic infection is identified because non-albicans *Candida* are more resistant to commonly used antifungals and also few species are intrinsically resistant to fluconazole.

CONSENT

Not applicable as the study was conducted in samples received in the laboratory and the consents were taken by the treating physicians.

ETHICAL APPROVAL

Not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Vijayakumar M. Revised statement on management of urinary tract infections. Indian society of pediatric nephrology. Indian Pediatrics. 2011;48:709-717.
2. Laverdiere M, Labba AC, Restieri C, Rotstein C, Heyland D, Madger S, et al. Susceptibility patterns of *Candida* species recovered from Canadian intensive care units. J Crit Care. 2007;22(3):245-50.
3. Da Silva EH, Da Silva Ruiz L, Matsumoto FE, Auler ME, Giudice MC, Moreira D, et al. Candiduria in a public hospital of São Paulo (1999-2004): Characteristics of the yeast isolates. Rev Inst Med trop S Paulo. 2007;49(6):349-53.
4. Saha R, Das S, Kumar A, Kaur IR. Pattern of *Candida* isolates in hospitalized children. Indian J Pediatr. 2008;75:858-60.
5. Lagrotteria D, Rotstein C, Lee CH. Treatment of candiduria with micafungin: A case series. Can J Infect Dis Med Microbiol. 2007;18(2):149-50.
6. Paul N, Mathai E, Abraham OCA, Michael JS, Mathai D. Factors associated with candiduria and related Mortality. J Infect. 2007;55:450-5.
7. Urinary Tract Infection: Clinical Practice Guideline for the diagnosis and management of the initial UTI in febrile infants and children 2 to 24 Months. American Academy of Pediatrics. 2011;128:3.
8. Jain N, Kohli R, Cook E, Gialanella P, Chang T, Fries BC. Biofilm formation by and antifungal susceptibility of *Candida* isolates from urine. Appl Environ Microbiol. 2007;73:1697-1703.
9. Seifi Z, Azish M, Salehi Z, Zarei Mahmoudabadi A, Shamsizadeh A. Candiduria in children and susceptibility patterns of recovered *Candida* species to antifungal drugs in Ahvaz. J Nephropathol-ogy. 2013;2(2):122-128.
10. Kobayashi CC, De Fernandes OF, Miranda KC, De Sousa ED, Silva Mdo R. Candiduria in hospital patients: A study prospective. Mycopathologia. 2004;158:49-52.
11. Nayman Alpat S, Özguneş I, Ertem 1. OT, Erben N, Doyuk Kartal E, Tözun M, et al. Evaluation of risk factors in patients with candiduria. Mikrobiyol Bul. 2011;45:318-324.
12. Sobel JD, Fisher JF, Kauffman CA, Newman CA. *Candida* urinary tract infections-epidemiology. Clin Infect Dis. 2011;52(6):433-6.
13. Kauffman CA, Vazquez JA, Sobel JD, Gallis HA, McKinsey DS, Karchmer AW, et al. Prospective multicenter surveillance study of funguria in hospitalized patients. Clin Infect Dis. 2000;30(1):14-18.
14. Robinson JL, Davies HD, Barton M, O'Brien K, Simpson K, Asztalos E. Characteristics and outcome of infants with candiduria in neonatal intensive care - a Paediatric Investigators Collaborative Network on Infections in Canada (PICNIC) study. BMC Infect Dis. 2009;9:183.
15. Kauffman CA. Candiduria. Clin Infect Dis. 2005;41(6):S371-6.
16. Binelli CA, Moretti ML, Assis RS, Sauaia N, Menezes PR, Ribeiro E, et al. Investigation of the possible association between nosocomial candiduria and candidaemia. Clinical Microbiology and Infection. 2006;12(6):538–543.
17. Fisher JF. Candiduria: When and how to treat it. Curr Infect Dis Rep. 2000;2:523–530.
18. Kristina B, Charles M, Gerard R. Renal candidiasis in neonates with candiduria. Pediatr Infect Dis J. 1999;18(11):959-63.

19. Achkar JM, Fries BC. *Candida* infections of the genitourinary tract. Clinical Microbiology Reviews. 2010;253–273.
20. Hollenbach E. To treat or not to treat – critically ill patients with candiduria. Mycoses. 2008;51(2):12-24.

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