

ORIGINAL ARTICLE

Candiduria in children: a first report from an Iranian referral pediatric hospital

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Key words

Candiduria • Children • Iran

Summary

Candida spp. especially *Candida albicans* is considered as one of the most common cause of fungal infections. The aim of our study was to determine epidemiology of candiduria in children who were referred to an Iranian referral hospital. During May 2011 to February 2013, among 4813 urine culture positive, 209 candida spp. isolates (4.3%) was found. Forty-one percent of candiduria infection was seen in patients between 1 month and 1 year, 24% in neonatant and 24% in patients 1 to 5 years. Candiduria was mainly

found in patients who had received more than 2 or 3 antibiotic during their hospitalization (37% and 24%, respectively). In our study, the highest frequency of candiduria was seen in patients who had received more than 2 antibiotics and more than 3 antibiotics during their hospitalization; therefore, the strategic goals to optimize antimicrobial use including optimizing choice and duration of empiric therapy as well as monitoring and providing feedback regarding antibiotic resistance are recommended.

Introduction

Candida spp. especially *Candida albicans* consider as one of the most common cause of fungal infections leading to a range of life-threatening invasive to non-life-threatening mucocutaneous diseases [1].

According to nosocomial Infection Surveillance systems of the United State, *candida* spp. are the 7th most common nosocomial pathogens [2]. Several reports over the last 30 years has been reported not only in dramatic increase in the prevalence of candiduria but also in the incidence of candida urinary tract infections (UTI) [3]. The recognition of differences in incidence, populations at greater risk, species distribution is important in order to establish appropriate measures of infection control and the management of this disease [4]. The aim of our study was to determine epidemiology of candiduria in children in an Iranian referral hospital.

Method

The diagnosis of a UTI due to *Candida* species is much more difficult and it has not been established the importance of quantitative urine cultures for UTI due to *Candida* [5]. In our study, urine samples were collected from patients who had symptoms suggesting a UTI.

However, there is no consensus cut-off limit to define candiduria and investigators use different definitions,

quantitation of the number of organisms in the urine to define infection was considered $\geq 10^4$ yeast cfu/ml.

Each urine sample was cultured on CHROM agar candida plates and incubated at 37°C for 24-48h aerobically. The number of colonies on each plate were counted and recorded based on colony colors. Furthermore, a direct smear was prepared from each colony and confirmed as yeasts. *Candida* isolates were identified based on colony morphology on CHROM agar candida and germ tube production. The following data were collected from the medical records of patients: gender, age, hospital unit, duration of hospitalization, use of central venous and urinary catheters during the hospitalization, the use of antibiotics at time of diagnosis of candiduria, previous usage of antifungal drugs and clinical finding.

Statistical analyses

The Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc, Chicago, US) was used for all analyses. Descriptive statistics were used to summarize patient variables.

Results

From May 2011 to February 2013, among 4813 urine culture positive, 209 *candida* spp. isolates (4.3%) was found (150 *Candida albicans* (72%) and 57 *Candida*

spp. (28%). The demographic data of patients with candiduria was shown in Tab. I. Candiduria was found in 66 girls (32%) and 143 boys (68%). The majority of candiduria infection was seen in patients less than 5 years. Forty-one percent of reported infection was in patients between 1 month and 1 year, 24% in neonatant and 24% in patients 1 to 5 years (Tab. I).

The highest frequency of candiduria was seen in patients who had been hospitalized over a month (73 cases, 35%), between 2 weeks to 1 month (57 cases, 27%), between 5 day to 2 week (52 case, 25%) followed by 27 cases (13%) that were hospitalized less than 5 day.

The highest frequency of candiduria was seen in patients who received more than 2 antibiotics (37%) or more than 3 antibiotics (24%) during their hospitalization (Tab. I).

Tab. I. Demographic data of patients with candiduria.

		N	%
Sex	Male	143	68
	Female	66	32
Age	Neonate	49	24
	1 month to 1 year	86	41
	1 year to 5 year	50	24
	6 year to 10 year	13	6
	11 year to 15 year	11	5
Ward	PICU	51	24.5
	Urology	30	14
	NICU	26	12
	Surgery	21	10
	CICU	20	10
	Gastroenterology	14	7
	Rheumatology	10	5
	Nephrology	10	5
	Infectious	9	4
	Neonatal	6	3
	Cardiology	5	2
	Emergency	4	2
	Oncology	2	1
	Neurology	1	0.5
Duration of hospitalization	<5 days	27	13
	5-10 days	27	13
	10-15 days	25	12
	15-30 days	57	27
	>30 days	73	35
Antibiotic usage	No	14	7
	2 or more antibiotic	78	37
	3 or more antibiotic	51	24
	Cephalosporins	37	18
	Meropenem	8	4
	Penicillin	7	3
	Piperacillin/tazobactam	4	2
	Vancomycin	1	0.5
	Aminoglycoside	1	0.5
	Others	8	4

PICU: Pediatric intensive care unit, NICU: Neonatal intensive care unit, CICU: Cardiovascular Intensive Care Unit.

Tab. II. Underlying diseases of patients with candiduria.

Diagnosis	N	%
Cardiovascular disease	37	18
Respiratory disease	22	10
Anomaly of urinary tract	21	10
UTI or nephrogenic disease	21	10
Gastrointestinal and liver diseases	19	9
Infectious disease	18	8.5
Nervous system	18	8.5
Neurosurgery	15	7
Metabolic diseases	8	4
Rheumatologic disease	7	4
Endocrine diseases	7	4
Immunodeficiency	4	2
Leukemia or Lymphoma	3	1
Prematurity and RDS	3	1
Other blood diseases	2	1
Surgical-site infections	2	1
Others	2	1
Total	209	100

UTI: Urinary Tract Infections, RDS: Respiratory Distress Syndrome.

The majority of children with candiduria were hospitalized in ICUs (pediatric intensive care unit (24.5%), neonatal intensive care unit (12%), and coronary care unit (10%) (Tab. I). Among underlying diseases, the highest frequency belonged to cardiovascular disorder (18%), respiratory diseases (10%), anomaly of urinary tract (10%), UTI or nephrogenic disease (10%), Gastrointestinal and liver diseases (9%), infectious diseases (8.5%) and neurologic disorders (8.5%) (Tab. II).

Among all patients, 38 (18%) and 25 (12%) had central catheter and urine catheter, respectively.

Diaper rash and oral thrush was reported in 70 (34%) and 12 (6%) of patients, respectively. In addition, 25 cases (12%) had genital anomalies and candidemia was present in 5 cases (2%). Thirty-four patients (16%) were treated with systemic antifungal drugs. Fluconazole was prescribed for 23 cases (11%), clotrimazol for 16 patients, nistatin for 12 cases and amphotericin B for 7 cases. Four cases were treated with combination of fluconazole and amphotericin B and the others did not receive any treatment for their infection.

Discussion

In the present study, candiduria was diagnosed in 4.3% of the patients with UTI. It has been reported that 11 to 52% of nosocomial urinary tract infections (UTIs) are caused by *Candida* spp. [6-11]. Increased age, female sex, antibiotic use, urinary drainage devices and prior surgical procedures are considered as risk factors for candiduria [12, 13]. Although females have higher risk for developing candiduria, In our study, similar to Jain et al. report, candiduria was more common in

males (68%) than females (32%) [14]. Candiduria has been dramatically increased among hospitalized patients especially among those patients with indwelling drainage devices [15, 16]. In our study, long-term indwelling urethral catheters or other urinary drainage devices were present in 40% of patients and all of the patients with candiduria had a known underlying illness. A study performed by Platt et al. showed that 26.5% of all urinary infections related to indwelling catheters were caused by fungi [15]. Philips et al. reported that *Candida* spp. were responsible for 25 of 60 (42%) UTI in infants admitted to a neonatal intensive care unit [17]. The frequency of candidemia in our study was 2% that was less than Philips et al. study that reported 52% [17]. Our result, confirm the Binelli et al. report which was reported that in the majority of patients the urinary tract was not the source of candidemia [16].

It has been reported that the prevalence of candiduria in the ICU population is increasing ranges from 19 to 44% of urine specimens depending upon different population and definition of candiduria [18-20]. Candiduria and candidemia occur commonly in neonatal and pediatric ICUs and particularly in premature infants [12, 17, 21-25]. *Candida* spp. were the pathogens identified in 42% of hospital-acquired urinary tract infections in a neonatal intensive care unit [17]. In this study, the majority of children with candiduria were hospitalized in ICUs (PICU (24.5%), NICU (12%), CICU (10%). The higher number of candiduria cases in patients of ICUs might be due to concurrent factors that contribute to the selection of these pathogens such as underlying diseases, immunodeficiency, and multiple manipulations by health care personnel and altered bacterial flora as well as use of antibiotics and long hospital stay [18, 19].

Use of antibiotics consider as a chief risk factor to develop *Candida* urinary tract infection [26]. In our study, the highest frequency of candiduria was seen in patients who had received more than 2 antibiotics and more than 3 antibiotics during their hospitalization; Although *C. albicans* is frequently reported as the most prevalent species infecting the urinary tract [16], non-albicans *Candida* spp. which better adapted to the urinary tract environment accounted for more than 50% of urinary *Candida* isolates [13, 27]; consequently, identification of *Candida* spp. isolates as well as monitoring and providing feedback regarding antifungal resistance is suggested. In addition, the strategic goals to optimize antimicrobial use including optimizing choice and duration of empiric therapy as well as monitoring and providing feedback regarding antibiotic resistance are recommended.

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