

Original article:

Study of candiduria with special reference to risk factors and species distribution

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Abstract

Background: In recent years, candiduria is increasingly reported from hospitalized patients. Although *Candida albicans* is considered as the most pathogenic species, many recent studies have documented a shift towards non *albicans Candida* (NAC spp) species. As many microbiology laboratories do not routinely identify species of *Candida* isolates from urine cultures, the change in trends of *Candida* spp. causing urinary tract infections (UTI) can't be easily traced. the present study was conducted with an aim to identify the species of *Candida* isolates from urine cultures and study risk factors associated with candiduria.

Materials and methods: *Candida* isolates from UTI were identified upto species level as per standard mycological protocol. Patient's risk factors were recorded and analyzed.

Results: The rate of *Candida* UTI was 9.1%. NAC were the predominant isolates from candiduria. Diabetes and fluconazole therapy/prophylaxis were major risk factors associated with candiduria due to NAC spp.

Conclusion: The shift towards Non *albicans Candida* species as a cause of candiduria is noted in the present study. Identification of infection causing *Candida* species is very essential as many isolates from NAC spp. are either intrinsically resistant or may acquire resistance during course of treatment to commonly prescribed antifungal drugs.

Key words: Candiduria, *Candida albicans*, Non *albicans Candida* species, risk factors.

Introduction

Among various genus of pathogenic fungi, *Candida* is an unique fungus which exist both as commensal and pathogen.¹ *Candida* spp. colonizes skin, the gastrointestinal and the genital tract. It is the only pathogen capable of causing broad spectrum of clinical manifestations ranging from mucocutaneous overgrowth to disseminated infections.²

Vulvovaginal candidiasis (VVC) in women, balanitis and balanoposthitis in men, and urinary tract infection (UTI) or candiduria in both sexes are most frequent manifestations of genitourinary *Candida* infections.³ UTI are the most common type of healthcare-associated infection (HCAI) accounting for more than 30% of infections reported by acute care hospitals.⁴

Although, candiduria is rarely manifests in structurally normal urinary tract and in healthy people, it is commonly reported from diabetic patients, critically ill bed ridden individuals and those on antibiotics.⁵ In recent years, candiduria is increasingly reported from hospitalized patients. It is one of the most common types of UTI in patients with indwelling urinary catheters.

Although *Candida albicans* is considered as the most pathogenic species, many recent studies have documented a shift towards non *albicans Candida* (NAC spp) species. NAC spp. are either inherently resistant or acquire resistance during course of treatment to commonly prescribed antifungal drugs.⁶

As many microbiology laboratories do not routinely identify species of *Candida* isolates from

urine cultures, the change in trends of *Candida* spp.³ causing UTI can't be easily traced. Therefore, the present study was conducted with an aim to identify the species of *Candida* isolates from urine cultures and study risk factors associated with candiduria.

Materials and methods.

The present descriptive cross sectional study was conducted in Department of Microbiology of tertiary care teaching hospital for a period of 2 years (January 2016 to December 2017). *Candida* spp. isolated from urine cultures were included in the study. Colony counts of $>10^5$ colony forming units (CFU)/mL was considered as significant for indicating candiduria in patients without indwelling urinary catheters whereas, $>10^4$ CFU/mL was considered as significant for patients without indwelling catheters.^{5,7}

Candida isolates were identified upto species level as per standard mycological protocol, which included germ tube production, carbohydrate assimilation, colony morphology and color on HiChrom *Candida* agar (Himedia Laboratories Pvt Ltd Mumbai, India). Hi*Candida* identification kit (Himedia Laboratories Pvt Ltd Mumbai, India) supplemented identification of *Candida* isolates.

Results

During the study period, a total of 6543 urine samples were received in Department of Microbiology. Out of these, a total of 1867 (28.5%) showed growth. Bacterial isolates were obtained from 1698 (90.9%) samples whereas 169 (9.1%) urine samples showed growth of *Candida*. The organism wise distribution of isolates from urine samples is shown in figure 1.

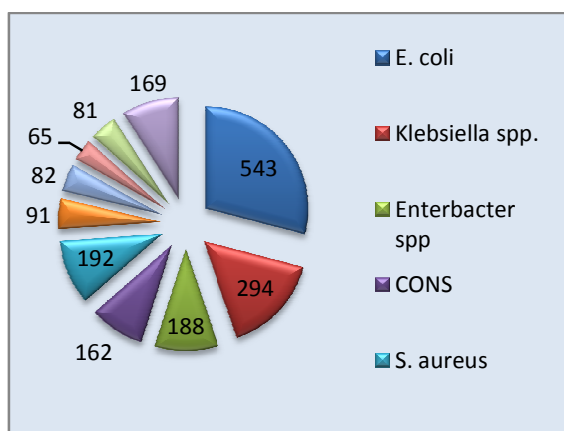


Figure 1: Organism wise distribution of isolates from urine samples.

Among 169 *Candida* isolates, only 49 (28.9%) were *C. albicans* whereas 120 (71.1%) were NAC spp. The species wise distribution of *Candida* isolates is shown in figure 2.

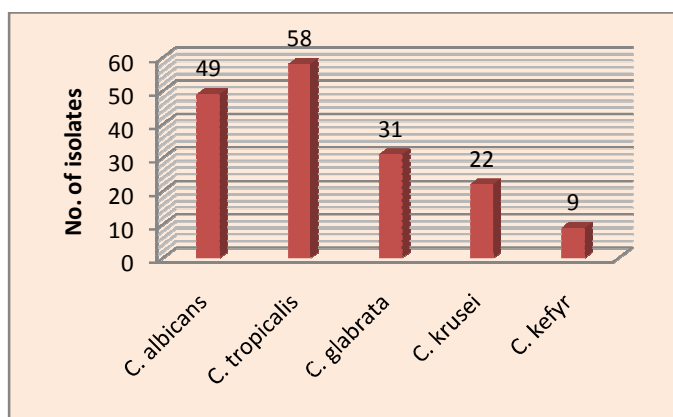


Figure 2: Species wise distribution of *Candida* isolates from urine samples.

In the present study, *C. tropicalis* was the most common NAC spp. and even surpassed *C. albicans*. *C. glabrata* was isolated from 31 samples. As shown in table 1, the incidence of candiduria was more common in females and patients belonging to advanced age group. Diabetes followed by presence of indwelling urinary catheter were the

major risk factors associated with candiduria. Diabetes (Fisher's exact test, *P* value 0.02) and Prophylactic/ therapeutic fluconazole therapy (Fisher's exact test, *P* value 0.002) were significant risk factors associated with candiduria due to NAC spp.

Table 1: Risk factors associated with candiduria.

Sr. No	Risk factor	No. (%)	<i>C. albicans</i> (%)	NAC (%)	<i>P</i> value
1)	Gender				
	Male	74 (43.8)	23 (31.1)	51 (68.9)	ND
	Female	95 (56.2)	26 (27.4)	69 (72.6)	
2)	Age group (years)				
	0-10	06 (3.6)	01 (16.7)	05 (83.3)	ND
	11-20	03 (1.8)	01 (33.3)	02 (66.7)	
	21-30	19 (11.2)	06 (31.6)	13 (68.4)	
	31-40	28 (16.6)	06 (21.4)	22 (78.6)	
	41-50	45 (26.6)	10 (22.2)	35 (77.8)	
	>50	68 (40.2)	25 (36.8)	43 (63.3)	
3)	Diabetes	129 (76.3)	24 (18.6)	105(81.4)	0.02*
4)	Antibiotic treatment	118 (69.8)	31 (26.3)	87 (73.7)	0.8
5)	Prophylactic/ therapeutic fluconazole therapy	28 (16.6)	02 (7.1)	26 (92.9)	0.002*
6)	Indwelling Foley's catheter	128 (75.7)	32 (25)	96 (75)	0.86

Discussion

UTI are extremely common disorders in clinical practice, second only to respiratory tract infections. The term UTI encompasses a wide variety of clinical entities whose common denominator is microbiological invasion of any of tissue of urinary tract extending from the renal cortex to the urethral meatus.⁸ Infection may predominate at a single site such as kidney (pyelonephritis), the bladder (cystitis), the prostate (prostatitis), the urethra (urethritis) or be restricted to urine (bladder bacteriuria), but the entire system is always at a risk of microbial invasion once one part is infected.⁸

In the present study, *E. coli*, *Klebsiella* spp, *Enterobacter* spp, *S. aureus* and *Candida* spp were the major isolates from UTI. Similar findings were reported by hospitals reporting to National Healthcare Safety Network (NHSN).⁹

In this study, the rate of *Candida* UTI was 9.1%. The isolation of *Candida* spp. from urine specimens puts both the clinician and microbiologist in dilemma, to whether consider this condition as an indication of upper or lower urinary tract infection or colonization of the bladder or contamination of the specimen. However, isolation of *Candida* from urine samples should never be ignored, as this condition may be the only and often the first indication of disseminated candidiasis.¹⁰

In the present study, NAC spp. (71.1%) were predominant cause of candiduria. The composition and pH of urine is known to selectively support the growth of NAC spp.¹¹ As compared to *C. albicans*, NAC spp. are not only better adapted to urinary tract but also difficult to eradicate. *C. tropicalis* was the predominant isolate. Similar finding was reported by Paul *et al* (2004)¹² and Deorukhkar *et al* (2016)¹¹. In the current study, *C. glabrata* was the second most common NAC spp. isolated from candiduria. Various recent studies have reported

increased isolation of *C. glabrata* from urine samples.¹¹ As *C. glabrata* is the only known haploid *Candida* spp., demonstration of budding yeast cells without hyphae in urine is usually considered as an indicator of *C. glabrata* UTI.

C. krusei was isolated from 22 (13.1%) urine samples. This NAC spp. is an emerging yeast and is intrinsically resistant to fluconazole.¹¹ The increased isolation of NAC spp. from urine samples highlights the importance of species identification of *Candida* isolates.

In the present study, candiduria was more common in females and patients belonging to advanced age group. Our findings are in accordance to other researchers.⁵ The lowered host defenses in geriatric age group may be responsible for the high incidence of candiduria.⁵ In women, colonization of vulvo vestibular area with *Candida* spp. may be the possible risk factor at of developing candiduria due to ascending infection.⁵ In this study, diabetes and fluconazole prophylaxis/treatment were observed as important risk factors for candiduria due to NAC spp. Kauffman (2005) reported the same findings.¹³ Diabetes is the most common underlying risk factor for *Candida* UTI and is noted in almost all studies. Fluconazole prophylaxis/therapy eliminate the more susceptible *C. albicans* and therefore lead to selection of more azole resistant NAC spp.¹¹

Conclusion

The shift towards Non *albicans Candida* species as a cause of candiduria is noted in the present study. Identification of infection causing *Candida* species is very essential as many isolates from NAC spp. are either intrinsically resistant or may acquire resistance during course of treatment to commonly prescribed antifungal drugs. Diabetes and fluconazole prophylaxis/treatment are important risk factors for candiduria due to NAC spp.

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