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A STUDY ON PHENOTYPIC CHARACTERIZATION AND ANTIFUNGAL SUSCEPTIBILITY PROFILE IN CANDIDURIA IN A TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Introduction: The increased incidence of candiduria in hospitalized patients is due to the use of indwelling devices, long-term antibiotics, parenteral nutrition, and immunocompromised status of the patient. In this study, an attempt was made to speciate, characterize, and determine the antifungal susceptibility pattern of *Candida* isolated from urinary tract infections (UTIs). **Materials And Methods:** A total of 169 *Candida* isolates were obtained from urine samples. The isolated *Candida* species Antifungal susceptibility testing of the isolated yeasts was done using Mueller-Hinton agar supplemented with 0.5 mg/mL methylene blue by Kirby-Bauer disk diffusion method for amphotericin B, fluconazole, Ketoconazole, Clotrimazole and voriconazole. **Results:** Out of 169 isolates, *Candida tropicalis* was the most frequently isolated species (53.8%), followed by *Candida albicans* (28.9%), *Candida glabrata* (7.01%), *Candida krusei* (1.1%), *Candida parapsilosis* (8.2%), and *Candida guilliermondii* (3.5%). A total of 36.68% were on broad spectrum antibiotics, 13.31% Urinary catheterized, 9.46% were pregnant, and .69% isolates showed Diabetes mellitus. Antifungal susceptibility profile of *Candida* species showed 25.4% and 22.4% resistance to amphotericin B and voriconazole, respectively. **Conclusion:** A rising trend in isolation of non-albicans *Candida* from urinary isolates was noticed, which was statistically significant when comparing catheterized and non-catheterized urinary isolates from our study. Due to this rise in non-albicans *Candida* species causing UTI that are intrinsically resistant to certain antifungal agents like azoles and increasing incidence of antifungal resistance, it is essential to monitor the antifungal susceptibility profile of *Candida* species causing candiduria.

KEYWORDS

Urinary Tract Infection (UTI), candiduria, *Candida* species, antifungal susceptibility

INTRODUCTION

Candida is a genus of yeast which is the most common cause of fungal infection. *Candida albicans* is the most important fungal opportunistic pathogen. It usually resides in the gastrointestinal and genitourinary tracts and in the oral and conjunctival flora.

The candiduria refers to the presence of yeast in urine either by the microscope observation of budding pseudo hypae, or by the growth of fungi in culture. Candiduria may also be a sign candidemia or invasive renal candidiasis. It may also cause candidemia during invasive urological procedures.Probably only 3-4% of cases of candiduria lead to candidemia, but 10% of all cases of candidemia are associated with a prior episode of candiduria. Candiduria can be defind as the presence of greater than 10^5 CFU/mL urine, through as little as 10^3 CFU/mL can result in disease in certain 'at risk' groups. Candiduria in ICU patients is characterized by a high mortality, largely through a significant relationship with candidemia,which in some patients may reach 50%. There is a rising trend of candiduria in hospitalized patients, due to the increased use of indwelling devices, parenteral nutrition, broad spectrum antibiotics, and chemotherapeutic agents.[1]

MATERIALAND METHODS:

1. Species Identification And Antifungal Susceptibility Testing

A total of 169 *Candida* species were studied from urine samples either mid stream urine or catheterized from OPD, wards or ICU patients, which were sent to the microbiology laboratory for fungal culture and sensitivity. The urine samples obtained were immediately processed by semi quantitative method as per standard procedures. For fungal culture, samples were inoculated on to Sabouraud dextrose agar and incubated at 25°C. Identification of the growth on SDA plates was done by colony morphology, Gram staining.

Candida isolates were identified upto species by standard mycological protocol including germ tube test, colony colour on HiChrom *Candida* agar [Figure1], sugar assimilation test[2], sugar fermentation[3,4] [Figure2], corn meal agar [5][Figure3], urease test[6] [Figure4]. HiChrom agar procured from Himedia Laboratories Pvt Ltd Mumbai.

Antifungal susceptibility testing of *Candida* isolates was performed on Muller-Hinton agar supplemented with 0.5mg/mL methylene blue by disk diffusion method (Himedia) for fluconazole, voriconazole, clotrimazole, ketoconazole, amphotericin B Interpretation of susceptibility was done using the breakpoint criteria defined by the CLSI document M44.[7]

Figure 1: Colour production on CHROM agar (A) *C. albicans*, (B) *C. tropicalis*, (C) *C. parapsilosis*, (D) *C. glabrata*, (E) *C. krusei*, (F) *C. guilliermnmondii*,

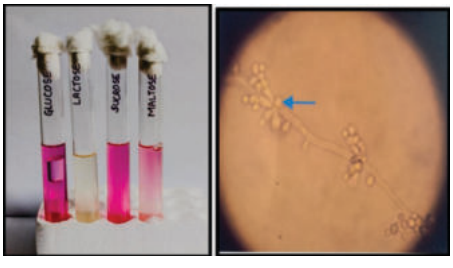

Figure 2: Sugar fementation test

Figure 3: CMA showing masses of blastospores at internodes in *C. albicans*

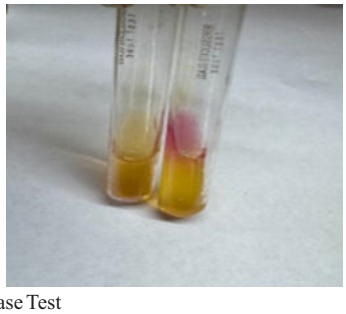

Figure 4: Urease Test

RESULTS

A total of 3918 urine samples were collected from the clinically suspected patients of UTI. Out of the total urine samples,clinically significant pathogens grown in 911 samples comprising 23.25% of overall culture positivity among urine samples. In 911 positive samples *Candida* grown in 169 (18.55% **).** On department wise distribution, samples recieved from in-patients 60.30% as compared out patient 39.64%. Represent the candiduria distributiomn among ICUs and wards. Candiduria cases are common in ICUs 64.50% than the ward cases with 35.50%.The incidence rate was high in patients between the age group of 61-70 years and the least incidence rate 6 was found in 0-20 year age group patients[Table1]. Regarding the gender wise, significant *Candida* isolated from females patients 71.60% as compared to male patients 28.40%.

Candida species that cause candiduria it was noted that Non-albicans *Candida* 71.1% was more common as compared to *Candida albicans* 28.9%. *Candida tropicalis* 53.8% were found to be most common isolates followed by *Candida albicans* 26.0%, *Candida parapsilosis* 8.2%, *Candida glabrata* 7.01%, *Candida guillermondii* 3.5%, *Candida krusei*1.1%[Figure 5]. Antifungal susceptibility testing was performed for all *Candida* species isolated from urine samples by manually. The antifungal tested were fluconazole, voriconaziole, clotrimazole, ketoconazole, amphotericin B [Table 2]. Voriconazole 88.7% and Amphotericin B 88.7% is highly susceptible and Fluconazole 25.4% and Clotrimazole 22.4% is highly resistant.[Table 3]

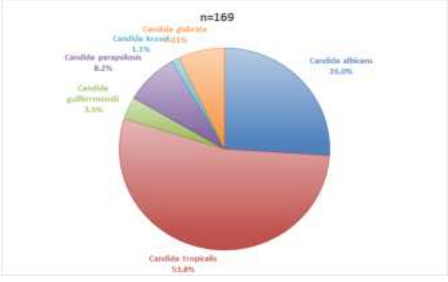

Figure 5: Distribution of various *Candida* species isolated from urine cultures (n=169**)**

Table 1: Age and gender wise distribution of *Candida* isolates (n=169)

S. No.	Age group (in years)	No. of cases	Females (121)	Male (48)
1.	0-10	6	04	02
2.	11-20	6	03	03
3.	21-30	31	20	11
4.	31-40	21	16	05
5.	41-50	12	9	03
6.	51-60	23	17	06
7.	61-70	39	28	11
8.	71-80	31	24	07
	Total	169	121 (71.60%)	48 (28.40%)

Table 2: Antifungal susceptibility pattern of different *Candida* species :

Antifungal (drugs)	*Candida albicans*		*Candida glabrata*		*Candida tropicalis*		*Candida guillier mondii*		*Candida parapsilosis*		*Candida krusei*	
	R %	S %	R%	S%	R%	S%	R%	S%	R %	S%	R%	S%
Amphotericin B	4 (9.0)	40 (90.9)	9 (9.8)	82 (90.1)	1 (8.3)	11 (91.6)	2 (33.3)	4 (66.6)	3 (21.4)	11 (78.5)	-	2 (100)
Fluconazole	19 (43.1)	25 (56.8)	14 (15.3)	77 (84.6)	IR	11 (91.6)	3 (50)	3 (50)	4 (28.5)	10 (71.4)	IR	-
Clotrimazole	9 (20.4)	35 (79.5)	12 (13.1)	79 (86.8)	7 (58.3)	5 (41.6)	3 (50)	3 (50)	6 (42.8)	8 (57.1)	1 (50)	1 (50)
Ketoconazole	11 (25)	33 (75)	11 (12.0)	80 (87.9)	6 (50)	6 (50)	4 (66.6)	2 (33.3)	1 (7.1)	13 (92.8)	-	2 (100)
Voriconazole	5 (11.3)	39 (88.6)	9 (9.8)	82 (90.1)	1 (8.3)	11 (91.6)	-	6 (100)	4 (28.5)	10 (71.4)	-	2 (100)

Table 3: Antifungal Susceptibility Pattern Of *Candida* Isolates (%)

ANTIFUNGALS	SUSCEPTIBLE	RESISTANT
Fluconazole	126(74.5%)	40 (23.6%)
Voriconazole	150(88.7%)	19(11.2%)
Ketoconazole	136 (80.4%)	33(19.5%)
Clotrimazole	131 (77.5%)	38 (22.4%)
Amphotericin B	150 (88.7%)	19(11.2%)

S: Susceptible, R: Resistant.

DISCUSSION

A total of 3918 urine culture samples received during the study period were analyzed. The urine culture positivity rate in our study was found to be 23.25% among 911 cases. The distribution of various pathogens as Gram positive cocci (36.33%), Gram negative bacilli (45.11%), and *Candida* species 169 (18.55%). Higher positivity rates 23.35% were observed in the study conducted by Dalen et al. Study of Renu Kumari Yadav et al[9] reported a similar positivity rate of 18.75% which is significantly similar the present study. Another study by Prakash V et al., reported a lower positivity rate of 18.6%. There may be a variation in urine culture positivity rate due to many factors which involve disruption of microflora of patients, hospital-based settings and immunocompromised status of patients.

In the present study, we also found that UTI due to *Candida* spp. was more common in old age (>60 yrs). This could be due to lowered host defence at extremes of age.In our study Candiduria was found to be more common in female (71.5%) than male (28.5%) patients in our study population.

Since colonization of vulvo vestibular area with *Candida* spp. is frequent in females, they are more at risk of developing candiduria due to ascending infection.[13]

The greater predisposition of the elderly is related to immunological factors, long-stay hospitalizations, and clinical procedures that may increase the risk of infection[13,14]

In the present study, a shift towards NAC (Non-albicans *Candida*) spp. 120 (71.1%) replacing *Candida albicans* 49 (28.9%)as a causative agent of candiduria was noted. *Candida tropicalis* (53.8%) was the major isolate in our study. This highlights the mycological shift towards NAC species.[15,16]

CONCLUSION

Candiduria is one of the major causes of morbidity and mortality in healthcare settings worldwide. Frequent empirical use of fluconazole and amphotericin B may be avoided as it may lead to a higher antifungal resistance. The increasing prevalence of candiduria in India emphasizes the need for prior knowledge of the local and national distribution of *Candida* spp. and their antifungal susceptibility patterns as it is expected to improve the development of treatment, outcome and strengthening of antifungal stewardship policies.

This study has shown that early detection of etiological agents by urine culture along with timely initiation of antifungal therapy can help in reduction of morbidity and mortality among immunocompromised patients.

REFERENCES

1. Kauffman C A, Fisher J F, Sobel J D Newman C A. Candida urinary tract infections-diagnosis. Clin Infect Dis. 2011;52 06: S452-S456. doi:10.1093/cid/cir111.
2. Chander J. Textbook of Medical Mycology.3rd ed.New Delhi:Mehta Publishers,2009.
3. Agarwal S, Manchanda V, Verma N, Bhalla P. Yeast identification in routine clinical microbiology laboratory and its clinical relevance. Indian J Med Microbiol.2011;29 (02):172-177.doi:10.4103/0255-0857.81794.
4. Collee JG, Marmion BP, Fraser AG, Simmons A.(eds.) Mackie & McCartney Practical Medical Microbiology.14th edition.London: Elsevier;2007.
5. Moore GS, Jaciow DM. Mycology for the clinical laboratory.1981.
6. Larone D H.Medically Important Fungi: A Guide to Identification.5th ed.Washington DC:ASM press2011.
7. Clinical and Laboratory Standards Institute. Method for Antifungal Disk Diffusion Susceptibility Testing of Yeastds. In: CLSI document M44(3rd). Wayne, PA: Clinical and Laboratory Standards Institute;2020.
8. Arendrup MC, Friberg N, Mares M et al. How to: interpet MICs of antifungal compounds according to the revised clinical breakpoints v.10.0 European committee on antimicrobial susceptibility testing (EUCAST). Clin Microbiol Infec 2020;26:1464-72.
9. Gould CV, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA. Healthcare Infection Control Practices Advisory Committee Guideline for prevention of catheterassociated urinary tract infections 2009. Infect Control Hosp Epidemiol. 2010;31:319–26.
10. Magill SS, Swoboda SM, Johnson EA, Merz WG, Pelz RK, Lipsett PA, et al. The association between anatomic site of Candida colonization, invasive candidiasis and mortality in critically ill surgical patients. Diagn Microbiol Infect Dis. 2006; 55: 293–301.

11. Tomczak H, Szałek E, Grześkowiak E. The problems of urinary tract infections with Candida spp. aetiology in women. Postepy Hig Med Dosw (Online). 2014;68:1036-39.
12. https://www.cdc.gov/hai/ca_uti/cauti_faqs.html
13. Laupland KB, Baqshaw SM, Gregson DB, Kirkpatrick AW, Ross T, Church DL. Intensive care unit-acquired urinary tract infections in a regional critical care system. Crit Care. 2005;9:60–5.
14. Shivanand Dharwad, Saldanha Dominic, R.M. 2011. Species identification of candida isolates in various clinical specimens with their anti-fungal susceptibility patterns. J. Clin. Diag. Res., 5(6): 1177–1181.
15. CDC www.cdc.gov/ Fungal / Diseases/ Candidiasis/ Index . html. Accessed August.
16. McCarty TP, Pappas PG. Invasive candidiasis. Infect Dis Clin. 2016;30(1):103-24.