

SPECIATION OF CANDIDA ISOLATES FROM URINARY TRACT INFECTION IN PATIENTS ADMITTED IN ICU AT A TERTIARY CARE UNIT

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Received : 09/07/2023
Received in revised form : 01/08/2023
Accepted : 11/08/2023

Keywords:

Candida Isolates, Urinary Tract Infection, ICU.

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DOI: 10.47009/jamp.2023.5.4.417

Source of Support: Nil.

Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (4); 2073-2077



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Abstract

Background: Globally, among other Candida species, Candida albicans is mainly responsible for systemic candidiasis and fungal nosocomial UTIs. Candida albicans is a dimorphic fungus which has a unique virulence property so it can switch between yeast and filamentous forms. There are several other attributes pertaining to C. albicans that have absolutely been considered as pathogenic markers including adhesion, tissue invasion, secreting hydrolytic enzymes, stereotropism and biofilm production.^[1-3] **Material & Methods:** This is a retrospective analysis was carried out at the Tertiary care hospital, JLNMC, Bhagalpur, Bihar. This is a hospital-based study carried out over 12 months from August 2022 to July 2023. Ethics committee approval was obtained for this study. The study was conducted on 1570 urine samples received from different clinical departments. **Results:** Among 1570 samples, 780 were culture positive; out of 780 cultures positive samples 170 Candida species were reported. Out of 170 Candida isolates 11 were reported from OPD clinics and 159 were from IPD wards. **Conclusion:** NAC has caused more UTIs, but C. albicans remains the most common fungal cause of UTIs. Clinicians are facing challenges to treat the Candida infection due to emergence of resistant strains. As a result of drug resistance, clinicians face challenges in treating Candida infections. Many new antifungal agents are under development which may have more advantages over current drugs when it comes to overcoming antifungal resistance and ensuring safety.

INTRODUCTION

Globally, among other Candida species, Candida albicans is mainly responsible for systemic candidiasis and fungal nosocomial UTIs. Candida albicans is a dimorphic fungus which has a unique virulence property so it can switch between yeast and filamentous forms. There are several other attributes pertaining to C. albicans that have absolutely been considered as pathogenic markers including adhesion, tissue invasion, secreting hydrolytic enzymes, stereotropism and biofilm production.^[1-3] It is possible to isolate Candida species from healthy urine samples, but the count can be very low and not significant. The percentage of positive urine cultures in a primary care setting is 5%, while it reaches 10% or more in tertiary care hospitals.^[4] A common clinical finding in hospitalised patients is Candida species in their urine (candiduria). Candida species in urine may be asymptomatic (in healthy people or

patients) or symptomatic. There are many clinical conditions in which patients are more prone to candiduria which includes interstitial cystitis, Epididymo-orchitis, prostatitis, pyelonephritis, and renal candidiasis. Asymptomatic candiduria is though mostly benign and is not considered as a disease. More than 200 species of Candida albicans are consistently reported to cause candiduria (20% of nosocomial infections). Most of available literature support showed that Candida is the most likely Candida species to cause candidiasis.^[5] The immune status of ICU patients is always on the weaker side which is beneficial for the Candida species to cause infections in these patients resulting in the high mortality rate and the prevalence is also very high.^[6,7] There are many factors which includes gender (female), age, prolonged antibiotic intake, sex activities, genetic inheritance, diabetes, immunosuppression, Acquired Immunodeficiency Syndrome (AIDS), pregnancy, cancer patients, multiple clinical procedures, hypertension,

hospitalisation, indwelling catheter or prosthetics, malnutrition, social behaviour, these are the predisposing factors leading to UTI candidiasis in patients.^[8,9] In general, inpatients are more likely to experience symptomatic candiduria, whereas outpatients and healthy adults are more likely to experience asymptomatic candiduria. Indwelling catheters are the important reservoir for these pathogens and with the help of these procedures (Catheterisation) pathogens easily reach the anatomical site and cause infections. Data is available claiming that non-albicans Candida (NAC) species cause significant increases in UTIs and candiduria.^[10] While there are non-albicans species infections, UTIs and candidiasis caused by *C. albicans* are more prevalent.^[10] In case of candiduria, the infection finally reaches to blood stream resulting into severe disseminated bloodstream infections (Candidaemia). The bloodstream infections is responsible for 30-40% mortality rate.^[11,12] As the case of candidiasis is increasing gradually resulting into the development of drug resistance which is major health concern worldwide. So to control this stage monitoring at regular intervals is a very necessary and crucial point. In the clinical case of candidal balanitis and vulvovaginal candidiasis it is very crucial to diagnose this infection in one sexual partner and should be prevent up to this level.^[13] Even though the disease i.e. candidal balanitis is well known Sexually Transmitted Disease (STD), but the significant studies are not available.^[14] A common fungal infection affecting 75% of women worldwide, vulvovaginal candidiasis is very easy to treat. Among the Candida species causing infections in young and adult individual's three most common species include, *C. albicans*, *C. glabrata*, and *C. tropicalis*. Although *C. parapsilosis* causes candiduria more frequently in neonates.^[3] Candiduria and UTIs by Candida spp have different prevalence rates depending on geographical location; therefore, regional data is essential for evaluating the shift and to determine the scenario at national level. Hence, this study was done retrospectively to assess the Candida prevalence in UTI.

MATERIALS AND METHODS

This is a retrospective analysis was carried out at the Tertiary care hospital, JLNMCH, Bhagalpur, Bihar. This is a hospital-based study carried out over 12 months from August 2022 to July 2023. Ethics committee approval was obtained for this study. The study was conducted on 1570 urine samples received from different clinical departments, among 1570 samples, 780 were culture positive, out of 780 cultures positive samples 170 Candida species were reported.

Inclusion Criteria

Microbiology fungal culture records which were related to only urine samples from all wards and ICU were included in the study retrospectively. Pure

growth of yeast isolates having significant colony count >103 CFU/mL.

Exclusion Criteria

The study excluded other clinical samples from all wards and ICU. A colony counts less than 103 CFU/mL was excluded from the study.

Data Collection

The study was conducted on 1570 urine samples received from different clinical departments, among 1570 samples, 780 were culture positive, out of 780 cultures positive samples 170 Candida species were reported. Candiduria and Candida UTIs data were collected from Institute's microbiology records retrospectively. Only urine samples received from inpatient and outpatient during the given period were included in this data screening. The collection of patient data, which contained only demographic information and the indication for the submission of samples, was also conducted. The term candiduria in clinical microbiology is described as the isolation of Candida species from urine samples on at least one occasion with >103 CFU/mL. Candida isolate is considered to be separate if it occurred more than 30 days apart or if it contained different species of Candida.

Isolate identification

A total of 10 µL of each uncentrifuged and homogenised urine sample was cultured with a calibrated loop on Cysteine Lactose Electrolyte Deficient (CLED) agar, (Himedia, Mumbai, India) incubated overnight at 37°C for 18 hours, aerobically. If the colony count was 105 or more CFU/ml and upon suspicion of Candida spp. a wet mount of an isolated colony was prepared and examined during microscopy and after confirmation of the Candida spp. the isolates were further processed as per standard protocol.^[7] Fungal colony morphology was confirmed by using Sabouraud Chloramphenicol Agar (Himedia, Mumbai, India), germ tube production, and micro morphology on Potato Dextrose Agar (PDA) (Himedia, Mumbai, India) and HiCrome Candida Differential Agar (Himedia, Mumbai, India). All clinical samples were processed according to standard microbiology protocol,^[7] with standard ATCC 25923 control strains.

RESULTS

Out of 170 Candida isolates 11 were reported from OPD clinics and 159 were from IPD wards. Out of 1570 total clinical (Urine) samples, 170 isolates were Candida species.

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Out of 170 patients 50 patients were male (29.41%) and 120 patients were female (70.58%), showing a female preponderance [Table 2].

Table 1: Distribution of patients according to age

Age	No. of cases	Percentage
0-10	5	2.94%
11-20	5	2.94%
21-30	104	61.17%
31-40	30	17.64%
41-50	4	2.35%
51-60	9	5.29%
61-70	9	5.29%
71-80	4	2.35%
Total	170	100%

Table 2: Distribution of patients according to sex

Sex	No. of cases	Percentage
Female	120	70.58%
Male	50	29.41%
Total	170	100%

Table 3: Distribution of patients according to co- morbidity

Co-morbidity	No. of cases	Percentage
Diabetic	158	92.94%
Non-Diabetic	12	7.06%
Total	170	100%

Table 4: Distribution of cases according to samples received from ICU and non-ICU cases

ICU / Non- ICU	No. of cases	Percentage
ICU	157	92.35%
Non-ICU	13	7.64%
Total	170	100%

Table 5: Distribution of cases according to sample received from different departments

Department	No. of cases	Percentage
General medicine	81	47.64%
General surgery	26	15.29%
Paediatrics	9	5.29%
Obstetrics and Gynaecology	54	31.76%
Total	170	100%

Table 6: Prevalence of Candida spp

Candida species	No. of cases	Percentage
Candida albicans	106	62.35%
Other Candida spp. (C. glabrata, C. tropicalis)	64	37.64%
Total	170	100%

DISCUSSION

This retrospective study was conducted in the Department of Microbiology at JLNMC from August 2022 to July 2023. The sample size of the present study was 1570 among them 780 was culture positive, out of 780 culture positive isolates 170 Candida strains were isolated. When candiduria is found in a patient, especially if they have no symptoms, it should not be dismissed or treated lightly, but requires careful evaluation.

Table 1 shows the distribution of patients according to age. Out of 170 patients 5 (2.94%) in between age group of 0-10 years, 5 (2.94 %) patients in between the age group of 11-20 years and incidence rate was high 104 (61.17%) in patients between the age group of 21-30 years ,30(17.64%) in between the age group of 31-40 years ,4(2.35%) in between the age group of 41-50 years ,9 (5.29%) in between age group of 51-

60 years ,9 (5.29%) patients in between age group of 61-70 years and the least incidence rate 4 (2.35%) was found in 71-80 years.

Table 2 shows the distribution of patients according to sex .Out of 170 patients 50 patients were male (29.41%) and 120 patients were female (70.58%), showing a female preponderance.

Table 3 shows distribution of patients according to co-morbidity. Out of 170 patients 158 patients were reported with diabetic (92.94%) and 12 patients were reported with non – diabetic (7.06%).

Table 4 Shows distribution of cases according to sample received from ICU /non -ICU. Out of 170 samples 157 samples were received from ICU (92.35%) and 13 sample were received from non -ICU (7.64%).

Table 5 Shows distribution of patients according to samples received from different departments. Out of 170 patients 81 patients were from general medicine

department (47.64%) , 26 patients were from general surgery department (15.29%) , 9 patients were from paediatrics department (5.29%) and 54 patients were from obstetrics and gynaecology (31.76%).

Table 6 shows the prevalence of candida spp. Out of 170 patients 106 patients were reported with candida albicans (62.35%) and 64 patients were reported with Other Candida spp. (37.64%).

Female patients with candiduria are more likely to be diagnosed than female patients.^[15] The candiduria in present study was high and the rate of NAC was reported lower (38.1%) than that of *C. albicans* (61.9%). Many healthy people shows microbial normal flora of *Candida albicans* and NAC in different anatomical sites like vagina, oral cavity, and alimentary canal. Additionally, in premenopausal and healthy females, *Candida* can colonise the external side of the urethral opening. It can be an opportunistic pathogen leading to fungal UTIs in the host.^[16-19] Fungal Urinary Tract Infections (UTIs) are relatively uncommon compared to bacterial UTIs. The study observed female to male ratio of 1:2.5 in accordance with study by Nayman Alpat S et al. ^[20] In the present study the candiduria was reported commonly in females (71.6%) as compared to males (28.4%). Females are at higher risk of developing candiduria as *Candida* species frequently colonised vulvovestibular area and from where they can ascend upwards and cause urinary tract infection.^[21] In this study candiduria were more prevalent in the age group 21-30 years (59.7%) followed by age 31-40 years (17.6%) and patients with age range of 51-60 years (5.6%). Kashid RA et al,^[22] reported that the prevalence of candiduria in patient's increases gradually as long term stay of Hospital and ICU increases. Moreover, candiduria in ICU patients is the marker of increased mortality.^[23] A total of 91.5% of candiduria cases were observed in the ICU, which indicates a higher mortality rate. In critically ill patients, the occurrence of candiduria should be regarded as a marker of invasive candidiasis. Presence of *Candida* in urine acts as a marker for haematogenous seeding to the kidneys. Candiduria reflects either colonisation or infection of the lower urinary tract or the kidneys.^[24] *Candida* species ranks the fifth most common nosocomial urinary pathogen in India.^[25] In accordance with available data, the most persistent nosocomial fungal infection is urinary tract candidiasis. There has been a rapid shift in the distribution of *Candida* species, which is primarily responsible for nosocomial fungal UTI. Infectious Diseases Society of America (IDSA) suggests that use of indwelling catheters may be eliminated in asymptomatic candiduria patients with no risk factors and for the patients with high risk factor group oral fluconazole should be prescribed for the prevention of severe candidiasis.^[26] There are certain factors that facilitate *Candida* infection, including immunocompromised status, immunosuppressive therapy, prolonged antibiotic treatment, catheterization, etc.^[27-29] Prevalence of *Candida* species including *Candida albicans* and

NAC from candiduria cases documented in the last 10 years from India .^[10,29-38] The emergence of antifungal resistance in *Candida* has risen due to the liberal use of antifungal, especially those from the azole group.^[30] In present study, Diabetes mellitus was a more prevalent co-morbidity factor account for (92.0%). *Candida albicans* was are the most common culprit causing candiduria in present study, but the rise in other *Candida* species is also of significant concern to clinicians.^[31-35] NAC species is on the rise along with *Candida albicans* as a cause of candiduria according to present study. *Candida albicans* are gradually being displaced by NAC (*C. glabrata* and *C. tropicalis*) as the scenario shifts progressively.^[36-38]

CONCLUSION

NAC has caused more UTIs, but *C. albicans* remains the most common fungal cause of UTIs. Clinicians are facing challenges to treat the *Candida* infection due to emergence of resistant strains. As a result of drug resistance, clinicians face challenges in treating *Candida* infections. Many new antifungal agents are under development which may have more advantages over current drugs when it comes to overcoming antifungal resistance and ensuring safety. *Candida* species isolated from clinical samples should be identified and tested for antifungal susceptibility since susceptibility differs between species.

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