ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 04 | April - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A CANDID APPROACH TO NOSOCOMIAL INFECTIONS: A STUDY ON HOSPITAL ACQUIRED YEASTS

Microbiology

Malabika Biswas Junior Resident, Department Of Microbiology, Calcutta School Of Tropical Medicine.

Bishal Gupta Contractual Medical Officer,Department Of Microbiology,Calcutta School Of Tropical Medicine.

Banya Chakraborty Professor,Department Of Microbiology,Calcutta School Of Tropical Medicine.

Anindita Rakshit* Assistant Professor, Department Of Microbiology,Calcutta School Of Tropical Medicine. *Corresponding Author

ABSTRACT

Aim : This study aims to assess the prevalence of nosocomial infections and to find out the prevalence of yeasts responsible for the same.
Material and Methods: Nosocomial infections were identified using CDC-NHSN guidelines. The prevalence of yeasts responsible for the same was assessed. Conventional and automated methods were used to isolate yeasts from relevant samples. The antifungal susceptibility testing was performed using automated method.
Result : During the study period,147 nosocomial infections were identified ,with a prevalence of 5%.Out of this,17 yeasts were isolated with a prevalence of 11.5%.There was a majority of non-albicans *candida* or NAC(53%).

KEYWORDS

nosocomial, yeasts, candida, prevalence

INTRODUCTION

Nosocomial infections can be defined as infections acquired in hospital by a patient admitted for a reason other than the infection in context. The infection should not be present or incubating at the time of admission and the symptoms should appear at least 48 hours after admission.[1] At a given time, the prevalence of healthcare acquired infections in low and middle income countries varies between 5.7% to 19.1%.[2] The past few decades have seen a dramatic rise in the incidence of nosocomial fungal infections. The National Nosocomial Infections Surveillance System indicated a rise of almost 500% in nosocomial fungal infections in large teaching hospitals.[3]

The myriad factors contributing to this includes: an inverse relation with immunosuppression, an increasing use of steroids, increasing myeloablative therapies for cancers and the frequency of solid organ and hematopoietic stem cell transplantation.[4] However the most important contributing factor for this rise is perhaps HIV.Ever since its discovery in the 1980s,yeasts,especially *Candida* has been one of the most important yeasts to be responsible for opportunistic infections in HIV/AIDS patients.Oppurtunistic yeast pathogens most commonly reported are *Candida* sp,*Cryptococcus neoformans,Trichosporon spp,Geotrichum spp,Pichia spp,etc.*[5]

The eclectic mix of fungal infections spells doom as far as infection control is concerned. Hence the present study was planned to gain an insight into the burden of yeasts responsible for hospital acquired infections to combat them.

OBJECTIVE

The aim of the study was to:

1. Assess the prevalence of nosocomial infections
2. Identify and find the prevalence of yeasts responsible for nosocomial infection.

METHODS

Type of study: Cross-sectional, observational, tertiary care based study.

Study Period: One year period from January 2019 to December 2019.

INCLUSION CRITERIA

- Patients who were diagnosed with nosocomial infections according to the CDC-NHSN criteria.
- Patients who gave consent to participate in the study.

EXCLUSION CRITERIA

- Patients who were admitted for less than 48 hours in the hospital.
- Patients who did not meet the criteria for nosocomial infections according to the CDC-NHSN criteria.[6]

Sample Collection

Clinical samples from appropriate sites were collected by sterile, aseptic procedure. Samples were inoculated in Sabourauds's dextrose agar (SDA), nutrient agar and blood agar and incubated at 37 degree Celsius for 18 hours.

Identification of Fungal Isolates

Identification of fungal isolates was done using Gram stain. Further speciation of the yeast isolates was done using CHROMagar, dalmau plate culture technique and VITEK-2D yeast cards. It should be noted that according to CDC guidelines, VITEK 2 with software 8.0 is able to identify *Candida auris* accurately.[7]

Antifungal susceptibility testing of the fungal isolates was performed using VITEK-2D AST cards.

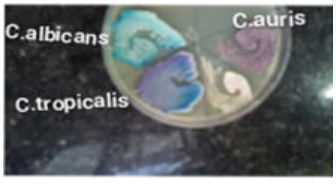


Image 1: CHROMagar showing different *Candida.*

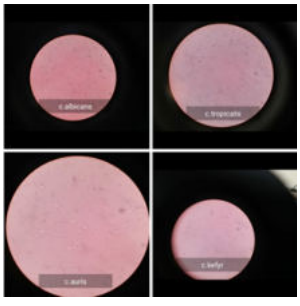
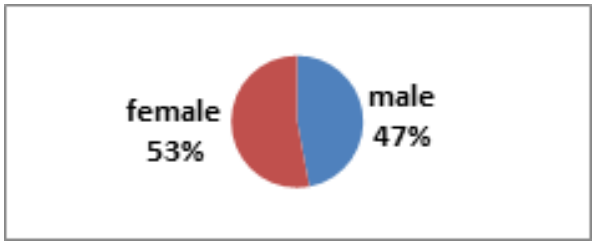


Image 2: microscopy of dalmau plate culture showing arthrospores

RESULTS

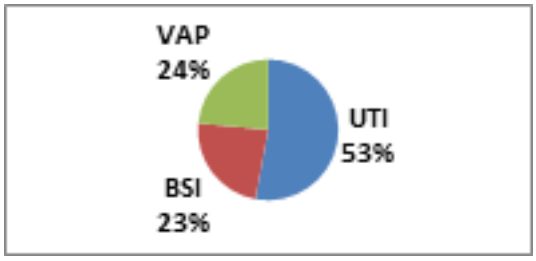
During a period of 1 year, 147 patients were identified to be suffering from various nosocomial infections (prevalence: 5%).17 yeast species were isolated from the patients affected by hospital acquired infections (prevalence: 11.5%).Out of that, 10.8% was attributed to *Candida* sp while 6.8% was due to *Trichosporon asahii* (n=1).A vast majority of the patients were admitted in the critical care unit (76%).

The majority of the isolates were obtained from females (53%) than males (47%).



The mean age was found to be 53.25 with a standard deviation of 17.2. Yeast isolates were most prevalent in ages 70 and above (23%).

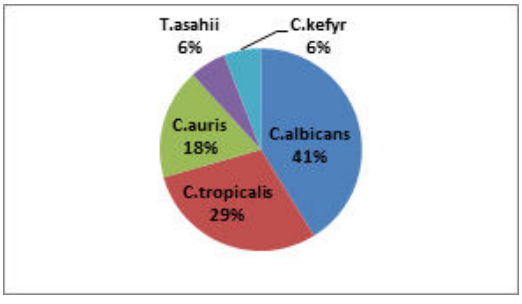
The maximum number of yeast isolates were obtained from patients suffering from catheter-associated urinary tract infections(53%), followed by ventilator associated pneumonia(24%) and blood stream infections(23%).



It was observed that the yeast infections were most prevalent in patients with urinary catheter(100%),diabetes mellitus(35%)followed by HIV infection(17%) ,corticosteroid intake(11%),chronic kidney disease(6%),chronic liver disease(6%).

41% of the isolated yeast species were *Candida albicans* while 53% were non-albicans *Candida*, 1 isolate of *Trichosporon asahii* was found.

Among the non-albicans species, 29% of the isolates were *Candida tropicalis* followed by *Candida auris* (18%) and *Candida kefyr* (6%).



Out of the all the patients admitted, 2 patients affected by *Candida auris*, expired.

All *Candida albicans* isolates (100%), were found to be sensitive to all antifungal.

Among the NAC, *Candida auris* isolates (100%) were found susceptible to echinocandins while resistant to amphotericin B and fluconazole.

DISCUSSION AND CONCLUSION

In our study, 11.5% of the total nosocomial infections were found to be caused by yeasts. In an Egyptian study by Mashad et al, the prevalence of nosocomial yeasts was found to be 6.3%.[8]

In another study by Prasad et al, the percentage of nosocomial urinary tract infection by yeasts was found to be 11.9%.[9]

The study conducted in our hospital showed a preponderance for females (53%) than males (47%).This is similar to the findings of Mashad et al where more females (51.7%) had yeast isolates than males (48.3%).[8]

In a study by Berrouane et al,infections caused by yeasts ,maximum yeasts were isolated from urine.[10] This is similar to our study where maximum number of yeast isolates was obtained from urine(53%).

Recent studies have shown urinary catheter is a significant risk factor for nosocomial candidiasis(65-90%).[11-13] This corroborates with the finding of our studies where yeast isolates were obtained from 53% of patients with catheter-associated urinary tract infections.

Long term metabolic disorders like diabetes mellitus and the human immunodeficiency virus results in defective cellular immunity resulting in a compromised immune status, making an individual more prone to infection by yeasts.[14]Accordingly,our study shows diabetes mellitus(35%),HIV(17%)and corticosteroid intake(11%) as the major determinants of hospital acquired yeast infections.

One of the most ominous findings in our study was the majority of non-albicans *Candida* (53%) over *Candida albicans* (41%).Our findings are similar to various studies where more than 50% of the *Candida* isolates are NAC species.[15-17]

Another notable feature in our study was the isolation of *Candida auris* in 18 %(n=3) of the isolates.*C.auris* outbreaks have been reported in India, United Kingdom, Colombia, South Africa and the United States.[18-22] It should be noted that all patients in our study had underlying invasive devices and history of multiple hospital admissions.2 of the 3 patients expired shortly after *C.auris* was isolated from their samples.

Nosocomial infections due to *Trichosporon asahii* are being increasingly reported from various centres.[23-24] it is an emerging invasive fungal infection.

In our study, we isolated *Trichosporon asahii* in a critically ill patient with urinary tract infection.

As reported in recent studies, azole resistance was found in our *Candida auris* isolates.[25] this is a matter of concern since azoles are commonly used antifungals.

Thus the present study makes it imperative to assess the correct burden of yeast infections that is in an unchecked rise. Antifungal stewardship is a need of the hour as well.

REFERENCES

1. World Health Organization. Guidelines on core components of infection prevention and control program at the national and acute healthcare facility level. World Health Organization; 2016.
2. Allegranzi B, Bagheri Nejad S, Combescure C, et al. Burden of endemic healthcare-associated infection in developing countries: systematic review and metaanalysis. Lancet 2011; 377: 228–41
3. Banerjee SN, Emori TG, Culver DH, et al. Secular trends in nosocomial primary bloodstream infections in the United States, 1980-1989. Am J Med 1991;91(suppl 3B):86S-9S.
4. Shoham, S., & Marr, K. A. (2012). Invasive fungal infections in solid organ transplant recipients. *Future microbiology*, *7*(5), 639–655.
5. Anwar, Khan P et al. "Profile of candidiasis in HIV infected patients." *Iranian journal of microbiology* vol. 4,4 (2012): 204-9.
6. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control.* 2008;36:309–32. doi: 10.1016/j.ajic.2008.03.002. PubMed PMID: 18538699
7. Ambaraghassi G, Dufresne PJ, Dufresne SF, Vallières É, Muñoz JF, Cuomo CA, Berkow EL, Lockhart SR, Luong ML. Identification of Candida auris by Use of the Updated Vitek 2 Yeast Identification System, Version 8.01: a Multilaboratory Evaluation Study. J Clin Microbiol. 2019 Oct 23;57(11):e00884-19. doi: 10.1128/JCM.00884-19. PMID: 31413079; PMCID: PMC6812989.
8. El-Mashad N B E, Abdel Aal A M, Elewa A M, Saad Elshaer M Y. Nosocomial Yeast Infections Among Cancer Patients in Egypt: Species Distribution and Antifungal Susceptibility Profile, Jundishapur J Microbiol. Online ahead of Print ; 12(2):e82421.
9. Prasad KN, Agarwal J, Dixit AK, Tiwari DP, Dhole TN, Ayyagari A. Role of yeasts as nosocomial pathogens & their susceptibility to fluconazole & amphotericin B. Indian J Med Res. 1999 Jul;110:11-7. PMID: 10709333.
10. Berrouane YF, Herwaldt LA, Pfaller MA. Trends in antifungal use and epidemiology of nosocomial yeast infections in a university hospital. J Clin Microbiol. 1999 Mar;37(3):531-7. doi: 10.1128/JCM.37.3.531-537.1999. PMID: 9986807; PMCID: PMC84452.
11. Jain M, Dogra V, Mishra B, Thakur A, Loomba PS, Bhargava A. Candiduria in catheterized intensive care unit patients : emerging microbiological trends. *Indian J Pathol Microbiol.* 2011;54(3):552–55.
12. 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.* 2003;30(1):14–18.
13. Rishpana MS, Kabbin JS. Candiduria in Catheter Associated Urinary Tract Infection with Special Reference to Biofilm Production. *J Clin Diagn Res*. 2015;9(10):DC11-DC13. doi:10.7860/JCDR/2015/13910.6690
14. Suzanne E. Geerlings, Andy I.M. Hoepelman, Immune dysfunction in patients with diabetes mellitus (DM), *FEMS Immunology & Medical Microbiology*, Volume 26, Issue 3-4, December 1999, Pages 259–265
15. Sachin C. Deorukhkar, Santosh Saini, Stephen Mathew, "Non-*albicans Candida* Infection: An Emerging Threat", *Interdisciplinary Perspectives on Infectious Diseases*, vol. 2014, Article ID 615958, 7 pages, 2014. https://doi.org/10.1155/2014/615958
16. F. Álvarez-Lerma, J. Nolla-Salas, C. León et al., "Candiduria in critically ill patients admitted to intensive care medical units," *Intensive Care Medicine*, vol. 29, no. 7, pp. 1069–1076, 2003.

17. S. Silva, M. Negri, M. Henriques, R. Oliveira, D. W. Williams, and J. Azeredo, "*Candida glabrata*, *Candida parapsilosis* and *Candida tropicalis*: biology, epidemiology, pathogenicity and antifungal resistance," *FEMS Microbiology Reviews*, vol. 36, no. 2, pp. 288–305, 2012.
18. Chowdhary A, Sharma C, Duggal S, et al. New clonal strain of Candida auris, Delhi, India. *Emerg Infect Dis*. 2013;19(10):1670-1673. doi:10.3201/eid1910.130393
19. Borman AM, Johnson EM. Candida auris in the UK: Introduction, dissemination, and control. *PLoS Pathog*. 2020;16(7):e1008563. Published 2020 Jul 30. doi:10.1371/journal.ppat.1008563
20. Escandón P, Chow NA, Caceres DH, Gade L, Berkow EL, Armstrong P, Rivera S, Misas E, Duarte C, Moulton-Meissner H, Welsh RM, Parra C, Pescador LA, Villalobos N, Salcedo S, Berrio I, Varón C, Espinosa-Bode A, Lockhart SR, Jackson BR, Litvintseva AP, Beltran M, Chiller TM. Molecular Epidemiology of Candida auris in Colombia Reveals a Highly Related, Countrywide Colonization With Regional Patterns in Amphotericin B Resistance. Clin Infect Dis. 2019 Jan 1;68(1):15-21. doi: 10.1093/cid/ciy411. PMID: 29788045.
21. Magobo RE, Corcoran C, Seetharam S, Govender NP. Candida auris-associated candidemia, South Africa. *Emerg Infect Dis*. 2014;20(7):1250-1251.
22. Anna Jeffery-Smith, Surabhi K. Taori, Silke Schelenz, Katie Jeffery, Elizabeth M. Johnson, Andrew Borman, Candida auris Incident Management Team, Rohini Manuel, Colin S. Brown Clinical Microbiology Reviews Nov 2017, 31 (1) e00029-17; **DOI:** 10.1128/CMR.00029-17
23. Kumar S, Bandyopadhyay M, Mondal S, Pal N. A Rare Case of Nosocomial Urinary Tract Infection due to Trichosporon asahii. J Glob Infect Dis. 2011 Jul;3(3):309-10. doi: 10.4103/0974-777X.83541. PMID: 21887069; PMCID: PMC3162825.
24. Khan ID, Sahni AK, Basu A, Haleem S. Trichosporon asahii urinary tract infection in immunocompetent patients. *Med J Armed Forces India*. 2015;71(4):373-376. doi:10.1016/j.mjafi.2014.08.013
25. Chaabane F, Graf A, Jequier L, Coste AT. Review on Antifungal Resistance Mechanisms in the Emerging Pathogen *Candida auris*. *Front Microbiol*. 2019;10:2788. Published 2019 Nov 29. doi:10.3389/fmicb.2019.02788