The Egyptian Journal of Hospital Medicine (April 2022) Vol. 87, Page 1608-1612

Incidence and Risk Factors of Funguria in Nosocomial Septic Patients in Surgical Intensive Care Unit

Mohammad Elzanaty Ahmed*[1], Sahar Mohammad Saad Aldeen[1], Ghada Elsayed Amr[2], Abdel Monem Abdel Aziz Salem[1]
Departments of [1]Anesthesia and Surgical Intensive Care and
[2]Clinical Pathology, Faculty of Medicine, Zagazig University, Egypt
***Corresponding author:** Mohammad Elzanaty Ahmed**, Mobile:** (+20) 0212987646, **Email:** drmohamedzanaty81@gmail.com

ABSTRACT

Background: Nosocomial candida infections had emerged as an increasing problem in the last years. Candidemia is late-onset ICU-acquired infection associated with high mortality.

Objective: The aim of the present study was to prevent and control of funguria in nosocomial septic patients in surgical ICU.

Patients and methods: The study was conducted in surgical Intensive Care Units (ICU) Zagazig University on 31 nosocomial patients with septic criteria after 7 days of admission in surgical ICU. Demographic features, underlying disease and concomitant infections were recorded for each patient during a period of 6 months.

Results: Among the studied 31 patients 23 (74.2%) of them were admitted for damage control laparotomy (DCL), due to road traffic accident (29.03%), (12.9%) were operated upon due to chronic subdural hematoma (SDH) or subarachnoid hemorrhage (SAH), (9.6%) of the studied patients were admitted with SAH due to gunshot and (22.5) of the studied patients due to metabolic acidosis. The most concomitant diseases was diabetes mellitus in (35.5%) of studied patients, followed by hypertension and ischemic heart disease in (32.3% and 19.4%) respectively, other concomitant diseases as chronic obstructive pulmonary disease (COPD) and hepatic disease were found in 9.7% and 3.2% of the studied patients respectively. Funguria was positive in (41.9) of studied patients, negative in (58.1) of them and no fungemia among the patients with positive funguria.

Conclusion: The incidence of funguria among surgical ICU patients was high in our study. Pseudomonas aeruginosa was the most frequent causative organism followed by acinetobacter baumannii and Klebsiella pneumonia.

Keywords: Funguria, ICU, Nosocomial Septic Patients.

Introduction:

Nosocomial infection is an infection acquired by patient during hospital stay[(1)]. Studies conducted during the past two decades have documented changes in pathogens causing sepsis and nosocomial infections and emphasized the increase of fungal infections, particularly those due to Candida species [(2)]. These patients are associated with prolonged length of stay in intensive care unit (ICU) and high mortality, despite advances in management and the availability of more active antifungal agents [(3)].

The presence of Candida species such as candida albicans in the urine is known as candiduria. Candiduria is categorized into asymptomatic (in healthy people or patients) and symptomatic forms. Symptomatic candiduria is seen in patients with cystitis, prostatis, pyelonephritis and renal candidiasis. However, asymptomatic candiduria is mostly benign and is not counted as a definite disease. Candida albicans is one of the most important fungal agents which may lead to candiduria (20% of nosocomial infections). A wide range of reported data shows that, Candida albicans ranks first for causing candiduria among more than 200 Candida species [(4)].

The progressive increase of sporadic cases of candida species infection emphasizes the need for adequate prevention measures. Candida species found on different objects and facilities, such as bedrails, a bed hand-controller, a mobile phone and floors [(5)]. Disinfectants with sporicidal activity and hydrogen peroxide based and healthcare facilities, resulting in highest reduction of Candida colony-forming unit (CFU) [(6)].

Fisher *et al.*[(7)] recommend that not administer antifungal agents unless the patient is symptomatic or at high risk for dissemination, such as post renal transplant patients and patients who are undergoing urinary tract instrumentation. Therefore, this study aimed to prevent and control of funguria in nosocomial septic patients in surgical ICU.

PATIENTS AND METHODS

The study was conducted in surgical ICU University included 31 nosocomial patients with septic criteria after 7 days of admission in surgical ICU.

Inclusion criteria: Nosocomial septic patients in surgical ICU after 7 days of admission in surgical ICU in age between 18 to 60, previous treatment with 5 days of antibiotic as well as previous treatment with immunosuppressive agents.

Exclusion criteria: Previous treatment with antifungals for 2 weeks and positive sepsis screen at admission.

Operational Design:

All cases admitted to surgical ICU of during a period of 6 months were included. For each patient, the

Received: 29/10/2021
Accepted: 27/12 /2021

following data were recorded: demographic features, underlying disease, concomitant infections.

Presence and duration of risk factors of funguria (urinary bladder catheter, central vein catheter, mechanical ventilation, total parenteral nutrition, diabetes mellitus, chemotherapy, surgical operation, burns, immunosuppression, trauma and organ transplantation).

Urine culture for identification of funguria in nosocomial septic patients after 7 day of stay in ICU. If there was funguria, blood culture was done for fungi.

Ethical Consideration:

The study was approved by the Local Ethical Committee of Zagazig University. Written consent was obtained from every patient prior to the procedures. This study has been carried out in accordance with the code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The collected data were analyzed by computer using Statistical Package for the Social Sciences version 24 (SPSS). Data were represented in tables and graphs, Continuous quantitative variables e.g. age were expressed as the mean ± SD and range, and categorical qualitative variables were expressed as absolute frequencies (number) and relative frequencies (percentage). The results were considered statistically significant when the significant probability was less than 0.05.

RESULTS

The presents study showed that the mean age of the studied patients was 44.9 years. 67.7 % of them were males **(Table 1)**.

Table (1): Demographic data of the studied patients

Demographic data	Studied patients (N=31)	
	No.	%
Sex		
Female	10	32.3
Male	21	67.7
Age (years)		
Mean ± SD	44.9 ± 18.45	
Range	19-88	

Among the studied 31 patients 23 (74.2%) of them were admitted for DCL **(Table 2)**.

Table (2): Cause of admission among the studied group

Item	Studied group (N=31)	
	No.	%
Cause of admission		
▪ DCL	23	74.2
RTA	9	29.03
Chronic SDH/SAH	4	12.9
Gun shot-SAH	3	9.6
Metabolic acidosis	7	22.5
▪ Gastrectomy-leakage from shunt/fistula	2	6.4
▪ AKI-Hemodialysis	1	3.2
▪ foot DVT/amputation	1	3.2
▪ Dehydration/hypoxia	2	6.4
▪ Brain tumor	1	3.2
▪ Fracture neck femur	1	3.2

The most concomitant diseases was diabetes mellitus in (35.5%) of the studied patients **(Table 3)**.

Table (3): Concomitant diseases among the studied patients

‡Concomitant disease	Studied patients (N=31)	
	No.	%
Diabetes mellitus	11	35.5
Hypertension	10	32.3
Ischemic heart disease	6	19.4
COPD	3	9.7
Hepatic disease	1	3.2

‡Multiple comorbidities were found

Funguria was positive in (41.9) of studied patients **(Table 4)**.

Table (4): Funguria among the studied patients

Funguria	studied patients (N=31)	
	No.	%
Funguria		
Negative	18	58.1
positive	13	41.9
Fungemia among Funguria (N=13) 0		0

Pseudomonas aeruginosa was the commonest organism found in (58.1%) of cases **(Figure 1)**.

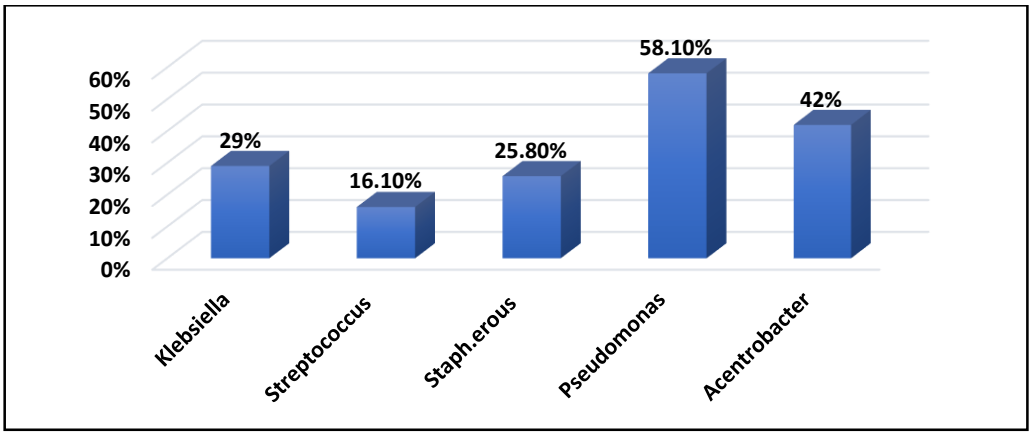

Figure (1): Bar chart showing organisms detected after culture among the studied patients

Regarding used antibiotics, piperacillin/tazobactam was the commonest used antibiotic in more than half of cases (54.8%) **(Table 5)**.

Table (5): Empirical antibiotic used among the studied patients

‡Antibiotic	Studied patients (N=31)	
	No.	%
Piperacillin / Tazobactam	**17**	**54.8**
Clindamycin	**12**	**38.7**
Ceftriaxone	**10**	**32.3**
Ciprofloxacin	**6**	**19.3**
Meropenem	**5**	**16.1**
Imipenem	**4**	**12.9**
Vancomycin	**4**	**12.9**
Cefipime	**2**	**6.5**
Ceftazidime	**1**	**3.2**
Metronidazole	**1**	**3.2**

‡Multiple antibiotic combinations were used

There was a significant difference in age and sex in relation to occurrence of funguria that was statistically higher among females and older patients **(Figure 2)**.

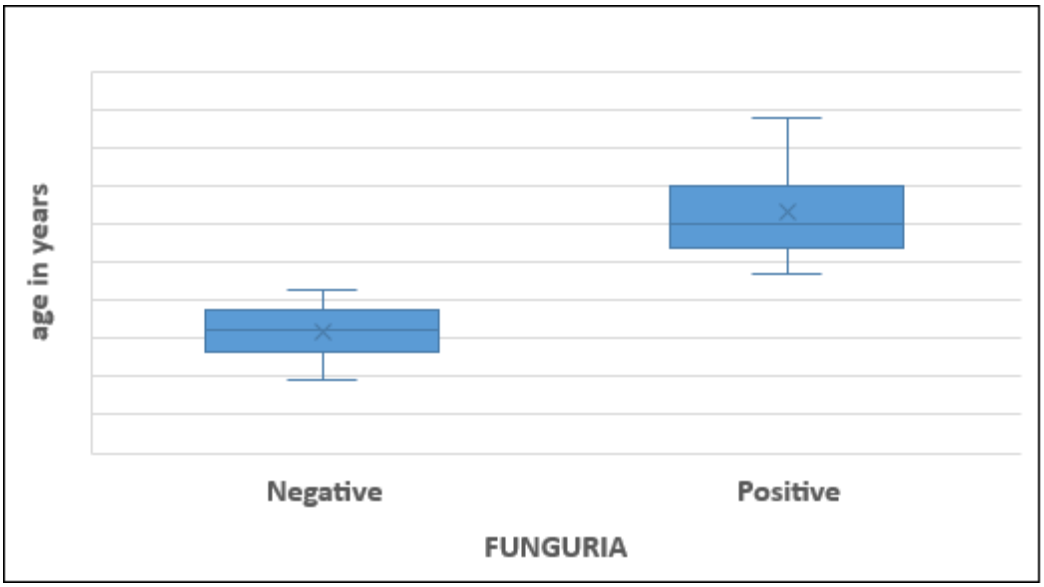

Figure (2): Box plot showing age distribution according to funguria among the studied patients

DISCUSSION

In the Intensive Care Units (ICUs), there are many risk factors that can leads to increasing funguria, such as use of indwelling urinary devices, frequent use of antibiotics, diabetes mellitus, immunosuppressive therapy, severity of the underlying illness, extreme of age, female sex, and prolonged hospitalization [8].

Regarding basic characteristics of our study population the mean age of the studied patients was 44.9 ± 18.45 years old, ranged from 19 to 88 years and there was a male predominance as males were (67.7 %) and (32.3%) were females. This came in agreement with **Passos *et al.*[9]** who conduct a study to identify possible predisposing factors for candiduria in intensive care unit (ICU) patients. The mean age was 53±19 years with slight male predominance (8\0 males vs. 73 females). **Alkilani *et al.*[10]** reported close results regarding sex distribution among studied population (200 intensive care patients) as there was male obvious predominance 125 male versus 75 female. In agreement with our results, **Patel *et al.*[11]** found that higher admission rates to Surgical Intensive Care Unit were observed for males and patients in age >40 years had 1.7 % higher risk of death. Male susceptibility in our result could be explained by their predisposition by concomitant diseases. The elderly besides suffering from illness such as hypertension and diabetes have poor physiological reserves to deal with postoperative complications [9].

Regarding cause of admission to surgical ICU in our study 23 patients (74.2%) of study population were admitted for DCL, about 1/3 of them were admitted due to road traffic accident (29.03%), 12.9% were operated upon due to chronic SDH or SAH and 9.6% of the studied patients were admitted with SAH due to gun shot. 2 cases were admitted due to gastrectomy-leakage from shunt/fistula. Single cases were admitted because of acute kidney injury (AKI), foot deep vein thrombosis (DVT) amputation, brain tumor, and fracture neck of femur. In accordance with our results, **Ghiasian *et al.*[12]** recorded underlying causes of ICU admission were classified as medical, surgical, and trauma in 48%, 20%, and 20% of the patients, respectively.

Patel *et al.*[11] found that the need for postoperative critical care is significantly higher in males, elderly population, abdominal and trauma surgeries, emergency surgeries, patients with poor preoperative risk stratification scores, preexisting medical illness, major intraoperative blood loss, and hypotension requiring inotropic support, and intra- or immediate postoperative respiratory problems.

The incidence of funguria in our study was 41.9% and 58.1% were negative. No cases of funguria were associated with fungemia. In accordance with our results **Ghiasian *et al.*[12]** found that candiduria was discovered in 50 (32.26%) patients, and in one or more urine samples, five different candida species were isolated during the ICU stay.

In the present study bacterial culture results showed that pseudomonas was the commonest organism found in (58.1%) of cases, followed by acinetobacter in 41.9% and Klebsiella in 29% of cases, staphylococcus auras and streptococcus pyogenic represented 25.8 and 9.7 % respectively. In contrast to this **Deorukhkar *et al.*[13]** reported that E. coli (33.7%) was the predominant isolate followed by Klebsiella pneumonia (22.1%) and Enterococcus spp. (14.3%), while Pseudomonas aeruginosa was (11.7), Staphylococcus auras was (11.7%), and Coagulase negative Staphylococci were (6.5%). The results of **Aly *et al.*[14]** found that Klebsiella spp. were the most commonly isolated microorganism (8/16, 50%), followed by Enterococci spp. (7/16, 44%) and a single S. auras isolate. This difference may be due to special antibiogram for each ICU.

In the current study, antibiotic therapy was one of the principals predisposing factors. Our data showed that piperacillin/tazobactam was the commonest used antibiotic in more than half of cases (54.8%), followed by clindamycin in 38.7% and ceftriaxone in 32.3% of cases, multiple antibiotic combinations were used, cefatizidime and metronidazole were the least used antibiotics in 3.2% only. In support of our study **Alkilani *et al.*[10]** reported that 100% of patients with positive candiduria were under antibiotic therapy and the risk of candiduria was highest after treatment with imipenem/meropenem group of drugs (75%), followed by cephalosporin (57%). Also, **Jain *et al.*[15]** found that long term broad spectrum antibiotic therapy was risk factor for candiduria. In addition **Ghiasian *et al.*[12]** reported that antibiotic therapy was the main (98.0%) predisposing factor. A total of 48 patients (out of 50) used broad-spectrum antibiotics. Furthermore, other researchers concluded that broad-spectrum antibiotic therapy can be one of the most important predisposing factors for development of candiduria in patients admitted to ICUs **[16].**

CONCLUSION

The incidence of funguria among surgical ICU patients was high in our study. Pseudomonas aeruginosa was the most frequent causative organism followed by acinetobacter baumannii and Klebsiella pneumonia.

Financial support and sponsorship: Nil.
Conflict of interest: Nil.

REFERENCES

1. **Brusaferro S, Arnoldo L, Cattani G (2015):** Harmonizing and supporting infection control training in Europe. J Hosp Infect., 89(4): 351-356.
2. **Wisplinghoff H, Bischoff T, Tallent S *et al.* (2004):** Nosocomial bloodstream infections in US hospitals: analysis of 24,179 in US hospitals: analysis of 24,179 cases from a prospective nationwide surveillance study. Clin Infect Dis., 39:309–317.
3. **Pfaller M, Diekema D (2007):** Epidemiology of invasive candidiasis: a persistent public health problem. Clin Microbiol Rev., 20:133–163.

4. **Voltan A, Fusco–Almeida A, Mendes–Giannini M (2014):** Candiduria: Epidemiology, resistance, classical and alternative antifungals drugs. SOJ Microbiol Infect Dis., 2: 1–7.
5. **Escandón P, Chow N, Caceres D (2018):** Molecular epidemiology of Candida auris in Colombia reveals a highly related country-wide colonization with, regional patterns in amphotericin B resistance. Clin Infect Dis., 68: 15-21.
6. **Ku T, Walraven C, Lee S (2018):** Candida auris: disinfectants and implications for infection control. Front Microbiol., 9:72-78.
7. **Fisher F, Sobel J, Kauffman C *et al.* (2011):** Candida urinary tract infection– treatment. Clin Infect Dis., 52: 457-466.
8. **Jain M, Dogra V, Mishra B *et al.* (2011):** Candiduria in catheterized intensive care unit patients: emerging microbiological trends. Indian Journal of Pathology and Microbiology, 54(3): 552-56.
9. **Passos X, Sales W, Maciel P *et al.* (2005):** Candida colonization in intensive care unit patients' urine. Memórias do Instituto Oswaldo Cruz, 100(8): 925-928.
10. **Alkilani A, El Shalakany A, El-Masry E *et al.* (2016):** Nosocomial candiduria in critically ill patients admitted to intensive care units in Menoufia University Hospitals, Egypt. Journal of Advances in Medicine and Medical Research, 16: 1-15.
11. **Patel S, Kacheriwala S, Duttaroy D (2018):** Audit of postoperative surgical intensive care unit admissions. Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine, 22(1): 10-14.
12. **Ghiasian S, Aghamirian M, Eshghi G (2014):** Nosocomial candiduria in critically Ill patients admitted to intensive care units in Qazvin, Iran. Avicenna Journal of Clinical Microbiology and Infection, 1(2): 21622-21622.
13. **Deorukhkar S, Saini S, Raytekar N *et al.* (2016):** Catheter-associated urinary tract candida infections in intensive care unit patients. J Clin Microbiol Biochem Technol., 2(1): 015-017.
14. **Aly S, Tawfeek R, Mohamed I (2016):** Bacterial catheter-associated urinary tract infection in the Intensive Care Unit of Assiut University Hospital. Al-Azhar Assiut Medical Journal, 14(2): 52-55.
15. **Jain S, Ahmad N, Tomar S (2020):** Epidemiology, characterization and antifungal susceptibility profile of candida species isolated from suspected cases of urinary tract infections at tertiary care centre of North Delhi. International Journal of Health Sciences and Research, 10: 286-290.
16. **Zarei-Mahmoudabadi A, Zarrin M, Ghanatir F *et al.* (2012):** Candiduria in hospitalized patients in teaching hospitals of Ahvaz. Iranian journal of Microbiology, 4(4): 198-202.