LETTER TO EDITOR

ICU-acquired Candidemia in COVID-19 Patients: An Experience from a Tertiary Care Hospital in Kerala, South India

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We read with interest the article by Rajni et al. analyzing the prevalence and etiology of bloodstream infections in coronavirus disease-2019 (COVID-19) patients.[1] The authors concluded that the incidence of bloodstream infections was low in COVID-19 patients. Particularly interesting was the fact that only one case of candidemia occurred in 1,578 patients, a significantly lower rate compared to the incidence of candidemia in other studies.[2–4] We believe that data would have been more informative if the incidence of infections was expressed per patient days.

We retrospectively analyzed the data of intensive care unit (ICU)-acquired blood stream infections (BSI), including candidemia in patients admitted to COVID-19 ICU in our hospital (KIMSHEALTH, Thiruvananthapuram, Kerala, South India). ICU-acquired BSI was defined as pathogen isolation from ≥1 blood specimen obtained at more than 48 hours after ICU admission. In patients with ≥2 BSIs, only the first one was included, unless the subsequent episode was fungal. Clinical and laboratory characteristics of patients who developed ICU-acquired candidemia were particularly analyzed.

During the time period between July 5, 2020 and February 28, 2021, 209 patients were admitted to our ICU dedicated for COVID-19 patients, accounting for 1,283 patient days. BSI was diagnosed in 22 patients (10.52 %), accounting for 17.14 BSI in 1,000 patient days. The organisms isolated were *Burkholderia cepacia* (four patients), *Candida* spp. (four patients), *Klebsiella pneumoniae* (three patients), *Acinetobacter baumannii* (three patients), *Enterococcus faecalis* (two patients), *Enterobacter cloacae* (two patients), *Pseudomonas aeruginosa* (one patient), methicillin-sensitive *Staphylococcus aureus* (one patient), and *Achromobacter* spp. (one patient) and *Escherichia coli* (one patient). We specifically analyzed the data of ICU-acquired candidemia in COVID-19 patients.

Candidemia accounted for 18.18% of the total BSI, affecting 1.91% of the admitted patients. The incidence of candidemia was 3.9 per 1,000 patient days. The distribution of *Candida* species was as follows: *Candida parapsilosis* (two patients), *C. auris* (one patient), and *C. albicans* (one patient). The clinical details of the patients are summarized in Table 1. All the patients had a hospital stay of more than 1 week before a diagnosis of candidemia was made and were on broad spectrum antibiotics. Three among the four patients with candidemia expired.

A higher incidence of candidemia has been reported in COVID-19 patients compared to other hospitalized patients.[2] In a previously reported cohort from India, candidemia affected 2.5% of COVID-19 patients admitted to the ICU, with *Candida auris* being the predominant species.[3] In another study from Brazil, Nucci et al. observed that the incidence of candidemia was 14.80 per 1,000 admissions in patients admitted with COVID-19.[4] Incidence of candidemia in patients admitted to our COVID-19 ICU was found to be lower than that was reported in most previous studies.

COVID-19 patients admitted to ICUs have a significant risk of developing candidemia. Most of these patients have many comorbidities, including advanced age, diabetes mellitus, chronic kidney disease, cancer, etc. Majority of the patients require prolonged hospital stays and central venous catheters. Corticosteroid has become standard of care for COVID-19 patients, and interleukin-6 inhibitors are being increasingly used. All these make a severely ill COVID-19 patient the ideal host for *Candida* to invade.

Candidemia is now considered as an "infection prevention issue."[5] We believe that a lower incidence of candidemia in our ICU patients is a result of emphasize on infection control measures, including hand hygiene, strictly following the device care bundles and surveillance for multidrug organisms, including *C. auris*.

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Table 1: Patient characteristics at the time of diagnosis of candidemia and outcomes

	Patient 1	*Patient 2*	*Patient 3*	*Patient 4*
Age/Sex	69/M	81/M	70/M	54/M
Days of hospitalization	22	12	7	9
Days of ICU stay	19	12	7	9
Day since SARS-CoV-2 positivity	3	4	12	11
Comorbidities	Carcinoma colon, CAD	HTN, DM, CAD	HTN, DM	HTN, DM
APACHE II	33	27	18	10
SAPS II score	77	71	51	28
SOFA score	15	11	7	2
Specific treatment for COVID-19	None	None	Remdesivir, methyl prednisolone	Favipiravir, dexamethasone
Oxygen support	IMV	Ambient air	NIV	NIV
Central venous catheter	Yes	No	Yes	No
Vasopressor requirement	Yes	Yes	No	No
Dialysis	No	Yes	No	No
TPN	No	No	No	No
Antibiotics received	Meropenem	Piperacillin-tazobactam	Polymyxin B, tigecycline	Piperacillin-tazobactam, metronidazole
Candida species	*Candida parapsilosis*	*Candida parapsilosis*	*Candida auris*	*Candida albicans*
Candida susceptibility	FLU(S), VRC (S), AMB (S), 5-FC (S), CAS (S), MFG (S)	FLU(S), VRC (S), AMB (S), 5-FC (S), CAS (S), MFG (S)	FLU(R), VRC (R), AMB (R), 5-FC (S), CAS (S), MFG (S)	FLU(S), VRC (S), AMB (S), 5-FC (S), CAS (S), MFG (S)
Antifungal therapy	Caspofungin	Caspofungin	None (diagnosed postmortem)	Fluconazole
Outcome	Expired	Expired	Expired	Discharged

APACHE II, acute physiology and chronic health evaluation II; SAPS II, simplified acute physiology score II; SOFA, sequential organ failure assessment; TPN, total parenteral nutrition; CAD, coronary artery diseases; DM, diabetes mellitus; HTN, hypertension; IMV, invasive mechanical ventilation; NIV, noninvasive ventilation; Flu, fluconazole; VRC, voriconazole; AMB, amphotericin-B; 5-FC, flucytosine; CAS, caspofungin; MFG, micafungin; S, sensitive; R, resistant

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