



CANDIDA INFECTION IN COVID 19 PATIENTS ADMITTED IN ICU

Microbiology

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ABSTRACT

Introduction: COVID-19 is known as a new viral infection. Viral-bacterial and *Candida* co-infections are one of the biggest medical concerns, resulting in increased mortality rates. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel β -coronavirus, is the main pathogenic agent of the rapidly spreading pneumonia called Coronavirus disease 2019 (COVID-19). SARS-CoV-2 infects much more people, especially the elder population, around the world than other coronavirus, such as SARS-CoV and MERS-CoV, which is a challenging current global public health system. Beyond the pathogenesis of SARS-CoV-2, microbial coinfection plays an important role in the occurrence and development of SARS-CoV-2 infection by raising the difficulties of diagnosis, treatment, prognosis of COVID19, and even increasing the disease symptom and mortality. To date, few studies have investigated bacterial and fungal superinfections in COVID-19 patients. Hence this study was undertaken.

Objective: The current study aimed to investigate the incidence of candidemia among patients admitted to the ICU for COVID-19.

Material and Methods: A total of 88 isolates of *Candida* species were isolated from urine, sputum, Blood and respiratory secretions from patients admitted in ICU in a span of twelve months (May 2020 to April 2021). These *Candida* species were identified by standard mycological techniques.

Results: In our study maximum isolates were from Urine (79.31%). *C.tropicalis*(51.72%) was the common isolate followed by *C.albicans*(25.28%).

Conclusion: Patients tend to have secondary infections after receiving invasive respiratory ventilations. More than half of the detected respiratory pathogens were bacteria while virus and fungi accounted for a high proportion in various samples. Our findings emphasize the concern of superinfection in COVID-19 patients due to *C.albicans* and non albicans *Candida* (NAC). Consequently, it is important to pay attention to bacterial and fungal co-infections in critical patients positive for COVID-19.

KEYWORDS

Covid-19, Coronavirus, Candida, ICU, Non-albicans Candida (NAC)

INTRODUCTION:

Since December 2019, an unprecedented outbreak of viral pneumonia caused by an initially unknown viral pathogen linked to a seafood associated wholesale market emerged in Wuhan, Hubei Province, China.^{1,2} The pathogen of the disease was soon identified as a novel Coronavirus (SARS-CoV-2), and the disease was named coronavirus disease-19 (COVID-19).³ Despite global containment and quarantine attempts, the incidence continued to increase, spread to many other countries and caused a pandemic with a great number of deaths.⁴ The mortality rate differs greatly from country to country.⁵ Among various factors leading to morbidity and mortality in COVID-19 patients, the prevalence and role of bacterial and fungal co-infections has not yet been discussed, particularly in patients suffering from acute respiratory distress syndrome (ARDS).

All the classic risk factors for developing candidemia in a critically ill patient are present in COVID-19 patients admitted to the ICU: mechanical ventilation, parenteral nutrition, broad-spectrum antibacterial treatment, indwelling central venous or bladder catheters, older age, comorbidities, lymphopenia, corticosteroids, etc. Different species of *Candida* have also been isolated from respiratory specimens from COVID-19 patients as unique pathogen and considered as cause of co-infection.^{6,7} However, the etiological value of yeasts isolated from the respiratory tract as causal agents of infection of the lung parenchyma is controversial: it is in fact questioned whether *Candida* could be the cause of pneumonia. In contrast to the defined culture threshold for bacterial colony forming units in BAL, there is no such standard to distinguish *Candida* colonization from pulmonary candidiasis.

The ongoing coronavirus disease (COVID-19) pandemic has overwhelmed healthcare systems worldwide. Reports from China and New York have highlighted the concern for nosocomial infections, primarily bacterial, in critically ill COVID-19 patients.^{1,3} Secondary *Candida* spp. bloodstream infections in COVID-19 patients with prolonged intensive care unit (ICU) stays have not been documented.

Yeast species belonging to the *Candida* genus including *C.albicans*, *C.guilliermondii*, *C.tropicalis* and *C.krusei* are the most prevalent

fungal species inhabiting various mucosal surfaces such as skin, respiratory digestive and urinary tract.⁸ *Candida* is among the most frequently recovered pathogen in the ICU, affecting between 6% and 10% of patients and some studies have noted an increasing trend for candidemia.⁹ Rocco et al pointed out the importance of early recognition of symptoms by urologists for proper triage of patients and to prevent missing possible SARS-CoV2 infection because of an overlap of COVID-19 and classical virological symptoms.¹⁰ A known proportion of patients who are admitted for the novel coronavirus disease 2019 requires ICU level of care. Prolonged ICU stay is a risk factor for the nosocomial candidemia. Although being commensal within the human host, *Candida* species are equipped with virulence attributes enabling them to invade when opportunities arise and cause various infections in humans especially when the immune system is impaired.¹¹

Awareness of the possibility of fungal coinfection is essential to reduce delays in diagnosis and treatment in order to help prevent severe illness and death from these infections. The risk factors for CAC includes common risk factors predisposing ICU to invasive candidiasis. These include diabetes mellitus, renal failure requiring haemodialysis, abdominal surgery, triple lumen catheters, parenteral nutrition, receipt of multiple antibiotics, length of ICU stay and poor abdominal infections.¹² Catheters are historically known as a portal of entry for acquiring nosocomial *Candida* infection such as *Candida auris* and *Candida parapsilosis*.¹³

Candida is among the most frequently recovered pathogen in the intensive care unit (ICU), affecting between 6% and 10% of patients, and some studies have noted an increasing trend for candidemia.¹⁴ Hence this study was conducted to study the prevalence of Candidiasis in ICU patients.

MATERIAL AND METHODS:

A total of 298 Covid19 patients were admitted in ICU from May 2020 to April 2021. Of the 298 patients, a total of 87 *Candida* isolates was isolated from various clinical specimens like urine, sputum, blood and respiratory secretions. Gram's stain was performed from the sputum and respiratory secretions after which samples all were inoculated on

Sabouraud dextrose agar, incubated at 37°C for 24–48 hours. Gram stain from the growth was done to confirm yeast cells. The samples which yielded growth were further identified by Germ tube test, Dalmou technique, inoculation on CHROM agar, sugar assimilation and fermentation test for final confirmation and speciation of species.^{15, 16}

RESULTS:

88 isolates of *Candida* species were isolated from urine, sputum, blood and respiratory secretions. Maximum isolates were *C. tropicalis* (52.27%) followed by *C. albicans* (25%). *C. krusei* (7.95%),

C. glabrata (6.81%), *C. parapsilosis* (5.6%) and each of *C. guilliermondii* and *C. dubliniensis* (1.1%)

Table 1:

SAMPLE	TOTAL ISOLATES (%)
URINE	69(79.31)
SPUTUM	09(10.34)
RESPIRATORY SECRETIONS	09(10.34)
BLOOD	01(1.1)
TOTAL	88(100)

Table 2:

SAMPLE	<i>C. albicans</i>	<i>C. tropicalis</i>	<i>C. dubliniensis</i>	<i>C. glabrata</i>	<i>C. krusei</i>	<i>C. parapsilosis</i>	<i>C. guilliermondii</i>
URINE	12	40	01	06	05	04	01
SPUTUM	5	02	-	-	01	01	-
RESPIRATORY SECRETION	5	03	-	-	01	-	-
BLOOD	-	01	-	-	-	-	-
Total	22(25)	46(52.27)	01(1.1)	06(6.81)	07(7.95)	05(5.6)	01(1.1)

DISCUSSION:

COVID-19 is a newly emerging life-threatening infectious disease and we are still trying to rapidly increase our knowledge concerning the disease. As a novel risk factor, COVID-19 has led to an increase in the incidence of candidemia and an elevated mortality rate. Despite being of clinical importance, there is a lack of data regarding COVID-19-associated candidemia (CAC). Mohammadreza Salehi et al reported *C. albicans* (70%) and NAC species (30%) from COVID19 patients.¹⁷ Eight yeast isolates were collected from patients with fungemia: five *Candida albicans*, three *C. glabrata*.¹⁸ Our study showed maximum isolation of *C. tropicalis* (52.27%) followed by *C. albicans* (25%). *C. krusei* (7.95%), *C. glabrata* (6.81%), *C. parapsilosis* (5.6%) and each of *C. guilliermondii* and *C. dubliniensis* (1.1%)

CONCLUSIONS:

The continuously using of invasive monitoring and aggressive use of broadspectrum antibiotics and surgical technologies in the ICU has not only improved survival of critically ill patients with life-threatening illnesses but has also increased the risk for fungal infections. Fungal infections can become severe and rapidly progressive and are often difficult to diagnose and treat. Although diagnostic and therapeutic modalities for some of the fungal infections are improving such as for *C. albicans*, more studies are needed for non-albicans *Candida* species.

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