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CASE REPORT

Fungal, parasitological, and bacterial coinfection in a severely ill COVID-19 patient in Peru

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Abstract

COVID-19 patients are prone to coinfections during their hospitalization. These coinfections are challenging as they involve longer hospital stays, high costs, and higher risk of mortality. Here, we present a case of a patient with multi-infection by resistant parasites, fungi, and bacteria during his hospitalization in a hospital in Lima, Peru.

KEYWORDS

COVID-19, cross infection, infectious diseases, *Klebsiella pneumoniae*, *Lophomonas*, SARS-CoV-2

1 | INTRODUCTION

Coronavirus disease 2019 (COVID-19), a 2-year respiratory illness, causes respiratory failure, coagulation disorders, and multisystem organ failure. Those who survive the infection can develop numerous emergent sequelae that mainly affect three systems: nervous, respiratory, and cardiac[1,2] The mortality rate of COVID-19 is directly related to the inflammatory state and complications in the clinical process.

COVID-19 patients may be affected by nosocomial infections as seen in other epidemics such as the AH1N1 influenza virus.[3] *Streptococcus pneumoniae* and *Staphylococcus aureus* have been isolated in these patients as a cause of complications during prolonged periods of hospitalization.[4] Coinfections in patients with COVID-19 have been reported during the pandemic, showing differences among affected populations.[5–10] The isolates include *Klebsiella pneumoniae*, *S. pneumoniae*, *Eschierichia coli*, *Enterobacter cloacae*, *Candida spp*, *S. aureus*, and *Pseudomonas aeruginosa* in various clinical specimens (such as urine, cerebrospinal fluid, and blood cultures), with several antibiotic resistance patterns.[8–11]

These coinfections may complicate the borderline health of COVID-19 patients by requiring new care, multidrug therapy, and increased risk of complications and patient mortality.[11,12] In Peru, coinfections in patients with COVID-19 have not been reported yet despite the high frequency of *Carbapenem-Resistant K. pneumoniae* (Cp-Kpn) and *Multidrug-Resistant Acinetobacter Enterobacteriaceae* isolations.[13]

Here, we describe an interesting case of bacterial, fungal, and parasitological infection in a patient with severe COVID-19.

2 | CASE REPORT

A 76-year-old Peruvian male patient without comorbidities presented acute respiratory failure type 2, classified with acute respiratory distress syndrome (ARDS), and suspected COVID-19. He was admitted to the intensive care unit (ICU) for mechanical ventilation. The patient is an administrator and has previously had knee surgery due to a sports injury (44 years ago). On admission, he was intubated and presented fever (38.6°C), a saturation of 78% (turned to 94% after ventilation), blood pressure of 110/70 mmHg, and respiratory rate of 29 breaths/min. The general physical examination was typical, and as part of the differential diagnosis, other respiratory infections were ruled out using the Respiratory Viral Panel I (CerTest Biotec S.L.).

The diagnosis of COVID-19 was confirmed by computed tomography (CO-RADS 4: abnormalities suspicious of COVID-19) and real-time reverse transcriptase-polymerase chain reaction (RT-PCR). During the 10 days of hospitalization, the oxygen consumption increased from 5 liters per minute since the day of admission, duplicating the amount of oxygen every 2 days, (being 10, 20, and 30 liters per minute) after 2, 3, and 4 days, consuming the total capacity until the end of hospitalization (Figure 1).

3 | INVESTIGATION

The normal values of the tests are shown in Table 1. Laboratory results showed hypoalbuminemia (3.2 g/dl) and increased lactate dehydrogenase (305.6 U/L), C-reactive protein (15.66 mg/dl), glucose (122.1 mg/dl), aminotransferase aspartate (68.9 U/L), gamma glutamyl transpeptidasa (46.3 U/L), and urea (82.4 mg/dl). The complete blood count (CBC) showed leukocytosis (14,000 cells/mcL) with neutrophilia (90.7%) and a severe neutrophil-to-lymphocyte ratio (25.40 cells/mcL). On the second day of hospitalization, the patient presented sustained fever, showing no improvement, so a blood

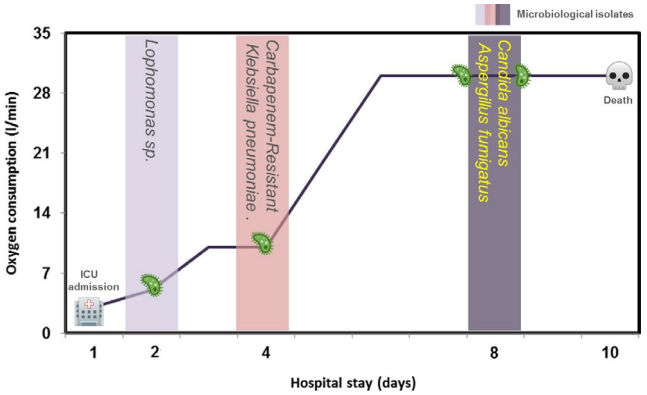

FIGURE 1 Timeline of parasitic (purple bar), bacterial (pink bar), and fungal (gray bar) infections during the days of hospitalization of a patient with COVID-19. The tracking line indicates the rapid increase in supplemented oxygen to the patient on mechanical ventilation

culture and microbiological study of body fluids were requested. The same day, *Lophomonas sp*. was diagnosed using bronchoalveolar lavage (BAL) (Video S1). Using the BAL sample, smear microscopy did not detect tuberculosis. Two days later Cp-Kpn isolation was reported with resistance to 20 antibiotics including tobramycin and colistin (Kirby–Bauer disk diffusion susceptibility test and E-test). On Day 8 of hospitalization, the laboratory reported *Candida albicans* and *Aspergillus fumigatus* indicating ventilator-associated pneumonia in addition to COVID-19. (Figure 2) Therapeutic management included a protein module (300 cc x nasogastric tube care, c/8 h), imipenem +Cilastatin (1 gr c/6 h Intravenous [IV]), amikacin (1 gr c/24 h IV), ranitidine (50 mg c/8 h IV), metamizole (1 gr IV), enoxaparin (40 mg c/24 h IV), hydrocortisone (100 mg c/8 h), and rocuronium bromide (50 mg). Metronidazole was administered at a dose of 0.5 g PO/twice a day for the treatment of Lophomonas, and Aspergillosis was treated with voriconazole 6 mg/kg IV on Day 1 and 4 mg/kg IV every 12 h for 5 days. The patient's condition did not improve after the therapies, and 2 days later, the patient died.

The present research was carried out following the principles outlined in the Helsinki Declaration. Also, CARE guidelines and methodology were followed in this study.

4 | DISCUSSION

Coinfections have been frequent in patients with COVID-19 in several countries/regions.[11] These coinfections, severe cases, and mortality in COVID-19 patients have been linked.[12] In this paper, we report a confirmed case of COVID-19 accompanied by parasitic (*Lophomonas*

TABLE 1 Baseline laboratory data of the patient

Laboratory parameters	At admission	Range reference	Result
Hemoglobin	13.7	13.5–17.5 gr/dl	
White blood cells	14,000	4500–9500 cells/mcL	
Platelet	177,000	150,000–350,000 cells/mcL	
Neurophils	90.7	42%–75%	
Lymphocytes	7.1	21%–51%	
Glucose	122.1	60–110 mg/dl	
Albumin	3.2	3.4–5.4 g/dl	
Lactate dehydrogenase	305.6	150–302 U/L	
C-reactive protein	15.66	<10 mg/L	
Procalcitonin	2.1	<0.5 ng/ml	
Aminotransferase aspartate	68.9	8–33 U/L	
Alanine aminotransferase	50.4	4–36 U/L	
Gamma glutamil transpeptidasa	33	5– 40 U/L	
Alkaline phosphatase	110	44–150 U/L	
Urea	82,4	5–20 mg/dl	
Creatinine	1.2	0.7–1.3 mg/dl	

Note: Normal values are shown in pink boxes, high results in purple boxes, and low results in violet boxes.

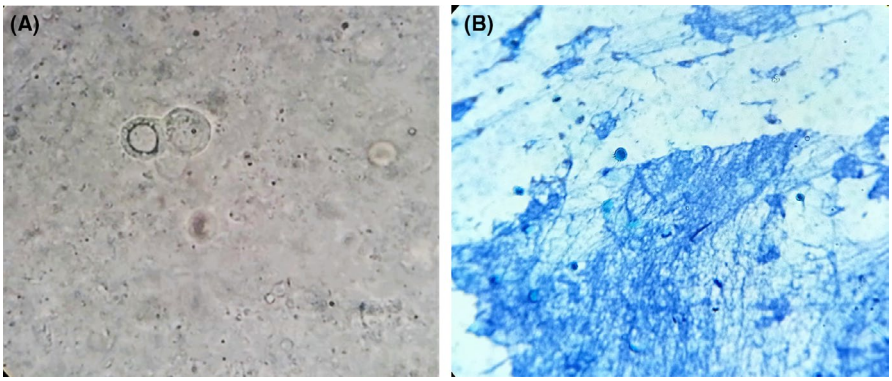

FIGURE 2 Microbiological isolates during the hospital stay of patients with COVID −19. (A) *Lophomonas sp.* (fresh sample, 100×), (B) *Aspergillus sp.* (Lactophenol Blue, 100×)

sp.), bacterial (Cp-Kpn), and fungal (*Candida albicans* and *Aspergillus fumigatus*) multi-infection during the early phase of the second wave of COVID-19 in March 2021.

Due to previous family support treatment, the patient developed ARDS and was admitted to the ICU with a high oxygen requirement. This approach was typical at the peak of the Peruvian pandemic and consists of empirical pharmacological management, vitamin, and oxygen supplementation, which can play a decisive role in the subsequent evolution of patients.[4] Also, this empirical treatment includes the prolonged use of corticosteroids that can lead to fungal and parasitological infections.[4,6]

Bacterial infections are the most common cause of coinfection in patients with COVID-19, generating high complications due to antibiotic resistance in most isolated patients.[13,14] *Acinetobacter baumanii* and Cp-Kpn are frequently isolated pathogens worldwide. Their impact on patients with COVID-19 is decisive as they lead to the use of broad-spectrum antibiotics with frequent adverse reactions weakening organs and leading to systemic failure.[12,13] Although an increased risk of death associated with Cp-Kpn has not been detected, this pathogen has frequently been isolated in hospitalized COVID-19 patients ranging from 0.35 to 53%.[15–17]

Coincidentally with the clinical and demographic characteristics of the present case, Cp-Kpn has been frequently isolated in older adult males with COVID-19 pneumonia admitted to the ICU.[17] Future studies are needed to understand the spectrum of Cp-Kpn during the COVID-19 pandemic. In Peru, there is increasing antibiotic resistance[13] in isolated patients resistant to hospital disinfectants[18] and may spread the virus in ICUs, impacting the safety of COVID-19 patients and causing rapid mortality.

Candida and *Aspergillus* species have also been previously reported as co-infectious species.[11,15,19] The presence of respiratory-parasitic infections in patients with COVID-19 has not been reported yet in Peru, but there

are cases reported in other countries.[9,10] *Lophomona* is an emerging flagellated protozoan as a hospital and community infectious agent in Peru.[20] In this case, bronchopulmonary lophomoniasis was described as part of the microbiological analysis of bronchopulmonary lavage. In particular, the severe manifestations of this disease are also difficult to discriminate. Also, the influence of *Lophomonas* on COVID-19 has not been established yet. So, it is important to continue surveillance for unusual respiratory pathogens, especially in countries with a high prevalence.

The patient's unfavorable and rapid evolution is not only related to COVID-19 infection, but coinfections have developed in a weak and dysregulated immune system leading to sepsis, which in itself is an independent factor of coinfection and deterioration, leading to an increased risk of mortality.[1,21]

Finally, the safety of hospitalized ICU patients emerges as a requirement during the pandemic because limited infection control measures may lead to infectious outbreaks and increased coinfections, affecting the patients with COVID-19. As recently demonstrated,[22] these coinfections could be connected to changes in microbiome-based immunity that have been altered in patients with COVID-19, could also influence the development of coinfections, and therefore should be a target for clinical microbiology.

5 | CONCLUSION

Coinfections represent a consequence of ICU hospitalization of COVID-19 patients and may impact the development of the disease by increasing the risk of mortality. Due to the increasing number of reports of hospital infections related to the clinical course of COVID-19 patients, hospital safety must be strengthened during the pandemic. These strategies should highlight the role of microbiology in addressing this threat, promoting surveillance activities and the comprehensive control of these pathogens.

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CONFLICTS OF INTERESTS

All authors declare no conflicts of interest.

AUTHOR CONTRIBUTION

JMS participated in patient management, data collection, and writing the draft, and critically reviewed the manuscript. SSS designed the manuscript, collected the data, and reviewed the manuscript. RV collected the data and reviewed the manuscript. RSH designed the manuscript and collected the data. WL critically reviewed the manuscript. ES collected the data. KCF critically reviewed the manuscript. HCP contributed to the interpretation of the cases and critically reviewed the manuscript.

ETHICAL APPROVAL

This case report was undertaken in accordance with the Declaration of Helsinki. This study was not part of a registered clinical trial, and we have data accessible to readers. Written informed consent was obtained from the patient's relatives for publishing this case report.

CONSENT

Informed consent has been used with the patient's relatives for data use and presentation in this study.

DATA AVAILABILITY STATEMENT

Data were available on request from the authors.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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