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Candida auris co-infection in critical care COVID-19 patients in Saudi Arabia, a single center case-control evaluation

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Introduction

Candida auris, since its first isolation in 2009, is being considered an emerging fungal pathogen and a global health threat. Recently there has been growing concern regarding drug resistance, difficulty in identification, as well as problems with eradication. Invasive candida infections or candidemia causes increased morbidity and mortality. Knowing that, multi-resistant candida, such as *C. Auris* can cause challenges in diagnosis and treatment potentiating the risk of death. During pandemics, short of supply of personal protective equipment (PPE) as well as overcrowded hospitals have led to breaches in infection control practices, leading to outbreaks of multi-drug resistant organisms, including *C. Auris*. Although outbreaks have been reported throughout the other hospitals in the region no previous reports on *C. Auris* – COVID-19 co-infections and its effect on patient's outcome.

Research Problem

During the current COVID-19 pandemic, coinciding with the increasing expansion of ICU COVID-19 patients, nosocomial spread of multi-resistant pathogens like *Candida Auris* is a potential infection control threat. Identification of the potential source and assess the impact of interventions provided is vitally needed. In our institute, we had couple of patients with culture positive for *C. Auris* resulting in an outbreak. Recognizing the factors associated with poor patients' outcome is necessary.

Research Objectives

Primary objective: To investigate the incidence of *Candida Auris* infection or colonization among hospitalized ICU patients who had a laboratory-confirmed COVID-19 infection, between June 2020 to May 2021.

Secondary objective: Identify the demographic and clinical features associated with poor outcome in the same patients' group compared to control cases.

Design: Chart review, single-center, retrospective 1:3 case-control study. Cases with positive culture for *Candida Auris* will be matched in 1:3 ratio to control cases with no *C. Auris* in terms of 1) gender 2) the age range of 10 years 3) date of admission range of 7 days.

Setting: This study will be performed in the COVID-19 units in the intensive care department of a newly established public hospital in Riyadh, Saudi Arabia. These units were established in the response to increasing critical care demand during the peak of COVID-19 cases in the country. Cases in this unit are received from other hospital and are only accepted if they had laboratory confirmed COVID-19 infection prior to transfer

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with the need to critical care services. The 60-bed department consisted of three separate critical care wards (Burn unit, CCU and MICU) each prepared with 20 beds.

The three COVID-19 units were equipped with all the necessary personal protective equipment (PPE) as well as hand hygiene precautions. All COVID-19 patients are placed under the contact and droplet isolation when admitted to the unit, while put under airborne isolation if undergoing aerosol generating procedures or while hooked to mechanical ventilation. A High-Efficiency Particulate Air (HEPA) filter is used when Airborne Infection Isolation Rooms (AIIRs) were not available. All health care providers were required to have basic training in infection control principles.

Inclusion/Exclusion: Between June 2020 and May 2021, all adult (>18 years) patients with laboratory confirmed COVID-19 infection and had any culture specimen positive for *C. Auris* from blood, urine, respiratory tract, skin and/or other sites. Cases with incomplete data will be excluded from the analysis.

Data source and collection: Patients' data will be extracted from the patients' medical records. Using a standardized data collection sheet, a trained health care provider will collect the patients' demographic, patient location, the patient history, risk factors for candidiasis (central venous catheter, use of broad-spectrum antibiotics, complicated abdominal surgeries, total parental therapy, neutropenia, acute renal failure, active malignancy) the basic laboratory, microbiological data (including first negative culture), length of stay, ventilator days, and therapeutics provided.

Relevant data on all admitted patients: Total admissions, total positive cultures, total candida positive cultures, average length of stay.

Study definitions: Invasive candida infection (ICI): Isolation of candida species (*C. Auris*) from at least one sterile body site in presence of symptoms and/or signs of infections. Health care associated blood stream infection (HCA-BSI): after 48 hours of admission, the first isolation of *Candida* species (*C. Auris*) from a blood culture in a patient with symptoms and/or signs of infection.

Candida colonization: Positive culture of *Candida* species (*C. Auris*) from non-sterile body sites without symptoms and/or signs of infections.

Microbiology: Different types specimens were collected and processed according to the CLSI standards in an outside laboratory with biosafety level 2. Following necessary incubation conditions, staining by gram stains is performed and followed by culture on blood, MacConkey, chocolate and Sabouraud agar and identification by Vitek-2. The antimicrobial sensitivities will be performed manually (E-test) and automatically (Vitek 2).

Study outcome: Death at 30 days following specimen collection date, Ventilator days, In-hospital length of stay.

Statistics: Labeling and data entry into the SPSS version 27 software will be followed. Data will then be cleaned and organized into different variables to be prepared for analysis. Basic analysis will be used, such as frequencies

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and cross-tabulations for demographics, microbiology and clinical outcomes. The method of analysis was chosen to achieve the aim and objectives of the study. Assessment of association between study variables and study outcome will be obtained by Chi-square test as needed.

Anticipated limitations: Total number of pathogens exceeds total number of blood cultures and that's because a single culture might have more than one isolate. Some difficulties will be during recognizing community acquired, and health-care acquired infection, and this will be overcome by doing more investigations. Patients who were being under broad spectrum antibiotic can affect their culture results and this is will be resolved by knowing types of antibiotics used and an infectious disease consultant will be consulted to decide the spectrum affects. Missing data will be resolved by digging more about the information.

Biography

Nahid Batarfi is from Infection Control and Prevention Department, Aldiriyah Hospital, Riyadh, Saudi Arabia.