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CASE REPORT

CASE OF COLONIZATION OF THE ORAL MUCOSA BY *Kodamaea ohmeri* IN A PEDIATRIC PATIENT ADMITTED IN AN INTENSIVE CARE UNIT

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ABSTRACT

Kodamaea ohmeri (*Pichia ohmeri*) is an emerging yeast that has caused different infections in humans, mainly in immunosuppressed and hospitalized patients. We report the case of a 3-year-old boy admitted to the intensive care unit with colonization of the oral mucosa by *K. ohmeri.* The yeast strain collected from this patient's oral mucosa was identified by the traditional method, chromagar *Candida*, and studied by Maldi-Tof. Since the number of invasive cases caused by fungi has increased, mainly due to rare and emerging yeasts, their identification is extremely important for an accurate diagnosis and more effective treatment.

KEY WORDS: Fungal colonization; nosocomial infection; *Pichia ohmeri.*

INTRODUCTION

The human oral microbiota is a complex environment involving several microorganisms, including *Candida* (Okolo et al., 2020). Among all *Candida* species, *C. albicans* commonly colonizes the oral mucosa in healthy individuals. This species is well adapted to the conditions of the human host and is controlled by its immune system (Vila et al., 2020). However, in adverse conditions, such as immunosuppression and hyposalivation, a local imbalance occurs, resulting in the proliferation of yeasts and consequent

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clinical manifestations (Dantas et al., 2020). Colonization of the oral mucosa is considered a risk factor for progression to sepsis (Batista et al., 2014).

Kodamaea ohmeri was also previously classified as *Pichia ohmeri* or *Yamadazyma ohmeri*. It has been considered an emerging human pathogen and has caused various types of infections with high mortality. It can cause both invasive and non-invasive infections, and a significantly high mortality rate of 50% has been reported (Zhou et al. 2021).

Considering the emergence of *K. ohmeri* as a pathogen of a nosocomial environment and the scarce reports of infection, this study aimed to report one case of colonization of the oral mucosa by this microorganism in a patient admitted to the pediatric intensive care unit (PICU).

CASE

A 3-year-old male pediatric patient was admitted to the emergency room at Hospital Infantil Darcy Vargas, located in the city of Sao Paulo, SP, Brazil, with severe acute respiratory syndrome at the beginning of 2020. The patient entered the emergency room with a history of cough two weeks before admission, which developed into a fever after three days. He underwent other medical services, initially being prescribed prednisolone, and when the fever started, he started with clarithromycin and inhalation with fenoterol, but the symptoms persisted. Upon admission to this hospital, the patient had chest pain, fever, and tachycardia but was hemodynamically stable. Due to persistent tachycardia, even with fever control, the patient was monitored in an emergency bed. An electrocardiogram (ECG) was performed, which showed sinus tachycardia, and a chest x-ray did not show an increase in the cardiac area nor an image suggestive of consolidation. However, after a new episode of fever, the patient presented a drop in general condition, hypoactivity, poor peripheral perfusion, and a drop in blood pressure. At this point, volume expansion was started with 0.9% saline solution, 10 mL/kg, to treat septic shock. Initially, expansion with 20 mL/Kg was not chosen due to suspicion of myocarditis. Concomitant with the first expansion, laboratory tests were collected, and ceftriaxone 100 mg/Kg/day was started. After the first expansion, there was no reversal of hypotension, and an additional 10 mL/Kg with 0.9% saline solution was subsequently administered. After the first two expansions, the patient remained poorly perfused and hypotensive, opting for a new expansion with 0.9% saline solution, 20 mL/Kg. After reaching 40 mL/Kg, the patient improved hemodynamic parameters. His blood pressure was normal, but slow peripheral perfusion persisted. At that moment, a place in the intensive care unit (ICU) was requested, and a central venous catheter (CVC) was placed to administer vasoactive drugs. While waiting to be transferred to the ICU and the procedure to be performed, hypotension returned, and a new expansion was performed with 0.9% SF of 20 mL/kg. Afterward, adrenaline 0.1 µg/kg/min

was started in peripheral access, and he was transferred to the surgical center for insertion of the CVC. During the procedure, after orotracheal intubation, he experienced cardiorespiratory arrest, which was reversed within two minutes. Then, still during the procedure, the patient experienced three more episodes of cardiorespiratory arrest, with respective durations of 4 minutes, 1 minute, and 2 minutes, reversed with cardiopulmonary resuscitation and adrenaline. After the procedure was completed, the patient was transferred to the ICU. He required mechanical ventilation and started treatment with oseltamivir, ceftriaxone, and clarithromycin, in addition to receiving a transfusion of packed red blood cells, dobutamine, epinephrine, and hydrocortisone. Preventive antifungal treatment was not performed. The following day, a computed tomography of the neck/chest was performed, which revealed cervical lymph nodes, and a computed tomography of the skull, with bilateral pneumonia, sinusitis on the left, and mastoiditis on the right diagnosed. The rapid influenza test was negative. Tracheal secretion cultures and blood cultures were negative. He took epinephrine until the third day of hospitalization and dobutamine until the fourth day. He continued taking oseltamivir until the fifth day of hospitalization. That same day, secretions from the patient's oral mucosa were collected using a swab. This material was sent to the laboratory for identification. Antifungal therapy was not introduced as the patient did not present any lesions or changes in the oral mucosa during the entire hospitalization period. The patient remained on mechanical ventilation until the sixth day of hospitalization. That same day, he was discharged from the ICU, as he was hemodynamically stable, without vasoactive drugs, with good saturation in room air, afebrile, and with good diuresis, being transferred to the pediatric ward to complete clinical treatment. Clarithromycin and hydrocortisone were administered until the seventh day of hospitalization. On the eighth day of hospitalization, a chest X-ray was performed without any changes. He continued taking ceftriaxone until the eleventh day of hospitalization. The patient was discharged on the fourteenth day of hospitalization.

After the isolation of the yeast, identification was carried out using the traditional method (Kurtzman et al., 2011) and chromagar *Candida*, where the macromorphology (Figure 1) and micromorphology (Figures 2 and 3) showed typical characteristics of *K. ohmeri*. The Maldi-Tof results, expressed as log scores, were 2.015, 2.042, and 2.071, confirming that it was *K. ohmeri*. Antifungal susceptibility testing by microculture was also carried out according to EUCAST (2020): amphotericin B (0.25 mg/L), voriconazole (0.06 mg/L), fluconazole (2 mg/L) and nystatin (16 > mg/L). The MIC values were not interpreted, as there are still no formally proposed clinical breakpoints for the *K. ohmeri* strain.

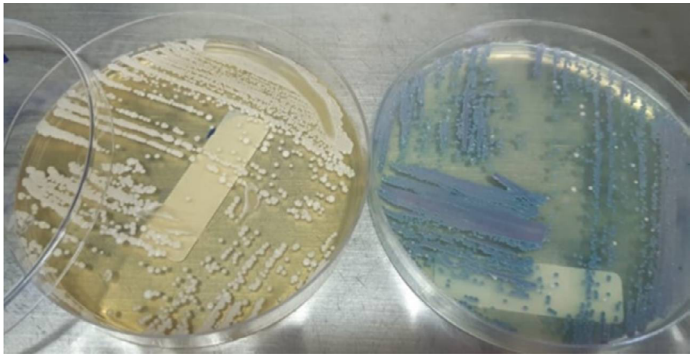

Figure 1. *K. ohmeri*: Macromorphological aspects in Sabouraud-dextrose agar (white colonies, creamy appearance) and Chromagar *Candida* (initially pink colonies and after 48 hours blue).

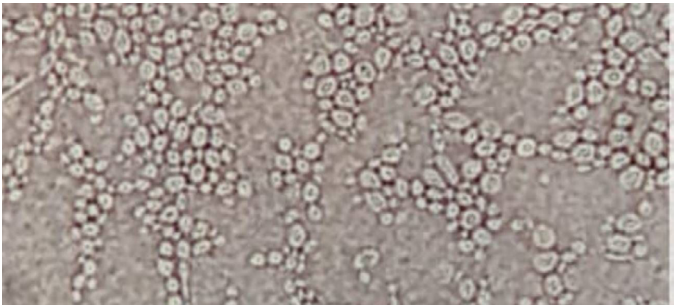

Figure 2. *K. ohmeri*: Micromorphological aspects in Ridell's technique: Round and oval cells, spherical ascus.

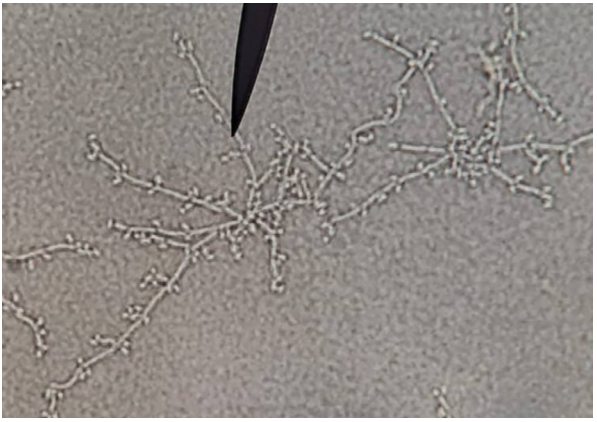

Figure 3. *K. ohmeri:* Micromorphological aspects in Ridell's technique Pseudohyphae and blastoconidia.

DISCUSSION

The present study showed colonization of the oral mucosa caused by a rare and emerging yeast species, *K. ohmeri,* in a 3-year-old pediatric patient admitted to the pediatric intensive care unit (PICU) due to severe acute respiratory syndrome.

When reviewing the literature, we can see that most of the reported cases caused by *K. ohmeri* are fungemia (74.2%), followed by endocarditis (11.3%) and peritonitis (6.4%). Nosocomial outbreaks involving newborns and children admitted to intensive care units (Zhou et al. 2021) were reported. One study reported 38 cases of *K. ohmeri* (previously identified as *C. tropicalis* based on biochemical and morphological tests). These events occurred at a tertiary medical center in India from August 2008 to December 2009. The vast majority occurred in the neonatal surgery ICU (78.9%), most involving severe and fatal infections, where mortality reached 31.8%. *K. ohmeri* fungemia compared to *C. tropicalis* fungemia at this medical center in India resulted in significantly higher mortality (50%) for *K. ohmeri* (Chakrabarti et al., 2014). Another nosocomial outbreak occurred in China, where six neonates had fungemia by *K. ohmeri*, five were treated with caspofungin, and one with fluconazole, all survived (Liu et al., 2013).

Of the entire literature review, only six studies reported the isolation of *K. ohmeri* from the oral mucosa. In India, the case of a 38-year-old patient with HIV and oral candidiasis was reported (Menon et al., 2010). In Italy, the case of a 78-year-old patient with lung cancer and oral mucositis was reported (Santino et al., 2013). In Brazil, strains of *K. ohmeri* were isolated from the oral mucosa of individuals with dental prostheses and the saliva of a patient with HIV (Pires-Gonçalves et al., 2007; Junqueira et al., 2012). In China, *K. ohmeri* was isolated from a patient with HIV and seven adult patients with head and neck cancer (Li et al., 2013; Wu et al., 2021).

In the present study, we could verify that the identification of *K. ohmeri* by traditional methods was not enough to accurately identify this yeast species. In the chromogenic medium, *K. ohmeri* presented pink colonies, which, after 48 h, changed to blue (Figure 1). Other authors mentioned this characteristic (Menon et al., 2010; Santino et al., 2013; Biswal et al., 2015).

In our study, proteomic identification (Maldi-Tof) was essential for correctly identifying this strain. Maldi-Tof has enabled rapid identification of *Candida* species in clinical laboratories and has been used successfully to identify *K. ohmeri* (Zhou et al., 2021). The rate of correct yeast identification by Maldi-Tof MS is 97.6% (Aslani et al., 2018).

Preventive measures related to *K. ohmeri* infection are similar to those for other fungi and microorganisms. From basic actions by healthcare professionals, such as frequent hand washing, adequate use of Personal Protective Equipment (PPE), adequate sterilization of all materials to be used,

and use of disposable materials, to the periodic carrying out of epidemiological studies and the susceptibility profile to antifungals of fungal infections in different medical centers have great relevance in guiding clinicians and optimizing their strategy for preventing and treating such fungal infections (Matta et al., 2017).

In conclusion, this research illustrates the colonization of the oral mucosa by an opportunistic, rare, and emerging *K. ohmeri* yeast strain in a pediatric patient with severe acute respiratory syndrome. Furthermore, it emphasizes the importance of rapid and accurate diagnosis of rare species in clinical material, which are increasingly emerging as opportunistic pathogens.

ETHICAL STATEMENT

Ethics approval from the Darcy Vargas Children's Hospital Ethics Committee (application number 0321128.2.0000.0075) was obtained. Written informed consent was provided by the patient's parents, acknowledging that patient data could be accessed through electronic or paper means, provided that the data is anonymized to protect their identity.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest to disclose.

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