EJCRIM
European Journal
of Case Reports
in Internal Medicine

THE FIRST REPORT OF *CANDIDA AURIS* INFECTION IN VIETNAM

Thong Dang-Vu[1], Dung Lam-Quoc[1], Ngoc Duong-Minh[1,2], Ha Vu[1], Lam Nguyen-Ho[1,2], Phu Truong-Thien[3], Khoa Nguyen-Dang[1,2]

[1] Department of Pulmonary Medicine, Cho Ray Hospital, Ho Chi Minh City, Vietnam
[2] Department of Internal Medicine, Faculty of Medicine, University of Medicine and Pharmacy at Ho Chi Minh City, Ho Chi Minh City, Vietnam
[3] Department of Microbiology, Cho Ray Hospital, Ho Chi Minh City, Vietnam

Corresponding author: Khoa Nguyen-Dang **e-mail:** nguyendangkhoa@ump.edu.vn

Received: 29/01/2024 **Accepted:** 02/02/2024 **Published:** 12/02/2024

Conflicts of Interests: The Authors declare that there are no competing interests.
Patient Consent: Informed consent was obtained from the patients or their families in this study.
Acknowledgements: We thank all healthcare professionals at the Department of Pulmonary Medicine and the Department of Microbiology of Cho Ray Hospital. We appreciate the patients and their families for consenting to the publication of this case.

This article is licensed under a Commons Attribution Non-Commercial 4.0 License

How to cite this article: Dang-Vu T, Lam-Quoc D, Duong-Minh N, Vu H, Nguyen-Ho L, Truong-Thien P, Nguyen-Dang K. The first report of Candida auris infection in Vietnam. *EJCRIM* 2024;**11**:doi:10.12890/2024_004335.

ABSTRACT

Infection caused by *Candida auris* ha *C. auris* s rapidly become a global health threat. *C. auris* created a significant healthcare burden due to various complicating factors, including misidentification by commercial identification methods, potent antifungal resistance, high mortality rates and the possibility of nosocomial outbreaks through direct contact. In Vietnam, there are currently no clinical reports on *C. auris* infections. Here, we present four clinical cases of *C. auris* infections in the Department of Pulmonary Medicine of Cho Ray Hospital in southern Vietnam. Through this report, we aim to highlight the attention to the emergence of *C. auris* in Vietnam. Further research on *C. auris* infections is warranted, focusing on newly observed clinical characteristics present in all cases in this report, including hypoalbuminaemia and corticosteroid usage. Moreover, one case of resistance to amphotericin B has been identified, possibly due to prior exposure to this antifungal agent.

KEYWORDS

Candida auris, sepsis, pneumonia, Vietnam

LEARNING POINTS

- Further research on *Candida auris* infections is warranted, focusing on newly observed clinical features present in all cases in this report, including hypoalbuminaemia and corticosteroid use during hospitalisation.
- While *Candida auris* remains susceptible to commonly used antifungal drugs, one case of resistance to amphotericin B has been documented, possibly due to prior exposure to this antifungal agent.

INTRODUCTION

Although *Candida auris* has only emerged in the last 15 years, this hazardous invasive fungal pathogen has rapidly spread to over 40 countries across various continents[1]. Well-known fungal pathogens are recognised for high mortality rates, reaching up to 50% in cases of invasive infections, with

EFIM
European Federation of Internal Medicine

Publisher
smc media srl

90% of deaths related to common fungi such as *Cryptococcus*, *Candida*, *Aspergillus* and *Pneumocystis*[2]. Numerous reports on *C. auris* infections have indicated an increasing trend in candidaemia caused by *C. auris*, with an incidence ranging from 5%–30%[3] and a mortality rate ranging from 30%–60%[1]. The World Health Organization listed *C. auris* as one of the four fungal pathogens in the critical priority group for research, development, and improvement of public health in 2022[4]. *C. auris* has posed a considerable strain on healthcare systems due to multiple complicating factors, such as misidentification through commercial identification methods[5], robust resistance to antifungal drugs, high mortality rates and the potential for nosocomial outbreaks via direct contact[1,5]. To our knowledge, there have been no previous reports of *C. auris* infections in Vietnam. We present four clinical cases of *C. auris* infection identified in the Department of Pulmonary Medicine at Cho Ray Hospital in southern Vietnam.

CASE DESCRIPTION

Although the first case of *C. auris* infection at the Department of Pulmonary Medicine of Cho Ray Hospital was confirmed in

	Case 1	Case 2	Case 3	Case 4
Age/Sex	59/Male	67/Male	73/Male	64/Male
Duration of hospitalisation (days)	37	27	23	73
Previous admission to a lower-level hospital	Yes	Yes	Yes	Yes
Surgery within 30 days or during hospitalisation	Tracheostomy	Tracheostomy	No	Tracheostomy
ICU admission	No	Yes	Yes	Yes
Parenteral nutrition	Yes	Yes	Yes	Yes
Corticosteroid during hospitalisation	Yes	Yes	Yes	Yes
Underlying lung disease	Respiratory failure Pneumonia Post COVID-19	Respiratory failure Pneumonia COPD History of TB Bronchiectasis	Respiratory failure Pneumonia COPD	Respiratory failure Pneumonia COPD
Underlying cardiac disease	Hypertension	Hypertension	Ischaemic heart disease Pulmonary embolism	No
Underlying liver disease	No	No	No	Acute hepatitis B
Other underlying condition	Myelodysplastic syndromes Neutropenia Malnutrition Hypoalbuminaemia	Functional bowel obstruction Septic shock Cushing syndrome Hypoalbuminaemia	Acute kidney failure Cushing syndrome Hypoalbuminaemia	Acute kidney failure Malnutrition Cushing syndrome Hypoalbuminaemia
Central venous catheter	No	Yes	Yes	No
Endotracheal tube	No	Yes	Yes	Yes
Gastric tube	Yes	Yes	No	Yes
Urinary catheter	Yes	Yes	No	No
Time from admission to positive culture results for *C. auris* (days)	22	31	25	10
Specimen positive for *C. auris*	Blood	Blood	Urine	Sputum, stool
***C. auris* antifungal susceptibility testing (MIC, µg/ml)**				
Fluconazole **Caspofungin** **Amphotericin B**	4 (S) 0.5 (S) 0.25 (S)	1 (S) 0.06 (S) 32 (R)	1 (S) 0.25 (S) 0.06 (S)	2 (S) 0.25 (S) 0.5 (S)
Antifungal use before the isolation of *C. auris*	No	Fluconazole Amphotericin B	No	No
Antifungal treatment after *C. auris* isolation	Caspofungin	Discharge before obtaining the result	Discharge before obtaining the result	Caspofungin
Other pathogen/ specimen	*P. aeruginosa* (sputum) *C. albicans* (sputum)	*C. tropicalis* (urine) *P. aeruginosa* (sputum) *C. tropicalis* (sputum) *Strongyloides stercoralis* (stool)	No	*K. pneumonia* (sputum) *A. baumannii* (sputum) *C. glabrata* (stool)
Outcome	Survived	Died	Died	Survived

Abbreviations: ICU, intensive care unit; COPD, chronic obstructive pulmonary disease; TB, tuberculosis; MIC, minimum inhibitory concentration; S, susceptible; R, resistant.

Table 1. The clinical details of four patients infected with Candida auris.

2020, we did not document any additional cases from 2020 to November 2022. However, since the second isolation of *C. auris* in November 2022, from November 2022 to May 2023, the Department of Pulmonary Medicine has documented four cases of *C. auris* infection. The clinical details of the four cases are outlined in *Table 1*.

All patients were males aged between 59 and 73, with hospital stays ranging from 23 to 73 days. All four cases shared common features, including prior admission to a lower-level hospital (100%), tracheostomy (75%), intensive care unit (ICU) admission (75%) and parenteral nutrition (100%). All four cases were diagnosed with pneumonia, respiratory failure and hypoalbuminaemia. Other known risk factors for invasive *Candida* infection include myelodysplastic syndromes with neutropenia (25%), malnutrition (50%) and having invasive medical devices (100%) (including central venous catheter, endotracheal tube, gastric tube, or urinary catheter).

Fifty per cent of *C. auris* infections were candidaemia. *C. auris* was identified using VITEK® 2 Compact (bioMérieux, France) and confirmed by matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS) (bioMérieux, France). This demonstrated sensitivity to fluconazole (minimum inhibitory concentration (MIC) by ETEST ranging from 1.0 to 4.0 µg/ml) and caspofungin (MIC ranging from 0.06 to 0.5 µg/ml). Resistance to amphotericin B was noted in one case, with an MIC of 32 µg/ml, possibly due to prior exposure to this antifungal agent. We utilised the following MIC breakpoints to establish resistance to antifungal drugs, including ≥32 µg/ml for fluconazole, ≥2 µg/ml for caspofungin and ≥2 µg/ml for amphotericin B[6]. Caspofungin was the first choice for treatment; however, the mortality rate was 50%.

DISCUSSION

This case report is believed to be the first on *C. auris* infections in Vietnam, indicating that this pathogen is likely to pose a significant medical challenge due to prolonged hospital stays (23–73 days), a high mortality rate (50%), delayed diagnosis (10–31 days after admission) and a low rate of antifungal prophylaxis use (75%). This highlights the need for epidemiological studies on *C. auris* in Vietnam in the future.

Although limited by the number of patients in this report, we observed that over 75% of the patients had tracheostomy, previous admission to a lower-level hospital, parenteral nutrition, chronic obstructive pulmonary disease, corticosteroid during hospitalisation, Cushing syndrome, hypoalbuminaemia and invasive medical devices. Many studies have shown that risk factors for *C. auris* infection include kidney failure, prolonged hospital stay, invasive mechanical ventilation use[4], urinary catheterisation (61–75.7%)[7,8], central venous catheterisation (25–100%)[5,9], total parenteral nutrition (47–100%)[8], surgery (25–77%)[5], diabetes (41%)[7], antifungal use within 30–90 days (41%)[7,8] and corticosteroid use during hospitalisation (24%)[7]. A study of 27 ICUs in India concluded that the time spent in the ICU before being diagnosed with candidaemia is significantly longer for *C. auris* (median 25 days) compared to other non-*C. auris* (median 15 days)[8]. Our study also indicates similar findings regarding risk factors for *C. auris* infection as observed previously, except for the high rate of patients with tracheostomy and hypoalbuminaemia. We hypothesise that *C. auris* may be capable of biofilm formation at the tracheostomy tube[5], leading to prolonged infection. In the fourth clinical case, a second surgery to replace the tracheostomy tube was performed, resulting in favourable outcomes. Moreover, albumin might contribute to preventing the invasion of *C. auris* into the bloodstream[10]. More studies are needed to clarify the roles of tracheostomy and hypoalbuminaemia in *C. auris* infection.

The MALDI-TOF MS method is recommended for identifying *C. auris*[5]. Although much remains unclear about the mechanisms of antifungal resistance, *C. auris* is strongly resistant to common antifungal drugs including azoles, echinocandins and amphotericin B. Data from three major studies by Chow et al.[11], Lockhart et al.[7] and Rudramurthy et al.[8] showed resistance rates of *C. auris* to fluconazole ranging from 58.1% to 93% and to amphotericin B from 13.5% to 35%. Resistance rates to voriconazole were from 2.7% to 54%, micafungin 7%, caspofungin 9.5%, with 23% to 41% resistance to at least two major antifungal classes, and 1% to 4% resistance to all three major antifungal classes. In this report, despite *C. auris* remaining susceptible to antifungal drugs (with only one case showing resistance to amphotericin B), the mortality rate remains high (50%). All reported deaths yielded positive results for *C. auris* after the patients died. In case 2, the emergence of amphotericin B resistance following prior exposure raised concerns about the rapid occurrence of drug resistance in *C. auris*[1,5]. Cases of echinocandin resistance without prior exposure to echinocandin were reported, suggesting potential inter-patient transmission[7]. Therefore, although the mechanisms of antifungal resistance in *C. auris* are complex, echinocandins are considered the first-line choice in treatment.

CONCLUSION

This case report represents the first regarding *Candida auris* infections in Vietnam. Further research is essential, particularly on the role of hypoalbuminaemia and corticosteroid use during hospitalisation in *Candida auris* infection. Moreover, the identification of resistance to amphotericin B in one case raises concerns, suggesting a potential link to prior exposure to this antifungal agent.

REFERENCES

1. Chowdhary A, Jain K, Chauhan N. Candida auris genetics and emergence. *Annu Rev Microbiol* 2023;**77**:583–602.
2. Brown GD, Denning DW, Gow NAR, Levitz SM, Netea MG, White TC. Hidden killers: human fungal infections. *Sci Transl Med* 2012;**4**:165rv113.
3. Cortegiani A, Misseri G, Fasciana T, Giammanco A, Giarratano A, Chowdhary A. Epidemiology, clinical characteristics, resistance, and treatment of infections by Candida auris. *J Intensive Care* 2018;**6**:69.
4. World Health Organization: WHO fungal priority pathogens list to guide research, development and public health action. [Internet]. Available at: https://www.who.int/publications/i/item/9789240060241 Geneva: World Health Organization; 2022.
5. Chowdhary A, Sharma C, Meis JF. Candida auris: a rapidly emerging cause of hospital-acquired multidrug-resistant fungal infections globally. *PLoS Pathog* 2017;**13**:e1006290.
6. Centers for Disease Control and Prevention. Antifungal susceptibility testing and interpretation 2024 [Internet] [cited 2024 Jan 29]. Available from:https://www.cdc.gov/fungal/candida-auris/c-auris-antifungal.html.
7. Lockhart SR, Etienne KA, Vallabhaneni S, Farooqi J, Chowdhary A, Govender NP, et al. Simultaneous emergence of multidrug-resistant Candida auris on 3 continents confirmed by whole-genome sequencing and epidemiological analyses. *Clin Infect Dis* 2017;**64**:134–140.
8. Rudramurthy SM, Chakrabarti A, Paul RA, Sood P, Kaur H, Capoor MR, et al. Candida auris candidaemia in Indian ICUs: analysis of risk factors. *J Antimicrob Chemother* 2017;**72**:1794–1801.
9. Calvo B, Melo ASA, Perozo-Mena A, Hernandez M, Francisco EC, Hagen F, et al. First report of Candida auris in America: clinical and microbiological aspects of 18 episodes of candidemia. *J Infect* 2016;**73**:369–374.
10. Sakai J. 1723. Human serum albumin regulates the growth of Candida auris in vitro. *Open Forum Infect Dis* 2019;**6**(Suppl 2):S631–S632.
11. Chow NA, Muñoz JF, Gade L, Berkow EL, Li X, Welsh RM, et al. Tracing the evolutionary history and global expansion of Candida auris using population genomic analyses. *mBio* 2020;**11**:e03364–19.