

Source details

Journal of the Egyptian Women's Dermatologic Society

Open Access ⓘ

Scopus coverage years: from 2015 to 2022

Publisher: Wolters Kluwer Health

ISSN: 1687-1537 E-ISSN: 2090-2565

Subject area: Medicine: Dermatology

Source type: Journal

CiteScore 2021
0.5

ⓘ

SJR 2021
0.168

ⓘ

SNIP 2021
0.284

ⓘ

[View all documents >](#)

[Set document alert](#)

 [Save to source list](#) [Source Homepage](#)

[CiteScore](#) [CiteScore rank & trend](#) [Scopus content coverage](#)

i Improved CiteScore methodology ✕

CiteScore 2021 counts the citations received in 2018-2021 to articles, reviews, conference papers, book chapters and data papers published in 2018-2021, and divides this by the number of publications published in 2018-2021. [Learn more >](#)

CiteScore 2021 ▼

$$0.5 = \frac{56 \text{ Citations 2018 - 2021}}{123 \text{ Documents 2018 - 2021}}$$

Calculated on 05 May, 2022

CiteScoreTracker 2022 ⓘ

$$0.4 = \frac{55 \text{ Citations to date}}{128 \text{ Documents to date}}$$

Last updated on 05 January, 2023 • Updated monthly

CiteScore rank 2021 ⓘ

Category	Rank	Percentile
Medicine		
Dermatology	#103/126	18th

[View CiteScore methodology >](#) [CiteScore FAQ >](#) [Add CiteScore to your site !\[\]\(dcadc17c064c775919616fcc152162e9_img.jpg\)](#)

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

ELSEVIER

[Terms and conditions ↗](#) [Privacy policy ↗](#)

Copyright © Elsevier B.V. ↗ . All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies ↗.





Journal of the Egyptian Women's Dermatologic Society

COUNTRY

[United States](#)



Universities and research
institutions in United States

SUBJECT AREA AND CATEGORY

[Medicine](#)
[Dermatology](#)

PUBLISHER

[Wolters Kluwer Medknow
Publications](#)

H-INDEX

5

PUBLICATION TYPE

[Journals](#)

ISSN

16871537, 20902565

COVERAGE

2015-2021

INFORMATION

[Homepage](#)

[How to publish in this journal](#)

SCOPE

The Journal of The Egyptian Women's Dermatologic Society (JEWDS) was founded by Professor Zenab M.G. El-Gothamy. JEWDS is published three times per year in January, May and September. Original articles, case reports, correspondence and review articles submitted for publication must be original and must not have been published previously or considered for publication elsewhere. Their subject should pertain to dermatology or a related scientific and technical subject within the field of dermatology.

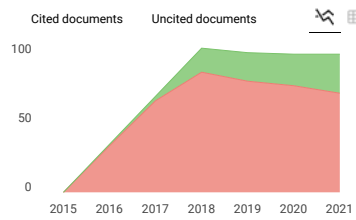
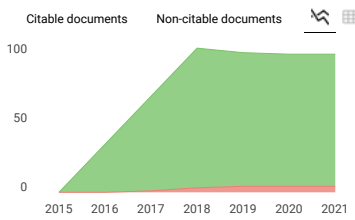
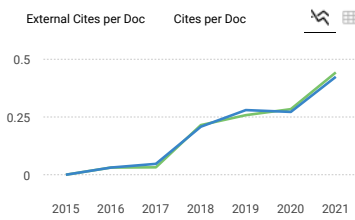
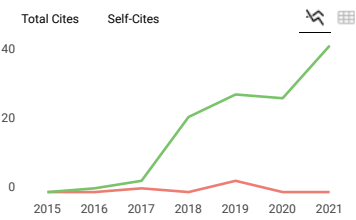
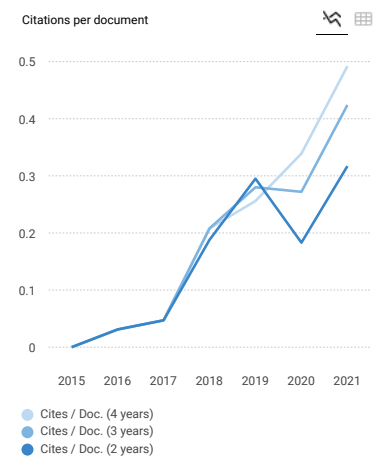
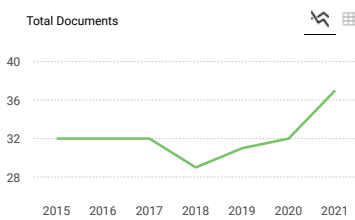
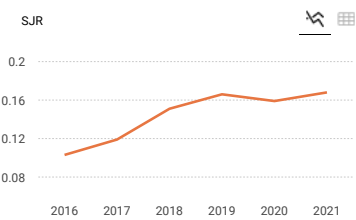


Join the conversation about this journal

FIND SIMILAR JOURNALS ?

options

<p>1</p> <p>Dermatologic Therapy</p> <p>GBR</p> <p>78% similarity</p>	<p>2</p> <p>International Journal of Dermatology</p> <p>GBR</p> <p>77% similarity</p>	<p>3</p> <p>European Journal of Dermatology</p> <p>FRA</p> <p>76% similarity</p>	<p>4</p> <p>Dermatology</p> <p>CHE</p> <p>75% similarity</p>	<p>5</p> <p>Dermatology Research and Practice</p> <p>EGY</p> <p>75% similarity</p>
---	---	--	--	--



Journal of the Egyptian Women's Dermatologic Society

Q4

SJR 2021 0.17

powered by scimagojr.com

Show this widget in your own website

Just copy the code below and paste within your html code:

```
<a href="https://www.scimagojr.com" data-bbox="193 811 293 823">
```

SCImago Graphica

Explore, visually communicate and make sense of data with our [new data visualization tool](#).



Metrics based on Scopus® data as of April 2022

Leave a comment

Name

Email
(will not be published)

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Developed by:



Powered by:



Follow us on @ScimagoJR

Scimago Lab, Copyright 2007-2022. Data Source: Scopus®

EST MODUS IN REBUS
1996-2022


[Edit Cookie Consent](#)



Table of Contents

[Next Issue](#)

[Previous Issue](#)



January-April 2022
Volume 19 | Issue 1
Page Nos. 1-71

Online since Sunday, January 2, 2022

Accessed 10,291 times.

[View issue as eBook](#)

[Issue statistics](#)

[RSS](#)

[POPULAR ARTICLES](#)


[JOIN AS REVIEWER](#)

[GET EMAIL ALERTS](#)

[RECOMMEND](#)

[Show all abstracts](#) [Show selected abstracts](#) [Export selected to](#) [Add to my list](#)

REVIEW ARTICLE



Acne on pigmented skin p. 1

Stefano Veraldi, Andrea G Faraci, Gianluca Nazzaro, Mauro Barbareschi
DOI:10.4103/jewd.jewd_39_21

[\[ABSTRACT\]](#) [\[HTML Full text\]](#) [\[PDF\]](#) [\[Mobile Full text\]](#) [\[EPub\]](#) [\[Sword Plugin for Repository\]](#)^{Beta}


ORIGINAL ARTICLES



Subjective versus objective recognition of facial vitiligo lesions: detection of subclinical lesions by Wood's light p. 7

Tag S Anbar, Mona A Atwa, Rasha T Abdel-Aziz, Rehab A Hegazy, Sarah I Ibrahim, Rabab M El Genedy, Ahmed A Afify, Mohammed T Anbar, Carmen I Farid
DOI:10.4103/jewd.jewd_42_21


[\[ABSTRACT\]](#) [\[HTML Full text\]](#) [\[PDF\]](#) [\[Mobile Full text\]](#) [\[EPub\]](#) [\[Sword Plugin for Repository\]](#)^{Beta}



Evaluation of vitamin D and vitamin D-binding protein levels and vitamin D receptor expression in basal cell carcinoma: a case-control study p. 14

Noha Abdel-Rahim Nagui, Marwa A Saleh, Sherien M El-Daly, Nohha H Khater, Dina A El Sharkawy
DOI:10.4103/jewd.jewd_33_21

[\[ABSTRACT\]](#) [\[HTML Full text\]](#) [\[PDF\]](#) [\[Mobile Full text\]](#) [\[EPub\]](#) [\[Sword Plugin for Repository\]](#)^{Beta}



Conventional and molecular diagnostics for detection of causative fungi in clinical samples of human dermatomycosis p. 21

Khaled M Tawfik, Refaat R Mohammed, Ali Sobhy, Asmaa S Shaltout
DOI:10.4103/jewd.jewd_38_21

[\[ABSTRACT\]](#) [\[HTML Full text\]](#) [\[PDF\]](#) [\[Mobile Full text\]](#) [\[EPub\]](#) [\[Sword Plugin for Repository\]](#)^{Beta}



Limitations of dermoscopy in detecting distal and lateral subungual onychomycosis among patients with severely dystrophic nail psoriasis p. 31

Mohamed H.M. El-Komy, Sara H Aboelmagd, Haidy S Khalil, Reem M Abdelrahman, Nermeen I Bedair
DOI:10.4103/jewd.jewd_43_21


[\[ABSTRACT\]](#) [\[HTML Full text\]](#) [\[PDF\]](#) [\[Mobile Full text\]](#) [\[EPub\]](#) [\[Sword Plugin for Repository\]](#)^{Beta}



Evaluation of serum selenium levels in patients with multiple warts: a case-control study in the north of Iran p. 39

Narges Alizadeh, Rana Rafiei, Abbas Darjani, Hojat Eftekhari, Kaveh Gharaei Nejad, Elahe Rafiei, Meghdad Nasiri
DOI:10.4103/jewd.jewd_37_21

[\[ABSTRACT\]](#) [\[HTML Full text\]](#) [\[PDF\]](#) [\[Mobile Full text\]](#) [\[EPub\]](#) [\[Sword Plugin for Repository\]](#)^{Beta}



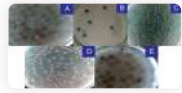
Transforming growth factor-beta and microRNA-21, microRNA-29b, microRNA-92, and microRNA-129 in systemic sclerosis patients: a case-control study p. 44



Mohammed Hassan Mohammed, Olfat G Shaker, Talal A.Abd El-Raheem, Alaa Abdulkhaleq, Basma H Khater
DOI:10.4103/jewd.jewd_50_21

[ABSTRACT] [HTML Full text] [PDF] [Mobile Full text] [EPub] [Sword Plugin for Repository]^{Beta}

Association between etiologic species with CD4 count and clinical features of oral candidiasis among HIV/AIDS patients p. 51



Dwi Murtiastutik, Cita R.S. Prakoeswa, Indah S Tantular, Muhammad Yulianto Listiawan, Afif N Hidayati, Evy Ervianti, Lunardi Bintanjoyo

DOI:10.4103/jewd.jewd_44_21

[ABSTRACT] [HTML Full text] [PDF] [Mobile Full text] [EPub] [Sword Plugin for Repository]^{Beta}

Mucocutaneous manifestations in patients with chronic kidney disease: a cross-sectional hospital-based study from North-East India p. 58



Hitesh S Khatri, Pankaj Adhicari, Manzoor A Parry, Manjuri Sharma

DOI:10.4103/jewd.jewd_55_21

[ABSTRACT] [HTML Full text] [PDF] [Mobile Full text] [EPub] [Sword Plugin for Repository]^{Beta}

CASE REPORT



Wilson-Jones angiosarcoma of the scalp associated with alopecia and chest edema: a case report p. 66

Galal El Enany, Noha Nagui, Hanan Nada, Marwa M Fawzy, Iman Sany, Suzan Shalaby, Omar El Ghanam

DOI:10.4103/jewd.jewd_46_21

[ABSTRACT] [HTML Full text] [PDF] [Mobile Full text] [EPub] [Sword Plugin for Repository]^{Beta}

QUIZ



What is your diagnosis?

p. 70

Mohamed H.M. El-Komy

DOI:10.4103/jewd.jewd_49_21

[HTML Full text] [PDF] [Mobile Full text] [EPub] [Sword Plugin for Repository]^{Beta}



[About](#) ↕

[Articles](#) ↕

[Authors](#) ↕

[Search](#) ↕

[Contact Us](#)

[Reader Login](#) ↕

Editorial Board

[About the journal](#)

[POPULAR ARTICLES](#)

[JOIN AS REVIEWER](#)

[GET EMAIL ALERTS](#)

[RECOMMEND](#)

Editor in chief:

Nayera Hassan Moftah, MD, DTQM, DHPE
Ex Dean of Faculty of Medicine for Girls, Al-Azhar University,
Professor of Dermatology and Venereology,
Department of Dermatology and Venereology,
Faculty of medicine for Girls, Al-Azhar University, Cairo, Egypt.
E mail: nayeramoftah@azhar.edu.eg & nayeramoftah@hotmail.com
Cell phone: +201222117774

Associate Editors (alphabetically):

Amira A. Eid, MD
Associate Professor of Dermatology and Venereology,
Department of Dermatology and Venereology,
Faculty of medicine, Alexandria University, Alexandria, Egypt
E mail: amira.eid@alexmed.edu.eg & dramiraeid@yahoo.co.uk

Mona R. E. Abdel-Halim, MD, ICDP-UEMS
Professor of Dermatology, Department of Dermatology, Faculty of medicine, Cairo University, Cairo, Egypt
E mail: abdelhalimmona@gmail.com

Nermeen S.A. Abdel Fattah, MD
Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of medicine, Ain Shams University,
Cairo, Egypt
E mail: nermeensamy2000@med.asu.edu.eg

Noha A. Nagui, MD
Professor of Dermatology, Department of Dermatology, Faculty of medicine, Cairo University, Cairo, Egypt
E mail: nohanagui@kasralainy.edu.eg

Rania M. Abdel Hay, MD
Professor of Dermatology, Department of Dermatology, Faculty of medicine, Cairo University, Cairo, Egypt
E mail: raniamounir@kasralainy.edu.eg

Founding Editor

Zenab M. G. El-Gothamy, MD
Professor and Ex Head of Department of Dermatology and Venereology, Ain Shams University, Cairo, Egypt
E mail: elgothamy@hotmail.com

Advisory Board (alphabetically):

Basma Mourad, MD
Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Tanta University, Tanta, Egypt

Carmen I. Farid, MR
Associate professor of Dermatology and Venereology, Department of Dermatology and Venereology, Alexandria University, Alexandria,
Egypt

Enas Attia, MD
Professor of Dermatology, Venereology, Department of Dermatology and Venereology Ain Shams University, Cairo, Egypt

Fatma H. Shabaka, MD
Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine for Girls, Al-Azhar University,
Cairo, Egypt

Galal A. El-Anani, MD
Professor of Dermatology, Department of Dermatology, Cairo University, Cairo, Egypt

Hamza Abd El Raouf, MD
Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Minya University, Minya,
Egypt

Hanan Nada, MD
Professor of Dermatology, Department of Dermatology, Cairo University, Cairo, Egypt

Hoda A. Moneib, MD
Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Ain Shams University,

Cairo, Egypt

Hoda N. Rasheed, MD

Professor of Dermatology, Department of Dermatology, Faculty of Medicine, Cairo University, Cairo, Egypt

Iman A. Seleit, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Menoufiya University, Menoufiya, Egypt

Khalid H. El-Hoshi, MD

Professor of Dermatology, Department of Dermatology and Venereology, Faculty of Medicine, Cairo University, Cairo, Egypt

Maha A. Shaheen, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Mahira H. El-Sayed, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Ain Shams University, Cairo, Egypt

May H. Elsamahy, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Medhat A. El-Mofty, MD

Professor of Dermatology, Department of Dermatology, Cairo University, Cairo, Egypt

Moetaz El-Domyati, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Minya University, Minya, Egypt

Mohamed Medhat El-Komy, MD

Professor of Dermatology, Department of Dermatology, Cairo University, Cairo, Egypt

Mohamed A. Habib, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Nadia Saleh, MD

Professor of Dermatology, Department of Dermatology, Faculty of Medicine, Cairo University, Cairo, Egypt

Nagwa H. Abdelaal, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine for Girls, Al-Azhar University, Cairo, Egypt

Nagwa M. Elwan, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Tanta University, Tanta, Egypt

Noha H. Mofteh, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Minya University, Minya, Egypt

Rasha M. Genedy, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Alexandria University, Alexandria, Egypt

Sameh K. Attia, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Minya University, Minya, Egypt

Samia Esmat, MD

Professor of Dermatology, Department of Dermatology, Faculty of Medicine, Cairo University, Cairo, Egypt

Tahra Leheta, MD

Professor of Dermatology, Department of Dermatology, Faculty of Medicine, Cairo University, Cairo, Egypt

Wafaa M. Ramadan, MD

Professor of Dermatology and Venereology, Department of Dermatology and Venereology, Faculty of Medicine, Tanta University, Tanta, Egypt

Wedad Z. Mostafa, MD

Professor of Dermatology, Department of Dermatology, Faculty of Medicine, Cairo University, Cairo, Egypt

Zenab M. G. El-Gothamy, MD

Professor and Ex Head of Department of Dermatology and Venereology, Ain Shams University, Cairo, Egypt

International Advisory Board (alphabetically):

Antonella Tosti, MD

Professor of Dermatology and Cutaneous Surgery at the University of Miami University of Miami, Miami, USA

Ashraf Badawi, MD

Professor of Dermatology, Laser Institute, Cairo University, Egypt

Visiting Professor of Dermatology and Laser applications, Szeged University, Hungary,
Vice President of the European Society for Lasers and energy based Devices "ESLD",
President of the European Society for Cosmetic and Aesthetic Dermatology "ESCAD"

Bassel H. Mahmoud, MD
Associate Professor of Dermatology and Mohs Surgery, University of Massachusetts Medical School, Worcester, MA, USA

Branka Marinovic, MD
Professor and Chair, Department of Dermatology and Venereology, University Hospital Center Zagreb, University of Zagreb School of Medicine, Croatia

Brigitte Dreno, MD
Professor and Head of the Cutaneous Oncology Department and head of the GMP Unit of Cell and Gene Therapy at Nantes University Hospital in France

Carmen Rodríguez-Cerdeira, MD
Consultor senior of Dermatology, University of Vigo, Vigo, Spain.

Christos C. Zouboulis, MD
Prof. and Director of the Departments of Dermatology, Venereology, Allergology and Immunology, Dessau Medical Center, Dessau, Germany

Dedee Murrell, MD
Professor and director of Dermatology at the St George Hospital, University of New South Wales, Sydney, Australia

Devinder M Thappa, MD, DHA, FRCP (Edin), FRCP (Glasg), FAMS, FIMSA,
Professor Senior Scale,
Dermatology and STD Department,
Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER),
Puducherry-605006, India

Dorothee Nashan, MD
Professor and Head of Department of Dermatology, Klinikum Dortmund, Germany

Gabriella Fabbrocini, MD
Professor of Dermatology, University of Naples Federico II, Naples, Italy

Gerd Plewig, MD
Professor of Dermatology, Department of Dermatology and Allergology
Ludwig-Maximilians-University of Munich, Munich, Germany

Neil Sadick, MD FAAD, FAACS, FACP, FACP
Professor in Weill Cornell Medical College, New York, USA

Sonia Stander, MD
Professor for Dermatology and Neurodermatology at the University Hospital Münster, Germany

Stefano Veraldi, MD
Professor of Dermatology, University of Milan, Milan, Italy

Valerie Callender, MD, FAAD
Professor of Dermatology at the College of Medicine, Howard University, Washington, D.C., USA



Go

[Advanced Search](#)

• Users Online: 44



- [About](#)
- [Articles](#)
- [Authors](#)
- [Search](#)
- [Contact Us](#)
- [Login](#)
 - [Sign Up](#)

[View optimized website for mobile devices](#)

Search

GO

[Similar in PUBMED](#)

Search Pubmed for

- [Murtiastutik D](#)
- [Prakoewa CR](#)
- [Tantular IS](#)
- [Listiawan MY](#)
- [Hidayati AN](#)
- [Ervianti E](#)
- [Bintanjoyo L](#)

Search in Google Scholar for

- [Murtiastutik D](#)
- [Prakoewa CR](#)
- [Tantular IS](#)
- [Listiawan MY](#)
- [Hidayati AN](#)
- [Ervianti E](#)
- [Bintanjoyo L](#)

Related articles

- [AIDS](#)
- [Candida albicans](#)
- [candidiasis](#)
- [CD4 counts](#)
- [HIV](#)

[Access Statistics](#)

[Email Alert](#) *

[Add to My List](#) *

* Registration required (free)

In this article

[Abstract](#)

[Introduction](#)

[Patients and methods](#)

[Results](#)

[Discussion](#)

[References](#)

[Article Figures](#)

[Article Tables](#)

Article Access Statistics

Viewed	742
Printed	26
Emailed	0

[◀ Previous Article](#) [ToC](#) [Next Article ▶](#)

ORIGINAL ARTICLE

Year : 2022 | Volume : 19 | Issue : 1 | Page : 51-57

Association between etiologic species with CD4 count and clinical features of oral candidiasis among HIV/AIDS patients

[Dwi Murtiastutik](#) ^{MD, PhD} ¹, [Cita R.S. Prakoewa](#) ¹, [Indah S Tantular](#) ², [Muhammad Yulianto Listiawan](#) ¹, [Afif N Hidayati](#) ³, [Evy Ervianti](#) ¹, [Lunardi Bintanjoyo](#) ¹

¹ Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo General Hospital, Surabaya, Indonesia

² Department of Parasitology, Faculty of Medicine, Universitas Airlangga, Surabaya; Institute of Tropical Disease, Universitas Airlangga, Surabaya, Indonesia

³ Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo General Hospital, Surabaya; Universitas Airlangga Teaching Hospital, Surabaya, Indonesia

Date of Submission 10-Dec-2020

Date of Decision 15-Aug-2021

Date of Acceptance 23-Aug-2021

Date of Web Publication 02-Jan-2022



Correspondence Address:

Dwi Murtiastutik

Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga, Dr Soetomo General Hospital, Jalan Mayjen Prof. Dr Moestopo No. 6-8, Surabaya 60285, East Java Indonesia

Login to access the email ID

Source of Support: None, **Conflict of Interest:** None

DOI: 10.4103/jewd.jewd_44_21



Abstract

Background Oral candidiasis (OC) is an oral mucosal disorder due to *Candida* genus. Its predisposing factor among patients with HIV/AIDS is mainly decreasing CD4 count. OC is commonly caused by *Candida albicans*. As CD4 decreases, the shift to *C. non-albicans* has been observed.

Objective To evaluate the association of *Candida* species with CD4 count and clinical features in HIV/AIDS patients with OC.

Patients and methods This is a cross-sectional study. A total of 114 oral rinse solution samples from HIV/AIDS patients with OC were collected. *Candida* species identification was done by culture in Chromagar followed by VITEK 2. The

association of *Candida* species with CD4 count and clinical features was analyzed using Pearson's χ^2 and Kruskal–Wallis tests.

Results There was growth of 149 isolates in culture from 114 patients. *C. albicans* was found in 104 (69.7%) isolates. *Candida* non-*albicans* were found in 45 (30.3%) isolates, namely *Candida krusei* in 22 (14.85%), *Candida glabrata* in 12 (8.1%), *Candida tropicalis* in six (4.05%), *Candida dubliniensis* in two (1.3%), *Candida parapsilosis* in two (1.3%), and *Candida lipolytica* in one (0.7%) isolate. *Candida* species was significantly associated with clinical types, episode types, pain on swallowing, CD4 count, and antiretroviral (ARV) use among all patients.

Conclusion Among HIV/AIDS patients with OC, growth of *C. albicans* only was more common in higher CD4 count, while mixed growth of *C. albicans* and *C. non-albicans* was more common in lower CD4 count. Clinical features associated with growth of *C. albicans* only were pseudomembranous type, recurrent OC, absence of pain on swallowing, and patients on ARV, whereas those associated with mixed growth of *C. albicans* and *C. non-albicans* were cheilitis type, first-episode OC, presence of pain on swallowing, and ARV-naïve patients.

Keywords: AIDS, *Candida albicans*, candidiasis, CD4 counts, HIV

How to cite this article:

Murtiastutik D, Prakoeswa CR, Tantular IS, Listiawan MY, Hidayati AN, Ervianti E, Bintanjoyo L. Association between etiologic species with CD4 count and clinical features of oral candidiasis among HIV/AIDS patients. *J Egypt Womens Dermatol Soc* 2022;19:51-7

How to cite this URL:

Murtiastutik D, Prakoeswa CR, Tantular IS, Listiawan MY, Hidayati AN, Ervianti E, Bintanjoyo L. Association between etiologic species with CD4 count and clinical features of oral candidiasis among HIV/AIDS patients. *J Egypt Womens Dermatol Soc* [serial online] 2022 [cited 2023 Jan 16];19:51-7. Available from: <http://www.jewd.eg.net/text.asp?2022/19/1/51/334709>

PDF Downloaded 102
Comments [\[Add\]](#)



Introduction

Oral candidiasis (OC) is an oral mucosal disorder due to *Candida* genus [1], and an independent predictor of immunodeficiency in AIDS patients [2]. The predisposing factor for OC among HIV/AIDS patients is mainly decreasing CD4 count [1]. OC is commonly caused by *Candida albicans*. As CD4 decreases, the shift to *C. non-albicans* like *Candida tropicalis*, *Candida glabrata*, and *Candida krusei* has been observed recently [2]. *Candida* species has been associated also with other features such as antiretroviral (ARV) use among HIV/AIDS patients with OC [3],[4]. This study evaluates the association of *Candida* species with CD4 count and clinical features among HIV/AIDS patients with OC.

Patients and methods

This was an observational analytical cross-sectional study. The participants in this study were HIV/AIDS patients who visited our institution and had OC opportunistic infections. Diagnosis of HIV/AIDS was done by rapid test/HIV three methods using Fokus (PT Fokus Diagnostic Indonesia, Jakarta Selatan, Indonesia), InTec (InTec Product Inc., Xiamen, China), and VIKIA (Biomérieux, SA, Marcy l'Etoile, France). Diagnosis of OC was based on clinical examination and 10–20% KOH examinations, followed by culture in Chromagar media (Becton Dickinson and Company, Franklin Lakes, New Jersey, USA) with subsequent culture in VITEK 2 (Biomérieux). CD4 T-lymphocyte count was evaluated with BD FACSCalibur device (Becton, Dickinson and Company, Franklin Lakes, New Jersey, USA).

The inclusion criteria were male or female patients and above 18 years of age. Patients who have or have not taken ARV were included in this study. The exclusion criteria were patients with no growth of fungal colony in the culture, history of other immunosuppressive diseases, consumption of antifungal medications within 3 months before the study, immunosuppressive medications, prolonged antibiotics or contraceptives, and dental caries. Patients who agreed to take part in the study received explanation about the study and gave informed consents. Ethical clearance has been given by the Health Research Ethics Committee of our institution with number of 1129/KEPK/IV/2019, dated April 20, 2019.

The patients were grouped based on CD4 T-lymphocyte level into three groups: patients with CD4 T-lymphocyte level of 1–100 cells/ μ l, CD4 T-lymphocyte level of 101–200 cells/ μ l, and CD4 T-lymphocyte level more than 200 cells/ μ l. Each group had 38 patients and the total sample was 114 patients. Samples were taken by consecutive sampling from patients fulfilling the inclusion criteria, until the required number of samples for each group was fulfilled.

The study commenced on May 2019 until 114 patients were obtained. Samples were taken from oral rinse solutions collected by asking patients to gargle using 25 ml of sterile aquadest, which were then stored in a sterile container and sealed, labeled with the identity of the patient, date and time of collection, and sent to the laboratory. Fungal culture is done in Chromagar media ([Figure 1]). In order to identify the species of *Candida*, subsequent culture was done in VITEK 2.



Figure 1 *Candida* colonies in Chromagar: (a) *Candida albicans* (green) and *Candida glabrata* (baby purple), (b) *C. albicans* (green) and *Candida parapsilosis* (white), (c) *C. albicans* (green), (d) *C. albicans* (green) and *Candida krusei* (pink), (E) *Candida tropicalis* (prussian blue).

[Click here to view](#)

Statistical analysis

The results were analyzed with SPSS, version 17 (IBM, Armonk, New York, USA). Pearson's χ^2 test was used to analyze the association between *Candida* species and sex, clinical types, episode types, pain on swallowing, CD4 count, and ARV use. Kruskal–Wallis test were used to analyze the association between *Candida* species and age. A *P* value of <0.05 was considered statistically significant.

Results

This study described 114 patients with OC and HIV/AIDS who fulfilled the inclusion criteria as study participants. The age characteristic of the study patients was mean \pm SD of 36.4 \pm 9.8 years old with range from 18 to 59 years old. There were more male (72.8%) than female patients (27.2%). This study showed chief complaint of whitish patches in the oral cavity in 100 (87.7%) patients, reddish patches in the oral cavity with patches and sores on the corners of the lips in seven (6.2%) patients, whitish and reddish patches in the oral cavity in four (3.5%) patients, and whitish patches in the oral cavity with patches and sores on the corners of the lips in three (2.6%) patients. The most common location was on the tongue in 54 (47.4%) patients, tongue and buccal and palatal mucosa in 49 (43.0%) patients, tongue, buccal, and palatal mucosa and lips in 10 (8.8%) patients, and buccal and palatal mucosa only in one (0.9%) patient. The clinical types of OC were mostly pseudomembranous type ([Figure 2]a), followed by cheilitis type ([Figure 2]b) and acute atrophic type ([Figure 2]c), in 103 (90.4%) patients, 10 (8.8%) patients, and one (0.9%) patient, respectively. Pain on swallowing was absent in 64 (56.1%) patients and present in 50 (43.9%) patients. Most patients had recurrent OC (88 patients, 71.1%), while others had first episode of OC (33 patients, 28.9%) ([Table 1]).



Figure 2 Clinical types of OC: (a) pseudomembranous, (b) cheilitis, (c) acute atrophic.

[Click here to view](#)

Characteristic	n (%)
Age (years)	
Mean	36.4
SD	9.8
Range	18-59
Sex	
Male	83 (72.8)
Female	31 (27.2)
Chief complaint	
Whitish patches in the oral cavity	100 (87.7)
Whitish and reddish patches in the oral cavity	4 (3.5)
Whitish patches in the oral cavity with patches and sores on the corners of the lips	7 (6.2)
Whitish patches in the oral cavity with patches and sores on the corners of the lips	3 (2.6)
Location	
Tongue	54 (47.4)
Tongue and buccal and palatal mucosa	49 (43.0)
Tongue, buccal, and palatal mucosa and lips	10 (8.8)
Buccal and palatal mucosa only	1 (0.9)
Clinical type	
Pseudomembranous	103 (90.4)
Cheilitis	10 (8.8)
Acute atrophic	1 (0.9)
Pain on swallowing	
Absent	64 (56.1)
Present	50 (43.9)
Episode type	
Recurrent	88 (77.2)
First episode	26 (22.8)

Table 1 Clinical features of the study patients

[Click here to view](#)

In this study, all patients grew fungal colonies in culture. There were 149 isolates of *Candida* species from 114 patients. The predominant species in this study was *C. albicans* in 104 (69.7%) isolates. *Candida non-albicans* were found in 45 (30.3%) isolates, namely *C. krusei* in 22 (14.85%), *C. glabrata* in 12 (8.1%), *C. tropicalis* in six (4.05%), *Candida dubliniensis* in two (1.3%), *Candida parapsilosis* in two (1.3%), and *Candida lipolytica* in one (0.7%) of the isolates. Growth of *C. albicans* only was found in 69 patients and *C. non-albicans* only were found in 10 patients. Mixed growth of *C. albicans* and *C. non-albicans* was found in 35 patients. *C. krusei* was found growing alone in nine patients and mixed with *C. albicans* in 13 patients. *C. tropicalis* was found growing alone in one patient and mixed with *C. albicans* in five patients. Other *C. non-albicans* species were found in mixed growth with *C. albicans*, namely *C. glabrata* in 12 patients, *C. dubliniensis* in two patients, *C. parapsilosis* in two patients, and *C. lipolytica* in one patient.

Candida species was significantly associated with clinical types ($P=0.011$), episode types ($P=0.003$), pain on swallowing ($P=0.002$), CD4 count ($P=0.000$), and ARV use ($P=0.004$), but was not significantly associated with sex ($P=0.747$) and age ($P=0.188$) among all patients. *Candida* species was associated with pain on swallowing and CD4 count, regardless of ARV use. *Candida* species was also significantly associated with clinical types among patients on ARV, and with sex among ARV-naive patients ([Table 2]). In general, growth of *C. albicans* only was more common in patients with higher CD4 count, pseudomembranous type and recurrent OC, without pain on swallowing, and patients on ARV, while mixed growth of *C. albicans* and *C. non-albicans* was more common in patients with lower CD4 count, cheilitis type and first episode of OC, presence of pain on swallowing, and ARV-naive patients ([Table 2]).

Characteristic	<i>C. albicans</i>	<i>C. non-albicans</i>	Mixed
Age (years)			
Mean	36.4	36.4	36.4
SD	9.8	9.8	9.8
Range	18-59	18-59	18-59
Sex			
Male	83	31	35
Female	21	14	10
Chief complaint			
Whitish patches in the oral cavity	100	4	4
Whitish and reddish patches in the oral cavity	4	0	0
Whitish patches in the oral cavity with patches and sores on the corners of the lips	7	0	0
Whitish patches in the oral cavity with patches and sores on the corners of the lips	3	0	0
Location			
Tongue	54	0	0
Tongue and buccal and palatal mucosa	49	0	0
Tongue, buccal, and palatal mucosa and lips	10	0	0
Buccal and palatal mucosa only	1	0	0
Clinical type			
Pseudomembranous	103	0	0
Cheilitis	10	0	0
Acute atrophic	1	0	0
Pain on swallowing			
Absent	64	0	0
Present	50	0	0
Episode type			
Recurrent	88	0	0
First episode	26	0	0

Table 2 *Candida* species and associated clinical and laboratory features

[Click here to view](#)

Discussion

OC is the most common opportunistic fungal infection among individuals infected with HIV/AIDS [2]. OC can affect various age groups and sex, from infants to the elderly. Marak and Dhanashree [5] showed that the most affected age group is 51–60-year-old group, which may be due to the low immunity and immunosuppressive diseases. In this study, there were more male than female patients. This is concordant with data from the Health Ministry of the Republic of Indonesia in 2017, which showed that HIV patients were more common in males than females [6]. Ambe *et al.* [7] showed that the prevalence of OC was not significantly associated with sex. In general, there is no difference of the prevalence of OC based on sex, because OC is different from vulvovaginal candidiasis that is influenced by hormonal factor [8],[9]. The age of the patients had mean \pm SD of 36.41 \pm 9.825 years old with range of 17–59 years old. This result may be due to that adults are productive and sexually active, thus engaging in many unsafe sexual practices risky for HIV transmission [10].

OC may be the first sign or symptom of HIV/AIDS disease, and may sometimes be the presenting complaint for patients [11]. *Candida* can spread extensively, directly from the oral cavity to other organs such as the digestive tract and many more [12]. The most common symptom was whitish patches in the oral cavity and the most common locations were

tongue and also mucosa, which correspond to the most common clinical type of OC, pseudomembranous OC [2],[9]. There was no associated pain on swallowing in the majority of patients. Pain on swallowing is a clinical sign that the lesion affects the pharynx and esophagus [9].

In this study, *C. albicans* was the predominant species growing in 104 isolates (69.7%), while *C. non-albicans* were found in 45 (30.3%) isolates, namely *C. krusei*, *C. glabrata*, *C. tropicalis*, *C. dubliniensis*, *C. parapsilosis*, and *C. lipolytica*. This proved that *C. albicans* was still the leading cause of OC, but *Candida non-albicans* began to be identified. Ambe *et al.* [7] showed similar result in which there were more *C. albicans* isolates (60.2%) than *C. non-albicans* (39.8%), and there were similar isolated *Candida non-albicans* species such as *C. glabrata*, *C. krusei*, *C. tropicalis*, and *C. parapsilosis* from HIV patients with OC in Cameroon. A meta-analysis study in sub-Saharan Africa from 2005 to 2015 also showed a prevalence of 33.5% for *C. non-albicans*, the most common among which was *C. glabrata*, followed by *C. krusei* and *C. tropicalis* [13]. Nelwan *et al.* [14] found *C. albicans* in 56.2% and *C. glabrata* in 15.3% of OC in Indonesian HIV/AIDS patients.

Predominance of *C. albicans* in OC among HIV/AIDS patients may be related to the pathogenicity of this species by production of hydrolytic enzymes, presence of multiple-adhesion factor, and ability to convert from yeast form to hyphal form that is crucial for tissue invasion [7]. *C. albicans* also synergistically aided colonization and infection by *C. glabrata*, while it was suppressed by *C. krusei*, which may explain the mixed growth of *C. glabrata* with *C. albicans*, and the growth of *C. krusei* only in some patients of this study [15]. *Candida non-albicans* are considered less virulent than *C. albicans* because of their lower adherence ability to mucosal and endothelial surface, less production of proteinase enzymes, and lack or lower ability to form hyphae [16]. However, increasing prevalence of *Candida non-albicans* is of importance because these species are inherently resistant to widely available fluconazole, resulting in a public health problem among HIV/AIDS population in sub-Saharan Africa [13],[17].

In this study, growth of *C. albicans* only was more common in patients with higher CD4 count, pseudomembranous type and recurrent OC, without pain on swallowing, and patients on ARV, while mixed growth of *C. albicans* and *C. non-albicans* was more common in patients with lower CD4 count, cheilitis type and first episode of OC, presence of pain on swallowing, and ARV-naive patients. Mushi *et al.* [3] found that *C. non-albicans* was increased in patients with low CD4. Substantial immunosuppression in HIV as reflected by low CD4 count may promote the growth of the less-pathogenic *C. non-albicans* and cause OC [3],[13]. Lam-Ubol *et al.* [4] showed that *C. non-albicans* was more common in highly active ARV therapy (HAART)-naive patients, and use of HAART was associated with the decrease of these species. HAART may act directly by inhibition of secretory aspartyl proteinase enzymes needed for growth of Candidal hyphae, and indirectly by improving CD4 levels to reduce *Candida* colonization [18],[19]. Nair and Shetti [20] showed the association between pseudomembranous OC and *C. albicans*. Ribeiro *et al.* [21] found that *C. albicans* was more common in recurrent OC, while *C. non-albicans* was found in primary OC. Although *C. albicans* was the most common cause of esophageal candidiasis [9], Redding *et al.* [22] found that the presence of *C. non-albicans* produced more severe pain on swallowing, as also seen in this study. Previous antifungal treatment increased the prevalence of *C. non-albicans* by exerting positive-selection pressure to these species that were less sensitive to these drugs [15]. Antibiotics use has also been associated with mixed infection by *C. non-albicans* and *C. albicans* [17]. However, intake of those medications has been excluded in this study.

This study has some limitations such as the relatively smaller number of ARV-naive patients and lack of details of ARV therapy. Future studies with larger samples of both patients on ARV and ARV-naive patients, and analysis of the association of duration and types of ARV to *Candida* species, are recommended.

In conclusion, *Candida* species was significantly associated with CD4 count, ARV use, clinical and episode types, and pain on swallowing among HIV/AIDS patients with OC. *C. albicans* was the predominant species, but growth of *C. non-albicans* alone or mixed with *C. albicans* was identified. Mixed growth was more common in lower CD4 count, cheilitis type, first-episode OC, pain on swallowing, and ARV-naive patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Walangare T, Hidayat T, Basuki S. The profile of *Candida* species in oral candidiasis patient with HIV&AIDS infection. *Period Dermatol Venereol* 2014; 26:29–35. †
2. Spalanzani RN, Mattos K, Marques LI, Barros PFD, Pereira PIP, Paniago AMM *et al.* Clinical and laboratorial features of oral candidiasis in HIV-positive patients. *Rev Soc Bras Med Trop* 2018; 51:352–356. †
3. Mushi MF, Mtemisika CI, Bader O, Bii C, Mirambo MM, Groß U *et al.* High oral carriage of non-albicans *Candida* spp. among HIV-infected individuals. *Int J Infect Dis* 2016; 49:185–188. †
4. Lam-Ubol A, Rungsyanont S, Vacharotayangul P, Sappayatosok K, Chankanka O. Oral manifestations, salivary flow rates and *Candida* species in Thai HIV-infected patients. *J Clin Exp Dent* 2019; 11:e138–e145. †
5. Marak MB, Dhanashree B. Antifungal susceptibility and biofilm production of *Candida* spp. isolated from clinical samples. *Int J Microbiol* 2018; 2018:2018. †

6. Direktorat Jenderal Pencegahan dan Pengendalian Penyakit Kementerian Kesehatan Republik Indonesia. Laporan situasi perkembangan HIV-AIDS & PIMS di Indonesia, Januari – Desember 2017. 2018. Available at: [https://siha.kemkes.go.id/portal/files_upload/Laporan_HIV\[3\]_AIDS_TW_4_Tahun_2017__1_.pdf](https://siha.kemkes.go.id/portal/files_upload/Laporan_HIV[3]_AIDS_TW_4_Tahun_2017__1_.pdf). [Accessed June 20, 2020]. †
7. Ambe NF, Longdoh NA, Tebid P, Bobga TP, Nkfusai CN, Ngwa SB *et al*. The prevalence, risk factors and antifungal sensitivity pattern of oral candidiasis in HIV/AIDS patients in Kumba District Hospital, South West Region, Cameroon. *Pan Afr Med J* 2020; 36:1–14. †
8. Suyoso S. Kandidiasis Mukosa. In: Bramono K, Suyoso S, Indriatmi W, Ramali L, Widaty S, Ervianti E, editors. *Dermatomikosis superfisialis pedoman dokter dan mahasiswa kedokteran*. 2nd ed. Jakarta: Badan Penerbit Fakultas Kedokteran Universitas Indonesia; 2013. p. 120–148. †
9. Cassone A, Cauda R. Candida and candidiasis in HIV-infected patients: where commensalism, opportunistic behavior and frank pathogenicity lose their borders. *AIDS* 2012; 26:1457–1472. †
10. Kambu Y, Waluyo A, Kuntarti K. Age people with HIV AIDS (PLWHA) precautions in connection with HIV infection. *J Keperawatan Indonesia* 2016; 19:200–207. †
11. Anwar KP, Malik A, Subhan KH. Profile of candidiasis in HIV infected patients. *Iran J Microbiol* 2012; 4:204–209. †
12. Maheshwari M, Kaur R, Chadha S. Candida species prevalence profile in HIV seropositive patients from a major tertiary care hospital in New Delhi, India. *J Pathog* 2016; 2016:2016. †
13. Mushi MF, Bader O, Taverne-Ghadwal L, Bii C, Groß U, Mshana SE. Oral candidiasis among African human immunodeficiency virus-infected individuals: 10 years of systematic review and meta-analysis from sub-Saharan Africa. *J Oral Microbiol* 2017; 9:1317579. †
14. Nelwan EJ, Indrasanti E, Sinto R, Nurchaida F. Antifungal susceptibility testing in HIV/AIDS patients: a comparison between automated machine and manual method. *Acta Med Indones* 2016; 48:35–40. †
15. Patil S, Majumdar B, Sarode SC, Sarode GS, Awan KH. Oropharyngeal candidosis in HIV-infected patients – an update. *Front Microbiol* 2018; 9:1–9. †
16. Deepa A, Nair BJ, Sivakumar T, Joseph AP. Uncommon opportunistic fungal infections of oral cavity: a review. *J Oral Maxillofac Pathol* 2014; 18:235–243. †
[\[PUBMED\]](#) [\[Full text\]](#)
17. Du X, Xiong H, Yang Y, Yan J, Zhu S, Chen F. Dynamic study of oral Candida infection and immune status in HIV infected patients during HAART. *Arch Oral Biol* 2020; 115:1–6. †
18. Mounika R, Nalabolu GK, Pallavi N, Birajdar SS. Association of oral candidal species with human immunodeficiency virus patients of West Godavari district, Andhra Pradesh – an in vitro study. *J Oral Maxillofac Pathol* 2021; 25:147–153. †
[\[Full text\]](#)
19. Cerqueira DF, Portela MB, Pomarico L, De Araújo Soares RM, De Souza IPR, Castro GF. Oral Candida colonization and its relation with predisposing factors in HIV-infected children and their uninfected siblings in Brazil: the era of highly active antiretroviral therapy. *J Oral Pathol Med* 2010; 39:188–194. †
20. Nair V, Shetti A. Diversity and clinical presentation of Candida species in human immunodeficiency virus patients with oral candidiasis. *Saudi J Oral Sci* 2019; 6:96–100. †
[\[Full text\]](#)
21. Ribeiro ALR, De Alencar Menezes TO, De Melo Alves-Junior S, De Menezes SAF, Marques-Da-Silva SH, Vallinoto ACR. Oral carriage of Candida species in HIV-infected patients during highly active antiretroviral therapy (HAART) in Belém, Brazil. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2015; 120:29–33. †
22. Redding SW, Kirkpatrick WR, Dib O, Fothergill AW, Rinaldi MG, Patterson TF. The epidemiology of non-albicans Candida in oropharyngeal candidiasis in HIV patients. *Spec Care Dent* 2000; 20:178–181. †

Figures

[\[Figure 1\]](#), [\[Figure 2\]](#)

Tables

[\[Table 1\]](#), [\[Table 2\]](#)



© Journal of The Egyptian Women's Dermatologic Society | Published by Wolters Kluwer - [Medknow](#)

- [Sitemap](#)
- [What's New](#)
- [Feedback](#)
- [Disclaimer](#)
- [Privacy Notice](#)

Online since 21st February 2019.

[Editorial and Ethics Policies](#)



Association between etiologic species with CD4 count and clinical features of oral candidiasis among HIV/AIDS patients

Dwi Murtiastutik^a, Cita R.S. Prakoeswa^a, Indah S. Tantular^{b,c}, Muhammad Yulianto Listiawan^a, Afif N. Hidayati^{a,d}, Evy Ervianti^a, Lunardi Bintanjojo^a

^aDepartment of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo General Hospital, Surabaya, Indonesia, ^bDepartment of Parasitology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia, ^cInstitute of Tropical Disease, Universitas Airlangga, Surabaya, Indonesia, ^dUniversitas Airlangga Teaching Hospital, Surabaya, Indonesia

Correspondence to Dwi Murtiastutik, MD, PhD, Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga, Dr Soetomo General Hospital, Jalan Mayjen Prof. Dr Moestopo No. 6-8, Surabaya 60285, East Java, Indonesia. Tel: +62 811 349 849; fax: +62 31 5501709; e-mail: dwimurtiastutik@yahoo.co.id

Received: 10 December 2020

Revised: 15 August 2021

Accepted: 23 August 2021

Published: 2 January 2022

Journal of the Egyptian Women's Dermatologic Society 2022, 19:51–57

Background

Oral candidiasis (OC) is an oral mucosal disorder due to *Candida* genus. Its predisposing factor among patients with HIV/AIDS is mainly decreasing CD4 count. OC is commonly caused by *Candida albicans*. As CD4 decreases, the shift to *C. non-albicans* has been observed.

Objective

To evaluate the association of *Candida* species with CD4 count and clinical features in HIV/AIDS patients with OC.

Patients and methods

This is a cross-sectional study. A total of 114 oral rinse solution samples from HIV/AIDS patients with OC were collected. *Candida* species identification was done by culture in Chromagar followed by VITEK 2. The association of *Candida* species with CD4 count and clinical features was analyzed using Pearson's χ^2 and Kruskal–Wallis tests.

Results

There was growth of 149 isolates in culture from 114 patients. *C. albicans* was found in 104 (69.7%) isolates. *Candida non-albicans* were found in 45 (30.3%) isolates, namely *Candida krusei* in 22 (14.85%), *Candida glabrata* in 12 (8.1%), *Candida tropicalis* in six (4.05%), *Candida dubliniensis* in two (1.3%), *Candida parapsilosis* in two (1.3%), and *Candida lipolytica* in one (0.7%) isolate. *Candida* species was significantly associated with clinical types, episode types, pain on swallowing, CD4 count, and antiretroviral (ARV) use among all patients.

Conclusion

Among HIV/AIDS patients with OC, growth of *C. albicans* only was more common in higher CD4 count, while mixed growth of *C. albicans* and *C. non-albicans* was more common in lower CD4 count. Clinical features associated with growth of *C. albicans* only were pseudomembranous type, recurrent OC, absence of pain on swallowing, and patients on ARV, whereas those associated with mixed growth of *C. albicans* and *C. non-albicans* were cheilitis type, first-episode OC, presence of pain on swallowing, and ARV-naïve patients.

Keywords:

AIDS, *Candida albicans*, candidiasis, CD4 counts, HIV

J Egypt Women's Dermatol Soc 19:51–57

© 2022 Egyptian Women's Dermatologic Society | Published by Wolters Kluwer - Medknow 1687-1537

Introduction

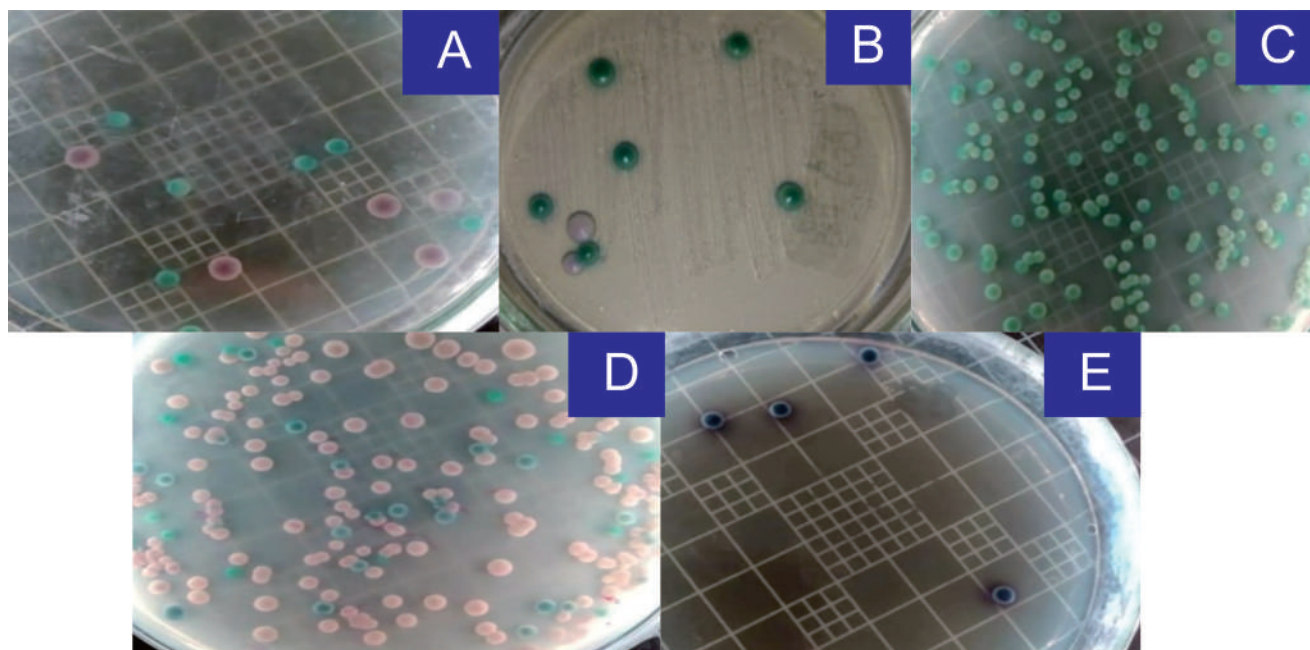
Oral candidiasis (OC) is an oral mucosal disorder due to *Candida* genus [1], and an independent predictor of immunodeficiency in AIDS patients [2]. The predisposing factor for OC among HIV/AIDS patients is mainly decreasing CD4 count [1]. OC is commonly caused by *Candida albicans*. As CD4 decreases, the shift to *C. non-albicans* like *Candida tropicalis*, *Candida glabrata*, and *Candida krusei* has been observed recently [2]. *Candida* species has been associated also with other features such as antiretroviral (ARV) use among HIV/AIDS patients with OC [3,4]. This study evaluates the association of *Candida* species with CD4 count and clinical features among HIV/AIDS patients with OC.

Patients and methods

This was an observational analytical cross-sectional study. The participants in this study were HIV/AIDS patients who visited our institution and had OC opportunistic infections. Diagnosis of HIV/AIDS was done by rapid test/HIV three methods using Fokus (PT Fokus Diagnostic Indonesia, Jakarta Selatan, Indonesia), InTec (InTec Product Inc., Xiamen, China), and VIKIA (Biomérieux, SA, Marcy l'Etoile, France). Diagnosis of OC was based on

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Figure 1



Candida colonies in Chromagar: (a) *Candida albicans* (green) and *Candida glabrata* (baby purple), (b) *C. albicans* (green) and *Candida parapsilosis* (white), (c) *C. albicans* (green), (d) *C. albicans* (green) and *Candida krusei* (pink), (E) *Candida tropicalis* (prussian blue).

clinical examination and 10–20% KOH examinations, followed by culture in Chromagar media (Becton Dickinson and Company, Franklin Lakes, New Jersey, USA) with subsequent culture in VITEK 2 (Biomérieux). CD4 T-lymphocyte count was evaluated with BD FACSCalibur device (Becton, Dickinson and Company, Franklin Lakes, New Jersey, USA).

The inclusion criteria were male or female patients and above 18 years of age. Patients who have or have not taken ARV were included in this study. The exclusion criteria were patients with no growth of fungal colony in the culture, history of other immunosuppressive diseases, consumption of antifungal medications within 3 months before the study, immunosuppressive medications, prolonged antibiotics or contraceptives, and dental caries. Patients who agreed to take part in the study received explanation about the study and gave informed consents. Ethical clearance has been given by the Health Research Ethics Committee of our institution with number of 1129/KEPK/IV/2019, dated April 20, 2019.

The patients were grouped based on CD4 T-lymphocyte level into three groups: patients with CD4 T-lymphocyte level of 1–100 cells/ μ l, CD4 T-lymphocyte level of 101–200 cells/ μ l, and CD4 T-lymphocyte level more than 200 cells/ μ l. Each group had 38 patients and the total sample was 114 patients.

Samples were taken by consecutive sampling from patients fulfilling the inclusion criteria, until the required number of samples for each group was fulfilled.

The study commenced on May 2019 until 114 patients were obtained. Samples were taken from oral rinse solutions collected by asking patients to gargle using 25 ml of sterile aquadest, which were then stored in a sterile container and sealed, labeled with the identity of the patient, date and time of collection, and sent to the laboratory. Fungal culture is done in Chromagar media (Fig. 1). In order to identify the species of *Candida*, subsequent culture was done in VITEK 2.

Statistical analysis

The results were analyzed with SPSS, version 17 (IBM, Armonk, New York, USA). Pearson's χ^2 test was used to analyze the association between *Candida* species and sex, clinical types, episode types, pain on swallowing, CD4 count, and ARV use. Kruskal–Wallis test were used to analyze the association between *Candida* species and age. A *P* value of <0.05 was considered statistically significant.

Results

This study described 114 patients with OC and HIV/AIDS who fulfilled the inclusion criteria as study participants. The age characteristic of the study

Figure 2



Clinical types of OC: (a) pseudomembranous, (b) cheilitis, (c) acute atrophic.

Table 1 Clinical features of the study patients

Characteristics	n (%)
Sex	
Male	83 (72.8)
Female	31 (27.2)
Age (years)	
Range	18–59
Mean±SD	36.4±9.8
Chief complaint	
Whitish patches in oral cavity	100 (87.7)
Reddish patches in oral cavity, patches and sores on corners of lips	7 (6.2)
Whitish and reddish patches in oral cavity	4 (3.5)
Whitish patches in oral cavity, patches and sores on corners of lips	3 (2.6)
Location	
Tongue	54 (47.3)
Tongue and mucosa	49 (43.0)
Tongue, mucosa and lips	10 (8.8)
Mucosa	1 (0.9)
Clinical types	
Acute pseudomembranous	103 (90.3)
Cheilitis	10 (8.8)
Acute atrophic	1 (0.9)
Chronic hyperplastic	0
Episode types	
First time	33 (28.9)
Recurrent	81 (71.1)
Pain on swallowing	
Yes	50 (43.9)
No	64 (56.1)
Total	114 (100.0)

patients was mean±SD of 36.4±9.8 years old with range from 18 to 59 years old. There were more male (72.8%) than female patients (27.2%). This study showed chief complaint of whitish patches in

the oral cavity in 100 (87.7%) patients, reddish patches in the oral cavity with patches and sores on the corners of the lips in seven (6.2%) patients, whitish and reddish patches in the oral cavity in four (3.5%) patients, and whitish patches in the oral cavity with patches and sores on the corners of the lips in three (2.6%) patients. The most common location was on the tongue in 54 (47.4%) patients, tongue and buccal and palatal mucosa in 49 (43.0%) patients, tongue, buccal, and palatal mucosa and lips in 10 (8.8%) patients, and buccal and palatal mucosa only in one (0.9%) patient. The clinical types of OC were mostly pseudomembranous type (Fig. 2a), followed by cheilitis type (Fig. 2b) and acute atrophic type (Fig. 2c), in 103 (90.4%) patients, 10 (8.8%) patients, and one (0.9%) patient, respectively. Pain on swallowing was absent in 64 (56.1%) patients and present in 50 (43.9%) patients. Most patients had recurrent OC (88 patients, 71.1%), while others had first episode of OC (33 patients, 28.9%) (Table 1).

In this study, all patients grew fungal colonies in culture. There were 149 isolates of *Candida* species from 114 patients. The predominant species in this study was *C. albicans* in 104 (69.7%) isolates. *Candida* non-*albicans* were found in 45 (30.3%) isolates, namely *C. krusei* in 22 (14.85%), *C. glabrata* in 12 (8.1%), *C. tropicalis* in six (4.05%), *Candida dubliniensis* in two (1.3%), *Candida parapsilosis* in two (1.3%), and *Candida lipolytica* in one (0.7%) of the isolates. Growth of *C. albicans* only was found in 69 patients and *C. non-albicans* only were found in 10 patients. Mixed growth of *C. albicans* and *C. non-albicans* was found in 35 patients. *C. krusei* was found growing alone in nine patients and mixed with *C. albicans* in 13

patients. *C. tropicalis* was found growing alone in one patient and mixed with *C. albicans* in five patients. Other *C. non-albicans* species were found in mixed growth with *C. albicans*, namely *C. glabrata* in 12 patients, *C. dubliniensis* in two patients, *C. parapsilosis* in two patients, and *C. lipolytica* in one patient.

Candida species was significantly associated with clinical types ($P=0.011$), episode types ($P=0.003$), pain on swallowing ($P=0.002$), CD4 count ($P=0.000$), and ARV use ($P=0.004$), but was not significantly associated with sex ($P=0.747$) and age ($P=0.188$) among all patients. *Candida* species was associated with pain on swallowing and CD4 count, regardless of ARV use. *Candida* species was also significantly associated with clinical types among patients on ARV, and with sex among ARV-naïve patients (Table 2). In general, growth of *C. albicans* only was more common in patients with higher CD4 count, pseudomembranous type and recurrent OC, without pain on swallowing, and patients on ARV, while mixed growth of *C. albicans* and *C. non-albicans* was more common in patients with lower CD4 count, cheilitis type and first episode of OC, presence of pain on swallowing, and ARV-naïve patients (Table 2).

Discussion

OC is the most common opportunistic fungal infection among individuals infected with HIV/AIDS [2]. OC can affect various age groups and sex, from infants to the elderly. Marak and Dhanashree [5] showed that the most affected age group is 51–60-year-old group, which may be due to the low immunity and immunosuppressive diseases. In this study, there were more male than female patients. This is concordant with data from the Health Ministry of the Republic of Indonesia in 2017, which showed that HIV patients were more common in males than females [6]. Ambe *et al.* [7] showed that the prevalence of OC was not significantly associated with sex. In general, there is no difference of the prevalence of OC based on sex, because OC is different from vulvovaginal candidiasis that is influenced by hormonal factor [8,9]. The age of the patients had mean±SD of 36.41±9.825 years old with range of 17–59 years old. This result may be due to that adults are productive and sexually active, thus engaging in many unsafe sexual practices risky for HIV transmission [10].

OC may be the first sign or symptom of HIV/AIDS disease, and may sometimes be the

presenting complaint for patients [11]. *Candida* can spread extensively, directly from the oral cavity to other organs such as the digestive tract and many more [12]. The most common symptom was whitish patches in the oral cavity and the most common locations were tongue and also mucosa, which correspond to the most common clinical type of OC, pseudomembranous OC [2,9]. There was no associated pain on swallowing in the majority of patients. Pain on swallowing is a clinical sign that the lesion affects the pharynx and esophagus [9].

In this study, *C. albicans* was the predominant species growing in 104 isolates (69.7%), while *C. non-albicans* were found in 45 (30.3%) isolates, namely *C. krusei*, *C. glabrata*, *C. tropicalis*, *C. dubliniensis*, *C. parapsilosis*, and *C. lipolytica*. This proved that *C. albicans* was still the leading cause of OC, but *Candida non-albicans* began to be identified. Ambe *et al.* [7] showed similar result in which there were more *C. albicans* isolates (60.2%) than *C. non-albicans* (39.8%), and there were similar isolated *Candida non-albicans* species such as *C. glabrata*, *C. krusei*, *C. tropicalis*, and *C. parapsilosis* from HIV patients with OC in Cameroon. A meta-analysis study in sub-Saharan Africa from 2005 to 2015 also showed a prevalence of 33.5% for *C. non-albicans*, the most common among which was *C. glabrata*, followed by *C. krusei* and *C. tropicalis* [13]. Nelwan *et al.* [14] found *C. albicans* in 56.2% and *C. glabrata* in 15.3% of OC in Indonesian HIV/AIDS patients.

Predominance of *C. albicans* in OC among HIV/AIDS patients may be related to the pathogenicity of this species by production of hydrolytic enzymes, presence of multiple-adhesion factor, and ability to convert from yeast form to hyphal form that is crucial for tissue invasion [7]. *C. albicans* also synergistically aided colonization and infection by *C. glabrata*, while it was suppressed by *C. krusei*, which may explain the mixed growth of *C. glabrata* with *C. albicans*, and the growth of *C. krusei* only in some patients of this study [15]. *Candida non-albicans* are considered less virulent than *C. albicans* because of their lower adherence ability to mucosal and endothelial surface, less production of proteinase enzymes, and lack or lower ability to form hyphae [16]. However, increasing prevalence of *Candida non-albicans* is of importance because these species are inherently resistant to widely available fluconazole, resulting in a public health problem among HIV/AIDS population in sub-Saharan Africa [13,17].

Table 2 *Candida* species and associated clinical and laboratory features

Clinical and laboratory features	All patients				Patients on ARV				ARV-naïve patients			
	<i>Candida albicans</i> only	<i>Candida non-albicans</i> only	Mixed#	P value	<i>Candida albicans</i> only	<i>Candida non-albicans</i> only	Mixed#	P value	<i>Candida albicans</i> only	<i>Candida non-albicans</i> only	Mixed#	P value
Sex												
Male	52	7	24	0.747	38	6	13	0.951	14	1	11	0.038*
Female	17	3	11		17	3	5		0	0	6	
Age (mean±SD)	35.3±8.7	40.9±9.3	37.5 ±11.3	0.188	35.9±9.4	39.8±9.1	38.8 ±10.1	0.339	33.1±5.1	51	36.2 ±12.6	0.353
Clinical types												
Pseudomembranous	66	10	27	0.011*	53	9	14	0.021*	13	1	13	0.278
Cheilitis	2	0	8		2	0	4		0	0	4	
Acute atrophic	1	0	0		0	0	0		1	0	0	
Episode types												
First episode	16	0	17	0.003*	8	0	4	0.305	8	0	13	0.198
Recurrent	53	10	18		47	9	14		6	1	4	
Pain on swallowing												
Yes	23	3	24	0.002*	20	2	12	0.036*	3	1	12	0.015*
No	46	7	11		35	7	6		11	0	5	
CD4 (cells/μl)												
1–100	18	0	20	0.000*	18	0	7	0.002*	0	0	13	0.000*
101–200	18	6	14		11	5	10		7	1	4	
>200	33	4	1		26	4	1		7	0	0	
ARV use												
Yes	55	9	18	0.004*	55	9	18	-	0	0	0	-
No	14	1	17		0	0	0		14	1	17	
Total	69	10	35		55	9	18		14	1	17	

ARV, antiretroviral. *Growth of *Candida albicans* and *Candida non-albicans* in one patient. *P-value <0.05 is considered statistically significant.

In this study, growth of *C. albicans* only was more common in patients with higher CD4 count, pseudomembranous type and recurrent OC, without pain on swallowing, and patients on ARV, while mixed growth of *C. albicans* and *C. non-albicans* was more common in patients with lower CD4 count, cheilitis type and first episode of OC, presence of pain on swallowing, and ARV-naïve patients. Mushi *et al.* [3] found that *C. non-albicans* was increased in patients with low CD4. Substantial immunosuppression in HIV as reflected by low CD4 count may promote the growth of the less-pathogenic *C. non-albicans* and cause OC [3,13]. Lam-Ubol *et al.* [4] showed that *C. non-albicans* was more common in highly active ARV therapy (HAART)-naïve patients, and use of HAART was associated with the decrease of these species. HAART may act directly by inhibition of secretory aspartyl proteinase enzymes needed for growth of Candidal hyphae, and indirectly by improving CD4 levels to reduce *Candida* colonization [18,19]. Nair and Shetti [20] showed the association between pseudomembranous OC and *C. albicans*. Ribeiro *et al.* [21] found that *C. albicans* was more common in recurrent OC, while *C. non-albicans* was found in primary OC. Although *C. albicans* was the most common cause of esophageal candidiasis [9], Redding *et al.* [22] found that the presence of *C. non-albicans* produced more severe pain on swallowing, as also seen in this study. Previous antifungal treatment increased the prevalence of *C. non-albicans* by exerting positive-selection pressure to these species that were less sensitive to these drugs [15]. Antibiotics use has also been associated with mixed infection by *C. non-albicans* and *C. albicans* [17]. However, intake of those medications has been excluded in this study.

This study has some limitations such as the relatively smaller number of ARV-naïve patients and lack of details of ARV therapy. Future studies with larger samples of both patients on ARV and ARV-naïve patients, and analysis of the association of duration and types of ARV to *Candida* species, are recommended.

In conclusion, *Candida* species was significantly associated with CD4 count, ARV use, clinical and episode types, and pain on swallowing among HIV/AIDS patients with OC. *C. albicans* was the predominant species, but growth of *C. non-albicans* alone or mixed with *C. albicans* was identified. Mixed growth was more common in lower CD4 count, cheilitis type, first-episode OC, pain on swallowing, and ARV-naïve patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Walangare T, Hidayat T, Basuki S. The profile of *Candida* species in oral candidiasis patient with HIV/AIDS infection. *Period Dermatol Venereol* 2014; 26:29–35.
- Spalanzani RN, Mattos K, Marques LI, Barros PFD, Pereira PIP, Paniago AMM, *et al.* Clinical and laboratorial features of oral candidiasis in HIV-positive patients. *Rev Soc Bras Med Trop* 2018; 51:352–356.
- Mushi MF, Mtemisika CI, Bader O, Bii C, Mirambo MM, Groß U, *et al.* High oral carriage of non-albicans *Candida* spp. among HIV-infected individuals. *Int J Infect Dis* 2016; 49:185–188.
- Lam-Ubol A, Rungsiyanont S, Vacharotayangul P, Sappayatosok K, Chankanka O. Oral manifestations, salivary flow rates and *Candida* species in Thai HIV-infected patients. *J Clin Exp Dent* 2019; 11: e138–e145.
- Marak MB, Dhanashree B. Antifungal susceptibility and biofilm production of *Candida* spp. isolated from clinical samples. *Int J Microbiol* 2018; 2018:2018.
- Direktorat Jenderal Pencegahan dan Pengendalian Penyakit Kementerian Kesehatan Republik Indonesia. Laporan situasi perkembangan HIV/AIDS & PIMS di Indonesia, Januari – Desember 2017. 2018. Available at: [https://siha.kemkes.go.id/portal/files_upload/Laporan_HIV\[3\]_AIDS_TW_4_Tahun_2017__1_.pdf](https://siha.kemkes.go.id/portal/files_upload/Laporan_HIV[3]_AIDS_TW_4_Tahun_2017__1_.pdf). [Accessed June 20, 2020].
- Ambe NF, Longdoh NA, Tebid P, Bobga TP, Nkfusai CN, Ngwa SB, *et al.* The prevalence, risk factors and antifungal sensitivity pattern of oral candidiasis in HIV/AIDS patients in Kumba District Hospital, South West Region, Cameroon. *Pan Afr Med J* 2020; 36:1–14.
- Suyoso S. Kandidiasis Mukosa. In: Bramono K, Suyoso S, Indriatni W, Ramali L, Widaty S, Ervianti E, editors. *Dermatomikosis superfisialis pedoman dokter dan mahasiswa kedokteran*. 2nd ed. Jakarta: Badan Penerbit Fakultas Kedokteran Universitas Indonesia; 2013. p. 120–148.
- Cassone A, Cauda R. *Candida* and candidiasis in HIV-infected patients: where commensalism, opportunistic behavior and frank pathogenicity lose their borders. *AIDS* 2012; 26:1457–1472.
- Kambu Y, Waluyo A, Kuntarti K. Age people with HIV AIDS (PLWHA) precautions in connection with HIV infection. *J Keperawatan Indonesia* 2016; 19:200–207.
- Anwar KP, Malik A, Subhan KH. Profile of candidiasis in HIV infected patients. *Iran J Microbiol* 2012; 4:204–209.
- Maheshwari M, Kaur R, Chadha S. *Candida* species prevalence profile in HIV seropositive patients from a major tertiary care hospital in New Delhi, India. *J Pathog* 2016; 2016:2016.
- Mushi MF, Bader O, Taverne-Ghadwal L, Bii C, Groß U, Mshana SE. Oral candidiasis among African human immunodeficiency virus-infected individuals: 10 years of systematic review and meta-analysis from sub-Saharan Africa. *J Oral Microbiol* 2017; 9: 1317579.
- Nelwan EJ, Indrasanti E, Sinto R, Nurhaida F. Antifungal susceptibility testing in HIV/AIDS patients: a comparison between automated machine and manual method. *Acta Med Indones* 2016; 48:35–40.
- Patil S, Majumdar B, Sarode SC, Sarode GS, Awan KH. Oropharyngeal candidosis in HIV-infected patients – an update. *Front Microbiol* 2018; 9:1–9.
- Deepa A, Nair BJ, Sivakumar T, Joseph AP. Uncommon opportunistic fungal infections of oral cavity: a review. *J Oral Maxillofac Pathol* 2014; 18:235–243.
- Du X, Xiong H, Yang Y, Yan J, Zhu S, Chen F. Dynamic study of oral *Candida* infection and immune status in HIV infected patients during HAART. *Arch Oral Biol* 2020; 115:1–6.
- Mounika R, Nalabolu GK, Pallavi N, Birajdar SS. Association of oral candidal species with human immunodeficiency virus patients of West Godavari district, Andhra Pradesh – an in vitro study. *J Oral Maxillofac Pathol* 2021; 25:147–153.
- Cerqueira DF, Portela MB, Pomarico L, De Araújo Soares RM, De Souza IPR, Castro GF. Oral *Candida* colonization and its relation with predisposing factors in HIV-infected children and their uninfected

- siblings in Brazil: the era of highly active antiretroviral therapy. *J Oral Pathol Med* 2010; 39:188–194.
- 20 Nair V, Shetti A. Diversity and clinical presentation of *Candida* species in human immunodeficiency virus patients with oral candidiasis. *Saudi J Oral Sci* 2019; 6:96–100.
- 21 Ribeiro ALR, De Alencar Menezes TO, De Melo Alves-Junior S, De Menezes SAF, Marques-Da-Silva SH, Vallinoto ACR. Oral carriage of *Candida* species in HIV-infected patients during highly active antiretroviral therapy (HAART) in Belém, Brazil. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2015; 120:29–33.
- 22 Redding SW, Kirkpatrick WR, Dib O, Fothergill AW, Rinaldi MG, Patterson TF. The epidemiology of non-albicans *Candida* in oropharyngeal candidiasis in HIV patients. *Spec Care Dent* 2000; 20:178–181.