Candida Spp In Oral Mucosa of Denture Wearers: A Pilot Study

Anuradha Sharma*, Deepa Anil Kumar*, Amit Kr. Tamrakar, Saranjit Singh Bhasin****

*Microbiology, **Prosthodontics, Faculty of Dentistry, Jamia Millia Islamia, New Delhi 110025, India

Abstract: Background: Oral mucosa of denture wearers is quite often subject to inflammation, a condition known as Denture Stomatitis, in which Candida spp. plays an important etiological role. Aim: To study the spectrum of Candida spp. in oral mucosa of denture wearers. Objective: To emphasis on evaluation of oral health of denture wearers, specially the elderly. Methodology: This prospective study was done in 2013 at a four year young, central university's tertiary dental college. Institutional Ethical Approval was obtained. Persons attending Prosthodontics OPD with a history of wearing maxillary complete dentures for a minimum of 6 months were included in the study. Swabs from the mucosal surface underlying the denture were sent for microbiological identification. Results: Of the 09 subjects, 07 were males and 02 females in the age group of 40 yrs to 80 yrs. C. albicans, C. krusei and C. glabrata were isolated, with a mixed growth of C. albicans and C. krusei seen in one subject. Conclusion: As denture stomatitis is frequently asymptomatic, periodic monitoring, for the presence of Candida species should be done. Investigation into factors causing the initial attachment of Candida spp. should be evaluated along with motivation of the aged for regular dental visits. [Anuradha S NJIRM 2017; 8(6):71-74]

Key Words: Candida albicans, Candida krusei, Candida glabrata, Denture Stomatitis, Elderly.

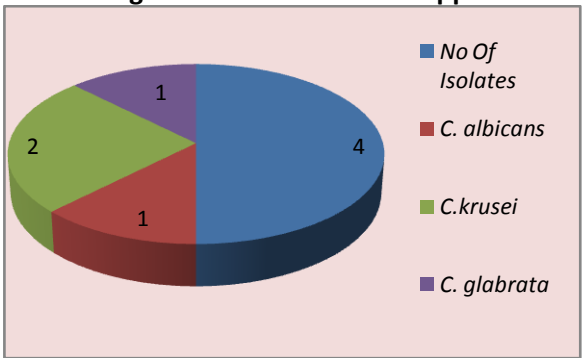
Author for correspondence: Anuradha Sharma, 404, 4th Floor, Microbiology, Faculty of Dentistry , Jamia Millia Islamia, Jamia Nagar , New Delhi - 110025 E-Mail: asharma2@jmi.ac.in M: 9968050032 / 7838230809

Introduction: Oral mucosa of denture wearers is quite often subject to inflammation. This is seen in edentulous persons using removable dentures, particularly, the elderly. Various prosthetic, local, systemic and infectious factors play an important aetiological role, Candida spp being one of them. Mild chronic erythematous candidiasis beneath an upper denture is known as Denture Stomatitis (DS). Newton's Classification classifies DS into Newton's Type 1 (Pin-point Hyperemia), Type2 (Diffuse Erythema) & Type 3 (Granular Inflammation).DS is mostly asymptomatic, but many patients suffer from halitosis, bleeding and swelling of the mucosa, burning sensation, xerostomia or dysgeusia [1].

Methods: This prospective study was done in 2013, after taking Institutional Ethical Approval. Persons attending Prosthodontics OPD, with a history of wearing complete dentures for a minimum of 6 months were included in the study and explained about the procedures and possible outcomes. After taking an informed written consent, sterile cotton swabs were used for swabbing the mucosal surface underlying the maxillary denture. First swab was inoculated on Sabouraud's Dextrose Agar (SDA), while the second was used to prepare a smear for Gram staining. The methods used for identification of the yeast up to the species level included Gram stain and germ tube test. Morphological identification was made by looking for the presence of chlamydospores, pseudohyphae, and blastoconidia arrangement on cornmeal agar and the isolates were also subcultured on chrome agar[2].

Result: Of the nine subjects, seven were males and two females in the age group of 40 yrs to 80 yrs. amongst predisposing local factors; smoking was noted in 01, poor oral hygiene in 01 , and acrylic material of dentures in 09 subjects. Paan chewing, alcoholism and denture wearing at night was not noted in any of the subjects**.** In the predisposing systemic factors, endocrinal disorder (diabetes) was noted in three subjects without any yeast carriage. Of the three subjects with Candida in their oral mucosa, two were edentulous due to advance age (>60 yrs) and had been wearing dentures for 2yrs - 8yrs, whereas one of them had local aggressive periodontitis and was wearing dentures since six months. None of them had DS. Swabs from three subjects were culture positive on Chrome Agar and SDA for Candida spp. but primary gram stained smear was negative. The number of isolates were 04. The species of Candida isolated were C. albicans (25%), C. krusei (50%) and C. glabrata (25%) (Fig.1), one of them being a mixed growth of C. albicans & C. krusei.

Fig .1: Isolates of Candida spp.



Discussion: Human oral cavity is a home for a large number of microbes having diverse nature, as it offers a unique environment with a multitude of ecological niches for microbial colonization. These organisms and their collective genome serve as important components of health and disease. Any factor causing disruption of oral biome is known to indicate, trigger, or influence the course of oral diseases. Of a large number of diverse fungi inhabiting oral cavity, Candida is an important component. C. albicans was the predominant species found to inhabit the oral cavity of healthy subjects. Other species include C. parapsilosis,C.tropicalis, C.metapsilosis, C. khmerensis, C. glabrata[3,4].

Wearing removable dentures is a compulsion for those who become edentulous due to periodontal disease and decay, developmental defects caused by severe malnutrition, genetic defects such as dentinogenesis imperfecta, local aggressive periodontitis and trauma, and in such cases, the local environment of the oral mucosa may get predisposed to candidiasis. Though not seen in all denture wearers**,** poorly fitting dentures, incorrect jaw relationships or occlusal errors can cause damage to the supporting tissues and can predispose to denture stomatitis in some of them. The dentures being worn by all the nine patients were of acrylic (polymethylmethacrylate), the advantage being that these are not susceptible to decay. However, Candida sp. has an ability to adhere to saliva-coated acrylic resin. Over time, changes occur in the surface acrylic base, such as increased surface roughness, favoring the accumulation of biofilm and thus the appearance of denture stomatitis in future [5-7] .

In the present study, 33% (3outof 9) of the complete denture wearers had yeast carriage in the maxillary mucosa without the presence of stomatitis. Mechanisms that limited proliferation in these cases cannot be explained by any single factor. However main factor responsible for this finding may be local mucosal immunity of the individual. Secretory immunoglobulin A (Ig A) and free secretory component (SC) in saliva, help in inhibiting the epithelial cell adhesion by Candida species. Mucosal epithelium is considered as the first line of defence against invading pathogens. Advanced research in immunology brought forth the active role played by epithelial cells in triggering immune response. It was reported that, upon recognition of the invading Candida species, epithelial cells secrete various antimicrobial peptides for the clearance or control of fungal infection directly. In addition to this, other immunological factors such as phagocytic cells- polymorhonuclear neutrophils, macrophages and dendritic cells- and several blood soluble factors like complement and antibody, also play an important role in the contribution of mucosal immunity to Candida infections. Another reason could be due to the small study population. Hence, similar study on a larger sample size is required to understand the exact scenario [8-9.] Although, yeast carriage is not related to the presence of stomatitis, asymptomatic colonization with potentially pathogenic yeasts should not be ignored. This is because, they have the ability to adhere to mucosal and denture surfaces by the production of phospholipase, and thus initiates the pathogenesis of DS [10-13]. The Non Candida albicans Candida (NCAC) species are a heterogeneous group of yeasts that differ from each other and from C. albicans. In recent years they have been reported as important emerging pathogens causing various clinical outcomes, mainly in immunosuppressed patients. Hence, in the era of increased reports of NCAC species isolated in different clinical situations, and with paucity of Indian data on its presence as oral commensals, the present study has revealed an interesting scenario where 75% of the isolates were NCAC. Although C. albicans has been reported as the most frequently isolated species from persons with denture stomatitis (81%, 96.8%) other NCAC species such as C. krusei (3.5%) and C. glabrata (7.14%), C. tropicalis (12.5%) and C. dubliniensis (1.7%) have also been isolated in persons with DS. Presence of non - Candida albicans Candida is an important finding, as there are reports of C. glabrata, C. krusei in denture related stomatitis type II and type III, C albicans together with C. tropicalis, C. glabrata, or both .It has been stated that, there exists a synergic relationship between various Candida species, which favours the colonization of more resistant strains. This in turn enhances the infection process and severity of the disease [14 – 17].

C. krusei was isolated from a 42 yr female who had been wearing complete dentures since 6months and also in a 62 year male using dentures since 8years ,in association with C. albicans. In the former, localised aggressive periodontitis with loss of bone support and poor oral hygiene had made her edentulous. Localised aggressive periodontitis previously known as

localised juvenile periodontitis is one of the rapidly progressive periodontal diseases. It is characterised by pattern of rapid vertical loss of alveolar bone around more than one permanent tooth mainly the permanent first molars and incisors. The severity of the destruction is not proportional to the mass of plaque or calculus present [18 - 19.]

There has been a rising concern about C. krusei, a multi- drug resistant pathogen, mostly in immunocompromised patients due to its complex susceptibility profile, a rapid adaptive response to antifungal treatments and up to 4-fold increased affinity for acrylic surfaces than epithelial cell surfaces. C. krusei shares Candida-related virulence factors, such as phospholipase, proteinase and host immunological factor modulator production, and phenotype switching and dimorphic transition. The strong hydrophobicity in the C. krusei cell membrane allows stronger attachment to non-polar surfaces. Prophylactic oral rinse therapy selects out C. krusei which is known to be resistant to fluconazole treatment leading to negative prognosis if not noticed early on. Fluconazole works by inducing the formation of reactive oxidative species (ROS), however this anti-fungal induces low amounts of ROS in C. krusei cells compared to the amounts of ROS observed in C. albicans cells exposed to the drug. C. krusei can activate an alternative respiratory pathway (ARP) when exposed to stress-inducing situations such as presence of an antifungal. The ARP reduces the presence of ROS and decreases the rate of ROS buildup in the cell allowing time for antifungal resistant cells to develop [19, 20] .

Despite the increased adherence, C. krusei remains less virulent than C. albicans and is more susceptible to immunological factors like lactoferrin, lysozyme, or polymorhonuclear leukocytes more so than any other Candida species analyzed, but are more resistant to murine bronchial lavage fluid. This susceptibility profile indicates that immunocompromised hosts show a strong selective pressure by removing strong inhibitors while anti-fungals select against the common Candida species. C. krusei shares Candida-related virulence factors, such as phospholipase, proteinase and host immunological factor modulator production, phenotype switching and dimorphic transition [21-24].

Conclusion: Candida forms an important part of the oral microbial flora, and is associated with various forms of oral candidosis, such as denture stomatitis. As denture stomatitis is generally asymptomatic, periodic monitoring for the presence of Candida species should be done. Investigation into factors causing the initial attachment of Candida spp. should be evaluated. Information on how these factors can be controlled is required, as this may help to prevent the disease. It is also very important to motivate denture users for periodic consultations specially the elderly and help them to overcome certain barriers to dental visits e.g cost factor, lack of oral healthcare tradition, casual approach to oral health and impaired mobility.

References:

1. Maller SU, Karthik KS, Maller VS Candidiasis in Denture Wearers-A Literature Review. JIADS. 2010; 1(1): 27-30.
2. Baumgartner C, Freydiere AM, Gille Y Direct identification and recognition of yeast species from clinical material by using albicans ID and CHROMagar Candida plates. J Clin Microbiol .1996 ; 34(2) : 454-6.
3. Ghannoum MA, Jurevic RJ , Mukherjee P K , Cui F, Sikaroodi M, Naqvi A, and Gillevet PM. Characterization of the oral fungalmicrobiome(Mycobiome)inhealthyindividuals.PLOSPathogens6(1):e1000713. https://doi.org/10.1371/journal.ppat.1000713.
4. Jain PA, Kulkarni RD, Ajantha GS and Shubhada C . A comparative evaluation of oral Candida carriage in HIV-infected individuals and HIV seronegative healthy individuals in North Karnataka. J Biosci Tech. 2011; 2 (2) :232-237 .
5. HadjievaH, Dimova M, Todorov S. Stomatitis Prosthetica –a Polyetiologic Disorder. J of IMAB Annual Proceedings (Scientific Papers). 2006 ; 12(2) :38-41.
6. Pereira – Cenci T, Del Bel Curry AA, Crielaard W, Ten Cate JM .Development of Candida-associated denture stomatitis: new insights. 2008; J Appl Oral Sci 16(2): 86-94.
7. Turell AJ. Etiology of inflamed upper denture bearing areas. 1966; Br Dent J : 542-6.
8. SoysaNS, Samaranayake LP and EllepolaAN Diabetes mellitus as a contributory factor in oral candidosis. Diabet Med. 2006; 23: 455-459.
9. ChengSC, JoostenLA, Kullberg BJ, Netea MG .Interplay between Candida albicans and the

Mammalian Innate Host Defense. Infect Immun. 2012; 80: 1304-1313.
10. Barbeau J, Seguin J, Goulet JP, Koninck L de, Avon SL, Lalonde B, Rompre P, Deslauriers N . Reassessing the presence of Candida albicans in denture-related stomatitis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2003; 95 (1) : 51-9.
11. Coco BJ, Bagg J, Cross LJ, Jose A, Cross J, Ramage G.Mixed Candida albicans and Candida glabrata populations associated with the pathogenesis of denture stomatitis. Oral Microbiol Immunol. 2008; 23(5): 377-83.
12. Gumru B, Kadir T, Uygun-Can B, Ozbayrak S.Distribution and phospholipase activity of Candida species in different denture stomatitis types . 2006; Mycopathologia 162(6) : 389 -94.
13. Sanitá PV, Zago CE, MimaEG,Pavarina AC , Jorge JH et al . In vitro evaluation of the enzymatic activity profile of non- albicans Candida species isolated from patients with oral candidiasis with or without diabetes. Oral Surg Oral Med Oral Pathol Oral Radiol. 2014; 118: 84-91.
14. Tay LY,Herrera DR, Gomes B P, dos Santos FA and Jorge.Identification of Candida spp. in patients with denture stomatitis: relationship with gender, age, time of denture use and Newton's classification . J Dent App. 2014; 1(3): 46-50.
15. Webb BC, Thomas CJ, Whittle T. A 2-year study of Candida associated denture stomatitis treatment in aged care subjects .Gerodontology . 2005; 22 : 168-176.
16. de Resende MA, de Sousa LV, de Olivieara RC, Koga-Ito CY, Lyon JP. Prevalence and antifungal susceptibility of yeasts obtained from the oral cavity of elderly individuals. Mycopathologia. 2006; 162: 39-44.
17. Consensus Report: Aggressive periodontitis .Ann Periodontol . 1999; 4, 53.
18. BurmeisterJA,Best AM, Palcanis KG, Caine FA, RanneyRR.Localized juvenile periodontitis and generalized severe periodontitis: Clinical findings. J Clin Periodontol . 1984; 11 :181–92.
19. Samaranayake YH, Wu PC, Samaranayake LP, SoM , Yuen KY . Adhesion and colonisation of Candida krusei on host surfaces. J Med Microbiol. 1994; 41 (4): 250-258.
20. SamaranayakeYH,Yuthika H and Samaranayake LP. Candida krusei: Biology, epidemiology, pathogenicity and clinical manifestations of an emerging pathogen. J Med Microbiol. 1994; 41: 295-310.
21. Panwar SL, Pasrija R, Prasad R. Membrane homeostasis and multidrug resistance in yeast. Bioscience Reports. 2008; 28: 217.
22. Samaranayake YH, Wu PC, Samaranayake LP, Ho PL .The relative pathogenicity of Candida krusei and Candida albicans in the rat oral mucosa. J Med Microbiol 1998; 47: 1047- 1057.
23. Costa-de-Oliveira S, Sampaio-Marques B, Barbosa M, Ricardo E, Pina- vaz C, Ludovico P, Rodrigues A . An Alternative Respiratory Pathway on Candida krusei: Implications on Susceptibility Profile and Oxidative Stress. FEMS Yeast Research. 2012; 12 (4): 423-429.
24. Peterson PE, Yamamoto T Improving the oral health of older people: the approach of the WHO Global Oral Health Programme .Community Dent Oral Epidemiol. 2005; 33: 81–92.

Conflict of interest: None

Funding: None

Cite this Article as: Anuradha S, Deepa K, Amit T, Saranjit B. Candida Spp In Oral Mucosa of Denture Wearers: A Pilot Study. Natl J Integr Res Med 2017; 8(6):71-74