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Original Article

Incidence of *Candida albicans* in Diabetic Patients with a Dental Prosthesis

K. Sayed Akber Pasha¹, Manu Rana², Swagat Kumar Mahanta³

¹Prosthodontist, Salmar, Karkala, Karnataka, India, ²Department of Conservative Dentistry and Endodontics, College Of Medical Sciences, Bharatpur, ³Department Of Community Dentistry M.B.Kedia Dental College Birgunj, Nepal

ABSTRACT:

Aim: The aim of this study was to determine the incidence rate of oral Candida species in diabetic subjects. **Methods:** A total of 100 non-insulin dependent diabetes patients including 50 diabetic and 50 non-diabetic denture wearers visited in department of dentistry were selected. Material for analysis included swabs taken from the palate mucosa and mucosal part of denture surfaces in denture wearers. Their oral rinse samples were collected for mycological examination, and cultured on CHROM agar Candida plates. Frequency and density of Candida species isolated from both groups were compared using SPSS software. **Results:** The higher density of isolated colonies was seen in diabetic group in compare with control group ($P = 0.0001$). *C. albicans* was the most common isolated Candida species in both groups, though diabetic patients with dentures had more non-albicans Candida isolated from their dentures compared to non-diabetic patients. **Conclusions:** Mycological findings from the present study revealed that diabetes mellitus can increase colonization of *Candida* in denture and mouth. By elimination of local and systemic factors in diabetic patients and improving their oral health care, *Candida* colonization and the risk of oral and systemic candidiasis will be decreased.

Keywords: *Candida albicans*, Colonization, Denture, Diabetes.

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Corresponding Author: Dr. Manu Rana, Department of Conservative Dentistry And Endodontics, ,College Of Medical Sciences, Bharatpur, Nepal.

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INTRODUCTION

Diabetes is a common health problem with a high morbidity and mortality. According to WHO fact sheet the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. Diabetes mellitus is a metabolic disorder that is characterized by an increase in blood glucose levels (hyperglycemia) and have an increased predisposition to the manifestations of oral diseases like candidiasis, which is associated with poor glycemic control and therapeutic dentures.¹

Oral candidiasis is a common opportunistic infection of the oral cavity caused by an overgrowth of *Candida* species, the commonest being *Candida albicans*. It is common and underdiagnosed among the elderly, particularly in those who wear dentures and in many cases is avoidable with a good mouth care regimen. It can also be a mark of systemic disease, such as diabetes mellitus and is a common problem among the immunocompromised. Oral candidiasis is caused by an overgrowth or infection of the oral cavity by a yeast-like fungus, *candida*.^{2,3}

Denture stomatitis is a chronic inflammatory condition of palatal and alveolar mucosa covered with removable dental prosthesis, and is associated with burning, bleeding, an unpleasant taste, or some time offensive breath in complete removable denture users.⁴ However, the prevalence of denture stomatitis is ranged from 15 to 65% in edentulous subjects, while in institutionalized denture wearing population it may reach at up to 72%.^{5,6} However, multi-factorial aetiology for this mucosal infection has long been reported, including trauma caused by ill-fitting dentures, microbial biofilm, poor denture hygiene, continuous denture wearing habits and several other systemic factors. Numerous studies showed the main role of *Candida albicans* in the development of denture stomatitis.^{7,8,9}

The aim of this study was to determine if there is a greater incidence of *C. albicans* in patients with diabetes in comparison with patients without diabetes when they use a dental prosthesis.

MATERIAL AND METHOD

In the current study, a total of 50 non-insulin dependent diabetes patients (25 men and 25 women), who were complete denture-wearers matched for age, and dental status and visited in department of dentistry were consecutively into this study as test group. The patients were in the age range of 62.8 ± 11.2 years. Their diabetic status was determined by history of previous diagnosis of diabetes, and their blood glucose levels were determined before sample collection using glucometer (with the mean fasting blood glucose level of 289.2 ± 72.8 mg/dl). The control group included 50 (25 men and 25 women) non-diabetics denture wearer (with the fasting blood glucose level less than 110 mg/dl) attending the department of dentistry in college of medical sciences, bharatpur, Nepal were randomly selected in dentistry department. Informed consent was signed by every subject participated in the study.

Inclusion and exclusion criteria

The subjects included in the study wore upper denture more than a year, did not made modifications of denture in this period, and lacked any of the following criteria: presence of any disease except type 2 diabetes and its chronic complication, aggressive periodontitis, presence of diseases or oral mucosa. No patient in either group had received antibiotics, steroids or immune therapy, or used any antiseptic mouth wash for the 6 months before entering the study. Diabetic people with complete denture with more than one year fasting blood glucose (FBS) level more than 130 mg/dl (in test group), and healthy people without any diabetic history and FBS less than 110 mg/dl (in control group) were included in this study.

Sample Collection

Samples for mycological examinations were obtained in the morning when patients fasted by swabbing from the palatal mucosa and mucosal surfaces of maxillary dentures were collected from patients. Swab cultures were immediately inoculated on Sabouraud dextrose agar (SDA) at 37°C for 48 h. After incubation, one calibrated microbiologist counted the growth density. The yeast growth density was defined as rare, medium or dense.

Further analysis were done using germ-tube production test, carbohydrate assimilation test and by using Chrom Agar medium.

Statistical Analysis

Statistical Analysis Frequency and density of recovered *Candida* spp. colonies (CFU/ml) isolated from both groups were compared using SPSS software with T test, and differences were considered significant at $p < 0.05$.

RESULTS

Positive culture of *Candida* species were inscribed on the denture of all diabetic subjects but this was seen in 78% of non-diabetics. The demographic characteristics of all subjects are summarized in table 1. The control group included more men. A significantly greater proportion of subjects with diabetes mellitus had higher colonization of *Candida* compared to on diabetic subjects. The average number of isolated colonies was 234 in diabetics, though it was 62.5 in non-diabetic group; and Mann-Whitney test showed that this difference was statistically significant ($P = 0.0001$).

Table 1

Variables	Diabetic	Non- diabetic
Average Age(years)	58.6	56.6
Average FBS(mg/dl)	230.88	80.8
Average denture use (years)	4.6	4.5
Average colony count (CFU)	234	62.5

Table 2: Isolated candida species

CANDIDA SPECIES	DIABETIC	NON-DIABETIC
Albicans	20	17
Tropicalis	10	8
Glabrata	9	6
krusei	6	4
Guillermondii	2	2
Albicans +tropicalis	2	2
Tropicalis +krusei	1	0

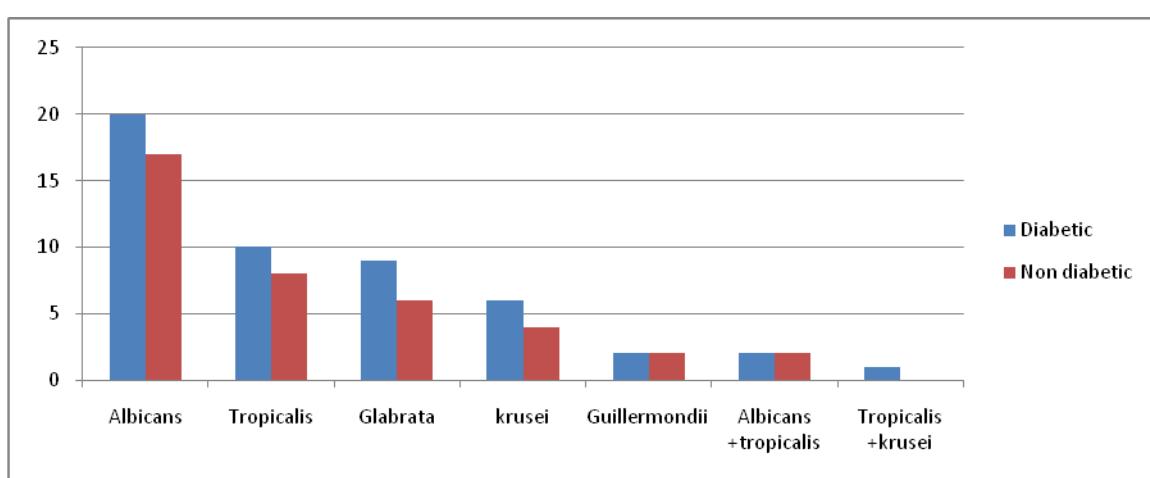


Figure 1: Frequency of *Candida* species isolated from denture of diabetic and non-diabetic groups.**DISCUSSION:**

Candida species are reported as the most frequent opportunistic fungi, causing candidiasis in different areas of human body including oral cavity. Since these fungi are commensally presented in human oral cavity, their colonization can promote oral candidiasis, with its different manifestations.¹⁰

Dental prosthesis is an artificial set of teeth created to replace some absent units in order to reestablish the masticatory and aesthetic functions. However, 60% of prosthesis users show clinical evidences or subclinical pathological problems caused by *Candida*. These oral pathologies are the result of poor oral hygiene, poor prosthesis adaptation, uninterrupted use, incorrect cleaning, and use after the expiration date. Those attitudes can lead to biofilm formation that will propitiate the colonization by yeasts and other microorganisms in the mucosa.^{11,12} Denture stomatitis, as a mucosal manifestation of oral candidiasis in elderly denture users, results from attachment and colonization of *Candida* species on denture hard surface.

In the present study a higher colonization of *Candida* species was seen in diabetic patients compared with non-diabetic subjects. This finding showed statistical significance when compared with non-diabetic patients ($P = 0.0001$). A similar trend was observed by some investigators that *Candida* count were higher among diabetics wearing dentures^{13,14,15}. However, in Daniluk's study⁷ there was no statistically significant difference between the two groups in *Candida albicans* colonization.

C. albicans was the most commonly isolated species in both groups which were followed by *C. tropicalis*, *T. glabrata*, *C. krusei*, and *C. guilliermondii* (Table 2). A statistically significant correlation was found between the number of colonies and amount of serum glucose level in diabetic group. Also, there was seen a statistical significant correlation between the colonization rate and the duration of using denture in diabetic group.

Concerning the maintenance of denture hygiene in order to improve oral mucosal health, the participants were informed to control their blood glucose level, and to regularly clean their dentures and keep them dry overnight. These are simple and efficient ways to control yeast colonization in denture wearers.^{16,17} This precaution seems appropriate since it is apparently difficult to improve the oral hygiene in denture wearers by mechanical or chemical plaque control.^{18,19}

CONCLUSIONS:

Mycological findings from the present study revealed that diabetes mellitus can increase colonization of *Candida* in denture and mouth. By elimination of local and systemic factors in diabetic patients and improving their oral health care, *Candida* colonization and the risk of oral and systemic candidiasis will be decreased.

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