

TO ASSESS THE FREQUENCY OF CANDIDIASIS IN DIABETIC DENTURE WEARER PATIENTS

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Abstract

Background: Oral candidiasis is a common opportunistic fungal infection that may occur more frequently in denture wearers, particularly in patients with diabetes mellitus.

Objective: To determine the frequency of oral candidiasis among diabetic denture wearers and compare it with non-diabetic denture wearers.

Methods: This case-control study was conducted at THQ Hospital Burewala and DIN Medical Complex from January 2025 to July 2025. A total of 60 denture wearers were included, comprising 30 diabetic patients as cases and 30 non-diabetic patients as controls. Participants were recruited using non-probability consecutive sampling. Demographic and clinical data were collected using a structured questionnaire.

Results: Oral candidiasis was detected in 21 (70.0%) diabetic denture wearers compared with 10 (33.3%) non-diabetic denture wearers. The difference was statistically significant ($p=0.004$), and diabetic denture wearers had approximately 4.67 times higher odds of candidiasis than controls (OR=4.67, 95% CI: 1.57–13.87). *Candida albicans* was the most frequently isolated species, accounting for 22 (71.0%) culture-positive cases. Candidiasis was also more common among participants with poor denture hygiene, overnight denture wearing, and denture use of five years or longer.

Conclusion: Oral candidiasis was significantly more frequent among diabetic denture wearers than among non-diabetic denture wearers. *Candida albicans* was the predominant species.

Introduction

Diabetes mellitus is an important chronic disease and a growing issue in the world. In fact, by 2025 it is estimated that there will be 300 million adults with diabetes in the world (1). Diabetes

and oral candidiasis have been the subject of many studies (2-13) in the literature, especially because diabetes makes people more likely to experience a fungal infection than do individuals without diabetes (2-4,10). It is known that yeast

binds to the surface of epithelial cells as a crucial initial event in yeast colonization and infection by candida (14). The diabetic patient has elevated glucose levels in saliva which are favorable for yeast growth, as there are more associated receptors for Candida (15). This has been shown by increased adherence of *C. albicans* to buccal cells from diabetic patients than that of nondiabetic patients (3,4). In addition, the microvascular degeneration seen in histologic studies of diabetic patients could make them more prone to Candida colonization (16), which could increase their susceptibility to infection. Another host factor that could contribute to the oral carriage of Candida in diabetics is the impairment of candidacidal activity of neutrophils in the presence of glucose (17). Salivary hypofunction, which occurs in diabetics, can also be a factor in candida colonization and hence, in the pathogenesis of oral candidiasis in diabetes (8).

The alteration of the oral mucosa associated with the denture in the oral cavity, along with the systemic complications may make the denture wearing patient with diabetes more susceptible to candidal infection (4,5,7,10,11). Diabetic patients wearing removable dentures showed a significantly higher incidence of Candida infection, and increased levels of Candida spp. (7,10,11). Having a removable denture can also reduce saliva flow rate, its pH, and the mechanical cleansing that occurs on the soft tissue surfaces by the tongue (18). Also, denture-induced trauma can decrease the resistance of the tissues to infection, due to increased permeability of the epithelium to soluble antigens and toxins of candida (19). Additionally, the tissue surface of the acrylic resin denture serves as a reservoir for microorganisms and increases their infective potential, and it exacerbates an existing condition (14,18). Therefore, diabetics may be at increased risk of oral candidiasis due to both systemic and local predisposing factors which can lead to an increase in the number of microorganisms.

Thus, the present study was designed to compare the prevalence of Candida spp. in well-controlled

type 2 diabetic and nondiabetic denture wearing patients with and without denture stomatitis.

Methodology

The study was done in a case-control design at THQ BUREWALA & DIN Medical complex from January 2025 to July 2025. There were 30 cases and 30 controls in the study. The eligible participants were selected by a non-probability consecutive sampling technique. A structured self-administered questionnaire was used as the data collection tool. Cases included diabetic patients who were denture wearers, whereas controls included non-diabetic patients who were denture wearers. The controls were chosen within the same clinical population, to ensure a group comparable to that of the cases. The patients who gave informed consent and were attending selected dental clinics in District Vehari were included. Control subjects did not have a history of diabetes mellitus, and cases did have a diagnosed diabetes mellitus. Those who refused consent, did not finish up the follow-up period, or had incomplete clinical and laboratory data were excluded.

Data Collection Procedure

Demographic and relevant clinical data were collected with consent, through a structured questionnaire. During the follow up period, oral samples were taken from the oral cavity from diabetic denture wearers and non-diabetic denture-wearing controls for mycological examination. The samples were cultured directly on Sabouraud agar medium. Fungal colonies were counted after incubation, and isolated colonies were identified by the use of appropriate standard laboratory identification tests. Data was collected separately for cases and controls and compared to later.

Data Analysis

The data were first entered into Microsoft Excel and then imported into SPSS 27 for data analysis. Data of numerical variables were summarized as mean $\pm$ SD, and data of categorical variables were shown as frequencies

and percentages. The relationships between categorical variables were evaluated by Chi-square test or Fisher's exact test, depending on the values of the variables. An odds ratio (OR) with 95% confidence interval (CI) was used to quantify the association between diabetes and mycological outcome. A p-value < 0.05 was deemed as statistically significant.

Results

A total of 60 denture wearers were included in the study, comprising 30 diabetic patients as cases and 30 non-diabetic patients as controls. The mean age of diabetic denture wearers was 59.1 ± 8.6 years compared with 57.3 ± 9.1 years among controls. The two groups were comparable with respect to age, gender, and duration of denture use. Oral candidiasis was more frequent among diabetic denture wearers than among non-diabetic controls.

Table 1. Demographic and Denture-Related Characteristics of Study Participants (N = 60)

Characteristic	Diabetic denture wearers (n=30), n (%) / Mean $\pm$ SD	Non-diabetic denture wearers (n=30), n (%) / Mean $\pm$ SD	p-value
Age, years	59.1 $\pm$ 8.6	57.3 $\pm$ 9.1	0.434
Gender			
Male	17 (56.7)	16 (53.3)	0.795
Female	13 (43.3)	14 (46.7)	
Duration of denture use, years	4.9 $\pm$ 2.4	4.5 $\pm$ 2.2	0.504
Duration of denture use			
<5 years	16 (53.3)	19 (63.3)	0.432
$\geq$ 5 years	14 (46.7)	11 (36.7)	
Denture hygiene status			
Good denture hygiene	14 (46.7)	19 (63.3)	0.194
Poor denture hygiene	16 (53.3)	11 (36.7)	
Overnight denture wearing			
Yes	17 (56.7)	13 (43.3)	0.302
No	13 (43.3)	17 (56.7)	
Oral candidiasis			
Present	21 (70.0)	10 (33.3)	0.004
Absent	9 (30.0)	20 (66.7)	
Total	30 (100.0)	30 (100.0)	—

The mean age was slightly higher among diabetic denture wearers; however, the difference was not statistically significant (p=0.434). Similarly, no

significant differences were observed between cases and controls regarding gender (p=0.795) or mean duration of denture use (p=0.504).

Table 2. Frequency of Oral Candidiasis Among Diabetic and Non-Diabetic Denture Wearers (N = 60)

Study group	Candidiasis present, n (%)	Candidiasis absent, n (%)	OR (95% CI)	p-value
Diabetic denture wearers (n=30)	21 (70.0)	9 (30.0)	4.67 (1.57–13.87)	0.004
Non-diabetic denture wearers (n=30)	10 (33.3)	20 (66.7)	Reference	
Total	31 (51.7)	29 (48.3)		

Oral candidiasis was detected in 21 (70.0%) diabetic denture wearers compared with 10 (33.3%) non-diabetic denture wearers. The difference was statistically significant ($p=0.004$).

Diabetic denture wearers had approximately 4.67 times higher odds of candidiasis compared with non-diabetic denture wearers (OR=4.67, 95% CI: 1.57–13.87).

Table 3. Distribution of Candida Species Among Culture-Positive Participants (n = 31)

Candida species	Diabetic cases (n=21)	Controls (n=10)	Total, n (%)
Candida albicans	15 (71.4)	7 (70.0)	22 (71.0)
Candida tropicalis	3 (14.3)	2 (20.0)	5 (16.1)
Candida glabrata	2 (9.5)	1 (10.0)	3 (9.7)
Mixed Candida species	1 (4.8)	0 (0.0)	1 (3.2)
Total	21 (100.0)	10 (100.0)	31 (100.0)

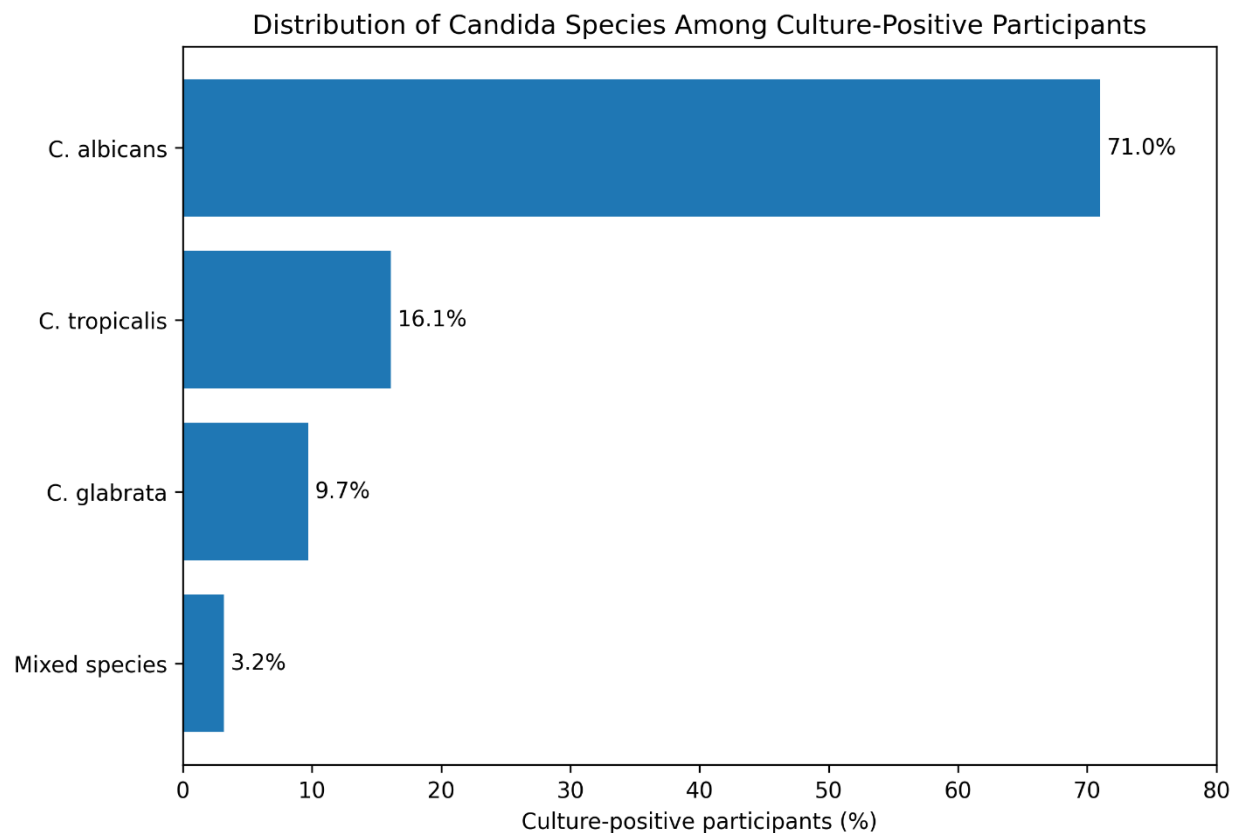


Figure 1: Distribution of Candida species among culture-positive participants. Candida albicans was the most frequently isolated species, identified in 71.0% of culture-positive participants, followed by Candida tropicalis in 16.1%, Candida glabrata in 9.7%, and mixed Candida species in 3.2%.

Among the 31 participants with candidiasis, Candida albicans was the predominant species and was isolated in 22 (71.0%) cases. Candida tropicalis was identified in five (16.1%), Candida glabrata in three (9.7%), and mixed Candida species in one (3.2%) participant. Oral candidiasis was significantly more frequent among participants with poor denture hygiene (70.4% vs. 36.4%, $p=0.009$), those who wore dentures overnight (66.7% vs. 36.7%, $p=0.020$), and those who had used dentures for five years or longer (68.0% vs. 40.0%, $p=0.032$).

Table 4. Association of Denture-Related Factors with Oral Candidiasis (N = 60)

Factor	Candidiasis present, n (%)	Candidiasis absent, n (%)	OR (95% CI)	p-value
Poor denture hygiene (n=27)	19 (70.4)	8 (29.6)	4.16 (1.40–12.35)	0.009
Good denture hygiene (n=33)	12 (36.4)	21 (63.6)	Reference	
Overnight denture wearing (n=30)	20 (66.7)	10 (33.3)	3.45 (1.19–9.99)	0.020
No overnight denture wearing (n=30)	11 (36.7)	19 (63.3)	Reference	
Denture use ≥5 years (n=25)	17 (68.0)	8 (32.0)	3.19 (1.08–9.37)	0.032
Denture use <5 years (n=35)	14 (40.0)	21 (60.0)	Reference	

Discussion

The objective of the present study was to determine the prevalence of candidiasis in diabetic denture wearers and to make comparisons with the non-diabetic denture wearers. Among the patients wearing diabetic dentures, 21 (70.0%) had oral candidiasis while 10 (33.3%) of the controls were non-diabetic. This difference was statistically significant, and the risk of developing candidiasis was ~4.7 fold higher among diabetic denture wearers. The results indicate that diabetes mellitus in combination with denture use may provide conditions that promote oral Candida colonization and infection. This increased incidence of candidiasis among diabetic denture wearers is in line with other studies that have reported that diabetics have higher Candida colonization. The one case-control study of diabetic and non-diabetic denture wearers found a significantly higher level of Candida colony density among the diabetic group and significant correlations between Candida colonization, blood glucose levels, and denture length of use. In a third study, complete denture wearers with T2D showed a positive association between blood sugar levels and Candida colony counts; however, Candida colonization was found to drop after enhanced glycemic control (20). The results suggest that hyperglycemia and changes in oral

conditions associated with diabetes may favour the growth of fungi.

In the present study, the species most frequently recovered from the cultures was *Candida albicans* (22, 71.0%). *Candida tropicalis* and *Candida glabrata* were less common. This result is similar to previous studies, where *C. albicans* was the most common *Candida* species isolated from denture wearers and diabetic patients, respectively. The high percentage of *C. albicans* could be associated with its high adherence to oral mucosal surfaces as well as denture acrylic, formation of biofilms and its persistence in the denture-bearing environment (21). There were also significant relationships between denture-related practices and candidiasis. There was a significantly greater prevalence of candidiasis in participants with poor denture hygiene than in those with good denture hygiene. Likewise, incidence of candidiasis was higher in denture wearers who wore their dentures at night and among those who had been wearing dentures for five years or more (22). The observations are clinically important because the dentures may serve as a surface for the attachment of *Candida* and the development of *Candida* biofilm, especially if the dentures are not cleaned properly or if they are allowed to constantly touch the oral tissues. *Candida* has been recovered significantly more often in denture wearers than in non-denture

wearers; this is a significant local predisposing factor of denture use (7,11). The results of this study highlight the need for periodic oral examination and mycological examination of diabetic denture wearers, especially those with poor denture hygiene and/or extended denture wearing time. Optimal glycemic control, proper denture cleaning, denture removal at night and replacement or adjustment of worn dentures in a timely fashion may help prevent *Candida* colonization and the subsequent oral infection. Prompt detection of a diabetic denture wearer's candidiasis may also enhance oral comfort and minimize the chances of a re-infection (23).

Limitations

There were several limitations in this study. Only two clinical centers were used with a relatively small sample size (N = 60), which could influence generalizability. Selection bias could also have been created using non-probability consecutive sampling. The study had only one mycological evaluation, and parameters such as glycemic control, diabetes duration, type, salivary flow and oral hygiene habits, denture age, type of denture material, smoking, recent use of antibiotics, and other factors that could affect *Candida* growth were not adequately controlled. The study also determined the presence of candidiasis, but not antifungal susceptibility or molecular identification of *Candida* spp. It is recommended that larger multicenter studies be conducted with better assessment of diabetic control and denture-related factors.

Conclusion

Diabetic denture wearers were more likely to experience oral candidiasis compared to the non-diabetic denture wearers. The predominant species found was *Candida albicans*. Other factors found to be related to the occurrence of candidiasis included poor denture hygiene and extended wearing time and overnight denture wearing. These results indicate that it is important to perform routinely oral examination, good denture hygiene and denture care, and effective glycemic control to lower the risk of

developing oral candidiasis in diabetic individuals wearing dentures.

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