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ORIGINAL ARTICLE/ARTICLE ORIGINAL

# Prevalence of *Candida* species in the buccal cavity of diabetic and non-diabetic individuals in and around Pondicherry

*Prévalence des espèces de Candida dans la cavité buccale des sujets diabétiques et des sujets non diabétiques aux alentours et à Pondichéry*

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## KEYWORDS

Buccal samples;  
*Candida* species;  
Pondicherry;  
Diabetic individuals;  
Antifungal susceptibility test

## Summary

**Objectives.** – The aim of the present study was to determine the prevalence of *Candida* in the buccal cavity of diabetic and non-diabetic individuals in and around Pondicherry, India and to analyse the antifungal susceptibility profile of the selected isolates.

**Materials and methods.** – A total of 400 buccal samples, 200 each from diabetic and non-diabetic healthy individuals were included in the study. Sabouraud's dextrose agar was used for isolation of *Candida* species. Identification was performed through microscopy, germ tube test, sugar fermentation test, sugar assimilation test and by using Hichrome agar. Distinct and phenotypically representative colonies were selected and subjected to ITS analysis. In vitro antifungal susceptibility testing for the isolated *Candida* species was performed using E-test.

**Results.** – Results revealed that the prevalence of *Candida* species in diabetic individuals was higher when compared with non-diabetic healthy individuals. The most predominantly isolated species in diabetic and non-diabetic individuals from buccal cavity was *Candida albicans*. *C. tropicalis* was predominant among the non-*albicans* *Candida* isolated from both diabetic and non-diabetic individuals. Among denture wearers *C. glabrata* was predominant. In vitro antifungal susceptibility testing shows that ketoconazole, fluconazole and itraconazole were effective against the isolated *Candida* species.

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## MOTS CLÉS

Échantillons buccaux ;  
Espèces de *Candida* ;  
Pondichéry ;  
Individus diabétiques ;  
Sensibilité  
aux antifongiques

**Conclusions.** – The rate of candidal carriage in diabetic individuals is higher. Different species of *Candida* are present in the oral cavity of diabetic individuals. There may be a positive correlation between glycemic control and candidal colonization. In vitro antifungal susceptibility testing of *Candida* species are required for proper management and treatment of candidal infections.

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## Résumé

**Objectifs.** – L'objectif de la présente étude consiste à déterminer la prévalence de *Candida* dans la cavité buccale des personnes diabétiques et des personnes non diabétiques habitant à Pondichéry et aux alentours de Pondichéry en Inde et à analyser le profil de sensibilité antifongique des isolats sélectionnés.

**Matériels et méthodes.** – Au total, 400 échantillons buccaux, 200 d'individus diabétiques et 200 d'individus non diabétiques ont été analysés. La gélose dextrose de Sabouraud a été utilisée pour isoler les espèces de *Candida*. L'identification a été réalisée par microscopie, par le test du tube germinatif, par le test de la fermentation des sucres, par le test de l'assimilation du sucre et en utilisant la gélose Hichrome. Des colonies distinctes et des colonies phénotypiquement représentatives ont été sélectionnées et soumises à l'analyse ITS. Analyse de sensibilité antifongique in vitro pour les espèces de *Candida* isolées a été réalisée en utilisant E-test.

**Résultats.** – Les résultats ont révélé que la prévalence des espèces de *Candida* chez les personnes diabétiques était plus élevée par rapport aux sujets sains et non diabétiques. Les espèces les plus isolées principalement dans la cavité buccale chez les personnes diabétiques et des personnes non diabétiques étaient *Candida albicans*. Les espèces de *C. tropicalis* étaient prédominantes chez les espèces non-*albicans* isolées chez les individus diabétiques et les individus non diabétiques. Parmi les porteurs de prothèses dentaires, l'espèce *C. glabrata* était prédominante. Le test de sensibilité antifongique in vitro montre que le kétoconazole, le fluconazole et l'itraconazole étaient efficaces contre les espèces de *Candida* isolées.

**Conclusion.** – Le taux de portage de *Candida* chez les personnes diabétiques est plus élevé. Différentes espèces de *Candida* sont présentes dans la cavité buccale des sujets diabétiques. Il peut y avoir une corrélation positive entre le contrôle glycémique et la colonisation par *Candida*. Les tests de sensibilité antifongique des espèces de *Candida* sont nécessaires pour la gestion et le traitement approprié des infections à *Candida*.

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## Introduction

Diabetes mellitus is a multisystemic disorder characterized by high blood sugar levels for a prolonged period. This is due to deficiency of insulin secretion or action. Researchers have reported that in the 21st century, diabetes mellitus is one of the largest emerging threats to health [1]. Although, there is an increase in the diabetes mellitus population in India, there are no clear-cut published studies to evaluate the oral fungal infection, which are prevalent in these diabetic individuals [22]. During the last 10 years, there is an increase in candidal infection and also changes have been noted in the species causing candidiasis [24]. In human beings, *Candida albicans* is one of the normal micro flora which is isolated from the oral cavity. The colonization of *Candida* species occurs on the mucosal surface immediately after birth and the risk of endogenous infection is persistent throughout the life of an individual [12]. Manifestations of oral candidiasis may occur in individuals infected with the HIV, with nutritional deficiencies, malignancies or with metabolic disorders, like diabetes mellitus [39]. Isolation of *Candida* species from the oral cavity of diabetes mellitus individual was frequent but the importance of *Candida* is a controversy [7]. In diabetes mellitus patients, the frequency of occurrence of these

organisms varies from 18 to 80% [37]. The presence of dentures exerts a greater effect on the species of *Candida* isolated from the buccal cavity than the diabetic status [9,17]. The differences in the *Candida* recovery are due to the methods followed in the laboratory, the number of subjects, the characteristics of the subjects, and also the techniques used in sampling [4,13,17]. The purpose of this study was to define the prevalence of *Candida* in the buccal cavity of type II diabetes mellitus individuals and healthy individuals, attending a diabetic clinic in Pondicherry. The in vitro antifungal susceptibility pattern of the isolated *Candida* species was also determined using the E-test method [3,28].

## Materials and methods

### Collection of buccal samples

The present study was approved by the Institutional Ethics Committee of Madras Diabetes Research Foundation. A part of the study was carried out at Dr. Mohan's Diabetes and Endocrine Specialties, Pondicherry.

Buccal swabs [20,21] were obtained from 400 subjects of both sexes (200 diabetic individuals and 200 non-diabetic individuals). The diabetic group comprised 200 randomly

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