

Oral *Candida spp* carriers: its prevalence in patients with type 2 *Diabetes Mellitus**

Portadores de *Candida spp* na cavidade oral: a sua prevalência em pacientes com diabetes mellitus tipo 2

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Abstract: BACKGROUND: Prevalence of oral candidiasis in diabetic patients is 13.7-64%. *Candida albicans* was the most frequently isolated species (75-86.5%).

OBJECTIVE: To obtain the prevalence of *Candida* carriers among patients with type 2 *diabetes mellitus* to identify the species of the yeast. Study design: It is an open, observational, descriptive, cross-sectional, and prospective study.

METHODS: We included voluntary patients from the National Diabetes Marathon and performed a blood glucose measurement, sialometry test, Gram-stained exfoliative cytology, and culture on Sabouraud dextrose agar and CHROMagar *Candida* TM. Results were analyzed using descriptive statistics.

RESULTS: We examined 141 patients (mean age 57 years): 103 women (73%) and 38 men (26.9%). Exfoliative cytology was positive in 32 cases (23 with oral lesions); 78 had oral lesions but no *Candida* (93.9%). *Candida* was isolated in 58 patients (41.1%), 21 (45.6%) had blood glucose greater than 126 mg/dl, and 37 (38.9%) had less than 126 mg/dl. The most frequent species was *C. albicans* (82.7%). Forty-two *Candida* carriers had salivary flow greater than 20 mm (72.4%), and 16 (27.5%) had hyposalivation. *Candida* was isolated in 25 of 79 patients with dental prosthesis (31.6%), 9 of 15 were smokers (60%), and 22 of 71 had symptoms (30.9%).

CONCLUSIONS: Prevalence of oral *Candida* carriers in patients with type 2 *diabetes mellitus* in Mexico was similar to that found in other countries; exfoliative cytology was effective in finding *Candida*; salivary flow rate, use of prosthesis, and presence of oral lesions and symptoms were similar in oral *Candida* carriers and negative patients. Most smokers were *Candida* carriers.

Keywords: *Candida*; Diabetes mellitus, type 2; Mexico; Mouth

Resumo: FUNDAMENTOS: A prevalência de candidíase oral em pacientes diabéticos é de 13,7- 64%. A espécie mais frequentemente isolada é *Candida albicans*(75-86,5%).

OBJETIVO: Obter a prevalência de portadores de *Candida* em pacientes com *diabetes mellitus* tipo 2 para identificar as espécies da levedura. Desenho do estudo: Aberto, observacional, descritivo, transversal e prospectivo.

MÉTODOS: Incluímos pacientes voluntários dentro da Maratona Nacional do Diabetes e realizamos medida da glicose sanguínea, teste sialométrico, coloração de Gram da citologia esfoliativa, cultura em ágar Sabouraud dextrose e CHROMagar *Candida* TM. Os resultados foram analisados com estatística descritiva.

RESULTADOS: Foram examinados 141 pacientes (média de idade de 57 anos), 103 mulheres (73%) e 38 homens (26,9%). A citologia esfoliativa foi positiva em 32 casos (23 com lesão oral), 78 tinham lesão oral, mas não tinham *Candida* (93,9%). *Candida* foi isolado em 58 pacientes (41,1%), 21(45,6%) tiveram glicemia superior a 126 mg / dl e 37 (38,9%) tiveram glicemia inferior a 126 mg / dl. A espécie mais frequente foi *C. albicans* (82,7%). 42 portadores de *Candida* tinham fluxo salivar maior que 20 mm(72,4%) e 16(27,5%) tinham hipossalivação. *Candida* foi isolado em 25 de 79 pacientes com prótese dentária (31,6%), 9 de 15 fumantes (60%), e 22 de 71 com sintomas (30,9%).

CONCLUSÕES: A prevalência de portadores de *Candida* oral em pacientes com *diabetes mellitus* tipo 2 no México foi semelhante a outros países; citologia esfoliativa foi efetiva em encontrar *Candida*; fluxo salivar, uso de prótese, presença de lesão oral e sintomatologia foi semelhante em portadores de *Candida* oral e pacientes não portadores. A maioria dos fumantes eram portadores de *Candida*.

Palavras-chave: Boca; *Candida*; Diabetes mellitus tipo 2; México

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INTRODUCTION

Patients with type 2 *diabetes mellitus* (DM) are at an increased risk of having opportunistic infections, including oral and vaginal candidiasis, periodontal and gingival diseases, dental caries, and salivary dysfunction.¹

Prevalence of nonspecific symptoms such as gustatory changes, glossodynia, and halitosis is 18-56%.² Other symptoms reported are dysgeusia, oral paresthesia, hotness or burning sensation.^{3,4}

Oral candidiasis is a superficial fungal opportunistic infection, caused mainly by *Candida albicans*.⁵ One factor that favors colonization of the mouth is poor glucose control, but this is still controversial.^{6,7}

Prevalence of oral candidiasis in diabetic patients is 13.7 to 64%, and lesions are asymptomatic in most cases.^{6,8}

The *Candida* species most frequently isolated from the oral cavity in patients with DM are *Candida albicans* (75 to 86.5%), *C. krusei* (4%), and *C. glabrata* (5%). They are mainly found on the surface of the tongue, followed by the palate and oral mucosa.^{9,10}

Identification of *Candida* species is based on characteristics such as macro and microscopic morphology, carbohydrate assimilation, and use of chromogenic media such as Aniline Blue, Fluoroplate™, Candichrom™, CandiSelect™, and CHROMagar *Candida*™. The latter enables the identification of *C. albicans*, *C. tropicalis*, *C. glabrata*, and *C. krusei* (green, blue, bright pink, and pale pink colonies, respectively), and although it is one of the most used media, there have been variations in sensitivity and specificity.¹¹⁻²⁰

MATERIALS AND METHODS

Our goal was to determine the prevalence of oral *Candida* carriers among patients with type 2 DM using Gram-stained exfoliative cytology and primo-isolation culture on Sabouraud dextrose agar to identify the isolated species with CHROMagar *Candida*™ and to determine blood glucose, rate of salivary secretion, use of dental prosthesis, smoking and oral lesions, and symptoms such as dryness, burning sensation, and bad taste.

This is a descriptive, open, observational, prospective, and cross-sectional study.

We included patients older than 18 years of both sexes with confirmed diagnosis of type II DM seen at the Mycology Section of the Department of Dermatology at Hospital General Dr. Manuel Gea Gonzalez during the XV National Diabetes Marathon in Mexico City.

Results were analyzed using descriptive statistics.

This study was approved by the Hospital Ethics Committee, and the subjects signed the informed consent form.

A sialometry test was performed as described by Lopez et al., and lesions suggestive of oral candidiasis were reported. To explore the oral cavity, a calibration trial was performed intra and inter-examiners based on the criteria by Ramirez et al.^{4,20}

Patients were sampled with a sterile swab for Gram-stained exfoliative cytology to demonstrate the presence of yeast and filamentous structures. Culture on Sabouraud dextrose agar (Becton Dickinson & BBL™) was also done and maintained at 37°C for up to two weeks. We conducted a direct examination of the cultures with sterile saline solution to verify the presence of yeast.

CHROMagar *Candida* (Becton Dickinson & BBL™) plates were inoculated and maintained at 37°C for up to 48 hours. Then, we identified the different species of *Candida*.

RESULTS

We examined 141 patients with type 2 diabetes mellitus: 103 women (73%) and 38 men (26.9%). Their age varied from 26 to 87 years (mean age 57).

Of the total patients enrolled in the study, 46 (32.6%) had blood glucose greater than 126 mg/dl, of whom 21 (45.6%) were *Candida* carriers. Of the 95 remaining patients with blood glucose less than 126 mg/dl, 37 (38.9%) had *Candida*. Exfoliative cytology showed yeast and filaments in 32 cases (55.1%), and 9 cases were negative. Of the group of 83 patients in whom *Candida* sp was not isolated, 78 (93.9%) had oral lesions.

Candida spp was isolated in 58 patients (41.1 %) using culture on Sabouraud dextrose agar: 45 women (75.5%) and 18 men (31%). The most frequently isolated species was *C. albicans* (82.7%). The species was not identified in two cases (Table 1).

Forty-two patients (72.4%) with *Candida* had a salivary flow rate higher than 20 mm, and 16 (27.5%) had hyposalivation (saliva flow lower than 20 mm). Among the negative *Candida* patients, 69 (83%) had normal salivary flow rate, and 14 (16%) had hyposalivation.

Of the 79 patients in the study who used dental prosthesis, 25 (31.6%) were *Candida* carriers, and 64 (81%) were negative.

TABLE 1: Isolated species of *Candida* sp.

Species	No	%
<i>Candida albicans</i>	48	82.7
<i>Candida glabrata</i>	5	8.6
<i>Candida kruzei</i>	3	5.1
<i>Candida</i> sp	2	3.4

Of all patients, 15 were smokers, and 9 (60%) of them were *Candida* carriers.

Twenty-two (37.9%) *Candida* carriers had symptoms, as well as 49 (59%) patients from the negative group (Table 2).

TABLE 2: Frequency of risk factors in *Candida sp* carriers

Factor	No	%
Prosthesis	25	43.1
Smoking	9	15.5
Oral lesions	23	39.6
Symptoms	22	37.9

DISCUSSION

In our study, prevalence of *Candida* carriers was 55.1%, which is similar to that found in other reports. The same is true for prevalence of *Candida albicans*.^{1, 5-10} Of the total number of *Candida* carriers, 75.5% were women, due to the greater number of women participating in the marathon and included in the study.

Twenty-three patients with oral lesions had positive Gram-stained exfoliative cytology, while 9 patients did not. *Candida* was not identified by exfoliative cytology or by culture in 83 patients with oral lesions. From these data, we deduced that not all oral lesions were caused by *Candida*. Therefore, it is necessary to confirm the presence of *Candida* with a proper procedure to avoid an unjustified antimycotic treatment. Exfoliative cytology was an effective, simple, fast, and economical tool to diagnose oral candidiasis.^{1, 5, and 6,8,10}

Among patients with *Candida sp*, 42 (72.4%) had a normal salivary flow rate, and just 16 (27.5%)

had hyposalivation. Among the negative cases, 69 (83%) had normal salivary flow rate, and 14 (16%) had hyposalivation. Thus, we can conclude that a lower salivary flow rate did not change the probability of being a carrier.⁴

Among 79 dental prosthesis users, 25 (31.6%) had the yeast, and 64 (81%) were negative. This finding does not correspond to the usual belief that the use of dental prosthesis is a predisposing risk factor for developing oral candidiasis.^{1, 8}

Fifteen patients enrolled in the study were smokers, of whom 9 (60%) were *Candida* carriers. Therefore, it can be inferred that smoking was a relative risk factor for presence of *Candida* in the oral cavity.

Of seventy-one patients who had symptoms, 22 (37.9%) were *Candida* carriers, while (59%) were not (Table 2), which suggests that the presence of symptoms was not related to the possibility of carrying *Candida* in the oral cavity, but perhaps to drugs used to control diabetes.^{2,3,4}

CONCLUSIONS

In our study, prevalence of *Candida* carriers was 55.1%, which is similar to that found in other reports. The same is true for prevalence of *Candida albicans*.^{1, 5-10} Not all oral lesions were caused by *Candida*. Therefore, it is necessary to confirm the presence of *Candida* with a proper procedure to avoid an unjustified antimycotic treatment. A lower salivary flow rate did not change the probability of being a carrier.⁴ In our study, the use of dental prosthesis did not show to be a predisposing risk factor for developing oral candidiasis.^{1, 8} Smoking was a relative risk factor for the presence of *Candida* in the oral cavity. Presence of symptoms was not related to the possibility of carrying *Candida* in the oral cavity, but perhaps to drugs used to control diabetes.^{2, 3, 4} □

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