

Oral Candida Colonization Among Adults in Morocco: Prevalence and Risk Factors

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Abstract

Original Research Article

Candida is a commensal microorganism of the oral cavity and part of the normal microbial flora. Oral carriage of *Candida* can be influenced by several factors and may lead to the development of oral candidiasis. Oral swabs were collected from 46 consultants at the stomatology department and then sent to the mycology laboratory for identification of isolates. The specimens were cultured on CandiSelect medium plates as well as on Sabouraud dextrose agar plates containing chloramphenicol. 38% of cultures were positive. *Candida albicans* was the most encountered specie (87.5% of positive cultures). Oral *Candida* colonization was more frequent in the following categories of patients: immunocompromised subjects, patients with malignancy, those undergoing chemotherapy, type 2 diabetics patients, smokers, and patients brushing their teeth irregularly (less than twice a day or occasionally). All of these associations were statistically significant. ($p < 0,05$). The diagnosis of oral *Candida* carriage prior to the presentation of clinical symptoms could prevent patients at risk of serious complications. The promotion of oral health and hygiene education could help stop the spread of yeast colonization.

Keywords: Candida, oral colonization, oral carriage, oral hygiene, culture, identification.

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INTRODUCTION

The human oral cavity is prone to colonization by different microorganisms; bacteria, protozoa, viruses, and fungi. Long called oral flora, the oral microbiota is acquired at birth from maternal and environmental microorganisms. In normal conditions, the microbiota present in an oral cavity is in a state of balance and does not lead to any pathological consequences. However, the stability of this flora remains fragile and under the influence of various factors such as immunosuppression, trauma, or poor oral hygiene, this state of equilibrium can quickly break down and cause various infections [1].

Despite the fact that bacteria constitute the major part of the oral microbiota, fungi colonizing the oral cavity are generally present in significant quantities. Among these fungi, yeasts are frequently found. The most often encountered are those of the genus *Candida* which are carried in the mouths of many individuals in a commensal state [2].

Candida albicans is the most incriminated micro-organism in oral colonization by fungi. The presence of *Candida albicans* in the oral cavity is not signifying of disease. In many individuals, *C. albicans* is a minor element of their oral flora, and no clinical symptoms are reported. Nevertheless, in some cases, oral candidiasis occurs and necessitates antifungal therapy [3].

In this study, we evaluate the prevalence of colonization of the oral cavity by yeasts of the genus *Candida*, and the related risk factors in consultants at the maxillofacial surgery and stomatology department of the military hospital Avicenne of Marrakech.

PATIENTS AND METHODS

1. Study and data collection

This is a prospective study conducted between February and April 2022 over a period of 3 months. Were included all consultants at the maxillofacial surgery and stomatology department of the military hospital Avicenne of Marrakech. A standardized data-collection form was used to retrieve demographic characteristics

(e.g., age, sex), underlying medical conditions (e.g., diabetes mellitus, immunodepression, cancer, antibiotic prescription), habits information (smoking, alcohol consumption), and information related to dental care and oral hygiene. Consent was clearly obtained by all participants.

2. Sample Collection and Fungal Culture

Oral swabs were collected from all participants and then sent to the mycology laboratory for analysis. The specimens were cultured within 2 h of collection on CandiSelect medium plates as well as on Sabouraud dextrose agar plates containing chloramphenicol and were incubated at 37° C for 48 h. If present, colonies from each medium plate were selected for further analyses.

3. Laboratory methods and identification

Isolates were identified by conventional mycological methods such as color formation in Candiselect Candida medium, microscopic morphology filamentation test, and when needed further yeast speciation was carried out by API 20C AUX yeast identification system (Biomerieux).

4. Statistical methods

Statistical analysis was performed on IBM SPSS Statistics version 23 software. The descriptive analysis consisted of a calculation of numbers and percentages for qualitative variables and a calculation of central tendency measures (means and medians) for quantitative variables. A comparison of qualitative variables was made using Pearson's Chi2 statistical test and Fisher's test when necessary. The statistical significance level was specified as $p < 0.05$.

RESULTS

1. Clinical characteristics of the study population :

45 patients were enrolled for this study. Male patients represented the majority of the sample with a frequency of 71%. The average age of our patients was

32.8 years. The 20-40 age group was the most represented with a prevalence of 58%.

The clinical characteristics found in our patients were: immunosuppression (16%), the concomitance of malignancy (11%), chemotherapy (9%), oral antibiotic therapy (38%), type 2 diabetes mellitus (29%), and feeling of dry mouth or xerostomia (26%).

Regarding the toxic habits of the population, 22% of patients were smokers, and regular alcohol consumption was reported by 15.5% of the population.

As for oral health; 16% of patients brushed their teeth at least twice a day, 71% brushed their teeth only once a day, and 13% brushed their teeth occasionally. 11% of patients had an oral prosthesis.

2. Evaluation of Candida colonization

38% of cultures were positive. *Candida albicans* was the most encountered specie (87.5% of positive cultures and 33% of all cultures). *Candida glabrata* and *Candida tropicalis* were also isolated with a prevalence of 2.2% respectively.

3. Risk factors for oral Candida colonization

Oral *Candida* colonization was more frequent in the following categories of patients : immunocompromised subjects, patients with malignancy, those undergoing chemotherapy, type 2 diabetics patients, smokers, and patients brushing their teeth irregularly (less than twice a day or occasionally). All of these associations were statistically significant. ($p < 0,05$).

The following factors did not appear to influence *Candida* colonization: patient age and gender, alcohol consumption, oral antibiotic therapy, dental prosthesis wearing, as well as hyposialia, and xerostomia. No statistical link was found between these associations.

Table 1: Factors influencing oral carriage of *Candida*

	Carriage of <i>Candida</i> (n=17)	p-value
Immunodepression		
Yes	5 (29%)	0,046
No	12 (7,6%)	
Malignant affection		
Yes	4 (23,5%)	0,039
No	13 (76,5%)	
Chemotherapy		
Yes	4 (23,5%)	0,016
Non	13 (76,5%)	
Diabetes mellitus		
Yes	9 (69,2%)	0,06
No	8 (47,1%)	
Daily teeth brushing		
Twice a day	0 (0%)	0,039
Once a day	13 (76,5%)	
Irregular (intermittent)	4 (23,5%)	

	Carriage of <i>Candida</i> (n=17)	p-value
Smoking		
Yes	9 (52,9%)	<0,001
No	8 (47,1%)	

DISCUSSION

The fungus *Candida albicans* is a frequent commensal colonizer of the oral cavity in many individuals [2]. The oral carriage of *Candida* varies from 2% to 70% according to previous studies [4]. These variations are mainly due to sampling methods. In the literature, *Candida albicans* is the species most frequently found in the mouth with a prevalence varying between 50% and 80% in colonized subjects [4]. To our knowledge, and according to the indexed literature, our study is the second in Morocco to assess the prevalence of oral *Candida* colonization and the risk factors associated with this carriage [5].

In this study, 38% of the patients of the study were colonized by *Candida*. This rate is lower than that found in the international literature in dental centers in Portugal and Colombia [5, 6]. The rate found is also lower than that of a Moroccan study carried out in a population of type 2 diabetics which found a prevalence of 47% [5]. The most frequently encountered species in our patients is *C. albicans*, which represented 87.5% of positive cultures. The same predominance is found in the international [4, 6, 7] and national literature [5], the frequencies found are also close to ours.

Vulnerability to *Candida* colonization can be influenced by various factors such as immunosuppression or diabetes mellitus [8]. In this study, significant associations were found between colonization by *Candida* and the following clinical characteristics: immunosuppression, concomitant malignancy, current treatment with chemotherapy and type 2 diabetes mellitus. Our results are supported by studies carried out in Sri Lanka [9] and in Saudi Arabia [10], which found a higher frequency of *Candida* colonization in diabetic patients. A study conducted in the United Kingdom concluded that there was a greater risk of colonization in subjects affected with cancers (solid tumors and hematological malignancies) [11].

This study highlights the importance of simple oral hygiene gestures such as regular tooth brushing. Indeed, our results found a clear predominance of *Candida* carriage in subjects brushing their teeth less than twice a day. This finding is also found in other international studies [12, 13].

The metabolites released during cigarette combustion induce greater permeability in the oral mucosa and allow greater adhesion of microorganisms [14]. We can easily deduce that smoking would increase the risk of oral colonization by *Candida*. In this study, a large proportion of smokers were colonized compared to non-smokers. This finding is controversial in the indexed

literature, with Gerós-Mesquita *et al.*, finding no link between smoking and oral candidiasis [15], while results from studies in Australia and Sri Lanka were consistent with ours [4, 9].

No statistical link was established in this study between wearing an oral prosthesis and *Candida* colonization. On the other hand, a previous national study had noted a greater frequency of *Candida* colonization among wearers of oral prostheses [5], which has also been observed internationally [7, 9]. In this study, the wearers of oral prostheses were few given the young age of the majority of patients (mean age of 32.8 years). This may explain our result. A study conducted in an older population would be desirable.

CONCLUSION

Our results showed that 38% of the patients in the study had oral colonization by *Candida*. The following factors were found to have an influence on colonization: Immunosuppression, the concomitance of malignant affections and chemotherapy, diabetes mellitus, smoking, and bad oral hygiene habits.

The diagnosis of oral *Candida* carriage prior to the presentation of clinical symptoms could prevent serious complications. We can also add that oral care and hygiene education could stop the spread of yeast colonization. Careful and regular surveillance of patients at risk is highly recommended.

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