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ORIGINAL PAPER

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Prevalence of Chronic Erythematous Candidiasis in Lebanese Denture Wearers: a Clinico-microbiological Study

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ABSTRACT

Objective: Chronic erythematous candidiasis also known as denture-related stomatitis refers to inflammatory changes of the denture-bearing mucosa. The aim of this study was to evaluate the prevalence of chronic erythematous candidiasis in a Lebanese population using clinical and microbiological examinations. **Materials and Methods:** Ninety-eight patients wearing full acrylic maxillary denture (50 women and 48 men) were included in this study. A clinical oral assessment and a microbiological exam using swab samples collected from the palate of these patients were performed and the data obtained were analyzed statistically. **Results:** Sixty-nine point thirty-eight per cent (69.38%) of the patients examined, (68 out of 98; 25 men and 43 women), presented chronic erythematous candidiasis. The statistical analysis showed that patient's gender was a significant predictor of the disease while no statistically significant relationship with the patient's age was found. **Conclusion:** Within the limits of this study, the prevalence of chronic erythematous candidiasis is estimated to be high in Lebanon. Women were more affected than men.

Keywords: Chronic erythematous, clinico-microbiological study, denture wearers, Lebanese, oral candidiasis, population.

ally caused by the pathological overgrowth of *Candida albicans*. It affects the skin (6), mouth (2), genitals (7), and rarely, it spreads in the form of an invasive systemic infection throughout the deep organ of the body such as the lungs (8), esophagus (9), liver (10), kidneys (11), and heart (12). Systemic candidiasis presents a mortality rate of 71–79% (13).

Oral candidiasis is frequent in infants and elderly aged (2). Many types of oral candidiasis have been described, among others, the acute pseudomembranous, the acute erythematous/atrophic, the chronic hyperplastic, the chronic erythematous/atrophic, the median rhomboid glossitis, and the angular cheilitis (14).

The chronic erythematous candidiasis (CEC), referred to “denture stomatitis”, is a chronic inflammation of the oral mucosa underlying a partial or total denture (2, 15, 16); the palatal mucosa being the most affected (2).

Clinically, CEC is presented as local or diffuse erythema and rarely nodular/papillary hyperplasia (17).

The diagnosis of CEC is based on a careful clinical assessment confirmed by a microbiological test to detect pathogenic *Candida albicans*.

The aim of this study was to evaluate the occurrence of CEC in a group of Lebanese denture wearers.

1. INTRODUCTION

Candida albicans, a type of the yeast *Candida*, is a commensal of the digestive tract and skin (1). Usually, it is harmless in healthy people (2). The occurrence of *Candida albicans* found in the oral cavity of the neonates has been reported to be 45 % (3), in healthy children 45%–65% (4), in healthy adults 30%–45% (2), and in denture wearers 50%–65% (5).

Candidiasis is a fungal infection gener-

2. MATERIALS AND METHODS

This study was conducted in accordance with the Helsinki agreement for research on humans. All the participants gave their consent. Inclusion criteria for patients in this study were:

- Aged between 40 and 80 years old.
- Wearing maxillary complete denture for more than a year.

Ninety-eight full acrylic maxillary denture-wearing patients (50 women and 48 men), meet-

ing the inclusion criteria, were selected and divided into 2 categories: a) age between 40 and 60 years old, and b) age older than 61 years old.

In order to make the diagnosis of CEC, a meticulous clinical oral exam was carried out followed by a quantitative microbiological measurement from the patient's palatal mucosa in order to confirm the presence of *Candida albicans* in its virulent form. The two procedures were performed by the same investigator.

The microbiological specimens were collected and transported by sterile devices (BBL Culture Swabs) from [Becton-Dickinson (New Jersey, USA) Microbiology System]. In the laboratory, a mix of Sabouraud's dextrose agar (dextrose 40 g/l, peptone 10 g/l, and agar 20 g/l), chloramphenicol 0.5 g/l, and actidione 0.5g/l was used for swabs culture; the incubation time was set to 48 hours at 37°C in aerobic conditions; 0.5 ml of animal serum was added to separate *Candida albicans* from other species by inducing filaments production.

Candida albicans colony counts expressed in colony forming unit (CFU)/ml collected from the palates were noted.

Data obtained was analyzed using SPSS, PC Statistical Package. Statistical analysis was performed with Chi-square tests and the statistical significance set at 0.05.

3. RESULTS

Our sample of Lebanese population consisted of 98 full maxillary denture wearers, 50 females (51.02%) and 48 males (48.97%). The patient's age ranged between 40 to 75 years, with a mean 62.05 years; out of the total 98 patients, 33 aged between 40 and 60 years whereas the rest were older than 60 (Table 1).

Variable		N	%
Age (years)	40-60	33	33.67
	> 60	65	66.32
Gender	Males	48	48.97
	Females	50	51.02

Table 1. Percent distribution of sample according to age and gender

Statistical analysis by X^2 tests was done to determine if there is a relation between patient's gender and age and CEC.

Concerning the gender, the clinical and microbiological assessments revealed a total of 68 patients (69.38%) [25 males (25.51%) and 43 females (43.87%)] presenting CEC; 30 patients (30.61%) [23 males (23.46%) and 7 females (7.14%)] had healthy palatal mucosa without any inflammation signs. When assessing the association gender-CEC it showed a statistically significant relationship ($p < 0.001$) (Table 2).

	CEC +	CEC -	Total
Male	25 (33.31) [2.07]	23 (14.69) [4.7]	48
Female	43 (34.69) [1.99]	7 (15.31) [4.51]	50
Total	68	30	98

Table 2. Statistics analysis (X^2 tests) showing association between gender and CEC; $X^2 = 13.2627$; p -value < 0.001 . (Statistically significant at $p < 0.05$); CEC +: presence of CEC. CEC -: absence of CEC

With respect the patient's age, results did not show any statistically significant relation between both age groups (40-60 years and > 60 years) and CEC ($p = 0.57114$). Twenty-seven

out of the 33 patients (81.81%), aged between 40 and 60 years showed CEC signs against 6 (18.18%); whereas for the second age group (> 60 years) 41 patients out of 65 (63.07%) showed CEC signs while 24 (36.92%) had a healthy mucosa (Table 3).

	CEC +	CEC -	Total
Age (years) 40-60	27 (22.9) [0.73]	6 (10.1) [1.67]	33
Age (years) > 60	41 (45.1) [0.37]	24 (19.9) [0.85]	65
Total	68	30	98

Table 3. Statistics analysis (X^2 tests) showing association between age groups and CEC; $X^2 = 3.6193$; p -value = 0.57114. (Statistically significant at $p < 0.05$); CEC +: presence of CEC. CEC -: absence of CEC

As for the distribution according to the type of the lesions, no statistically significant relation was found neither with the patient's gender nor age groups (Tables 4 and 5).

	CEC (local erythema)	CEC (diffuse erythema)	CEC (nodular hyperplasia)	Total
Male	3 (1.84) [0.73]	20 (22.06) [0.19]	2 (1.10) [0.73]	25
Female	2 (3.16) [0.43]	40 (37.94) [0.11]	1 (1.90) [0.42]	43
Total	5	60	3	68

Table 4. Statistics analysis (X^2 tests) showing association between gender and types of CEC; $X^2 = 2.6188$; p -value = 0.269983. (Statistically significant at $p < 0.05$)

	CEC (local erythema)	CEC (diffuse erythema)	CEC (nodular hyperplasia)	Total
Age (years) 40-60	2 (1.99) [0.00]	25 (23.82) [0.06]	0 (1.19) [1.19]	27
Age (years) > 60	3 (3.01) [0.00]	35 (36.18) [0.04]	3 (1.81) [0.78]	41
Total	5	60	3	68

Table 5. Statistics analysis (X^2 tests) showing association between age groups and types of CEC; $X^2 = 2.0721$; p -value = 0.354845. (Statistically significant at $p < 0.05$)

Out of the 98 patients, 5 (5.1%) [3 males (3.06%) and 2 females (2.04%)] presented a local erythematous lesion, against 60 (61.22%) [20 males (20.40%) and 40 females (40.81%)] presenting a diffuse erythema, and 3 (3.06%) [2 males (2.04%) and 1 female (1.02%)] having the hyperplastic type (Table 4).

On the other hand, a significant proportion from the two age groups adhered to the diffuse erythematous type of CEC. Only a minority (8 patients) (8.16%) displayed local erythematous and hyperplastic types. Interestingly, no patients from the younger group presented a hyperplastic type of CEC (Table 5).

4. DISCUSSION

Chronic erythematous candidiasis is a common problem in denture-wearer patients. Usually asymptomatic, the inflammatory erythema of the oral mucosa supporting the denture can be in some cases accompanied by pain or burning sensation (18).

Many researchers have studied in different ways (clinically and/or microbiologically) and in several races, the prevalence of CEC reported to be ranged between 11 to 60% (19). According to a systematic review and meta-analysis by Moosazadeh et al. (20), the prevalence of CEC, based on clinical examination

only, in 12 Iranian studies varied from 1.91% to 54.6%; the total number of persons examined was 2271 with an average age ranging from 32.68 to 87.5 years and a sample size floating between 40 and 343 individuals.

Similarly, in Chilean (21) and Finnish (22) clinical studies, CEC was found to be the most frequent oral mucosal lesion among individuals older than 65 years with an incidence of 22.3% and 25%, respectively.

Another clinical study performed by Zissis et al. (23) who compared the occurrence of CEC in two populations, British and Greek, concluded that a statistically significant difference exists between them with 27% and 39.7%, respectively.

The same applies to the study of Kossioni (24) who clinically examined 106 Greeks and observed CEC in 39.6% of them.

In the present study, the prevalence of CEC which was found to be 69.38% cannot be compared with any of the findings cited above due to the difference in the assessment method which is contrary to the others based on both clinical and microbiological examinations. However, this result agrees with what was stated by Budtz-Jørgensen (65%) (25), Webb et al. (65%) (26), Pahlavanzadeh et al. (70%) (27), and Tavakol and Emdadi (75%) (28), who have adopted the same technique of patient's evaluation by searching the pathogen form of *Candida albicans* in addition to the clinical examination.

Unlike this findings, clinico-microbiological studies conducted by Zomorodian et al. (29) and Jafari Nodoshan et al. (30), concluded that the prevalence of CEC was respectively 41.5% and 58% respectively. This difference might be related to a difference in the samples size or to the patient education with regard to a good oral and denture hygiene.

Despite the fact that both genders are affected by CEC, women in the current study were more frequently concerned with 43 out of 50 (86%) included in the sample against 25 out of 48 men (52.08%); this supports what was reported in the literature (18, 19, 26, 31) and seems to be related to the women continuous use of the denture for aesthetic and social reasons.

In our study, among the 98 patients examined, the diffuse erythematic type of CEC was the most retrieved (61.22%) followed by the local erythematic type (5.10%) and the hyperplastic type (3.06%); this confirms the statements of Scully (32) and Burket et al. (33).

As for the patient's age, it was found irrelevant predictors of the disease; all age groups were affected by the disease with a predominance of the patients older than 61 years. This result corroborates the one we noticed in a previous study aimed to evaluate the denture-related factors predisposing to denture stomatitis in a Lebanese population (34).

Finally, our study aiming to evaluate the prevalence of CEC is not without limitation; because of the restricted number of patients assessed, exact conclusions must be delayed until future research validates our results.

5. CONCLUSION

The prevalence of CEC in Lebanese denture wearers investigated by clinical and microbiological examinations is found to be high compared to other populations with a female predominance. Among all the clinical types of CEC, the diffuse erythematic one is the most common.

• Conflict of interest: none declared.

REFERENCES

- Conti HR, Whibley N, Coleman BM, Garg AV, Jaycox JR, Gaffen SL. Signaling through IL-17C/IL-17RE is dispensable for immunity to systemic, oral and cutaneous candidiasis. *PLoS ONE*. 2015; 10(4): e0122807.
- Akpan A, Morgan R. Oral candidiasis. *Postgrad Med J*. 2002; 78: 455-9.
- Manning DJ, Coughlin RP, Poskit EM. *Candida* in mouth or on dummy? *Arch Dis Child*. 1985; 60(4): 381-2.
- Berdicevsky I, Ben-Aryeh H, Sazargel R, Gutman D. Oral candida in children. *Oral Surg Oral Med Oral Pathol*. 1984; 57(1): 37-40.
- Arendorf TM, Walker DM. The prevalence and intra-oral distribution of *Candida albicans* in man. *Arch Oral Biol*. 1980; 25(1): 1-10.
- Asokan N, Binesh VG. Cutaneous problems in elderly diabetics: A population-based comparative cross-sectional survey. *Indian J Dermatol Venereol Leprol*. 2016. doi: 10.4103/0378-6323.190875
- Brandolt TM, Klafke GB, Gonçalves CV, Bitencourt LR, Martinez AM, Mendes JF, et al. Prevalence of *Candida* spp. in cervical-vaginal samples and the in vitro susceptibility of isolates. *Braz J Microbiol*. 2017; 48(1): 145-50.
- Arshad H, Garcia S, Khaja M. Case report of invasive, disseminated candidiasis with peripheral nodular cavitory lesions in the lung. *Respir Med Case Rep*. 2016; 20: 34-7.
- Aghdam MRF, Sund S. Invasive esophageal candidiasis with chronic mediastinal abscess and fatal pneumomediastinum. *Am J Case Rep*. 2016; 17: 466-71.
- Albano D, Bosio G, Bertoli M, Petrilli G, Bertagna F. Hepatosplenic Candidiasis Detected by (18)F-FDG-PET/CT. *Asia Oceania J Nucl Med Biol*. 2016; 4(2): 106-8.
- Hebecker B, Vlaic S, Conrad T, Bauer M, Brunke S, Kapitan M, et al. Dual-species transcriptional profiling during systemic candidiasis reveals organ-specific host-pathogen interactions. *Sci Rep*. 2016; 6: 36055.
- Bandyopadhyay S, Tiwary PK, Mondal S, Puthran S. Pacemaker lead *Candida* endocarditis: Is medical treatment possible? *Indian Heart J*. 2015; 67 Suppl 3: S100-2.
- Patil S, Rao RS, Majumdar B, Anil S. Clinical Appearance of Oral *Candida* Infection and Therapeutic Strategies. *Front Microbiol*. 2015; 6: 1391.
- Lewis MAO, Lamey PJ. *Clinical oral medicine*. Oxford: Butterworth-Heinemann, 1995.
- Lund RG, da Silva Nascente P, Etges A, Ribeiro GA, Rosalen PL, Del Pino FA. Occurrence, isolation and differentiation of *Candida* spp. and prevalence of variables associated to chronic atrophic candidiasis. *Mycoses*. 2010; 53(3): 232-8.
- Aly FZ, Blackwell CC, MacKenzie DA, Weir DM, Elton RA, Cumming CG, et al. Chronic atrophic oral candidiasis among patients with diabetes mellitus -role of secretor status. *Epidemiol Infect*. 1991; 106(2): 355-63.
- Newton AV. Denture sore mouth. *Br Dent J*. 1962; 112: 357-60.
- Gendreau L, Loewy ZG. Epidemiology and etiology of denture stomatitis. *J Prosthodont*. 2011; 20(4): 251-60.
- Arendorf TM, Walker DM. Denture stomatitis: a review. *J Oral Rehabil*. 1987; 14(3): 217-27.
- Moosazadeh M, Akbari M, Tabrizi R, Ghorbani A, Golkari A, Banakar M, et al. Denture Stomatitis and *Candida Albicans* in

- Iranian Population: A Systematic Review and Meta-Analysis. *J Dent Shiraz Univ Med Sci.* 2016; 17(3 Suppl): 283-92.
21. Espinoza I, Rojas R, Aranda W, Gamonal J. Prevalence of oral mucosal lesions in elderly people in Santiago, Chile. *J Oral Pathol Med.* 2003; 32(10): 571-5.
 22. Nevalainen MJ, Närhi TO, Ainamo A. Oral mucosal lesions and oral hygiene habits in the home-living elderly. *J Oral Rehabil.* 1997; 24(5): 332-7.
 23. Zissis A, Yannikakis S, Harrison A. Comparison of denture stomatitis prevalence in 2 population groups. *Int J Prosthodont.* 2006; 19(6): 621-5.
 24. Kossioni AE. The prevalence of denture stomatitis and its predisposing conditions in an older Greek population. *Gerodontology.* 2011; 28(2): 85-90.
 25. Budtz-Jørgensen E. The significance of *Candida albicans* in denture stomatitis. *Scand J Dent Res.* 1974; 82(2): 151-90.
 26. Webb BC, Thomas CJ, Willcox MD, Harty DW, Knox KW. *Candida*-associated denture stomatitis. Aetiology and management: a review. Part 2. Oral diseases caused by *Candida* species. *Aust Dent J.* 1998; 43(3): 160-6.
 27. Pahlavanzadeh MR, Jafari AA, Ahadian H, Ghafourzadeh M, Mirzaei F. Survey the frequency of Oral Candidiasis in Denture Users Referred to Yazd School of Dentistry. *J Toloo-e-behdasht.* 2013; 11: 103-13.
 28. Tavakol P, Emdadi Sh. Evaluation of prevalence of oral candidiasis in patients using complete Denture wears. *Dent Sch J Hamadan.* 2001; 1: 87-90.
 29. Zomorodian K, Haghighi NN, Rajaei N, Pakshir K, Tarazooie B, Vojdani M, et al. Assessment of *Candida* species colonization and denture-related stomatitis in complete denture wearers. *Med Mycol.* 2011; 49(2): 208-11.
 30. Jafari Nodoshan A, Fallah A, Mirzaei M. The Frequency of *Candida* and *Staphylococcus* Colonization in the Oral Cavity of the Elderly. *Med Lab J.* 2008; 1: 27-31.
 31. Wilson J. The aetiology, diagnosis and management of denture stomatitis. *Brit Dent J.* 1998; 185: 380-4.
 32. Scully C. *Oral and maxillofacial medicine: the basis of diagnosis and treatment* (2nd Ed.). Edinburgh: Churchill Livingstone. 2008: 201-3.
 33. Burket LW, Greenberg MS, editors. *Burket's Oral Medicine.* 11th ed. Hamilton, Ont: BC Decker. 2008: 81.
 34. Aoun G, Cassia A. Evaluation of denture-related factors predisposing to denture stomatitis in a Lebanese population. *Mater Sociomed.* 2016; 28(5): 392-6.