Oral mucosa alterations in a socioeconomically deprived region: prevalence and associated factors

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Abstract: This study aimed to evaluate the prevalence and factors associated with oral mucosa alterations in patients from Vale do Jequitinhonha, Brazil. The sample consisted of 511 patients of both genders. Questionnaires were used to obtain information about patient gender, age, race, systemic disease state, medication use, cigarette use and alcohol consumption. Physical examinations were then performed to identify lesions of the oral mucosa. Descriptive analyses, Chi-squared tests and logistic regressions were then used to analyze the results ($p < 0.05$, 95% CI). In this population, 84.9% (434/511) of patients were found to have alterations in their oral mucosa. The most common alterations were melanotic maculae (36.0%), linea alba (33.9%), traumatic ulcers (21.5%), Fordyce's granules (20.4%), coated tongue (12.5%) and fissured tongue (10.0%). Melanotic maculae were more frequently observed in black patients, with an odds ration (OR) of 7.51. Being female was a statistically significant predictive factor for having a visible linea alba (OR: 1.90) and a fissured tongue (OR: 2.11). No statistically significant association was found between the presence of oral lesions and systemic disease, medication use, alcohol use and smoking. The high observed prevalence of melanotic maculae and Fordyce's granules suggests that these alterations could be considered typical characteristics of the population of the Vale do Jequitinhonha. Coated tongue may be related to the socioeconomic deprivation in the region. Furthermore, the high prevalence of traumatic ulcers may be associated with the traumatic agents that caused patients to seek dental care.

Descriptors: Mouth Mucosa; Mouth Diseases; Prevalence.

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Introduction

The diagnosis of oral mucosa alterations depends on the ability of dentists to distinguish between pathological changes and normal variation within the oral structures.[1] A knowledge of normal alterations and lesions and their association with systemic changes, deleterious habits and medication use is therefore essential for the diagnosis, treatment and establishment of prevention policies.[2]

Studies in various parts of the world have reported the prevalence of oral mucosa alterations, as well as their association with systemic changes and with deleterious habits such as smoking and alcohol consumption. The prevalence rates of such alterations usually vary with gender, age,

race and socioeconomic status.[3-14]

The Vale do Jequitinhonha is a region largely known for its low social indicators and is currently one of the areas of greatest inequality and social exclusion in Brazil.[15] The microregion of Diamantina is located in this region and is known as the gateway to the Vale do Jequitinhonha.

Despite the socioeconomic deprivation faced by many inhabitants of the Vale do Jequitinhonha, or perhaps because of it, few studies have assessed the oral conditions of the population of this region, especially with regard to the prevalence of alterations on the oral mucosa. Once these alterations are studied in different populations, subsequent epidemiological studies will then be able to provide an understanding of the prevalence, extent and severity of oral diseases in order to investigate the factors associated with these diseases and assist in the distribution of public health resources.[16]

Therefore, the purpose of this study was to determine the prevalence and associated factors of oral mucosa alterations among 511 patients aged 12 to 78 years attending an oral health service in Vale do Jequitinhonha, Brazil.

Methodology

The present cross-sectional study was carried out on a sample of 511 patients who were treated in the dental clinics of the Federal University of Vales of Jequitinhonha and Mucuri (UFVJM), located in Diamantina, Minas Gerais, Brazil. Patients of both genders and above age 12 who sought care in the clinics between March and August of 2009 were included in the study.

The research team consisted of five investigators. The research was divided into two stages. In the first stage, 20 patients who were not part of the main study were randomly selected and evaluated for the presence or absence of oral mucosa alterations. The diagnostic results were compared with a gold standard (minimum kappa value = 0.81, maximum kappa value = 0.89), and any differences of opinion were discussed among the researchers and resolved through consensus. In the second stage, photographs of oral mucosa alterations in a color atlas were observed. Images of lesions not observed in the first clinical stage were selected.

Using questionnaires administered through face-to-face interviews, information such as age, gender, race, medical and pharmacological history and alcohol and cigarette use was collected. Participants were then subjected to a clinical examination of the oral mucosa through direct inspection of the oral cavity under artificial light (KAVO, São Paulo, Brazil) and with the use of disposable wooden spatulas (Estilo, São Paulo, Brazil). Examinations were performed according to World Health Organization criteria,[17,18] and biosafety standards were observed. At the time of examination, all participants were informed of the state of their oral mucosa and were referred to the appropriate departments depending on their treatment needs.

Twenty-six types of oral mucosa alterations were observed. The cases that required additional tests to confirm the diagnosis were referred to the UFVJM stomatology clinic for biopsy and were included in this study only after a definitive diagnosis was obtained.

The collected data were analyzed by the *Statistical Package for Social Science* Software *(*SPSS for Windows, version 17.0, SPSS Inc., Chicago, USA). Initially, we performed a descriptive analysis of the absolute and relative frequencies of all of the variables in the study. Next, we used the Chi-squared test to verify any associations that we found between oral mucosa alterations and each of the independent variables. A p-value ≤ 0.05 was accepted as significant. All independent variables that were significantly associated (p-values ≤ 0.20) with the more frequent oral mucosa alterations were included in our multivariate logistic regression model.

The study received approval from the Ethics Committee of the UFVJM. The patients were informed about the objectives, risks and benefits of the work and signed informed consent forms after agreeing to participate.

Results

A total of 511 patients with an average age of 33.3 years (SD = 9.5) participated in this study. The results of the frequency analysis of the studied variables are presented in Table 1.

Table 1 - Absolute and relative frequencies of the variables studied.

Variables	Absolute Frequency (relative)
Oral Mucosa Alterations	
Yes	434 (84.9%)
No	77 (15.1%)
Gender	
Female	367 (71.8%)
Male	144 (28.2%)
Age	
12-19 years	90 (17.6%)
20-59 years	395 (77.3%)
60-78 years	26 (5.1%)
Race	
White	170 (33.3%)
Phaeoderm	244 (47.7%)
Black	97 (19.0%)
Systemic Diseases	
Hypertension	25 (4.9%)
Neurological disorders	17 (3.3%)
Endocrinopathy	16 (3.2%)
Medications	
Analgesics	64 (12.5%)
Antihypertensive	41 (8.0%)
Anxiolytic	30 (5.9%)
Anti-inflammatory	8 (1.6%)
Cigarette Use	
Yes	80 (15.7%)
No	431 (84.3%)
Alcohol Use	
Yes	223 (43.6%)
No	288 (56.4%)
Total	511 (100.0%)

In this study, 833 oral mucosa alterations were found in 434 participants (84.9%), and some individuals had more than one type of alteration (Table 1). A total of twenty-six different mucosal changes were diagnosed, the most common of which were melanotic maculae (36.0%), linea alba (33.9%), traumatic ulcers (21.5%), Fordyce's granules (20.4%), coated tongue (12.5%) and fissured tongue (10.0%) (Table 2).

In this study, the prevalence of these alterations was different between the genders. Fissured tongue, coated tongue and linea alba ($p < 0.05$) were most prevalent in female subjects ($p < 0.05$; Table 2). Statistically significant associations were observed between the group ranging from 20 to 59 years of age and melanotic maculae ($p < 0.05$; Table 3).

The results of logistic regression analyses on factors most commonly associated with the most prevalent oral mucosa alterations are presented in Table 4.

Discussion

This study's findings should be interpreted with caution because we found that the prevalence of certain oral mucosa alterations was relatively low. Furthermore, comparison with other epidemiological studies is complicated by different experimental methodologies. However, the wide variety of oral mucosa alterations identified in this study is consistent with the findings of other reports.[4-7,10,12,14]

Of the 511 patients enrolled in this study, 71.8% (n = 367) were female. This overrepresentation of female patients has also been observed in other epidemiological studies of the prevalence of oral mucosa alterations.[5,10,13,14] It is possible that this observation reflects a greater concern about oral health among women than among men.[11,19]

The prevalence of oral mucosa alterations found in this study was higher (84.9%) than in similar studies in Spain[7] (51.9%) and Turkey[10] (41.7%). Such variations in the prevalence rates of oral mucosa alterations may be the result of geographical differences, socio-demographic characteristics of the study populations, and a lack of standardized diagnostic criteria and experimental methodologies.[4-12]

Lesions of a traumatic origin are those most commonly reported in different parts of the world.[11] In this study, traumatic ulcer (21.5%), inflammatory fibrous hyperplasia (2.3%), hyperkeratosis (0.2%) and prosthesis-induced mucositis accounted for 58.1% of the total mucosal alterations, which are quite high compared to the previously-reported values of 7.8% and 5.6% reported in two studies of an adult Brazilian population.[20,21] This might be due to the fact that the participants in our study were

Table 2 - The distribution of oral mucosa alterations according to gender.

Oral mucosa alterations	Female (n = 367, 71.8%)		Male (n = 144, 28.2%)		Total (n = 511, 100%)	
	n	%	n	%	n	%
Pigmentation						
Melanotic maculae	130	70.7	54	29.3	184	36.0
Tongue lesions						
Fissured tongue	30	58.8	21	41.2	51	10.0*
Coated tongue	38	59.4	26	40.6	64	12.5*
Varices	4	80.0	1	20.0	5	1.0
Hairy tongue	2	100.0	0	0.0	2	0.4
Geographic tongue	7	70.0	3	30.0	10	2.0
Infections						
Angular cheilitis	6	60.0	4	40.0	10	2.0
Exfoliative cheilitis	3	50.0	3	50.0	6	1.2
Actinic cheilitis	1	50.0	1	50.0	2	0.4
Candidiasis	11	84.6	2	15.4	13	2.5
Recurrent herpes	3	60.0	2	40.0	5	1.0
Abscess/Fistula	2	100.0	0	0.0	2	0.4
Traumatic mucosa lesions						
Linea alba	136	78.6	37	21.4	173	33.9*
Traumatic ulcers	76	69.1	34	30.9	110	21.5
Inflammatory fibrous hyperplasia	1	100.0	0	0.0	1	0.2
Hyperkeratosis	1	100.0	0	0.0	1	0.2
Mucositis by prosthesis	1	100.0	0	0.0	1	0.2
Fordyce's granules	67	64.4	37	35.6	104	20.4
Leukoedema	15	45.5	18	54.5	33	6.5*
Aphtha	10	71.4	4	28.6	14	2.7
Mandibular torus	11	84.6	2	15.4	13	2.5
Palatine torus	3	33.3	6	66.7	9	1.8*
Buccal exostosis	3	75.0	1	25.0	4	0.8
Amalgam tattoo	3	100.0	0	0.0	3	0.6
Sturge Web syndrome	1	100.0	0	0.0	1	0.2
Burning mouth syndrome	1	100.0	0	0.0	1	0.2
Total of oral mucosa alterations: 833						

Chi-square test. *Statistically significant, according to gender ($p < 0.05$).

seeking dental care for traumatic agents in the oral cavity, such as maladapted partial or complete removable dentures, malocclusion, dental caries or unsatisfactory restorations.

Melanotic maculae were the most prevalent oral mucosa alteration, found in 36.0% of cases and with a higher frequency in black patients (OR: 7.66). A number of studies also report an association between melanotic maculae and the black race.[22-24] In this study, the lower prevalence of melanotic maculae among subjects aged 60 to 78 years (OR: 0.20) has no definite relationship. A knowledge of

Table 3 - The distribution of oral mucosa alterations according to age group.

Oral mucosa alterations	12-19 years (n = 90, 17.6%)		20-59 years (n = 395, 77.3%)		60-78 years (n = 26, 5.1%)		Total n
	n	%	n	%	n	%	
Pigmentation							
Melanotic maculae	38	20.7	142	77.2	4	2.2	184*
Tongue lesions							
Fissured tongue	10	19.6	35	68.6	6	11.8	51
Coated tongue	9	14.1	51	79.7	4	6.3	64
Varices	0	0.0	3	60.0	2	40.0	5*
Hairy tongue	0	0.0	2	100.0	0	0.0	2
Geographic tongue	4	40.0	6	60.0	0	0.0	10
Infections							
Angular cheilitis	1	10.0	7	70.0	2	20.0	10
Exfoliative cheilitis	0	0.0	6	100.0	0	0.0	6
Actinic cheilitis	0	0.0	1	50.0	1	50.0	2
Candidiasis	1	7.7	9	69.2	3	23.1	13
Recurrent herpes	1	20.0	4	80.0	0	0.0	5
Abscess/Fistula	0	0.0	2	100.0	0	0.0	2
Traumatic mucosa lesions							
Linea alba	33	19.1	135	78.0	5	2.9	173
Traumatic ulcers	17	15.5	86	78.2	7	6.4	110
Inflammatory fibrous hyperplasia	0	0.0	10	83.3	2	16.7	12
Hyperkeratosis	0	0.0	1	100.0	0	0.0	1
Mucositis by prosthesis	0	0.0	1	100.0	0	0.0	1
Fordyce's granules	17	16.3	78	75.0	9	8.7	104
Leukoedema	4	12.1	27	81.8	2	6.1	33
Aphtha	1	7.1	13	92.9	0	0.0	14
Mandibular torus	1	7.7	10	76.9	2	15.4	13
Palatine torus	0	0.0	9	100.0	0	0.0	9
Buccal exostosis	1	25.0	3	75.0	0	0.0	4
Amalgam tattoo	0	0.0	3	100.0	0	0.0	3
Sturge Web syndrome	0	0.0	1	100.0	0	0.0	1
Burning mouth syndrome	0	0.0	0	0.0	1	100.0	1**
Total of oral mucosa alterations: 833							

Chi-squared test. *Statistically significant, according to age ($P < 0.05$). **Statistically significant, according to age ($P < 0.001$).

this alteration and an ability to properly identify it in patients is important, as melanin pigmentation in the oral mucosa may require a diagnostic biopsy.[25,26] Moreover, although this condition was not found to be associated with tobacco use in this study, previous studies have reported a possible association between smoking and the development of melanotic maculae.[22,24]

Fordyce's granules are ectopic sebaceous glands that accounted for 20.4% of the oral mucosa alterations identified in our study. This prevalence is higher than that found in studies conducted in Tur-

Table 4 - Logistic regression results for the most prevalent oral mucosa alterations.

Alterations most prevalent	Odds Ratio (OR) (CI 95%)	p
Melanotic Maculae		
Gender (Male:0; Female:1)	0.97 (0.64-1.48)	0.901
Age		
12-19 years	1.00	
20-59 years	0.71 (0.43-1.11)	0.186
60-78 years	0.20 (0.06-0.66)	0.008*
Race		
White	1.00	
Feoderm	6.12 (3.60-10.40)	0.000*
Black	7.51 (4.00-14.09)	0.000*
Linea alba		
Gender (Male:0; Female:1)	1.90 (1.21-2.96)	0.005*
Age		
12-19 years	1.00	
20-59 years	0.85 (0.51-1.41)	0.543
60-78 years	0.35 (0.11-1.05)	0.062
Traumatic Ulcers		
Gender (Male:0; Female:1)	0.88 (0.55-1.42)	0.616
Age		
12-19 years	1.00	
20-59 years	1.17 (0.64-2.12)	0.597
60-78 years	1.49 (0.52-4.22)	0.450
Fordyce's Granules		
Gender (Male:0; Female:1)	0.66 (0.41-1.06)	0.093
Age		
12-19 years	1.00	
20-59 years	1.03 (0.56-1.87)	0.919
60-78 years	2.19 (0.81-5.94)	0.122
Coated Tongue		
Gender (Male:0; Female:1)	1.69 (0.96-2.97)	0.066
Age		
12-19 years	1.00	
20-59 years	0.74 (0.20-2.70)	0.649
60-78 years	0.87 (0.28-2.73)	0.822
Fissured Tongue		
Gender (Male:0; Female:1)	2.11 (1.12-3.96)	0.020*
Age		
12-19 years	1.00	
20-59 years	1.00 (0.29-3.44)	0.993
60-78 years	0.60 (0.21-1.72)	0.345

*Statistically significant ($P < 0.05$). **Statistically significant ($P < 0.001$).

key[10] (1.3%) and India[27] (6.5%), but lower than that reported in studies carried out in Thailand (57.7%), Mexico[22] (55.0%) and Malaysia[23] (61.8%). This presence of Fordyce's granules was not significantly associated with any independent variables evaluated in the present investigation. However, a number of previous studies have reported that the prevalence of Fordyce's granules increases with age[6,22] and is higher in the male gender.[21]

Epidemiological studies conducted in different parts of the world have found tongue lesions to be among the most common alterations of the oral mucosa.[4,10,22,23] Our study corroborates these findings, as coated tongue (12.5%) and fissured tongue (10.0%) were among the seven most prevalent alterations that we identified. Coated tongue may be related to a poor oral health status,[4,7,28] which has in turn been associated with low socioeconomic status.[28] This association between poor overall oral health and low socioeconomic status may explain the high prevalence of this condition in the population studied. However, a number of studies have reported a statistically significant association between coated tongue and tobacco smoking,[4] which we did not observe in this study.

Linea alba and fissured tongue were significantly associated with the female gender ($p < 0.05$), occurring approximately twice as frequently in females than in males. This finding was previously reported in a study conducted in Turkey.[10] Some studies report a higher incidence of fissured tongue among men[5] and elderly patients.[10] Others report a statistically significant association between fissured tongue and a history of allergy.[9] However, we did not find these associations in the present study.

The fact that we did not observe a statistically significant association between the main oral mucosa alterations and a patient's status with respect to systemic disease, alcohol use and tobacco use may be due to the hereditary characteristics of the oral mucosa alterations reported.

The results of this study provide a basis for future studies involving regions with known socioeconomic deprivation, such as the Vale do Jequitinhonha, and may contribute toward public policies directed at oral disease prevention and control programs in this region.

Conclusions

The alterations most commonly identified in this study were melanotic maculae, linea alba, traumatic ulcers, Fordyce's granules, coated tongue and fissured tongue. Furthermore, we found that gender, age and race were all factors that were significantly associated with the presence of oral mucosa alterations.

The high prevalence of melanotic maculae and Fordyce's granules indicates that these alterations should be considered normal characteristics of the population of the Vale do Jequitinhonha. On the other hand, the high prevalence of coated tongue may be related to the socioeconomic deprivation in the region and traumatic ulcers may be associated with the traumatic agents that caused patients to seek dental care.

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