

Halitosis Related Parameters from Patients with Chronic Periodontitis

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Abstract

Background: The present study aimed to make the analyses of halitosis related parameters from patients with generalized chronic periodontitis.

Materials and Methods: Patients (n = 112) answered an interview, and then they have had their breath collected by halimeter and evaluated by organoleptic test, visible plaque index, gingival bleeding index, index of tongue coating and periodontal examination.

Results: There were about 75% of periodontal patients with halitosis. For both, organoleptic test as halimeter, the results showed a greater degree of halitosis in the greater age groups, in the report of gums bleedings and brushing less than three times per day. Only according to the organoleptic test, the report of brushing/scraping the tongue daily generated statistical difference and showed less halitosis. The other parameters (stress, smoke, dry mouth, respiratory disorders, diabetes, dental floss etc) did not show any statistical difference. There was no statistical difference between the halitosis measurements of organoleptic test and halimeter.

Conclusions: Advanced age, bleeding gums and decreased brushing frequency can influence halitosis; as well as frequency of brushing tongue was superior only in organoleptic evaluation. The study showed about 75% of periodontal patients with halitosis

Keywords: Halitosis; Bad breath; VSC; Periodontitis

Introduction

Nowadays, halitosis has become a topic of interest to the entire scientific community and especially for people who suffers with this problem [1]. Halitosis is the main concern that leads people to the frequent use of mouthwashes and chewing gums [2].

Periodontal disease is an opportunistic infection associated with the formation of biofilm on tooth surfaces leading to destruction of the tooth supporting bone and subsequent loss of teeth. Studies conducted over the past 50 years have shown a direct relationship between periodontal disease and the odor of the breath [3]. There are high levels of volatile sulfur compounds (VSC) in periodontal patients, and these have more tongue coating than healthy patients [4].

There are few studies evaluating the prevalence of halitosis in the population, with reported rates ranging from 22 to 50% [5,6,10].

In Japan, Miyazaki, *et al.* [7] found that the prevalence of halitosis about 27,5%. In Brazil [8], the incidence of halitosis may reach 40%. In China [9], found prevalence about 27% in the sample and, in Switzerland [10], approximately 107 recruits of 626 young male adults had never complained about halitosis. In a retrospective study [11] from 2003 to 2010, 82% of patients were diagnosed true halitosis.

Several authors [11-13] agree that the correct prevalence of halitosis is still unclear and the lack of epidemiological data about halitosis generates the importance of more researches. In particular, studies about the prevalence of halitosis in patients with periodontal disease are even smaller. So, the present study aimed to make the analyses of halitosis related parameters from patients with generalized chronic periodontitis.

Materials and Methods

Study Design

This research was a cross-sectional observational study adapted [9,10], performed between May 2010 and September 2011, with 112 volunteers, 59 women and 53 men, ages between 40 and 69 (average 52.75 ± 6.69).

Selection of volunteers

According to inclusion criteria, the voluntary participants of this study were patients with generalized chronic periodontitis [14]; without systemic involvement; without periodontal treatment in the last 12 months; without use of antibiotics in the last 6 months; no history of radiation therapy to the neck or head. All individuals involved were informed of the importance and purpose of the study and signed an informed consent form, previously approved by the Ethics Committee under number 0082.0.228.000-10. After evaluation, patients received the specific periodontal therapy.

Experimental phase

The volunteers started with a questionnaire about halitosis related parameters. The participants were instructed to refrain from eating/drinking or other oral hygiene practices in the morning for measurement of morning bad breath [15], and the presence of halitosis was measured using a halimeter (Inter scan Corp., Chatsworth, CA, USA), previously calibrated, and by organoleptic test. The halimeter is a VSC monitor responsible to collect the volatile sulfur gases from the mouth of the patients in parts per billion (ppb) [16]. The cut of point of halimeter was 80 ppb. The organoleptic test is considered the gold standard test because it shows the true clinical relevance, it works better than the other methods due to the fact that the human nose can inhale more than ten thousand odors, not only the sulfur gases [17]. And it works when the same calibrated examiner inhales the breath from mouth of the patient following the scores: 0-4 (0 = no odour; 1 = natural odour; 2 = about 15 cm; 3 = distance about 50 cm; 4 = above 50 cm) [17].

Index of tongue coating (WTCl) [18] was also performed: the dorsum of the tongue was divided into six areas, three in the back and three in the front area. The tongue coating in each sextant is scored: 0 = no coverage, 1 = mild coverage, 2 = severe coverage. The value of tongue coating is obtained by adding all the six areas, scoring 0-12. All subjects were clinically assessed by the same calibrated examiner, who showed a kappa coefficient intra individual of $p = 0.871$.

Finally, periodontal examination, where the following parameters were measured: (1) probing on pocket (PP), insertion loss level (IL) and bleeding on probing (BOP) [19]. This examination was performed by a single calibrated examiner (using a periodontal probe, University of North Carolina type, 15 mm - Hu - Friedy, USA).

Statistical analysis

The data analyses were performed using Chi-square and Fisher's exact test. All differences were considered significant at $p < 0.05$. Statistical analyses were performed using SigmaPlot® statistical software package (Systat Software Inc., San José, CA, USA).

Results

Tables 1 and 2 show the number of volunteers according to questionnaire related parameters of halimeter and organoleptic test, respectively.

For both, organoleptic test and halimeter, the results showed statistical difference according to the age, where there was a greater degree of halitosis in the greater age groups ($p = 0.019$; 0.001 , respectively). In addition, a statistical difference was observed in the volunteers with gingival bleeding ($p = 0.001$; 0.001 , respectively) and brushing less than three times per day ($p = 0.001$; 0.001 , respectively), they showed a greater degree of halitosis.

		< 100 ppb	> 101 ppb	P value
Gender	M	12	41	0.918*
	F	13	46	
	< 50	17	33	
Age ^a	51-60	7	37	0.019*
	> 60	1	17	
Stress	Yes	12	33	0.500*
	No	13	54	
Smoker	Yes	5	17	0.821*
	No	23	67	
Dry mouth	Yes	0	6	0.222**
	No	25	81	
Respiratory disorder	Yes	7	11	0.117**
	No	18	76	
Diet	Yes	8	18	0.361*
	No	17	69	
Diabetes	Yes	0	11	0.068**
	No	25	76	
Food (garlic, cabbage etc)	Yes	22	64	0.215*
	No	3	23	
Medicines	Yes	1	12	0.290**
	No	24	75	
Stomach diseases	Yes	0	4	0.290**
	No	25	83	
Do you think you have halitosis?	Yes	18	74	0.146**
	No	7	13	
Someone told you that you have?	Yes	2	3	0.584**
	No	23	84	
Waking up halitosis?	Yes	16	61	0.736*
	No	9	26	
Bleeding gums? ^a	Yes	9	65	0.001
	No	16	22	
Dental floss	Yes	8	24	0.857*
	No	17	63	
Mouth rinse	Yes	4	19	0.721*
	No	21	68	
Brushing tongue	Yes	13	4	0.205**
	No	29	66	
Brush more than three times? ^a	Yes	16	17	0.001*
	No	9	68	

Benign migratory glossitis***	Yes	0	4	0.573**
	No	25	83	
Tongue coating***	< 4	25	82	
	5-9	0	5	0.348**
	> 12	0	0	

Table 1: Number of periodontal patients according to questionnaire and evaluated by halimeter (*chi-square test; **Fisher exact test; ***assessed by the investigator; $\alpha < 0.05$).

		0,1	2,3,4	P value
Gender	M	15	38	0.737*
	F	14	45	
Age α	< 50	16	18	
	51-60	46	12	0.000*
	> 60	1	19	
Stress	Yes	14	31	0.416*
	No	15	52	
Smoker	Yes	4	18	0.934*
	No	26	64	
Dry mouth	Yes	0	6	0.157**
	No	29	77	
Respiratory disorder	Yes	7	11	0.140**
	No	22	72	
Diet	Yes	7	19	0.905*
	No	22	64	
Diabetes	Yes	1	10	0.283**
	No	28	73	
Food (garlic, cabbage etc)	Yes	7	19	0.905*
	No	22	64	
Medicines	Yes	7	11	0.140**
	No	22	72	
Stomach diseases	Yes	1	3	0.724**
	No	28	80	
Do you think you have halitosis?	Yes	23	69	0.856*
	No	6	14	
Someone told you that You have?	Yes	2	3	0.385**
	No	27	80	
Waking up halitosis?	Yes	19	58	0.838*
	No	10	25	
Bleeding gums? α	Yes	4	70	0.000*

	No	25	13	
Dental floss	Yes	10	22	0.562*
	No	19	61	
Mouth rinse	Yes	9	14	0.174*
	No	20	69	
Brushing tongue □	Yes	10	7	0.001**
	No	19	76	
Brush more than three times? □	Yes	28	7	0.000*
	No	1	76	
Benign migratory glossitis ***	Yes	0	4	0.295**
	No	29	79	
	< 4	29	29	
Tongue coating***	5-9	0	0	1.000**
	> 12	0	0	

Table 2: Number of periodontal patients according to questionnaire and evaluated by organoleptic (*chi-square test; **Fisher exact test; ***assessed by the investigator; □ < 0.05).

Only according to the organoleptic evaluation, brushing tongue generated statistical difference (p = 0.001), where the group that volunteers did not brush their tongue had a greater degree of halitosis.

Table 3 shows there is no statistical differences between the halitosis measurements undertaken by halimeter and organoleptic test (p = 0.106).

	Organoleptic				
	0 No odour	1 Natural odour	2 Privacy halitosis (15 cm)	3 Speaker halitosis (50 cm)	4 Social halitosis (> 50 cm)
Total	04	25	36	43	04
	Halimeter				
	80 ppb Absence of halitosis	80 - 100 ppb Perceptible odor	100 - 120 ppb Moderate halitosis	120 - 150 ppb Hard halitosis	> 150 ppb Severe halitosis
Total	06	19	41	33	13

Table 3: Numbers of patients in each scale (organoleptic test and halimeter) to demonstrate correlation between measurements of halitosis (p = 0.106).

In the sample analyzed, according to the organoleptic test and halimeter, about 74% and 77% of patients with periodontal disease suffered from halitosis, respectively, averaging 75.80% (± 2.47).

Discussion

The present study aimed to make the analyses of halitosis related parameters from patients with generalized chronic periodontitis and approximately 75% of volunteers had halitosis. The study also showed that age, gingival bleeding and decreased brushing frequency could influence halitosis.

The findings of a retrospective study [11] showed approximately 82% of patients with halitosis, and other study [20] found about 61%. However, studies [7,9] found a prevalence of halitosis about 27% and 14%. Other studies showed prevalence between 2% and 49% [6-9,21-24], but the present study was made in periodontal patients, differing from the above-cited studies that analyzed a portion of the population.

In the present study, the halitosis was measured by halimeter and organoleptic test, and it was observed that there was no statistical difference between the measurements undertaken by halimeter and organoleptic test (Table 3). The findings are also in agreement with others studies [9,16,25], that also found that organoleptic evaluation were significantly correlated with scores of halimeter.

The morning breath, collected in this study, has often been used as a model for testing the clinical efficacy of various therapies and studies of halitosis, because patients suffering with halitosis require a longer recruitment, the selection is difficult (due to feeling ashamed of participants), and standardization is more complicated (origin, behavior, diagnosis) [26-32].

A study [20] with a questionnaire in patients with halitosis found that no significant difference with respect to gender, smoking and dental floss but they found significant differences in age, frequency of brushing and bleeding gums regarding halitosis, in agreement with the findings of our study. The data of the present study showed, for organoleptic test as halimeter, that the groups who reported bleeding gums and brushing less than three times a day had a higher degree of halitosis. We also found greater degree of halitosis in older's age groups. However, the a fore mentioned authors found differences in the presence of tongue coating and dry mouth, which was not found in the present study. There is a higher relationship between VSC and tongue coating, independent of age [7,22]. Others authors [9] did not find age as a risk factor but as well as in the present study, another study [33] found a higher incidence of halitosis in older's age groups

The use of dental floss does not contribute to reduction of VSC [31], as in the present study. In addition, this study there was no difference in smoker's volunteers, as others studies [7,22].

A study [34] in dental students evaluated by halimeter and organoleptic test found higher rates of halitosis in male students than female students (83% vs 71%) but it does not find differences in age groups. The present study found difference according to the age however not according to the gender. The risk of persistent malodour was higher in men over 20 years of age compared with those aged 20 years or under [35]. A study found that men showed higher levels of VSC against women [7] and in another study [36], periodontal patients in Israel men also had a higher degree of halitosis. Tsai, *et al.* [37] found no difference between men and women, as well as in the present study. In Kuwait [38] and in Turkey [39] also found no differences between the gender, however, different of studies in Poland [40] and Saudi Arabia [41], found a higher prevalence in men.

In the research conducted by Bornsten, *et al.* [10], tongue coating was found that the only factor contributing to organoleptic scores and highest values of VSC. Researches [42,43] found a strong relationship with tongue coating on the organoleptic test, however other study [44] did not find this relationship. A strong relationship between tongue coatings in the organoleptic test was found but the tongue coating was not related to periodontal parameters. Still according to the same authors [37], there was a reduction of halitosis, according to the organoleptic test and VSC measurements, when they cleaned the tongue coating. A study [4] showed that patients with chronic periodontitis have more tongue coating and more production of VSC. In studies [31,45,46], the tongue has been identified as most responsible for the production of VSC. In the present study there was no statistical difference according to the index of tongue coating. Studies [45,47] showed that only brushing the teeth was not effective in reducing halitosis scores.

Different clinical researches [29,48,49] have shown a relationship between scraping tongue and reduced levels of VSC. Scraping the tongue is a component for reducing the halitosis but is unable to be treatment alone [50]. In the current study, in organoleptic test, the group without brushing tongue showed a greater degree of halitosis.

Conclusion

There were about 75% of periodontal patients with halitosis. It was concluded that age and gingival bleeding, as brushing frequency can influence the degree of halitosis, according organoleptic and halimeter evaluation. Only according to the organoleptic evaluation, brushing the tongue was more effective.



Figure 1: Tongue coating.



Figure 2: Halimeter employed in the research. Participants with his mouth half open, waiting for the halimeter register the highest result of sulfides in ppb.

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