

Bad breath and oral health conditions

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Abstract

Halitosis is a common health condition. The origin of bad breath is related to systemic conditions, but in the majority of cases - about 85%, it is related to oral factors. Our aim was to investigate the presence and degree of bad breath and to compare its incidence to oral health conditions, age, and professional hygiene. We examined 179 healthy patients with a portable sulfide monitor.

We can see that the values of bad smell in patients who come into the office for professional cleaning of the oral cavity are higher than all the studied groups. We can safely confirm that the people who came for such a manipulation really needed cleaning. We found that professional mouth cleaning reduces bad breath values by one.

Dentures offer a reservoir for microorganisms and are associated with elevated values of halitosis. Patients with removable dentures have an average of bad breath 1.67, which is the most elevated level. Bad breath correlates to the greatest extent with age and tongue coating, but we found a correlation also with inflamed gingiva and oral-hygiene levels.

Keywords: *bad breath, halitosis, oral diseases, coating of the tongue, deep cavities, dentures, portable sulfide monitor*

Introduction

Halitosis or bad breath is an oral health condition characterized by unpleasant odor from the oral cavity. The origin is sometimes unclear, but it has been attributed in about 85% of cases to oral cavity conditions. It is estimated to be found in around 22 to 50% of the world population and it carries serious social and personal repercussions (1, 2, 3, 4).

Oral causes are linked to deep carious lesions, tongue coating, oral infections, mucosal ulcerations, periodontal and peri-implant disease, pericoronitis, impacted debris or food, poor oral health care, improper cleaning of dentures, and salivary gland problems (1,5). Halitosis results from the microbial degradation of oral organic substrates including volatile sulfur compounds (VSC). Causes include uses of tobacco

products, dry mouth, medical conditions, a *Helicobacter pylori* infection, gastro-intestinal, liver or kidney diseases, respiratory infection, diabetes, seasonal allergies, some cancers, metabolic diseases (6-13).

Bad breath is significantly related to tongue coating thickness, periodontal pocket depth, lower intake of beverages, and no food consumption within 2 hours prior to oral examination (14, 15). Oral malodor is caused mainly by facultative bacteria on the tongue that produce volatile organic compounds (17).

Oral health declines with age. As a result, the need for removable prostheses increases. Denture plaque and poor denture hygiene is associated with stomatitis or *Candida* infections. Dentures may serve as a reservoir of infectious pathogens or may contribute to oral malodour. Dentures offer a reservoir for microorganisms associated with bacterial endocarditis, aspiration pneumonia, gastrointestinal infection and chronic obstructive pulmonary disease. Good oral hygiene is a major in controlling denture plaque biofilm (18). Opportunist pathogens like coliforms and staphylococci have been isolated from false teeth. Teeth neighboring the dentures are more susceptible to periodontal diseases or caries. This is maybe due to an increased plaque biofilm levels and retention of food. The material of the dentures provides a substrate for plaque retention (19). In 2011 Honda, E. et al. discovered that institutionalised elderly people had a higher amount of *Candida* spp. in denture wearers and elevated levels of staphylococci and oral malodor compared to non-institutionalised people (20).

Statistically significant differences were found in VCS values between a group before and after a professional health care session (21). A study showed that professional oral health care by dental hygienists provided to elderly patients needing nursing care was associated with an attenuation in the presence of fever and fatal pneumonia (22). In 2013 Sinjari, B. et al. found significant differences in VCS levels before and after a professional health care session (21).

Aim

The aim of the study is to investigate the presence and degree of bad breath and to compare its incidence to varying oral health conditions, age, and professional hygiene.

Materials and methods

We examined 179 healthy patients with an average age 45.7 years (range 3-82). The men included in this investigation were with an average age 42.1, and the women's age was 46.2 years.

With a device for measuring bad breath we investigated the levels of odor in patients. We used a portable sulfide monitor HC-212SF FitScan Breath Checker of Tanita Corporation of America, Inc. The apparatus quantifies volatile sulfur compounds-hydrogen sulphide (H_2S), mercaptan (CH_3SH), dimethylsulfide (CH_3-S-CH_3) and hydrocarbon from the mouth on a scale from 0 to 5. It operates with a semiconductor gas sensor. The degree of the odor is classified into six grades - 0: no odor; 1: barely noticeable; 2: slight but clearly noticeable; 3: moderate; 4: strong and 5: very strong. When the device is on we must wait for about five seconds for it to calibrate. The time is counted in the display with the values of 5 to 0. As soon as the unit is ready for testing, it beeps. The patient should blow from a distance of about five centimeters. If the patient does not blow out immediately after the beep or does not hit the sensor the unit display indicates „error“. This reduces the possibility of errors.

Along with reporting the results of bad breath, we registered the age, the number of deep caries lesions, oral hygiene status, gingival inflammation, and coating on the tongue of the people.

For the assessment of oral hygiene status we chose the oral hygiene index of Green and Vermillion - OHI (23), widely used in dental practice, representing the total of debris index and calculus index. We counted

the index on representative teeth (16, 11, 24, 31- vestibulary; 36 46 - lingualy). Our goal was to get quick and accurate data of the oral hygiene level of the surveyed patients.

We used Papilla bleeding index of Saxer and Muhleman (PBI) to assess gingival inflammation (24). Scraping was carried out orally at the I and III quadrant and vestibularly in the II and IV quadrant. The Papilla bleeding index is calculated by dividing the sum of the index by the number of papillae investigated. We divided patients into four groups, where the value 1 corresponded to lack of gingivitis, value 2 - mild gingivitis, value 3 - moderate gingivitis and value 4 - severe gingivitis.

Using the index of G. Delanghe et al. we evaluated the extent of the coating on the dorsal surface of the tongue. The latter is split into three parts - front 1/3, middle 1/3 and rear 1/3. The results are recorded according to the following scale: "0" - no coating; "1" - thin layer exceeding 1/3 of the dorsal surface of the tongue; "2" - fine layer spreading is more than 2/3 or a thick layer is covering more than 1/3 of the surface; "3" - tight delay deposited on more than 2/3 of the dorsal surface of the tongue (25).

Results And Discussion

We monitored the changes in the degree of bad breath in patients who came in the dental office for professional hygiene of the mouth. Before cleaning, the values were 1.67 (SD \pm 0.52) and 0.67 after (SD \pm 0.82) (fig 1). In our previous research in healthy patients, we obtained a result of 0.87 for the group under 18 years of age, 1 for the group 19-51 years of age and 1.5 for the group over 51 years. In this study, the average value was 0.88 for men and 1.39 for women (1).

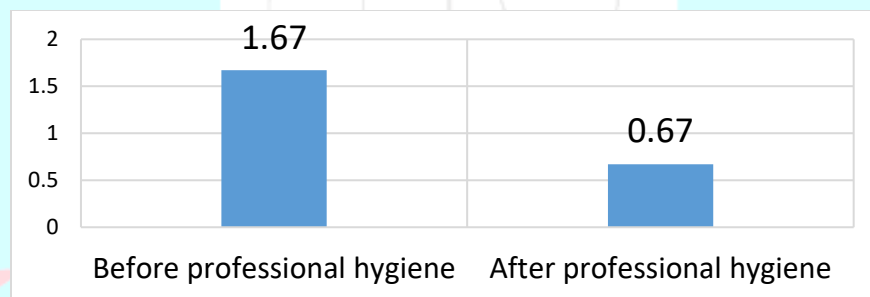


Figure 1. Values before and after professional oral hygiene

We can see also that the values of bad smell in patients who come into the office for professional cleaning of the oral cavity are higher than all the studied groups and find confirmation that the people who came for such a manipulation really needed cleaning. We found that professional mouth cleaning reduces bad breath values by one.

Our research confirms the results of Deutscher, H. et al. They conclude that oral hygiene instructions reduced VSC values in patients with oral halitosis and/or periodontal diseases, independent of tongue cleaning and the use of mouth rinses (26). In 2013 Sinjari, B. et al. also found statistically significant differences in VCS values between groups before and after the professional health care session (21). Oral hygiene, tongue cleaning and periodontal therapy reduce the concentration of volatile Sulphur compounds (27).

Patients with removable dentures have an average of bad breath 1.67 (SD \pm 1.12) and a median 1 (Fig. 2). These values are considered the highest reported by us, which probably is due to the advanced age of these patients or to factors related to dentures, which favor the increase of bad breath. In the mainstream group values of bad smell are 1.17 (SD \pm 1.07) and median 1.

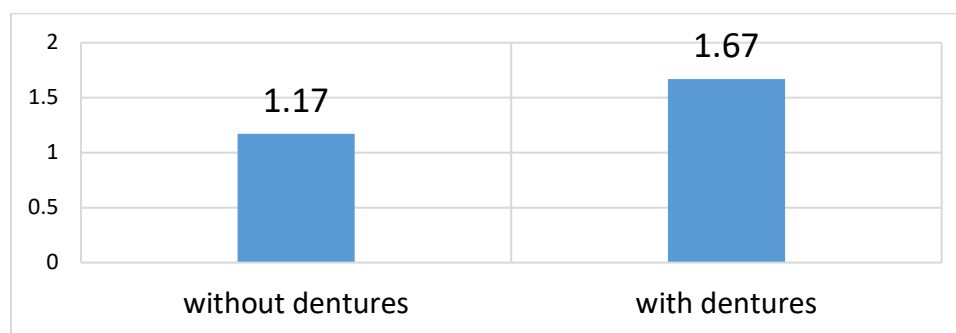


Figure 2. Degree of bad breath in patients with removable dentures compared to the total group

We collected data from oral examinations including the presence of large carious lesions, coating on the tongue, values of OHI, PBI, age and the extent of bad breath (Table 1).

Table 1. Correlations of the tested parameters according to Pearson

Pearson	Bad breath	Age	Deep cavities	OHI	PBI	Coating on the tongue
Bad breath	1	263, *	, 172	, 163	, 235 *	,502 **
Age	263, *	1	, 240 *	, 237 *	, 180	, a 177
Deep cavities	, 172	, 240 *	1	,550 **	,589 **	,365 **
OHI	, 163	, 237 *	,550 **	1	,827 **	,484 **
PBI	, 235 *	, 180	,589 **	,827 **	1	,471 **
Coating on the tongue	,502 **	, 177	,365 **	,484 **	,471 **	1

Significance of the correlation at $p = 0.05$; * Significance of correlation at $p = 0.01$

Table 2. Correlations of the studied parameters according to Spearman's

Spearman's rho	Bad breath	Age	Deep cavities	OHI	PBI	Coating on the tongue
Bad breath	1	,351 **	224, *	, 145	, 260 *	,473 **
Age	,351 **	1	, 245 *	, 190	, 143	, 178
Deep cavities	224, *	, 245 *	1	,581 **	,552 **	, 286 *
OHI	, 145	, 190	,581 **	1	,793 **	,428 **
PBI	, 260 *	, 143	,552 **	,793 **	1	,392 **
Coating on the tongue	,473 **	, 178	, 286 *	,428 **	,392 **	1

Significance of the correlation at $p = 0.05$; * Significance of correlation at $p = 0.01$

We found significant correlation links between bad breath, the number of deep carious lesions ($p = 0.05$) and tongue coating, PBI, OHI ($p = 0.01$). The age of the patients correlates with bad breath, cavities and deep oral-hygiene index ($p = 0.05$). OHI correlates with age ($p = 0.05$) and especially with the number of deep cavities and gum inflammation ($p = 0.01$).

Multiple correlation links are found between our analysis and Spearman's (Table 2). Here, the most frequent correlation is between bad breath and age, and tongue coating ($p = 0.01$). We also found significant correlation links in the index of gum inflammation ($p = 0.01$) and the number of deep caries ($p = 0.05$). Deep cavities correlate significantly with the values of OHI and PBI ($p = 0.01$) (28).

Conclusion

This study demonstrated that the values of bad smell of patients who come into the office for professional cleaning of the oral cavity are higher than all the studied groups and confirmed that the people coming for such a manipulation really needed cleaning.

Dentures offer a reservoir for microorganisms and are associated with elevated values of halitosis. Bad breath correlates to the greatest extent with age and tongue coating, but we found correlations also with inflamed gingiva and the status of oral hygiene.

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