

Prevalence and awareness of halitosis in a sample of Jordanian population

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Abstract

Objectives: This study was conducted to estimate the prevalence and awareness of halitosis among the subjects of a population, and also to compare the results of Halimeter[®] readings to self-estimation of halitosis and to assess the relationship between halitosis and oral health. **Materials and Methods:** A sample of 205 employees from the Jordan University for Science and Technology (JUST) were selected as study subjects. A standardized questionnaire focusing on dental hygiene, self-reported halitosis, and smoking was filled by all participants. In the clinical examination, the objective values for assessment of oral health and the presence of halitosis were gathered through an organoleptic test (OLT) and the measurement of volatile sulfur compound (VSC) level by Halimeter for each participant. **Results:** The prevalence of halitosis was 78%, with low rate of awareness (20.5%). The amount of TC played the most important role in increasing the concentration of VSCs in mouth air ($P < 0.001$). **Conclusion:** A statistically significant correlation was found between OLT and Halimeter values ($P < 0.001$). Subjective patients' opinion did not correlate with the objective evaluation of halitosis. TC scores and smoking were the factors significantly associated to halitosis. The Halimeter showed promising characteristics regarding diagnosis of halitosis for clinical setting and field surveys.

Key words: Awareness, halitosis, oral hygiene, prevalence, tongue coating

INTRODUCTION

“Halitosis” is a term used to describe any undesirable odor in expired air, regardless of whether the odorous substances originate from oral or non-oral sources.^[1]

Bad breath is not only a personal problem, but also affects the public, as it occurs within a social and cultural context and it affects one's body image and self-confidence.^[2] Scientists studied the psychosomatic

aspects of patients complaining of halitosis and they found that the patients had high scores for obsession and compulsion and interpersonal sensitivity, and the psychological conditions in terms of anger, inadequacy, sensitivity, decreased self-confidence, and insecurity in social and intimate relations were closely associated with these patients.^[2-6] The most fascinating problem regarding halitosis is the apparent inability of a person to know by him/herself whether he/she has halitosis and to what extent.^[7] They may not be aware of their breath bad odor due to a normally functioning olfactory system which has become desensitized to its own stimulants.^[8] Telling people about their bad breath is very embarrassing and it is difficult to approach this issue as a person's feeling may be hurt; for this reason, dental professionals should be prepared and trained to practice in a sensitive and appropriate manner to deliver optimal oral health care and hygiene.^[9] A number of methods have been used to detect the presence of halitosis either

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directly or indirectly. Direct tests include direct smelling of the exhaled air by judges; this technique is called organoleptic or hedonic measurement and is considered the most logical measurement approach.^[10] It can also be detected by sniffing of bad breath and determination of the odoriferous sulfur-containing substances by volatile sulfur compounds (VSCs) monitor or gas chromatography.^[11,12] It can be detected indirectly by identifying the odor-producing microorganisms or assessing their byproducts *in vitro*.^[13,14] Halitosis is a multi-factorial problem that requires a well-defined approach to achieve definitive diagnosis and treatment. Several studies analyzed the etiology of halitosis and found that 75–90% of the cases had halitosis of intraoral sources, about 40% caused by Tongue Coating (TC) and 30% due to periodontal disease. Only 4–10% of the cases were caused by extraoral sources.^[15,16] Few studies have documented the prevalence of oral malodor in a sample chosen to represent the entire population. Reported rates ranged from 2% to more than 40%. Moreover, there is no touchstone in defining a halituous patient, i.e., there are no universally accepted standard criteria for data collection, evaluation of halitosis, instructions to patients before examination, and instruments used in diagnosis of halitosis, making comparisons between the results of these studies rather difficult if not impossible.

The aim of this study was to investigate the awareness of halitosis in a sample of Jordanians to assess its prevalence and to find the possible factors associated with this condition.

MATERIALS AND METHODS

Study sample

Before starting the study, an approval for the study and its protocol was obtained from the Institutional Review Board (IRB) at the Jordan University for Science and Technology (JUST; approval number 2009/111).

A list of employees was selected from the Human Resources Unit of JUST. A random selection of 300 subjects out of 3000 employees was carried out. The randomization was achieved using the random selection command of the computer program Predictive Analytics Software (PASW) of Statistical Package for Social Sciences (SPSS). Each selected individual was handed a written invitation to participate in the study, including the consent and pre-examination instruction; those who did not respond at the first time were re-contacted by phone.

Inclusion criteria

The participant should be 18 years of age or older, free from respiratory tract infections during examination, should not have been on antibiotics for at least 3 weeks prior to the assessment, refrain from eating odorous foods for 48 h before the assessment, refrain from ingesting any food or drink, omit their usual oral hygiene practices, mouth rinses, breath fresheners, and chewing gum for at least 2 h before their appointment, and refrain from smoking for at least 1 h before assessment.^[17] Breakfast and tooth brushing without toothpaste were allowed in order to avoid confusion between breath malodor and morning breath.^[18] The examiner (T. H.) refrained from using any scented cosmetics for 2 months before the start of the examination period and throughout the examination period. The examiner also used flavorless toothpaste and refrained from drinking coffee and eating garlic, onions, and spicy foods during the examination days.^[17,19] This was essential to prevent dietary and cosmetic odor from influencing halitosis assessment.

Candidates who agreed to take part were given an appointment at the post-graduate dental clinic of JUST. The clinical examination was performed by a calibrated examiner (T. H.) who was extensively trained and was calibrated by an experienced periodontist of University Periodontal Dentistry (M. H.) for 2 months before the start of the study to perform the halitosis and periodontal status examinations and diagnosis, until the supervisor was satisfied with the examiner's ability for diagnosis.

Questionnaire

The study utilized a self-administered questionnaire comprising 28 questions. The questionnaire was modified from that used in the Breath Testing Clinic in the University of British Columbia.^[20] Only the following questions were evaluated in the present study:

- Medical history regarding known blood, heart, respiratory, intestinal, liver, or renal diseases and allergies. Also, a history of diabetes was recorded (yes/no)
- Dental and oral hygiene: How many times per day do you brush your teeth? Do you floss? (yes/sometimes/never); Do you clean your tongue? (yes/sometimes/never); Do you use any mouth rinses? (yes/sometimes/never)
- Consumption of alcoholic beverages: Never/rarely/daily/several times per day
- Smoking: Exact number of cigarettes smoked per day for how many years?

- Do you suffer from bad breath odor? (yes/sometimes/never)
- How did you know that you suffer from bad breath odor? Someone told me/people act funnily around me/I just know/my dentist
- Have you had any treatments for bad breath odor? (yes/no); If you got it treated, what measurement did you use?
- Do you have any social problems because of your bad breath odor?
- Are you concerned about other people's behavior toward yourself on account of your breath odor? (yes/no).

Clinical parameters

At the beginning, the oral hygiene of each participant was assessed using the Plaque Index (PI) of Silness and Løe, 1964^[21] and the Gingival Index (GI) of Løe and Silness, 1963.^[22] Periodontal status of all teeth was assessed using probing pocket depth (PPD) and clinical attachment level (CAL). PPD and CAL were measured at six sites per tooth for all teeth, excluding third molars. Periodontitis was defined as the presence of four or more teeth with one site or more with PPD ≥ 4 mm and CAL ≥ 3 mm.^[23] Accordingly, it was assessed whether the subject was periodontally involved or not, regardless of the severity of the disease. Then, the TC index of each recruit was graded using the modified grading scale.^[24] Finally, the organoleptic assessment of halitosis was performed using the six-point organoleptic scale as described by Rosenberg and coworkers.^[10] If halitosis did not exist, but the patient believed that he or she had oral malodor, the diagnosis was pseudo-halitosis.^[25] The organoleptic score measurement was carried out before all other measurements, i.e. TC and Halimeter® (Interscan Corp., Chatsworth, CA, USA) readings, to avoid any bias. To standardize the procedure and avoid adaptation of the examiner's sense of smell to possibly detectable odors, there was a break of 5 min after each examination.^[26]

After the oral examination, halitosis was assessed with a portable industrial sulfide monitor, Halimeter. According to the manufacturer, halitosis is diagnosed at a VSC value ≥ 140 ppb of the Halimeter, and this value was used in the present study.^[27] After the clinical examination, in order to correlate organoleptic test (OLT) scores with the Halimeter readings, the OLT scores were further categorized as: Grade 0 = normal odor, Grade 1 and 2 = mild odor, Grade 3 = moderate odor, and Grade 4 and 5 = severe odor. In order to make a diagnosis of the breath odor,

we used the classification of halitosis proposed by Yaegaki and Coil.^[25]

Data were entered into a statistical computer program, SPSS, version 18 (SPSS Inc., Chicago, IL, USA) for data processing and analysis. Data analysis included descriptive statistics, comparisons of means, and test of association. The Chi-square test was used to assess the association between categorical variables. Differences or associations with probabilities (*P*-value) of ≤ 0.05 level were considered statistically significant.

RESULTS

Study population

Out of the 300 approached employees, 221 responded (73.6%) and of them, 208 were fit to participate according to the study criteria. They consisted of 105 males (50.5%) and 103 females (49.5%) and their ages ranged from 18 to 68 years with a mean (\pm SD) age of 32.2 years (± 9.912). A sample size of 208 from a population of 3000 achieves 100% power using a two-sided binomial test.

Questionnaire analysis

Most of the subjects reported brushing their teeth twice a day (43.9%; 90 out of 205), while only 6 participants mentioned that they never brush their teeth. Flossing was performed by 81 subjects (39.5%). Tongue cleaning was reported by 79 subjects (49.4%), and 133 subjects (64.9%) were using a mouth rinses. Smoking was reported by 57 subjects (27.8%; minimum one cigarette per day). None of the study participants said that they drank alcohol. Regarding subjects' self-estimation of halitosis, 157 subjects answered they never suffered from halitosis (75.8%) and 48 persons (28.9%) reported having experienced halitosis. Of those persons suffering from halitosis (42 out of 48), 37.5% ($n = 15/42$) were aware of it by themselves either by smelling their breath or their saliva, while 7.5% ($n = 3/42$) were made aware of it by their friends and relatives, but no one was made aware by his/her dentist. The most reported method used among aware halituous subjects to overcome halitosis problems was chewing gum (45.2%), followed by using mouth washes (33.3%). On the other hand, using tongue scrapper was the least used method (7.2%). Regarding the impact of halitosis on the social and family relations of subjects who were aware of it, only 42.9% reported that they hesitate to talk to others. However, 85.7% of the subjects who were aware reported that their bad breath does not prevent them from meeting other

people and neither interferes with their social and family life. About 83% of the sample subjects do care about others' reaction toward their oral odor, while only 16.9% do not care about it.

Awareness and prevalence of halitosis

A high significant association was between diagnosis of halitosis by OLT and Halimeter readings ($P \leq 0.001$). Based on the OLT categories, about 45, 89, 44, and 30 subjects presented with normal, mild, moderate, and severe halitosis, respectively. Based on the Halimeter readings, about 48, 89, 42, and 29 of the subjects presented with normal, mild, moderate, and severe halitosis, respectively. In order to correlate the halitosis status with clinical findings, the three-subject difference between the OLT and the Halimeter readings in the normal breath odor categories was excluded from further analysis. Therefore, 160 subjects (78%) out of the 205 included participants were diagnosed as having genuine halitosis and 45 (19.1%) were healthy. Among the healthy individuals, six subjects were diagnosed with pseudo-halitosis.

Among the 160 subjects who were diagnosed as halituous, only 42 (20.5%) were aware of their problem and 118 (57.6%) were not aware of it. OLT categories were further recoded into either halituous or non-halituous cases in order to further investigate the association between halitosis and the various variables studied [Table 1].

There were no significant differences between males and females regarding the prevalence (53.1% vs. 46.9%) ($P = 0.12$) and awareness of halitosis (52.4% vs. 47.6%) ($P = 0.91$).

Clinical findings and their relation to prevalence and awareness of halitosis

Tongue coating was present in 96.6% of the examined participants (198 of 205 study subjects). Presence of TC and its severity were significantly associated with

halitosis ($P < 0.001$). Ninety-four percent and 71.1% of subjects with severe and moderate TC had halitosis, respectively, while only 27.8% of those with light TC had halitosis. The severity of TC was significantly associated with the level of VSCs ($P < 0.001$). Also, it increased among those who reported not practicing tongue brushing ($P < 0.001$) [Table 2].

The mean PI and GI values recorded in the examined subjects were ~ 0.5 and ~ 0.4 , respectively. Higher scores appeared among halituous compared to non-halituous subjects; however, the difference was not significant ($P = 0.089$ and $P = 0.095$, respectively). Only 20 subjects out of 205 were diagnosed as periodontally involved subjects; however, a significant association between periodontal disease and the level of VSCs was evident among these subjects ($P < 0.01$). The proportion of periodontally involved subjects increased from 2.2% in the normal oral odor group to 5.6, 16.7, and 24.1% in mild, moderate, and severe oral odor groups.

The objectivity of self-estimation of halitosis

Pearson correlation coefficient that was calculated to evaluate the relationship between self-reported assessment and the clinical assessment (VSCs readings and OLT) of halitosis showed no correlation between them ($P > 0.01$) [Table 3].

Correlation between oral hygiene habits and prevalence and awareness of halitosis

The majority of subjects who reported that they do brush their teeth uniformly had halitosis. However, all those who never brush their teeth were halituous ($P = 0.042$). There was no statistical association between the frequency of flossing ($P = 0.440$) and use of mouth washes ($P = 0.144$) with halitosis. There were no significant differences in the reported tooth brushing frequencies ($P = 0.822$) and tongue brushing ($P = 0.925$) dental flossing frequencies ($P = 0.36$) and using mouth washes ($P = 0.816$) among aware and non-aware subjects.

DISCUSSION

The major aim of this cross-sectional study was to determine the awareness, distribution, and related determinants of halitosis in the target sample, in order to predict the future health care needs in controlling and solving this social and health problem, with no interest in generalizing our findings to the total Jordanian population. Since oral malodor

Table 1: Prevalence and awareness of halitosis according to OLT and VSC levels

Severity of halitosis	n (%)			Total
	Aware	Unaware	Pseudo-halitosis	
Normal odor	39 (86.7)	0 (0)	6 (13.3)	45 (22.0)
Mild odor	21 (23.6)	68 (76.4)	0 (0)	89 (43.4)
Moderate odor	10 (23.8)	32 (76.2)	0 (0)	42 (20.5)
Severe odor	11 (37.9)	18 (62.1)	0 (0)	29 (14.1)
Total	81 (39.5)	118 (57.6)	6 (2.9)	205 (100)

OLT=Organoleptic test, VSC=Volatile sulfur compound

Table 2: The association between TC, halitosis, VSC levels, and reported tongue brushing

	n (%)		VSC levels				Reporte tongue brushing			P*
	Halituous	Non-halituous	Normal	Mild	Moderate	Sever	Yes	No	Total	
TC										
No	3 (42.9)	4 (57.1)	4 (57.1)	2 (28.6)	1 (14.3)	0 (0.0)	5 (71.4)	2 (28.6)	7 (3.4)	
Light	5 (27.8)	13 (72.2)	13 (72.2)	3 (16.7)	1 (5.6)	1 (5.6)	17 (94.4)	1 (5.6)	18 (8.8)	
Moderate	54 (71.1)	22 (28.9)	22 (28.9)	31 (40.8)	15 (19.7)	8 (10.5)	33 (43.4)	43 (56.6)	76 (37.1)	
Severe	98 (94.2)	6 (5.8)	6 (5.8)	53 (51.0)	25 (24.0)	20 (19.2)	51 (49.0)	53 (51.0)	104 (50.7)	<0.001
Total	160 (78.0)	45 (22.0)	45 (22.0)	89 (43.4)	42 (20.5)	29 (14.1)	106 (51.7)	99 (48.3)	205 (100)	

TC=Tongue coating, VSC=Volatile sulfur compound, *=P<0.001

Table 3: Objectivity of self-estimation

	n (%)	Professional diagnosis n (%)		P*
		Healthy	Genuine halitosis	
Subjects' self-estimation				
Complained of halitosis	48 (23.4)	6 (13.3)	42 (26.25)	
Did not complain of halitosis	157 (76.6)	39 (86.8)	118 (73.75)	0.07
Total	205 (100)	45 (22.0)	160 (78.0)	

*Fisher's exact test significance

is an olfactory stimulus, direct smelling of the exhaled air by judges is considered the most logical measurement approach.^[10,15,17,28-33] Published studies include protocols with different organoleptic scales for defining halitosis. Most researchers use either Schmidt *et al.* scale,^[34] which is a three-point scale, or Rosenberg *et al.* scale,^[10] which is a six-point scale. The latter was used in this study because it is more discriminative. This scoring index has established itself as a gold standard and is used for treatment and research purposes throughout the world. Nevertheless, reliability and reproducibility are problematic with this index, and efforts have been made to simplify it.^[35] Intra- and inter-observer variations are also a frequent finding; therefore, training and calibration of breath odor judges are needed for standardized examinations.^[36] To overcome this compromise, and also due to the fact that it is an uncomfortable procedure for both the examiner (judge) and the examined subject, it was decided clearly that OLT should not be the sole method for defining patients with halitosis. This fact led several investigators to propose quantitative approaches based on measurement of VSCs which are associated with halitosis.^[37] The Halimeter measurement is an objective way of assessing halitosis. However, the arbitrary fixing of threshold measurements for halitosis using the Halimeter may lead to wide variation between

studies. Iwanicka-Grzegorek *et al.* used a threshold of 125 ppb for halitosis,^[38] Roldan *et al.* used a level of 170 ppb,^[39] Richter used a value of 150 ppb,^[40] and Kazor *et al.* used a level of 200 ppb.^[41] In our study, we followed the most recent values set by the Halimeter manufacturers.^[27,42] A complication of setting a Halimeter threshold is that some patients with objectionable malodor organoleptically may have a Halimeter reading below the manufacturer's threshold, whereas others without organoleptically detectable halitosis may have a Halimeter reading above the threshold. This may be explained in two ways. Firstly, the Halimeter is mainly sensitive to the VSCs, hydrogen sulfide and methyl mercaptan. Other compounds such as volatile fatty acids and the polyamines, putrescine and cadaverine, may be detected organoleptically, but not on using the Halimeter. Secondly, the Halimeter is more sensitive to hydrogen sulfide than methyl mercaptan, but organoleptically methyl mercaptan is more objectionable. However, the results of the study show the high significant correlation between OLT scores and Halimeter values in the diagnosis of halitosis. This is in agreement with the major epidemiological studies regarding halitosis.^[10,19,43-46]

Few studies have documented the prevalence of oral malodor in a sample chosen to represent the entire population. There are several reasons for this. Lack of scientific data may be due to the differences in cultural and racial appreciation of odors for patients as well as for investigators. Moreover, there are no universally accepted standard criteria for data collection, evaluation of halitosis, instructions for patients before examination, and instruments used in diagnosis of halitosis, making comparisons between the results of these studies rather difficult if not impossible. In addition, the surveyed samples rarely represented populations in general. The prevalence of halitosis in this Jordanian population was 78%, which is higher than that reported by epidemiological studies in other communities that ranged between 2% and 40%,^[19,43,47-51] this may be due

to the overall poorer oral hygiene and periodontal status of the subjects in our study. Or the assumption by other authors that halitosis might be an underestimated oral health problem in the general population may be true.^[44,51,52] The most interesting observation of this study is that a majority (57.6%) of the subjects with halitosis were not aware of it, and only 20.5% were aware of their problem. That is a typical finding called the “bad breath paradox” where halitosis sufferers are completely unaware of their bad breath odor,^[53] because individuals become adapted to their own oral and body odors,^[7,8] but that does not prevent someone with halitosis from noticing it in others.^[37] People who are not aware of their oral bad breath may encounter social and professional rejection without knowing why. In light of lack of studies that measure the awareness of halitosis, it may be assumed that other communities have higher awareness, based on the presence of having halitosis centers in those communities and the lack of such centers in our community. In addition, the prevalence studies in other communities and the lack of such studies in ours may also support the assumption of higher awareness of halitosis in those communities.^[54] The percentage of pseudo-halituos subjects (2.9%) in our study was much lower than that reported in other studies; this may reflect other populations’ concern and awareness regarding the presence of such a social handicap and its consequences.

Age was not a risk factor for the increase in level of VSCs in this study, and this is in agreement with many previous investigations.^[19,43,47] Gender of the participants did not influence the awareness and presence of halitosis as detected both by Halimeter and OLT, and this is in agreement with other studies^[10,19,37,55] and in contrast with a recent cross-sectional survey from Rio de Janeiro which showed that the prevalence of persistent halitosis was nearly three times higher in men than in women, regardless of age.^[56] The smoking prevalence in this study population was 27.8%. Smoking was significantly associated with higher organoleptic scores and higher VSC values. This is in agreement with Bornstein *et al.* and Miyazaki *et al.*^[19,44] In contrast, Liu *et al.*^[43] and the Swiss army study^[51] found no correlation between smoking and halitosis. Cigarette smoke itself contains significantly higher VSC levels which can be detected by the Halimeter.^[57] Furthermore, smoking has a negative effect on the periodontium, which may also promote halitosis.^[58] Smokers in this study were significantly more aware of their halitosis problem than non-smokers probably because it is a common knowledge that smoking causes oral and breath odors. Tongue coating was present in

96.6% of the study sample (in 198 out of 205 subjects examined). The presence of TC and its severity were significantly associated with halitosis and VSC levels. These results are in agreement with other studies, that the dorsum of the tongue represents the primary source of VSCs^[59] and its severity is significantly associated with halitosis.^[44,51,60-66] This significant association led Winkel and Tangerman to consider TC assessments as a useful method in detecting oral malodor.^[61] Clinical studies comparing halitosis and periodontal diseases have produced conflicting results.^[19,67-70] In our study, we did not find a significant correlation between the GI or PI with odor judge scores or Halimeter scores, which agrees with previous reports.^[19,44,51] However, there was a strong correlation between the presence of periodontal disease and the VSC levels. The proportion of periodontally involved subjects increased from 2.2% in the normal oral odor group to 5.6, 16.7, and 24.1% in the mild, moderate, and severe oral odor groups, respectively. This is in agreement with many studies.^[37,71-73] Söder *et al.* found that PI was significantly correlated with halitosis and that periodontitis patients with halitosis had more severe disease than those without.^[47] Delanghe *et al.* found that oral malodor is frequently (87%) caused by an oral problem (tongue coating > gingivitis > periodontitis).^[60] There was no association between self-reported tooth brushing frequency and halitosis; this is in agreement with previous studies.^[19,70] The majority of those who reported regular tooth brushing were halituos; on the other hand, all those who never brushed their teeth were halituos, and this may indicate that there might be some benefit of tooth brushing in solving this problem. The efficiency of brushing techniques used by the participants was not addressed in this study, so a confident conclusion cannot be drawn about the role of tooth brushing in solving halitosis problem. The results also revealed that tongue brushing is more helpful and this was reported by other studies where tooth brushing accompanied with tongue cleaning resulted in a substantial reduction in VSC levels.^[74] Removal of plaque from the tooth surfaces by brushing has been found to be less than half as effective in reducing oral malodor as tongue brushing alone.

Another aspect to be considered is how the halituos subjects who are aware of their condition notice their bad breath problem. It is interesting to point out that about 55% of those subjects noticed their halitosis problem by themselves or were told by others, including parents, spouses, other relatives, and friends, but no one was made aware of it by his/her dentist. Besides, the majority of these subjects (83%)

stated that they are concerned about others' reaction to their bad oral odor, and this may affect their body image and self-confidence. The American Dental Association (ADA's) survey showed that patients themselves initiated discussions of their halitosis with their oral health care providers. This is surprising in light of the potential embarrassment it causes. Among those patients who were unaware of or unwilling to disclose their problem, a hygienist broached the subject 31% of the time, while a dentist brought it up 27% of the time.^[75] Therefore, the role of dentist in limiting this social and medical problem should be activated by training them to use sensory and instrumental examination tools, to treat the complaint of halitosis.

The most reported method used by the halituous subjects, who were aware of their problem, to overcome the problem was chewing gum (67.9%), which is not a successful method. Studies show that these halituous subjects make desperate attempts to mask the odor through the frequent use of mints and chewing gum, compulsive brushing, and repeatedly using flavored mouth rinses.^[76] Others have chosen smoking as a way to mask the odor and become socially more acceptable. Many have become withdrawn and antisocial to avoid the painful embarrassment of close contact.^[77]

CONCLUSIONS

Halitosis is widespread in the study population and is accompanied by a low level of awareness. Tongue coating and smoking are significantly associated with halitosis. Tooth brushing alone is not effective in solving this problem, so tongue brushing should be part of daily oral hygiene and should be included in the oral hygiene instructions given to patients and the public. Also, health care providers should pay more attention to health education regarding halitosis since halitosis from an extra-oral origin can be the sign of an underlying systemic disease. Therefore, it is substantiated to organize halitosis consultations in a multidisciplinary setting, assembling periodontists, and ear–nose–throat specialists, specialists in internal medicine, and psychologists or even psychiatrists.

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