

Original Article

Prevalence and Risk Factors of Halitosis (Oral Malodor) Among Patients Attending A Dental School Clinic in Egypt: A Cross-Sectional Study

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Abstract

Objective: we aimed to evaluate the prevalence and risk factors associated with halitosis in a sample of dental patients attending a dental school outpatient clinic.

Material and methods: 318 patients were examined for halitosis in Ahram Canadian University (ACU) dental school outpatient clinic during the period of March-June 2019. Two methods were used to reach a diagnosis: a questionnaire and an organoleptic score.

Results: 76.1% of the dental patients were diagnosed as having halitosis based on the clinical examination. The mean score of halitosis among the study group was 2.31. The self-awareness of halitosis was 38% of the study group, and 13.2% reported having halitosis in the non-halitosis group. 16.98 % of patients had halitosis and periodontal disease, and 14.15% of the patients have halitosis and smoke.

Conclusion: Halitosis in dental patients is a common condition. Therefore, implementation and reinforcement of a halitosis prevention and management protocol in dental clinics are a health and social need.

Keywords: Halitosis; Cross-sectional studies; Dental schools; Prevalence; Sensation.

Introduction

Halitosis, also known as “bad breath” or “oral malodor” is a common problem with various socioeconomic effects. The prevalence of halitosis varies between 22% and up to 50% in some societies [1]. In about 80% of cases, halitosis is generated by microbial degradation of the oral organic substrates. Main degradation products involve volatile sulfur-containing compounds [2].

The causes of halitosis are summarized in (figure 1) based on a review by Bicak in 2018 [3] where halitosis is divided into two groups which are delusional (pseudohalitosis, halitophobia) and genuine. Genuine halitosis is divided into two subgroups which are physiologic and pathologic halitosis. Pathologic halitosis can be oral or extraoral [3]. The main cause of physiological halitosis is the dorso-posterior region of the tongue [4]. An important cause of intraoral pathological halitosis is the presence of

periodontal diseases [5]. Crypts of the tonsils are found to contain malodorous substrates [2]. This indicates the important role of the dentist in diagnosing and managing bad odor.

The three major methods for diagnosis of halitosis are self-reported halitosis, organoleptic measurement, and volatile sulfur compound (VSC) measurement. Organoleptic measurement is a simple and widely used method where a plastic tube is placed in the mouth of the patient and the patient is told to slowly breathe into this tube [4].

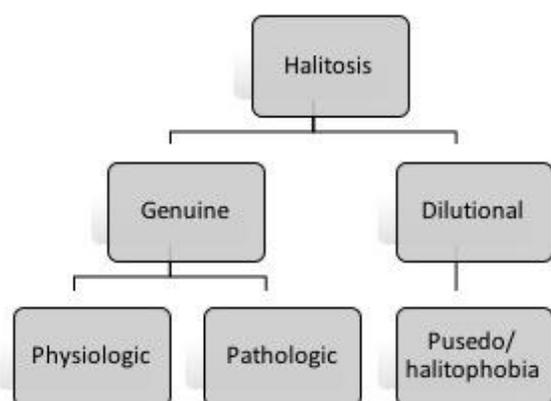


Fig 1: summarizes the types of halitosis based on Bicak, 2018

Many trials were conducted to compare the different regimens for controlling bad breath, overall, the three management pillars include identifying and managing the underlying causes, using mechanical measures, and using chemical measures. Since the main origin of physiological halitosis is increased tongue coating, mechanical tongue cleaning which is known as scarping is more effective than mouth rinsing. Dental practitioners should instruct their patients on how to brush their tongues to prevent side effects. The chemical approach involves using a chlorhexidine mouthwash. However, chlorhexidine should not be used for more than two weeks; therefore, zinc-containing mouthwashes have been recommended for this purpose. Other alternative ways involve chewing

gum; however, it has been reported that sugarless gum increased methyl mercaptan, one of the main components of halitosis. Similarly, mint did not reduce the concentration of methyl mercaptan, and it only masks the bad breath. So, there is still a need for the development of novel approaches which actually reduce VSC [4].

Up to our knowledge, this was the first study to evaluate the prevalence and risk factors among a sample of adult dental patients in Egypt. So, our aim was to evaluate the prevalence and common causes of halitosis among patients attending Ahran Canadian University (ACU) dental school outpatient clinic.

Subjects and methods:

Ethical approval was obtained from the ethical committee at the Faculty of Dentistry, Cairo University, since the study dental school does not have an ethical committee, with the number 19-3-20. The research protocol included a detailed study design and setting. In this cross-sectional study, 318 patients were examined for halitosis in Ahran Canadian University (ACU) dental school outpatient clinic during the period of March-June 2019 excluding the period of Ramadan. Two methods were used to reach a diagnosis: a questionnaire and an organoleptic score. The questionnaire included demographic data such as age and gender. Each patient, who answered yes to having halitosis, was asked the remaining questions of the questionnaire including halitosis history and risk factors. Others who answered no, their answers were reported in question five. The questionnaire was adapted from a previous study [6] as shown in table 1 and translated into Arabic. The Arabic translation was included in the supplementary material. A pilot study was conducted on 40 patients to check the clarity of the questions. Patients were informed of the confidentiality of their personal information and each patient signed informed consent.

The organoleptic examination was performed by two examiners for each patient and

the average score was taken. A score of 0-5 was given and a score of 2 or more was diagnosed as halitosis. The organoleptic test was performed by asking the patient to breathe deeply by inspiring the air through the nostrils and holding the breath for a while then expiring through the mouth while the examiner smells the odor at a distance of 20

cm. The severity of odor is classified on a scale from 0- to 5-point where 0: no odor, 1: barely noticeable odor, 2: slight but clearly noticeable odor, 3: moderate odor, 4: strong odor, and finally 5: extremely strong odor [7].

Table 1: Basel University Halitosis Questionnaire [6]

Questions	Choices
1. How do you know that you have bad breath?	The body language from other people Someone told me I just know
2. When did you first notice that you have bad breath?	years ago months ago weeks ago
3. Do you smoke?	yes or no if yes, how many cigarettes a day?
4. Does your bad breath influence on your private life or your social life? If yes, which one?	please answer in your own words
5. Do you think that you have bad breath at present?	yes or no
6. What do you think is responsible for your bad breath?	please answer in your own words
7. What measures have you undertaken to fight against bad breath?	Nothing at all mouthwash, chewing gum, breath mints avoided certain foods, which foods: anything else:
8. Have you visited any other doctors about your bad breath? (Dentist, physician, ENT specialist...?)	yes or no if yes, what type of doctor? dentist, family doctor, ENT specialist, internist, other physician?
9. What treatments were carried out by these doctors?	Examination of the mouth, the throat, the sinuses, the stomach, the blood, x-rays, gastroscopy/endoscopy, dental treatment, other:
10. Were any medications or treatments prescribed or recommended?	yes or no if yes, which one? antibiotics, medication against stomach acid, mouthwash, throat lozenges, other:
11. Are you on a special diet?	yes or no if yes, which one?

The clinical examination was used to examine the oral soft tissues, particularly the presence of a coated tongue as well as the presence of restorations or prosthetics either fixed or partial. The tongue coating was considered if there was a thin coating covering over 2/3 of the

dorsal surface of the tongue or a thick coating covering over 1/3 of the dorsal surface of the tongue [8], [9]. If halitosis was diagnosed from an oral cause, a corresponding therapy was started

for ethical reasons. All the patients were given oral hygiene instructions including mechanical cleaning of the teeth and the tongue two to three times a day in addition to the prescription of chlorhexidine gluconate mouth wash 0.12 twice daily for two weeks when appropriate.

Data were statistically described in terms of mean \pm standard deviation (\pm SD), and range, or frequencies (number of cases) and percentages when appropriate. A comparison between the study groups was done using Chi-square (χ^2) test. Two-sided *p* values less than 0.05 were considered statistically significant. All statistical calculations were done using the computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 22 for Microsoft Windows.

Results:

The total number of patients was 318. 76.1% of the patients were diagnosed as having halitosis based on the clinical examination. Table 2 summarizes the self-reported causes of halitosis based on the questionnaire. Table 2 shows that the dental-related causes were the most common causes of halitosis (48.9%). This percentage was followed by GIT-related causes (15.3%). The mean score of halitosis among the study group was 2.31 and the patient gender distribution was 114 males (35.85%) and 204 females (64.15%). The age ranged from 18 to 76. The average age of patients was 33.22 years. The gender distribution presented in table 4 showed that among all the halitosis patients 40.3% were males and 59.7% were females. Results also showed that within each gender group, 86% of the males had halitosis (98 of total 114 males) and 71.1 % of the females had halitosis (144 out of total 204 females). As shown in table 5, the total the self-awareness of halitosis was 38% of the study group, 13.2% reported having halitosis in the non-halitosis group. 45.9% were aware patients in the halitosis group. Table 6 showed that 16.98 % of patients

had halitosis and periodontal disease, and 14.15% of the patients have halitosis and smoking. Table 7 shows the severity of halitosis by the organoleptic scoring system. The scores were (4.4 %) and (33.01%) for grade 5 and grade 2 respectively.

The majority of patients (46.1%) chose mouthwash, chewing gum, and breath mints as measurements against bad breath. 70.7% of the participants did not visit any doctor.

Discussion:

Halitosis means oral malodor and is an important multifactorial health problem that affects both the psychological and social life of individuals. It is the third common reason for referral to dentists after dental caries and periodontal diseases [3]. Up to our knowledge, this was the first study to evaluate the prevalence of halitosis among a group of adults in Egypt. Although there are many prevalence studies done in many countries, this study highlights some of the behavioral and cultural causes of halitosis in Egypt. These causes include fasting during the month of Ramadan or outside the month of Ramadan and consumption of certain food such as raw garlic and onions.

In the current study, a translated questionnaire was used [6]. A pilot study was conducted and the questions were completely understandable. In addition, an organoleptic score was measured.

Despite its subjective nature, the organoleptic test remains the gold standard method to diagnose halitosis [10]. The self-reported oral halitosis through a questionnaire is considered a useful instrument for assessing the prevalence of halitosis, especially in population-based epidemiological studies [11]. Some studies which assessed bad odor used the ORG [12] or self-reported halitosis [13] as a primary score. Other studies measured VSC levels; however, it has

shown that the measurement of VSC levels presents low sensitivity and therefore the test is recommended as an adjunct instead of a substitute to the organoleptic assessment [14].

In this study, the total number of patients was 318.

The patient gender distribution was 114 males (35.85 %) and 204 females (64.15%).

The average age of patients was 33.22 years. 76.1% of the participants were diagnosed to have halitosis through the organoleptic score with a mean score of 2.31. This high prevalence

Table 2: The self-reported causes of halitosis

Causes	Percentage	Examples (in the patient's own words)
Dental/ oral	48.9%	Abscess, broken restoration, broken tooth, calculus deposits, cavity, no teeth brushing, fixed or removable restoration, gum inflammation, orthodontic wires
GIT	15.3%	Stomach bacteria, worms, or parasites
I don't know	15%	
Smoking	11.5%	
Food	2.8%	Garlic, onion
Morning breath	2.2%	
Fasting	1.6%	
ENT	0.6%	Common cold, adenoids, sinus infection, tonsilitis
Other factors	2.1%	Not drinking water, skipping meals, etc

Table 3: Descriptive data of the study group

	N	Minimum	Maximum	Mean	SD
Age	318	18	76	33.22	12.22
Number of cig/day	44	1	40	12.25	9.027

Table 4: Correlation between gender and halitosis using Chi-square (χ^2) test

	Self-awareness		Total	P-value	
	No	Yes			
Halitosis	No	66 (86.8%)	10 (13.2%)	76 (100%)	<0.001*
	Yes	131 (54.1%)	111 (45.9%)	242 (100%)	
Total		197 (62%)	121 (38%)	318 (100%)	

Table 5: Patients' self-awareness of halitosis using Chi-square (χ^2) test

		Gender		Total	P-value
		Males	Females		
Halitosis	No	16 (21.3%)	60 (78.7%)	76 (100%)	0.003*
	Yes	98 (40.3%)	144 (59.7%)	242 (100%)	
Total		114(35.85%)	204 (64.15%)	318 (100%)	

*p-value was considered significant when <0.05

Table 6: Frequency of the most common causes of halitosis

	Total	Percentage
Periodontal disease	54	16.98%
Smoking	45	14.15%

Table 7: Organoleptic scoring system

Score	Frequency	Percent %	Total
0	23	7.23	76.1%
1	53	16.66	
2	105	33.01	
3	92	28.93	
4	31	9.74	
5	14	4.4	
Total	318	100	100

was similar to that reported by Tarakji et al. who investigated halitosis in a sample of Jordanians and found the prevalence of halitosis to be 78% [15]. This was also approaching the study done on Chinese population which found that 65.9% of the patients had an organoleptic score ≥ 2 [16]. Although the percentage of halitosis in the current study was high, the percentage of the participants with severe halitosis (grade 5) was only 4.4%. One explanation for this high percentage is the study population which was dental patients where the dental causes were reported to be the most common cause of the bad odor. This indicates the importance of halitosis examination, scoring, and management in the dental office.

The self-awareness of halitosis was 38% of all the study participants. This percentage was very similar to that reported by Lopes et al. who concluded that the prevalence of self-reported halitosis was 39.67%. [13]. However, it was lower than that reported in a Pakistani study that used a questionnaire to evaluate the prevalence of halitosis where the prevalence of self-reported halitosis was 75.1% [17]. The high self-awareness percentage of Nazir et al. may be due

to the self-awareness of the study group which was students and interns.

Surprisingly, 13.2% of the patients reported having halitosis among the non-halitosis group and 45.9% were aware of having halitosis among the true halitosis group.

In the present study, the prevalence of halitosis among all patients according to gender was 40.3% males and 59.7% females. This is explained by the fact that the number of female participants in the study group was much higher than the number of men participants. However, within each gender group, 86 % of the males had halitosis and 71.1 % of the females had halitosis which may be correlated with the increased smoking prevalence as well as a slight tendency of poor oral hygiene among males. Moreover, 16.89% of the participants had halitosis with periodontal disease and 14.15% had halitosis with smoking.

Dental-related causes were the most frequent response (48.9%), which is much higher than the percentage reported by Zürcher & Flippi [6] as 23.5% reported “the oral cavity” as a cause. This may be explained by the fact that the study

was conducted at a dental school as opposed to Zürcher & Flippi's study which was conducted at a halitosis clinic. This percentage was followed by GIT-related causes (15.3%) which approaches that reported by Zürcher & Flippi [6] which was 17%.

Additionally, some interesting cultural-related answers were recorded in response to the open-ended question number six "What do you think is responsible for your bad breath?". For example, 1.6% of the patients reported that they noticed halitosis during fasting. Although the fasting month was excluded from the examination, some patients still reported fasting as a reason because fasting can be done outside Ramadan as well, especially during the month following Ramadan. This percent was small enough not to affect the results. Others reported morning association. On the other hand, some food was reported as a cause of halitosis such as garlic and onion. Some patients related the cause of halitosis to GIT problems and they described them as "worms, parasites, fungi or rot in the abdomen or stomach issue". However, most of the answers were related to dental causes such as food impaction, periodontal diseases, or orthodontic appliances.

Mouthwash, chewing gum, and breath mints were reported by 46.1% of the study group as the most used methods to overcome halitosis. The majority of patients by Zürcher & Flippi [6] also had a similar response, but their percentage was higher (94.5%).

In the current study, 70.7% of the participants did not visit any doctor to treat halitosis. This was in contrary to Zürcher & Flippi [6] where 63% of the patients visited one or more doctors for halitosis. Perhaps because their study was conducted in a specialized halitosis clinic.

Conclusion: Halitosis in dental patients is a common condition. Therefore, implementation and reinforcement of a halitosis prevention and management protocol are a health and social need.

Recommendations:

Since the general dentists and the Oral Medicine specialists have an important role in diagnosing and managing bad odor, and hence the oral causes including periodontal diseases and increased tongue coating are the most common causes of halitosis, we recommend the followings:

1. Halitosis self-reported questionnaire to be a part of the routine patient history in the dental office.
2. Halitosis scoring to be an integral part of the intra-oral examination in the dental office.
3. Reinforcement of the oral hygiene instructions with particular attention to mechanical tongue cleaning which is known as scarping.

Recommendations for further research:

1. A correlation cross-sectional study investigating the relation between halitosis and specific systemic diseases (For example, GIT diseases) should be conducted. Patient referral to a physician and confirming the systemic causes of halitosis using laboratory tests should be considered.
2. Future research needs to be conducted to evaluate halitosis based on volatile sulfur compound (VSC) measurement.
3. A cross-sectional study needs to be conducted to evaluate the prevalence of halitosis in the general population.

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Conflict of interest:

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