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Investigation

Halitosis: Are dentists being prepared for this challenge? – A questionnaire survey in a dental school

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ABSTRACT

Halitosis is multifactorial and has a high prevalence. It is a very common cause of distress and may have a severe impact in one's self esteem and social life. Previous studies show that more than 75% of cases originate in the mouth. The purpose of this study was to evaluate the level of knowledge and attitude of students towards halitosis, and the training given at a school of dentistry.

An anonymous questionnaire was distributed to 80 dental students at a randomly chosen Portuguese faculty, one-month before graduation, in May 2009.

The overall response rate was 84%. The majority of students (42%) pointed the stomach as the most frequent cause of halitosis. Subjects did not know the oral conditions that are more related (49%) and which therapeutic agents in mouthwashes are the appropriate ones to treat halitosis (55%). Moreover, the majority of students (70%) reported that they would prefer not to highlight their patients' halitosis on a routine check-up, if not requested by the patient, and that they did not feel prepared to manage these patients (72%).

In this study, students' knowledge, attitude and reported education on halitosis was poor. This is an original investigation, so it is not possible to compare these findings with other studies. However, considering its outcomes and the high interest from both students and patients, it is fundamental that dental schools should be committed to give their students a strong emphasis on this condition.

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Halitose: Estão os dentistas a ser preparados para este desafio? - Um inquérito realizado numa faculdade de Medicina Dentária

R E S U M O

Palavras chave:

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A halitose é uma patologia multi-factorial com elevada prevalência na população. Pode conduzir à diminuição da auto-estima e ser, inclusivamente, um factor perturbador das actividades sociais. Estudos prévios demonstraram que mais de 75% dos casos têm uma origem bucal. Assim, os objectivos deste estudo foram avaliar o nível de conhecimento e a atitude dos estudantes no âmbito da halitose, e o ensino leccionado numa faculdade de Medicina Dentária.

Um questionário anónimo foi distribuído a 80 alunos de Medicina Dentária, numa faculdade portuguesa, seleccionada de forma aleatória, um mês antes da conclusão do mestrado integrado (Maio de 2009).

A taxa de resposta foi de 84%. A maioria dos alunos (42%) referiu o estômago como a origem mais frequente da halitose. Quase metade dos alunos (49%) afirmaram desconhecer quais as condições orais que estão mais relacionadas e 55% desconheciam quais os agentes terapêuticos presentes num elixir mais adequados para tratar a halitose. Além disso, a maioria referiu que não comunicaria aos seus pacientes um diagnóstico de halitose se estes não referissem queixas (70%), e que não se sentem preparados para a sua abordagem clínica (72%).

Neste estudo verificou-se que o conhecimento, a atitude e o ensino recebido por parte dos alunos foi insuficiente. O presente trabalho é inédito, não sendo possível por isso comparar os resultados com outros estudos. No entanto, considerando o elevado interesse, tanto dos alunos como dos pacientes, é de salientar a importância de uma maior valorização deste tema por parte das faculdades de Medicina Dentária.

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Introduction

Halitosis is an unpleasant and often offensive odour emanating from one's breath. Besides halitosis, other terms are used for this condition: bad breath, foul breath, oral malodour and foetor ex-ore.¹

Most adults suffer from genuine halitosis occasionally, whilst an estimated 10–30% of the population suffers from this problem regularly.¹ There are also some patients who stubbornly complain about halitosis when others do not perceive it (pseudohalitosis).²

Halitosis is multifactorial and may involve both oral and non-oral conditions. More than 75% of all cases have an oral origin. The most frequent are poor hygiene, tongue coating, periodontal disease and decreased salivary flow rate. The basic process is microbial degradation of organic substrates. Non-oral aetiologies of halitosis include disturbances of the upper and lower respiratory tract, disorders of the gastrointestinal tract, some systemic diseases, metabolic disorders, medication and food ingestion.^{1,3,4}

In the USA, halitosis is estimated to be the third most frequent reason for dental consultation, after dental caries and periodontal disease.⁵ Even though there may be a concern for physical health, the majority of those affected are more worried about the social implications.⁶ As a consequence, halitosis usually has relevant psychological effects. The range goes from a small impact and intensity, to cases where people's lives are entirely disturbed, even though often

it is not a sign of a disease and, very rarely, a danger to one's life.⁷ Those who suffer from this condition, being aware of its implications, try desperately to disguise their malodour by using chewing gums or mint sweets, by brushing their teeth compulsively and by gargling repeatedly with commercial mouth rinses. Also frequent are acquired patterns of behaviour, such as covering one's mouth, keeping a distance from other people or even avoiding all social interaction.⁸ There are even some anecdotal reports of patients who committed suicide.^{9,10}

The interest of the scientific community in this field has increased significantly over the last two decades, which has resulted in the creation of two scientific societies – the International Society for Breath and Odour Research (www.isbor.net) and the International Association for Breath Research (www.iabr.li) – as well as a proliferation of articles on this subject. A variety of publications can be found, such as clinical managing guides,⁴ literature reviews about etiological factors, specific means of diagnosis, and appropriate therapies.^{1,11} However, some experts suggest that a lot of professionals lack knowledge and training on halitosis's aetiology, diagnosis and treatment.^{6,12,13}

It is evident nowadays that halitosis is something that people in general are concerned about. This situation requires health professionals to have a considerable commitment and training in managing the referred condition. The purpose of this paper was to evaluate, in a school of Dentistry, students' level of knowledge, attitude towards halitosis and education received about it.

Material and methods

An anonymous questionnaire was distributed to dental students at a randomly chosen Portuguese faculty, one-month before graduation, in May 2009. Simplicity of use, ready understanding and anonymity were sought in order to encourage an adequate response rate. A pilot study was performed comprising 5% of the total sample in order to verify its viability. The questionnaire was elaborated by the authors and contained two sections. The first section (questions 1-5) was aimed at assessing students' general knowledge about halitosis, focusing on some aspects about aetiology, diagnosis and treatment (Fig. 1). Only one of the options presented was considered correct by the authors, in conformity with the scientific literature latest findings and experts' opinions.^{1,3,4,14-18}

The second section (questions 6-10) was aimed at assessing who the respondents thought was the health professional best qualified to be the first to see halitosis patients. This section also aimed at assessing students' attitude when confronted with a non-complaining halitosis patient and assessing students' evaluation of the education received (Fig. 2). Finally, participants were also asked to give information about their individual average faculty grades so far. Student's t-test was used to compare these values. Statistical significance was set at a 95% level.

Results

In total, 67 questionnaires were collected from a total of 80 students, giving an overall response rate of 84%. The results are also presented in Figures 1 and 2. The correct options considered by the authors, regarding questions 1-5, have been underlined.

Regarding the level of knowledge on halitosis (Fig. 1), 42% of participants pointed the stomach as the most frequent cause of halitosis. Others mentioned oral causes: gingival sulcus/periodontal pockets and tongue, 25% and 22% respectively. Faced with the options given, the majority of students also pointed out that they did not know which volatile compounds were more frequently associated with halitosis (58%), the oral conditions that are more related (49%), and which therapeutic agents in mouthwashes are the appropriate ones to treat halitosis (55%). Answers were more varied when participants were asked to choose an appropriate diagnostic tool, although gastric endoscopy was the most frequent answer (40%).

When asked who should be the first professional to manage a complaining halitosis patient, students were mainly divided between gastroenterologist specialists (42%) and dentists (39%). Also, the majority of students (70%) reported that they would prefer not to discuss their patients' halitosis on a routine check-up, if not requested by the patient. Concerning students' report and evaluation of the education given at the faculty, the majority of students stated that, all in all, the time was less than one hour (78%) and insufficient (67%). The majority (72%) also stated that, at that point in their studies, they did not feel prepared to manage patients with halitosis (Fig. 2).

Finally, the association between the number of correct answers (referring to questions 1-5) and the individual student's average faculty marks was not significant (Table 1).

Please choose only **ONE** of the options for your answer

1. Which is the most frequent source of bad breath?

- a) Stomach 42%
- b) Gingival sulcus / periodontal pocket 25%
- c) Tongue 22%
- d) Nasal cavity 2%
- e) I do not know 9%

2. Out of the following volatile compounds, which ones are the most frequently related to halitosis?

- a) Amine compounds such as cadaverine and putrescine 4%
- b) Methane 8%
- c) Sulphur compounds such as hydrogen sulphide and methyl mercaptan 25%
- d) Urea and ammonia 4%
- e) I do not know 59%

3. The oral conditions that favour most the production of volatile compounds related to halitosis are:

- a) Alkaline pH and Gram-negative bacteria 16%
- b) Alkaline pH and Gram-positive bacteria 6%
- c) Acid pH and Gram-negative bacteria 21%
- d) Acid pH and Gram-positive bacteria 8%
- e) I do not know 22%

4. Which of the following diagnostic tools is considered the gold-standard concerning halitosis?

- a) Gas chromatography 4%
- b) Organoleptic examination (use of one's sense of smell) 2%
- c) Gastric endoscopy 40%
- d) Sulphide monitoring 24%
- e) I do not know 30%

5. Which active compounds in a mouthwash would you recommend to reduce volatile sulphur compounds (VSCs)?

- a) Cetylpyridinium chloride, chlorine dioxide, zinc, chlorhexidine digluconate 22%
- b) Mint, cysteine and tryptophan amino acids 15%
- c) Alcohol and castor oil 5%
- d) There are no active compounds available in the market that reduce VSCs 3%
- e) I do not know 55%

Figure 1 – First section of questionnaire and results.

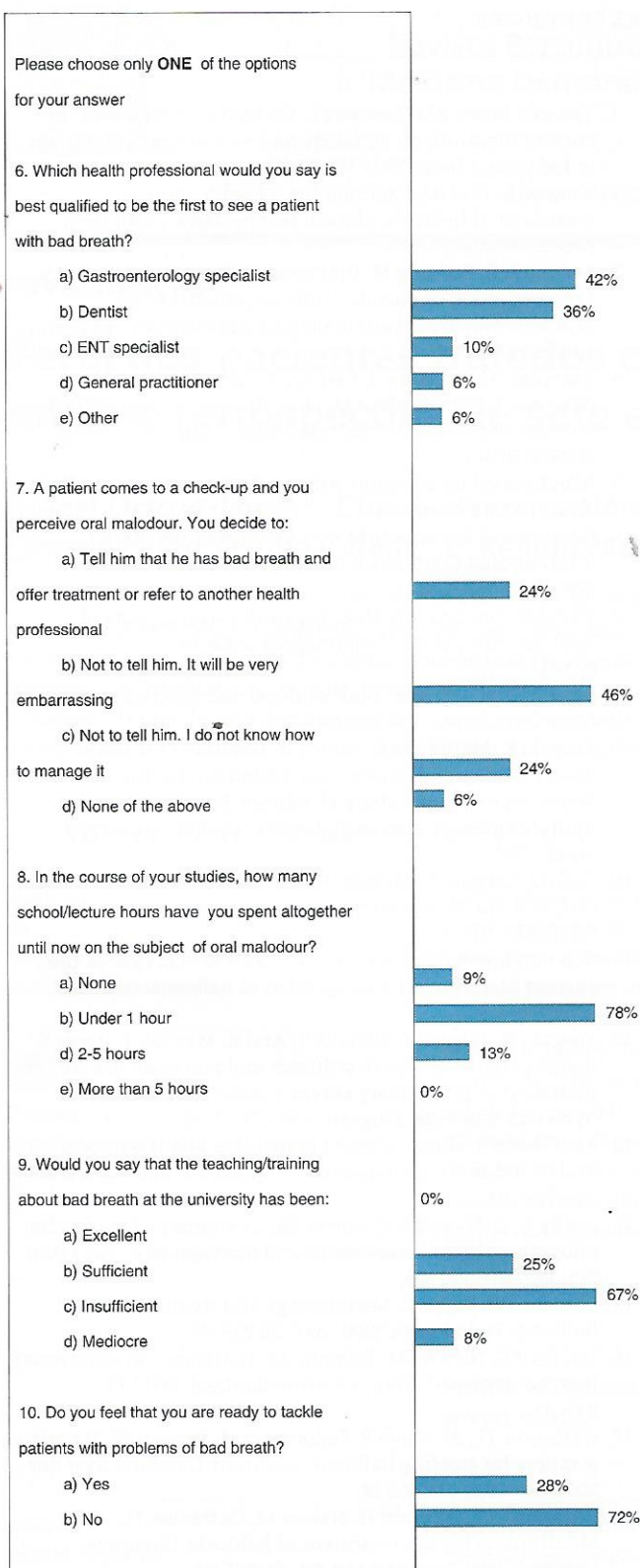


Figure 2 – Second section of questionnaire and results.

Discussion

This study concerning halitosis is internationally unprecedented, so it is not possible to compare these findings with other studies. The overall response rate was above our expectati-

Table 1 – Number of correct knowledge answers (questions 1-5) and student's average marks.

	Number of correct answers (0-5) Mean \pm SD	p value ^a
Group A (N = 33) High marks (≥ 14 out of 20)	1.24 \pm 0.83	0.5628
Group B (N = 34) Low marks (< 14 out of 20)	1.09 \pm 1.04	

^a Student's t-test.

ons. A very high interest regarding this subject was observed from the students. However, this study presents some limitations. The main ones are: a small sample and its unicentric characteristics. Moreover, the use of a non-validated and self-completion questionnaire may have resulted in an information bias.

The first section of the questionnaire was aimed at assessing students' knowledge. The results were disappointing. Review articles clearly indicate that above 75% of the cases have an oral origin. Particularly, the Gram-negative bacteria and alkaline pH conditions are associated with volatile sulphur-containing compounds (VSCs) production, such as hydrogen sulphide (H_2S), methyl mercaptan (CH_3SH), and dimethyl sulphide [$(CH_3)_2S$], generating oral malodour. Although gingival sulcus/periodontal pocket is a common site, tongue coating is referred to as the major site for halitosis production. The stomach is referred to as a rare cause of oral malodour.^{1,3,4,14,15} Recently, and in conformity with previous reports^{3,15} from other multidisciplinary bad breath clinics, Quirynen et al.⁴ reported that less than 4% out of 2,000 patients consulted, presented extra-oral causes (systemic and digestive included).

Also, 42% of students think that gastroenterologists' specialists should be the first to approach these patients, and 40% would opt for gastric endoscopy as the diagnostic tool, instead of organoleptic measurement, gas chromatography, and sulphide monitoring, considered by van den Broek et al.¹ as the three primary measurement methods of genuine halitosis. Among these, organoleptic measurement has been considered the gold standard.¹ These students' answers may confirm that a very considerable fraction of health professionals share the society's common belief that the stomach is a frequent cause of halitosis.^{13,17}

Students' knowledge was poor in regards to which active compounds in a mouthwash they would recommend to control halitosis in a case of high VSCs. A recent systematic review on mouthwashes concluded that those containing antibacterial agents such as chlorhexidine and cetylpyridinium chloride may play an important role in reducing the levels of halitosis-producing bacteria on the tongue, and chlorine dioxide and zinc containing mouthwashes can be effective in neutralisation of odoriferous sulphur compounds.¹⁸ Some authors suggest that health professionals are confused about 'over the counter' mouthwashes that claim to eliminate halitosis and are not familiar with evidence-based and literature supported active compounds.¹⁸ Our findings support this idea. Also, this could lead to another

issue, i.e. whether no-evidence based products, in huge mass media marketing campaigns by dominant industries, can influence dentists' decisions concerning halitosis.

Another focus of this survey was to find out whether the students would inform their patients of their oral malodour. The majority (70%) answered no, mainly due to being a socially embarrassing situation (46%) and because they lacked knowledge of how to deal with it (24%). It is well known that bad breath is still taboo in modern societies, but these results should open a debate about the role of the dentists in detecting halitosis. Its high prevalence should be considered. In an annual session of the American Dental Association, 92% of the dentists reported to see patients complaining of chronic bad breath, and 50% detected six or more patients with halitosis on a weekly basis.¹⁹ It is apparent that a large section of genuine halitosis patients are not aware of having it.²⁰ Moreover, halitosis is an indicator of a variety of pathologic conditions, both oral and extra-oral, and its assessment is important to early diagnosis.

Results also show no significant differences between the number of correct answers given about knowledge by students with higher and lower average marks ($p > 0,05$). This supports the idea that the lack of information was not a matter of individual learning performance, but of insufficient education given by the faculty. More than two out of three students reported not to be prepared to deal with this pathology, and gave a negative evaluation of the teaching received. It seems clear that a period of less than an hour throughout the whole course of studies is not enough to educate and train students to deal with this pathology. The question: "Are dentists being prepared for this challenge?" should be asked in every dental school.

Conclusions

In this study, students' demonstrated a lack of knowledge on halitosis and reported an insufficient level of education on the subject. However, multicentric studies are needed to better support these findings.

People in general, give halitosis a great deal of importance and it can be a manifestation of several diseases. Therefore its early diagnosis seems to be a must. The late proliferation of scientific publications and clinical guides about this matter may be of great assistance to health practitioners.

Because the majority of halitosis causes are oral, dentists should be the primary health professionals on screening and managing halitosis in complaining patients. Poor education may lead to disclaimer and lack of confidence by dental professionals and unsatisfactory response to patients' needs. In order to counter this, dental schools should be committed to give their students a strong emphasis on this condition. Self-evaluation examining may be a starting point.

Conflicts of interest

The authors have no conflicts of interest to declare.

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