Understanding Halitosis: A Survey on the Knowledge and Perceptions of Dental Students

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Abstract

1.Background/Objectives: Currently, there is a lack of definitive data regarding the prevalence of halitosis. This study was conducted to assess the knowledge and awareness of dental medicine students regarding halitosis, as well as to examine their approach to the diagnosis and management of patients presenting with this condition. 2.Methods: A total of 95 dental students were invited to participate in this cross-sectional study, conducted between February and June 2024. The data collection instrument consisted of a self-administered, structured questionnaire comprised of 14 questions. All items were mandatory, ensuring that every submission represented a complete data set for analysis. The study was conducted in accordance with ethical principles related to human subjects research, particularly concerning participant privacy, confidentiality, and data protection. Descriptive statistics were employed to analyze the data, with a focus on calculating frequency distributions and percentages. 3.Results: Among fourth-year respondents, only 58.1% reported familiarity with the term. In comparison, a significantly higher proportion of fifth-year students—86.2%—indicated awareness of the condition. This trend continued in the sixth year, with 89.3% of students reporting familiarity with halitosis, suggesting a gradual increase in awareness as students advance through their academic training. When asked whether they had access to instruments or tools for diagnosing or managing halitosis. Among fourth-year respondents, 64.5% reported lacking such instruments, while 35.5% stated they had access. Fifth-year students reported a slightly more favorable ratio, with 41.4% indicating access to instruments and 58.6% reporting the opposite. Similarly, among sixth-year students, 42.9% had access to instruments, while 57.1% did not. 4. Conclusion: In conclusion, while the current study highlights encouraging improvements in dental students' awareness and clinical exposure to halitosis over time, it also reveals critical gaps in theoretical knowledge and confidence in management.

Keywords: halitosis, malodour, dental students, knowledge, awareness

INTRODUCTION

The scientific literature employs a diverse range of terms to describe the condition commonly known as bad breath, including halitosis, foetor ex ore/foetor oris, oral malodour, mouth odour, breath odour, unpleasant oral odour, breath malodour, offensive breath, and foul smells [1]. The term halitosis itself is derived from the Latin word halitus (meaning breath) and the Greek suffix -osis (indicating a pathological condition), thus referring to a pathological state characterized by an unpleasant odour emanating from the oral cavity. This condition is also referred to by various synonymous terms such as chronic bad breath, oral malodour, tongue malodour, foetor ex ore, and foetor oris. [2,3}.

Currently, there is a lack of definitive data regarding the prevalence of halitosis. Although numerous studies have attempted to estimate its prevalence, most fail to clearly distinguish between different types of halitosis. Despite this limitation, the available literature suggests a general prevalence of approximately 30%. A recent systematic review and meta-analysis reported a pooled prevalence estimate of 31.8%, although substantial heterogeneity was observed across the included studies [4].

Miyazaki et al. proposed a primary classification of halitosis into intra-oral halitosis (IOH) and extra-oral halitosis (EOH). Extra-oral halitosis, which accounts for approximately 5–10% of all cases, may arise from either bloodborne or non-bloodborne sources. Bloodborne causes include systemic conditions such as diabetes mellitus, hepatic and renal disorders, as well as the intake of specific medications and foods. Non-bloodborne origins are typically associated with respiratory and gastrointestinal pathologies. In contrast, intra-oral halitosis is responsible for 80–90% of cases and is primarily linked to pathological conditions within the oral cavity. Both aerobic and anaerobic bacteria are implicated in IOH through the production of volatile sulfur compounds (VSCs), which are primarily responsible for the malodour.

Subsequent classification systems have further refined the understanding of halitosis. Tangerman and Winkel introduced a more comprehensive diagnostic framework, distinguishing genuine halitosis into physiological and pathological types, each further subdivided into intra-oral and extra-oral forms. Additionally, they identified pseudo-halitosis and halitophobia (also referred to as delusional halitosis or monosymptomatic hypochondriasis) as separate clinical entities. In cases of halitophobia, individuals persistently believe their breath is malodorous despite the absence of objective evidence, a perception often intensified by societal norms and pressures surrounding oral freshness [9].

Building upon these frameworks, Aydin and Harvey-Woodworth later proposed a more detailed pathological classification, identifying five distinct categories of halitosis: oral, airway, gastroesophageal, bloodborne, and subjective halitosis [10].

Although a substantial body of research on halitosis exists, there remains a relative paucity of high-quality clinical data in Western countries concerning its etiology and clinical characteristics within large patient populations. A landmark study published in 2009 addressed this gap by analyzing the etiology and clinical features of halitosis in 2,000 patients attending a multidisciplinary bad breath clinic in Leuven, Belgium. This study highlighted that halitosis represents the most common reason for seeking dental consultation, surpassing even dental caries and periodontal disease [11].

The etiology of halitosis is multifactorial, with sources broadly classified into intraoral and extraoral origins. Intraoral causes account for approximately 80–90% of cases and are primarily associated with oral pathologies such as periodontal disease, tongue coating, and poor oral hygiene [10,12]. In contrast, extraoral halitosis, comprising about 10% of cases, is attributed to conditions such as ear, nose, and throat (ENT) infections; respiratory tract diseases (e.g., sinusitis, tonsillitis, bronchiectasis, malignancies); and certain chronic systemic

disorders, including gastroesophageal reflux disease (GERD), diabetes mellitus, carcinomas, and renal or hepatic insufficiencies.

A common misconception among patients and healthcare providers is that halitosis predominantly originates from the stomach. However, the gastrointestinal tract is rarely a direct source of malodour; rather, it may contribute indirectly via haematogenous dissemination of volatile compounds. Only in rare cases can the esophagus, stomach, or intestines be implicated directly in halitosis. Furthermore, metabolic disorders involving enzymatic or transport dysfunctions—such as trimethylaminuria—can lead to systemic production of malodorous volatile compounds, resulting in both halitosis and altered chemosensory perception [7].

Pharmacological agents also play a significant role in the development of halitosis. Many medications induce xerostomia (dry mouth), which reduces salivary flow and facilitates the proliferation of odor-producing oral bacteria. Additionally, specific drugs—including nitrates prescribed for angina, phenothiazines used in psychiatric treatment, and certain chemotherapeutic agents—can produce volatile compounds that directly contribute to oral malodour [13-15].

The treatment of oral malodor is based on addressing its underlying causes. Oral malodor is produced by microorganisms that metabolize sulfur-containing amino acids in proteins, releasing malodorous gases.

Managing patients with halitophobia presents a significant clinical challenge and requires a high level of professional expertise. These individuals often exhibit persistent concern about having bad breath despite the absence of objective evidence, and they may be resistant to reassurance or psychological intervention. As such, dentists should have a comprehensive knowledge when providing halitosis consultations and consider interdisciplinary collaboration with a psychologist or psychiatrist—contingent upon patient consent—in order to ensure comprehensive and effective management.

Aim and objectives

This study was conducted to assess the knowledge and awareness of dental medicine students regarding halitosis, as well as to examine their approach to the diagnosis and management of patients presenting with this condition.

MATERIAL AND METHODS

A total of 95 dental students were invited to participate in this cross-sectional study, conducted between February and June 2024. The inclusion criteria required that participants be enrolled in the fourth, fifth, or sixth academic year of dental school and that they provide informed, voluntary consent to take part in the research. The students were approached through the WhatsApp messaging platform, where they received a standardized invitation message containing a concise overview of the study's aims and objectives, along with a link to the online questionnaire. Participation in the study was entirely voluntary, and no incentives were offered. To maintain the integrity of the data and ensure participant anonymity, responses were collected without any personal identifiers. This approach was intended to create a secure and confidential environment that would encourage honest and accurate self-reporting.

The data collection instrument consisted of a self-administered, structured questionnaire created using Google Forms. The questionnaire was specifically designed to evaluate dental students' knowledge and awareness regarding halitosis, their clinical exposure to patients affected by the condition, their familiarity with relevant classification systems—such as the differentiation between genuine halitosis, pseudo-halitosis, and

halitophobia—as well as their understanding of diagnostic tools (e.g., halimeters or organoleptic assessment) and perceptions concerning the effectiveness of various treatment approaches. The questionnaire comprised 14 questions in total, incorporating a mix of multiple-choice and yes/no response formats. All items were mandatory, ensuring that every submission represented a complete data set for analysis.

Informed consent was considered implied upon the voluntary completion and electronic submission of the questionnaire. The study was conducted in accordance with ethical principles related to human subjects research, particularly concerning participant privacy, confidentiality, and data protection. No personal or sensitive information was collected at any stage of the research process.

The responses were automatically compiled by the Google Forms platform into Excel spreadsheets for further analysis. Descriptive statistics were employed to analyze the data, with a focus on calculating frequency distributions and percentages. This analytical approach allowed for the identification of trends and patterns in knowledge, awareness, and clinical attitudes toward halitosis across different academic years, providing valuable insights into the preparedness of future dental professionals to recognize and manage this often-overlooked condition.

RESULTS

Initially, students were asked whether they were aware of the condition known as halitosis or oral malodour. Among fourth-year respondents, only 58.1% reported familiarity with the term. In comparison, a significantly higher proportion of fifth-year students—86.2%—indicated awareness of the condition. This trend continued in the sixth year, with 89.3% of students reporting familiarity with halitosis, suggesting a gradual increase in awareness as students advance through their academic training.

Students were subsequently asked whether they had ever encountered a patient presenting with halitosis. The majority of sixth-year students responded affirmatively, indicating either frequent or occasional encounters, with only 3.5% reporting that they had never encountered such a patient. Among fifth-year students, 6.9% indicated they had never treated a patient with halitosis. In contrast, 22.6% of fourth-year students reported never encountering a patient with halitosis, while 61.3% stated they had encountered such patients only rarely. These findings suggest a progressive increase in clinical exposure to halitosis with advancing academic year, which is consistent with the increasing level of clinical training and patient interaction.

Participants were also asked whether they would inform a patient if halitosis was detected during a clinical encounter. Responses showed a positive trend across academic years, with a growing willingness to communicate this condition to patients. Among fourth-year students, 58.1% reported they would inform the patient. This proportion increased to 75.9% among fifth-year students and 75.0% among sixth-year students, indicating a heightened sense of professional responsibility and confidence in patient communication among more senior students.

To assess the depth of knowledge regarding halitosis, students were asked whether they were familiar with any classification systems related to the condition. The majority of fourth-year students (90.3%) reported no familiarity with halitosis classifications (Figure 6.a). A modest improvement was observed among fifth-year students, of whom 31.0% reported some familiarity, and among sixth-year students, where 35.7% indicated awareness. These results point to a persistent gap in theoretical knowledge that remains underaddressed throughout dental training.

In another question, students were asked whether they had access to instruments or tools for diagnosing or managing halitosis. Among fourth-year respondents, 64.5% reported lacking such instruments, while 35.5% stated they had access. Fifth-year students reported a slightly more favorable ratio, with 41.4% indicating access to instruments and 58.6% reporting the opposite. Similarly, among sixth-year students, 42.9% had access to instruments, while 57.1% did not. These findings suggest that practical exposure to halitosis-related equipment remains limited even in the advanced stages of dental education.

Finally, students were asked to choose from a list of products what they would recommend to a patient presenting with halitosis (Table 1). Across all academic years, the responses showed a generally similar pattern, indicating a shared understanding of available therapeutic options despite some variability in knowledge, exposure, and access to diagnostic tools.

Table 1. Student´s perception regarding treatment of halitosis

Product	4th Year (n = 31)	%	5th Year (n = 29)	%	6th Year (n = 28)	%
Mouthwash	31	100.0%	25	86.2%	27	96.4%
Night guard	1	3.2%	3	10.3%	1	3.6%
Dedicated toothpaste	26	83.9%	21	72.4%	23	82.1%
Tongue scraper	29	93.5%	26	89.7%	25	89.3%
Electrical toothbrush	24	77.4%	15	51.7%	19	67.9%
Chewing gum	14	45.2%	11	37.9%	8	28.6%
None	0	0.0%	0	0.0%	0	0.0%

In the section focusing on etiology, students were asked what they believe causes halitosis. Answers were slightly more varying (Table 2).

Table 2. Distribution of perceived causes of halitosis according to different study semesters

Cause	a (n, %)	b (n, %)	c (n, %)
Caries	29 (93.5%)	24 (82.8%)	23 (82.1%)
Periodontitis	24 (77.4%)	20 (69.0%)	24 (85.7%)
Tongue coating	25 (80.6%)	21 (72.4%)	21 (75.0%)
Dry mouth	27 (87.1%)	26 (89.7%)	23 (82.1%)
Uncleaned dentures	25 (80.6%)	26 (89.7%)	21 (75.0%)
Stomach diseases	30 (96.8%)	27 (93.1%)	28 (100%)
Colon diseases	22 (71.0%)	15 (51.7%)	12 (42.9%)
Too much saliva	9 (29.0%)	1 (3.4%)	3 (10.7%)
Taking daily food	11 (35.5%)	3 (10.3%)	2 (7.1%)
Coffee drinking	14 (45.2%)	11 (37.9%)	11 (39.3%)
Oral Chroma	10 (32.3%)	5 (17.2%)	9 (32.1%)

Lastly, in our survey, we decided to gather insights from students regarding their perspectives on the effectiveness of halitosis treatments. The responses from fourth-year students, as depicted in Figure 11.a, revealed that 54.8% of them were of the opinion that these treatments could be successful. Interestingly, 45.2% believed that the treatments were indeed effective, showcasing a positive outlook among the majority of respondents. It is worth noting that none of the fourth-year students expressed a definitive "no" when it came to the success of halitosis treatments.

Moving on to the fifth-year students, a higher level of optimism was observed. A significant 65.5% of fifth-year students stated that halitosis treatments were successful. Additionally, 34.5% of them were open to the idea that these treatments might work, indicating a willingness to explore different possibilities. Once again, similar to the fourth-year students, none of the fifth-year students outright rejected the notion of treatment success.

When we delved into the responses from sixth-year students, a more varied perspective emerged. A small percentage, specifically 3.6%, firmly believed that halitosis treatments were not successful. On the other hand, a majority of 57.1% expressed confidence in the effectiveness of these treatments. Interestingly, 39.3% of sixth-year students remained uncertain about the outcomes, opting for a neutral stance by choosing the "maybe" option. This diverse range of opinions among the sixth-year students highlights the complexity of evaluating the success of halitosis treatments.

DISCUSSIONS

Halitosis, defined as an unpleasant odor emanating from the oral cavity, is a common condition that affects a significant portion of the global population. Despite its high prevalence and considerable impact on social functioning and psychological well-being, halitosis is often overlooked in both clinical settings and undergraduate dental education [4,5]. The present study aimed to assess the awareness, exposure, and confidence of dental students regarding halitosis and to evaluate how these competencies develop over the course of their academic training.

Our findings demonstrate a positive trend in the self-reported familiarity and comfort of dental students in managing halitosis as they progress through their academic years. Awareness rose substantially from 58.1% in fourth-year students to 89.3% in sixth-year students. This increase corresponds with findings from other studies indicating that clinical exposure and increased contact with patients improve confidence in diagnosis and communication [16,17]. Furthermore, the proportion of students who had never encountered a patient with halitosis decreased from 22.6% to just 3.5%, suggesting that direct clinical interaction plays a key role in developing clinical acumen.

The improvement in students' willingness to inform patients about their condition also reflects a growth in communication skills and professional maturity. This aligns with prior literature emphasizing that soft skills, such as patient communication and empathy, evolve with experience and are critical for managing socially sensitive conditions like halitosis [17,19]. Discussing halitosis with patients can be challenging due to the stigma associated with it, and adequate training in this area is essential for building both confidence and competence.

Nevertheless, the study also uncovered several persistent knowledge gaps. One of the most striking deficiencies was students' limited understanding of halitosis classification, particularly the differentiation between genuine halitosis, pseudo-halitosis, and halitophobia, as defined by the International Society for Breath Odor Research (ISBOR) [20-22]. Even among sixth-year students, awareness of these subtypes was suboptimal. This lack of theoretical foundation can impede accurate diagnosis and individualized treatment planning, thereby affecting patient outcomes.

The limited access to diagnostic tools and halitosis-specific management resources—reported by fewer than half of the respondents across all years—further suggests an underrepresentation of halitosis in clinical training environments. Previous research has shown that the use of diagnostic devices such as halimeters and gas chromatography can significantly improve the accuracy of halitosis detection [22-28], yet these tools remain underutilized in many dental programs, possibly due to cost or perceived clinical irrelevance.

Additionally, although belief in treatment effectiveness improved with academic advancement, a notable proportion of students—especially in earlier years—expressed uncertainty regarding the outcomes of halitosis management. This may stem from limited exposure to follow-up care or comprehensive treatment protocols during their training. Studies have shown that a multimodal approach—combining mechanical debridement, antimicrobial agents, and behavioral modification—can be highly effective in managing intraoral halitosis [29-33]. However, without sufficient clinical experience and theoretical instruction, students may lack confidence in recommending or delivering such treatments.

The disconnect between increasing clinical exposure and persisting knowledge gaps underscores the need for a more structured and integrated approach within dental curricula. While experience enhances familiarity, it does not guarantee depth of understanding unless supported by comprehensive educational content. Curricular reforms should prioritize the inclusion of halitosis as a standalone topic, with emphasis on its multifactorial etiology, classification systems, psychosocial implications, and treatment modalities.

Furthermore, interdisciplinary collaboration could enrich the learning experience. Given the diverse etiology of halitosis—including gastrointestinal, respiratory, and psychological origins—collaborative instruction involving otolaryngologists, gastroenterologists, and mental health professionals could help students develop a more holistic view of the condition [34-38].

In conclusion, while the current study highlights encouraging improvements in dental students' awareness and clinical exposure to halitosis over time, it also reveals critical gaps in theoretical knowledge and confidence in management. Addressing these gaps through targeted curricular enhancements and expanded clinical training will be essential in preparing future dental professionals to manage halitosis comprehensively and empathetically. Ultimately, such improvements could enhance patient care and reduce the social stigma associated with this common yet under-discussed condition.

CONCLUSIONS

In conclusion, while the current study highlights encouraging improvements in dental students' awareness and clinical exposure to halitosis over time, it also reveals critical gaps in theoretical knowledge and confidence in management. Addressing these gaps through targeted curricular enhancements and expanded clinical training will be essential in preparing future dental professionals to manage halitosis comprehensively and empathetically. Ultimately, such improvements could enhance patient care and reduce the social stigma associated with this common yet under-discussed condition.

Conflicts of Interest

The authors declare no conflict of interest.

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