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Assessment of Self-Perceived Halitosis and Oral Hygiene Habits Among Dental Students in Ernakulam District

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Abstract

Aim: The aim of this study was to evaluate the self-perception of oral malodour and oral hygiene habits among dental students in Ernakulam district of Kerala. **Materials and Methods:** A structured and validated questionnaire comprising of ten questions was distributed to 787 students of five dental colleges in the Ernakulam district of Kerala. The questionnaire evaluated the self-perception of halitosis, the oral hygiene practices among them and the presence of gingival bleeding, dental caries and dryness of mouth. **Results:** The dental students here included 678 females and 109 males. Self-perceived halitosis was reported by 46(42.2%) male students and 221(32.6%) female students showing a statistically significant difference ($p<0.05$) between both genders in reporting self-perceived halitosis. **Conclusion:** The results reveal a higher prevalence of self-perceived halitosis among males compared to females in this sample. The knowledge about halitosis and related factors was also greater among this sample of dental students. **Clinical significance:** The findings of our study highlight the fact that the regular removal of tongue coating and use of interdental aids along with regular oral hygiene measures can significantly reduce halitosis in an otherwise healthy individual.

Keywords: Halitosis, Cross-Sectional Study, Oral Hygiene, Periodontal Disease, Prevalence, Oral Malodour

1. Introduction

The word 'halitosis' originates from the Latin term "halitus" which means breath that was used with the Greek suffix "osis"[1]. It refers to the unpleasant odour emanating from the oral cavity of an individual. According to the American Academy of Periodontology, as stated in the Glossary of Periodontal Terms, Halitosis is defined as breath that is offensive to others, caused by a variety of reasons including but not limited to bacterial coating of tongue, different types of food, periodontal disease and systemic disorders[2]. Fetor oris, fetor ex ore, bad breath or oral malodour are the other terms in use to describe halitosis. The source of halitosis may either be pathological or physiological in origin. Both intraoral as well as extraoral determinants have a role in its multifactorial etiology. However, the

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source of origin is intra oral in approximately 90% cases, consisting of deep caries, food debris, tongue coating, mucosal ulcers, periodontal disease, ineffective cleaning of dentures, peri-implant disease or decreased salivary flow rates. Among these, tongue coating is the most frequently encountered intraoral factor in an otherwise healthy individual with the odor arising from the dorso-posterior aspect of the tongue[3]. The extraoral factors contributing to halitosis may include various underlying systemic diseases such as GERD (gastro-esophageal reflux disease), menstruation, diabetes mellitus, renal failure, lung carcinomas, tonsillitis, sinusitis and the use of certain medications. The compounds responsible for oral malodor are primarily the volatile sulphur compounds (VSC) which include methyl mercaptan (CH3SH), hydrogen sulphide (H2S), and dimethylsulfide [(CH3)2S][4]. These compounds are produced intraorally by the resident anaerobic Gram-negative microorganisms comprising of *Porphyromonas gingivalis, Treponema denticola, Prevotella intermedia, Porphyromonas endodontalis, Enterobacteriaceae, Bacteroides loescheii, Centipeda periodontii, Tanerella forsythia, Fusobacterium nucleatum* and *Eikenella corrodens*[5]. The odoriferous products result from the interaction of these microorganisms with the sulfur-containing compounds found in gingival crevicular fluid (GCF), saliva, blood and cells.

Dominic *et al.* in 1982 proposed a classification based on etiology for halitosis[6]. Bogdasarian in 1986 suggested another classification also based on cause.[7] The one based on systemic and local factors was propounded by Glickman in 1894[8] while another classification based on treatment needs was given by Miyazaki *et al.*[9] Halitosis can be broadly classified based on its source and nature into Genuine Halitosis and Delusional Halitosis [Figure 1][14].. Genuine halitosis may be further classified into physiologic and pathologic. Physiological halitosis or morning halitosis is foul morning odour from the oral cavity that may be caused by salivary stagnation and putrefaction of entrapped food particles and desquamated epithelial cells due to the bacterial accumulation on the tongue dorsum (coated tongue) and reduced intake of fluids[10]. The belief of an individual that he/she is suffering from halitosis, in its absence is a condition known as pseudo-halitosis. In cases where this belief persists after undergoing treatment for halitosis, it is highly likely that the person suffers from halitophobia[11]. Transient malodour caused following consumption of specific

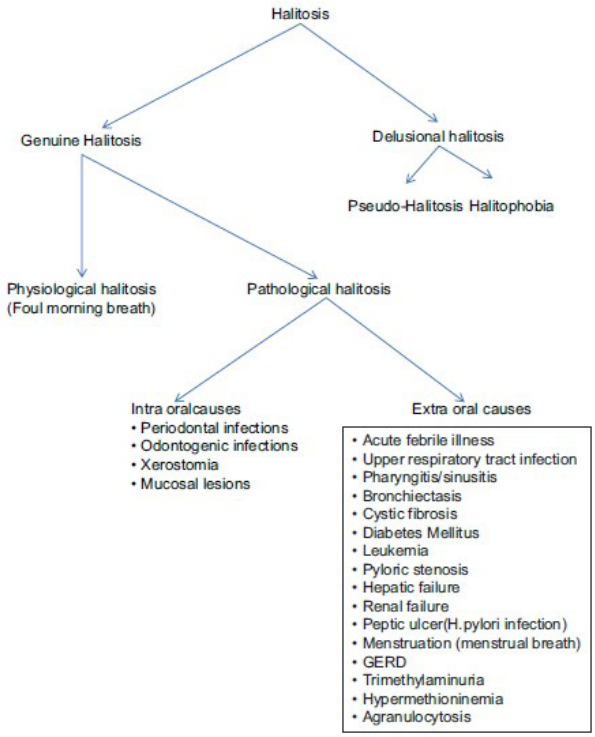


Figure 1. Classification of halitosis[14].

food substances like onion, garlic, alcohol or certain medications should not be perceived as halitosis[12].

Halitosis which is a quite common condition that could have a serious psychosocial impact on an individual. In essence, an effective treatment of oral malodor relies on an accurate diagnosis along with the administration of a cause-related therapy. There are several clinical, radiographic, and special assessments involved in the management of oral malodour. The "gold standard" for diagnosing oral malodour in a clinical setting is organoleptic assessment, which is typically subjective[13]. Gas chromatography, wrist lick test and halimeter examination are the other diagnostic techniques currently in use. Now, there are numerous agents which are readily available in the market that can temporarily mask the malodor such as chewing gums and mouth rinses, which may prevent the person from reaching out to a dentist for a definitive treatment.

An individual suffering from halitosis usually tends to reach out to the primary care practitioner for management of the condition. Most medical practitioners and dentists are not well informed about the possible causes of oral malodor and the current treatment options for the same. The epidemiological research conducted in this area

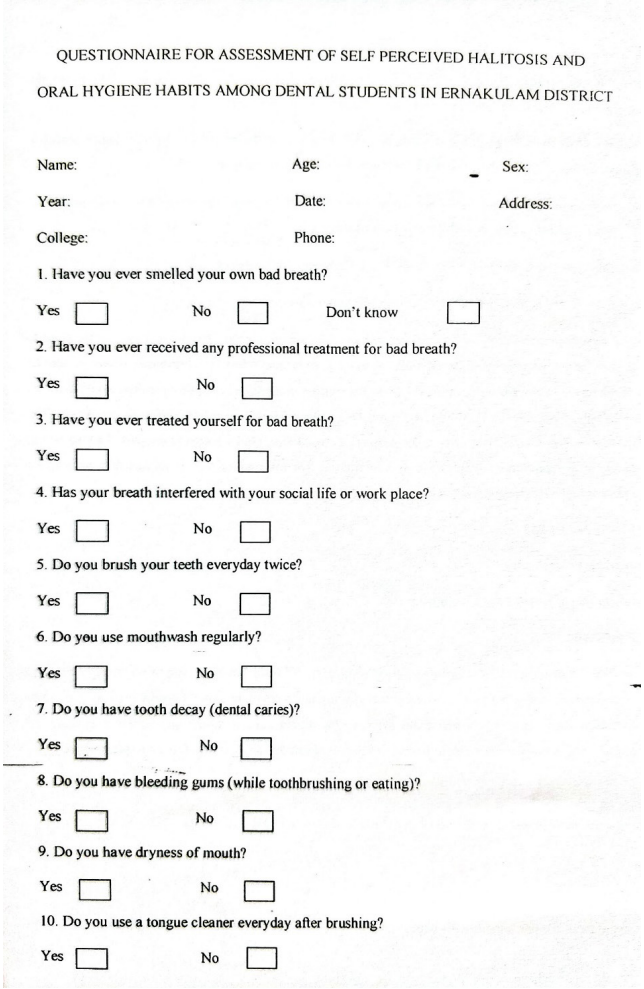
is also inadequate as it continues to be an important but underrated taboo. This lack of empirical evidence may be attributed to the variations in cultural or rather ethnic appreciation of odours and the lack of uniformity in assessment methods used which may be subjective or objective. In addition, very few studies, particularly in the dental population document the prevalence of self-perceived halitosis in community-based samples. Therefore, this necessitates further research among dental students to improve their awareness regarding self-perception of oral hygiene and health in general. Furthermore, it is both socially and medically vital to ensure that oral malodor is reported and a conclusive treatment is provided by identifying the root cause. So, this current study aims to evaluate the self-perception of oral malodor and oral hygiene habits among dental students in the Ernakulam district of Kerala.

2. Materials and Methods

The study was carried out among 787 dental students studying in the following dental colleges in Ernakulam district of Kerala:

- Annoor Dental College and Hospital, Muvattupuzha
- Amrita School of Dentistry (AIMS), Kochi
- Mar Baselios Dental College, Kothamangalam
- St. Gregorios Dental College, Chelad
- Indira Gandhi Institute of Dental Sciences, Nellikuzhi

This is a cross sectional study where a convenient sampling method was used. A structured and validated questionnaire[14] containing 10 questions in English were filled by the dental students individually. Male and female dental students who were willing to participate, were enrolled in the study and, upon agreement, asked to sign an informed consent form. Ethical approval for the study protocol was obtained from the Institutional Review Board (Annoor Dental College and Hospital, Muvattupuzha) and prior permission from heads of the respective institutions participating in the study were also obtained. Students who were interested to participate but could not do so due to their absence on the respective day were allowed to fill in their responses through an online survey application (Survey Monkey). An E-consent was also obtained from them through the same. The



QUESTIONNAIRE FOR ASSESSMENT OF SELF PERCEIVED HALITOSIS AND ORAL HYGIENE HABITS AMONG DENTAL STUDENTS IN ERNAKULAM DISTRICT

Name: Age: Sex:

Year: Date: Address:

College: Phone:

1. Have you ever smelled your own bad breath?

Yes ☐ No ☐ Don't know ☐

2. Have you ever received any professional treatment for bad breath?

Yes ☐ No ☐

3. Have you ever treated yourself for bad breath?

Yes ☐ No ☐

4. Has your breath interfered with your social life or work place?

Yes ☐ No ☐

5. Do you brush your teeth everyday twice?

Yes ☐ No ☐

6. Do you use mouthwash regularly?

Yes ☐ No ☐

7. Do you have tooth decay (dental caries)?

Yes ☐ No ☐

8. Do you have bleeding gums (while toothbrushing or eating)?

Yes ☐ No ☐

9. Do you have dryness of mouth?

Yes ☐ No ☐

10. Do you use a tongue cleaner everyday after brushing?

Yes ☐ No ☐

Figure 2. Questionnaire.

questionnaire comprised of ten questions [Figure 2] which evaluated the self-perception of halitosis, treatment (self or professional) for halitosis and the oral hygiene habits (toothbrushing frequency, use of interdental aids, and mouth rinses) among them. The gender and age of the participants were also documented. All the questions were explained to the participants and any doubt regarding them were clarified immediately by the principal investigator. The questionnaire was furnished in English language after ensuring that all of the participants could comprehend it.

All the data obtained were enrolled into Microsoft Excel and statistical package for social sciences (SPSS) version 24 was utilized for statistical analysis. Here, Pearson Chi-square test was used to evaluate the differences between the different variables, and the level of statistical significance was set at ($p < 0.05$).

3. Results

Our study population comprised of 787 participants in the age group of 18 to 25 years [Figure 3]. All the questions provided to them were answered and thus, included for statistical analysis. Among the 787 dental students who participated in the study, 109 (13.9%) were males and 678 (86.1%) were females. Among males, 46 (42.2%) reported self-perceived halitosis while 41 (37.6%) provided us with a negative response, and 22 (20.2%) had little knowledge of its presence or absence; whereas in females, 221 (32.6%) reported self-perceived halitosis, 364 (53.7%) responded negatively, and 93 (13.7%) had little knowledge of its presence or absence [Figure 4]. The differences observed here were significant ($p < 0.05$). Thus, the values indicate a higher prevalence of self-perceived halitosis among males compared to females in this population which is similar to the results obtained from previous studies by Marja LL, Andrea Almas K and Andrea Z (2016); Al- Hawish K *et al.* (2003), and Al-Atrooshi BA, Al-Rawi AS (2007).

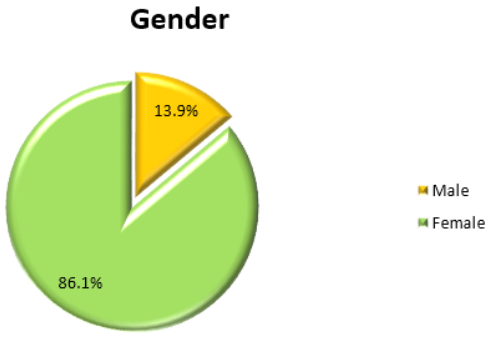


Figure 3. Study population.

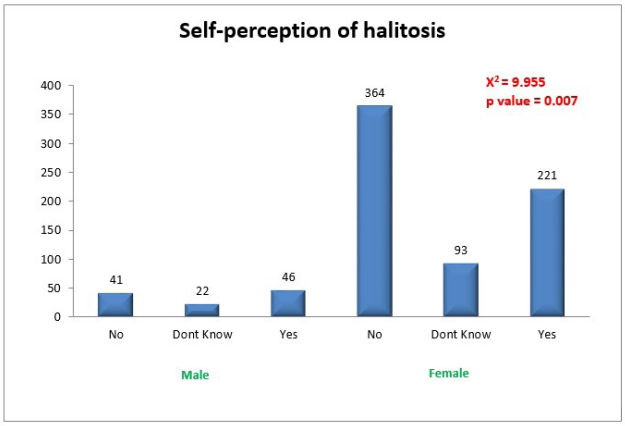


Figure 4. Comparison for self-perception of halitosis among males and females.

Questions	Male		Female		Chi-Square	P value
	Yes	No	Yes	No		
Have you ever received any professional treatment for bad breath?	32	77	114	564	9.778	0.002
Have you ever treated yourself for bad breath?	35	74	176	502	1.811	0.178
Has your breath interfered with your social life or work place?	38	71	166	512	5.268	0.022
Do you brush your teeth everyday twice?	80	29	455	223	1.704	0.192
Do you use mouthwash regularly?	43	66	223	455	1.805	0.179
Do you have tooth decay (dental caries)?	54	55	282	396	2.425	0.119
Do you have bleeding gums (while tooth brushing or eating)?	39	70	193	485	2.416	0.120
Do you have dryness of mouth?	22	87	151	527	0.239	0.625
Do you use a tongue cleaner every day after brushing?	55	54	347	331	0.020	0.889

Figure 5. Responses for the questions based on gender.

The responses to the questionnaire were categorised according to gender and analysed using the Pearson Chi-square test [Figure 5].

Significant differences were observed between males and females in self-perception of halitosis, in receiving professional treatment and in its interference in their social lives or work places ($P < 0.05$). There was no statistically significant difference in their oral hygiene habits (the use of mouth wash, use of tongue cleaners and brushing twice daily) and presence of carious teeth, bleeding gums or dryness of mouth.

4. Discussion

The history of sources related to halitosis can be traced back to the ancient Greek and Roman periods. Halitosis is an oral condition which is frequently observed in both genders and in all age groups, but with varying prevalence rates. As halitosis is a problem associated with many implications that may be personal, professional or social, the data obtained regarding its rate of prevalence may be of much value. Data reveals that in the general population, prevalence rate of halitosis is 50% in the USA, 6% to 23% in China and 21.7% in males to 35.3% in females in India[15] which emphasizes its relevance as a widespread global problem. Although there are several methods employed to assess the presence of halitosis, the most frequently used method by the common man is self-perception which is a rather subjective means of evaluation. A study in Switzerland consisting of 626 young adult males revealed

that 17% of of them had never had halitosis[16], while another study in the city of Bern in Switzerland reported the prevalence of self-perceived oral malodor to be 32%[17]. It is indeed noteworthy that Al-Ansari *et al.*, in 2006 observed a strong association between poor oral hygiene practices and self-reported oral malodor in the Kuwaiti population[18] with the prevalence rate of self-reported oral malodor being 23.3%. Various other factors such as female gender, lack of education, being 30 years of age or older, history of smoking, never using dental floss, history of chronic sinusitis or gastrointestinal disorders were also demonstrated to be substantially associated with self-perceived oral malodor. However, as per the observations from a multi-disciplinary breath consultation in Germany, 28% of the patients who reported there did not show any detectable signs of oral malodour inspite of complaining of bad breath[19].

Owing to the fact that dentists are the most likely category of health professionals to identify the condition, the proportion of individuals seeking professional help for halitosis in the sample analysed here remains minimal. A study in Mumbai showed that among the 127 dental students who reported affirmative for halitosis, around 51% were males[20]. They also identified a pronounced association between oral malodour and oral pathologies like bleeding gums, dental caries etc. A relevant finding by them which is worth mentioning, was that 17% of the students who suffered from halitosis had a history of systemic illnesses. In general, the study population demonstrated poor oral hygiene habits and about 48% students with halitosis used chewing gum to cover up their bad breath. Meanwhile, another study among dental students in Pakistan revealed increased female (51.4%) students reporting oral malodour in comparison to males (23.7%)[21]. These findings indicate that the absence or presence of halitosis is usually discerned by people on their own and the source of origin could either be extraoral or intraoral.

The results of our study revealed a greater self-perception of halitosis among males with no significant difference in the oral hygiene practices among males and females. In this study, 25.9% of the participants suffering from halitosis reported that the condition has had a profound impact on their social life implying that self-perceived halitosis is a multi-dimensional psycho-physiological issue[22]. Van der Sleen *et al.* in a systematic review observed that tongue scraping or brushing may potentially reduce the occurrence of tongue coating along with oral malodour[23]. However, another systematic review revealed that tongue brushing may not have much of an effect on reducing oral malodor in the long run[24]. The fact that the likely source of odor may not be intraoral if oral malodour persists inspite of good or improving oral hygiene habits, needs to be emphasized.

A systematic review, published by Cochrane, indicated that mouth rinses containing cetylpyridinium chloride (CPC) and chlorhexidine (CHX) could inhibit the VSC production while those with zinc and chlorine dioxide may potentially neutralize these compounds that result in halitosis[25]. In the absence of periodontal disease, the presence of oral malodor in younger population may be associated with tongue coating[26]. Although the presence of self-perceived halitosis in our study sample may be attributed to the minimal use of tongue cleaner, the oral hygiene habits were reportedly excellent with most of them brushing twice a day. This was however not surprising as the study population here is that of dental students. Effective flossing along with tooth brushing may potentially reduce oral malodour, specifically in groups with poor oral hygiene habits and associated periodontal diseases[27].

Dental caries was more prevalent in the sample studied here in comparison to gingival bleeding or mouth dryness. In males, dental caries were reportedly higher than in females while gingival bleeding was greater in females. The higher prevalence of gingival bleeding in females could be attributed to the surge in certain female hormones like estrogen and progesterone at the time of puberty especially during the various phases of menstrual cycle.

A major limitation of our study was the lack of correlation of self-perceived oral malodor with clinical evaluation. In addition, the extraoral factors related to halitosis including lower socioeconomic status, chronic sinusitis, upper respiratory tract infections and gastrointestinal tract disorders were not taken into account here.

5. Conclusion

To conclude, more often than not, halitosis is a reflection of poor health in most cases. Our study identified a lower prevalence of self-perceived malodor with a significant male predilection among the population of dental students here. Nevertheless, these observations, need to be substantiated by objective examination to establish its

prevalence. The awareness regarding oral malodour and its possible contributing factors was also substantially greater in the sample studied here. The dentists undoubtedly play a vital role in ensuring good oral health in the community. Furthermore, it is our duty as dental professionals to ensure that every individual receives an appropriate diagnosis and to make an attempt to treat the underlying cause as early as possible.

6. Clinical Significance

The findings of our study highlight the fact that the regular removal of tongue coating and use of interdental aids like dental floss along with regular oral hygiene measures like tooth brushing can bring about a significant reduction in halitosis in an otherwise healthy individual. In the light of all extraoral and psycho-social factors associated with the perception of halitosis, which were discussed previously, these measures may also promote the overall well-being of the society as a whole rather than the individual alone.

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