

# Correlation of oral hygiene practices, smoking and oral health conditions with self perceived halitosis amongst undergraduate dental students

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## Abstract

**Objective:** The present study was undertaken to determine the prevalence of oral hygiene practices, smoking habits and halitosis among undergraduate dental students and correlating the oral hygiene practices, oral health conditions to the prevalence of self perceived oral malodour. **Materials and Methods:** A self-administered questionnaire was distributed among 277 male and female students. A questionnaire was developed to assess the self-reported perception of oral breath, awareness of bad breath, timing of bad breath, oral hygiene practices, caries and bleeding gums, dryness of the mouth, smoking and tongue coating. **Results:** The results indicate female students had better oral hygiene practices. Significantly less self-reported oral bad breath ( $P = 0.007$ ) was found in female dental students (40%) as compared to their male counterparts (58%). It was found that smoking and dryness of mouth had statistically significant correlation with halitosis ( $P = 0.026$ ,  $P = 0.001$ ). Presence of other oral conditions such as tongue coating and dental caries and bleeding gums also showed higher prevalence of halitosis in dental students. **Conclusion:** A direct correlation exists between oral hygiene practices and oral health conditions with halitosis. Females exhibited better oral hygiene practices and less prevalence of halitosis as compared to male students.

**Key words:** Dental students, halitosis, oral hygiene, oral malodour

## INTRODUCTION

Halitosis is the general term used to describe any disagreeable odour in expired air, regardless of whether the odorous substances originate from oral or non-oral sources. Other names used are fetor ex ore, fetor oris, bad or foul breath, breath malodour, and oral malodour.<sup>[1]</sup> Researchers conventionally use an osmoscope to study the sources and conditions surrounding bad breath.

Results from previous studies suggested that even though there are several causes of bad breath including those resulting from a systemic or nasopharyngeal pathology or condition, the main source of most halitosis is the oral cavity. Non-oral sources of breath odour are generally related to systemic problems and/or medications including conditions such as diabetes, liver and kidney disorders, and pulmonary disease. Some medications, especially those that reduce salivary flow such as antidepressants, antipsychotics, narcotics, decongestants, antihistamines, and antihypertensive drugs contribute towards non-oral sources of breath odor.<sup>[2-4]</sup>

Systemic conditions and medications can contribute to breath problems, but the majority of bad breath originates in the oral cavity. Bacterial putrefaction<sup>[5-7]</sup> by gram-negative anaerobic bacteria, particularly those residing on the posterior dorsum of the tongue,

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utilize sulphur containing amino acids, primarily cysteine and methionine<sup>[8-10]</sup> to produce volatile sulphur compounds (VSCs) which lead to halitosis.<sup>[11]</sup> Other organic components e.g., organic acids, indole/skatole, putrescine, cadaverine may be involved in the production of halitosis.<sup>[12]</sup> Hydrogen sulphide (H<sub>2</sub>S), methyl mercaptan (CH<sub>3</sub>SH), and dimethyl sulphide [(CH<sub>3</sub>)<sub>2</sub>S] have been identified as the predominate VSCs responsible for oral malodor.<sup>[9,13,14]</sup> While the tongue is considered the primary source of VSC production, other dental problems can generate these offensive gases. Dental conditions such as gingivitis, periodontal disease, gross carious lesions, and poor oral hygiene have been shown to contribute to bad breath.<sup>[15-18]</sup> However, when dental disease is the source of oral malodour, treatment of the condition will often eliminate the problem.<sup>[17,19]</sup>

Oral health is an integral part of general health. The oral health care providers of a country are responsible for enhancement of oral health of the entire nation and they can only do so if they have sound oral health themselves. As there is not much data available on the oral hygiene practices and oral malodour in dental students of India so the study was aimed at assessing the oral hygiene practices of the future dentists who hold the responsibility of maintenance of oral health of the entire nation. Oral malodour is a characteristic finding in poor oral health so this parameter was assessed to evaluate oral hygiene.

The other objectives of the study were to find out if there is any difference between the oral hygiene and self reported halitosis amongst male and female dental students.

## MATERIALS AND METHODS

A questionnaire based study was carried out at Gain Sager Dental College and Hospital after taking approval from the institutional ethical committee. Final sample consisted of 277 (200 female and 77 male) dental students as more number of female students is enrolled each year as compared to males. The sample consisted of equal distribution of male and female students from second year (69 students), third year (70 students) fourth year (69 students) and dental interns (69 students).

A self-administered questionnaire was developed to assess the prevalence of oral hygiene habits including brushing, flossing, tongue cleaning, use of mouthwash, self-perception of oral health, awareness of bad breath, timing of bad breath, caries and bleeding gums, dryness of mouth, smoking habits, and tongue coating.

The questionnaire was developed by reviewing the literature.

### Data collection

The questionnaire was distributed all the dental students in the mentioned institution with permission and co-operation of the head of the institute and the respective head of the departments. The identity of the students was not disclosed and the confidentiality of the identity was assured to them. Sufficient amount of time of 10 minutes was provided for the filling up of the questionnaire.

### Statistical analysis

The data was entered into Statistical Package for Social Sciences (SPSS) version 16.0 and was utilized for data analysis. Chi-square test was used for comparisons among male and female students and to correlate the oral hygiene practices, smoking habit, presence of dry mouth, dental caries, bleeding gums and tongue coating to the prevalence of oral malodour. The significance level (*P* value) was set at 0.05.

## RESULTS

Out of a total of 381 students, 290 students filled the questionnaire and responded. The response rate was 76%. The incomplete questionnaires were not included in the study. Valid cases were those who answered the questionnaire completely. The number of valid cases for data analysis was 277 (72.7%). All the respondents were in the age range of 19-25 years with a mean age of 21.2 years.

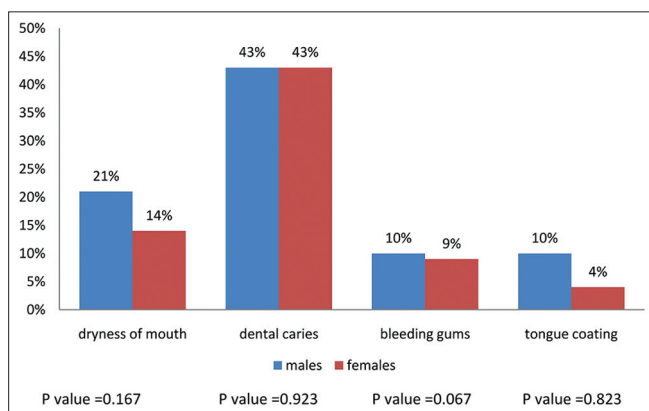
The results revealed that all participants reported to brush their teeth daily. 40.8% of individuals brushed only once a day, 57.4% brushed twice and 1.4% brushed three times, whereby a very few (4%) brushed four times a day. Also the difference in result between males and females was not statistically significant. 69.9% used one tooth brush for less than 3 months, 25.4% for less than 6 months and 5.1% for more than 6 months with no statistically significant difference among male and female students. Only 14.8% of students use a dental floss. 93.5% dental students claim to clean their tongue daily but only 44.7% of them use a tongue cleaner to do so while the others (55.3%) use a toothbrush for this task. This result was found to be statistically significant when comparison was done among the male and female students (*P* = 0.017) (*P* < 0.05). 32.1% of dental students use a mouthwash daily and only 25% of them use a mouthwash prescribed by a dentist [Table 1].

Self-reported prevalence of dryness of mouth, dental caries, tongue coating and bleeding gums was assessed among male and female dental students. However, there was no statistically significant difference in the results between the two groups (*P* > 0.05) [Figure 1].

**Table 1: Prevalence of various oral hygiene practices being followed by the dental students**

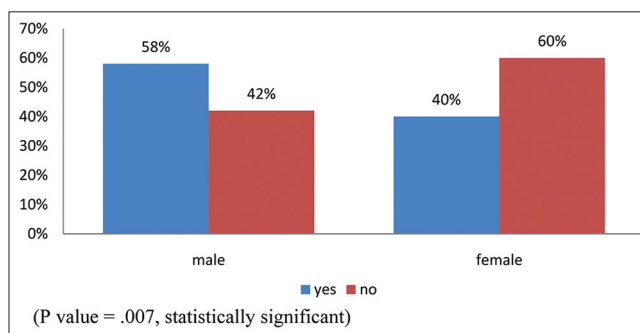
	Males (77 students)		Females (200 students)		Total (277 students)		Statistical significance	
	n	%	n	%	n	%	X <sup>2</sup>	P value
Students brushing everyday	77	100	200	100	277	100	-	-
Students brushing once daily	37	48.1	76	38	113	40.8	3.984	0.267
Students brushing twice daily	121	60.5	38	49.4	159	57.4		
Students brushing thrice daily	2	1.0	2	2.6	4	1.4		
Students brushing more than three times daily	1	0.5	0	0.0	1	0.4		
Students changing their brush within 3 months	144	72.4	48	62.3	192	69.6	2.647	0.266
Students changing their brush within 6 months	46	23.1	24	31.2	70	25.4		
Students changing their brush after 6 months	9	4.5	5	6.5	14	5.1		
Students using a dental floss	30	15.0	11	14.3	41	14.8	0.022	0.881
Students cleaning their tongue	189	94.5	70	90.9	259	93.5	1.180	0.277
Students using a tongue cleaner to clean their tongue	93	49.2	22	32.4	115	44.7	5.745	0.017*
Students using a toothbrush to clean their tongue	96	50.8	46	67.6	142	55.3		
Students using a mouthwash	63	31.5	26	33.8	89	32.1	0.131	0.717
Students who smoke	5	2.5	5	6.5	10	3.6	2.548	0.110

\*P&lt;0.05 was taken as significant

**Figure 1:** Prevalence of self assessed presence of dry mouth, dental caries, coating over the tongue and bleeding gums amongst dental students

Almost 58% of male and 40% of female students had self-perceived bad breath [Figure 2]. The difference in data was statistically significant ( $P = 0.007$ ) ( $P < 0.05$ ). The majority of students, 84.4% male and 88.6% female, experienced bad breath after waking up [Table 2]. Almost 15% of female and 11% of male students experienced bad breath while they are hungry and 7.6% of females and 20% males experience halitosis during thirst. This difference in result was statistically significant ( $P = 0.042$ ). Some students also perceive halitosis while working, talking to other people and when they are tired. Almost 1% of females and 2% of males experience halitosis all day long.

It was found that students who brush twice daily experience less halitosis as compared to students who brush once daily. Students who changed their brush within three months experienced less halitosis as compared to ones who changed their brush within 6 months or after six months [Table 3]. 44.5% of students with a habit of tongue cleaning, 53% of students using a dental floss and 50.6% of students

**Figure 2:** Prevalence of self perceived halitosis amongst dental students

using a mouthwash experience oral malodour. Halitosis was present in 80% of the individuals who smoke. This result showed statistical significance ( $P = 0.026$ ) Presence of dry mouth was directly correlated to presence of halitosis with high statistical significance ( $P = 0.001$ ). Halitosis was present among 52% of individuals with dental caries. It was more prevalent among those who had decayed lesions as compared to filled lesions. Also, 53% of dental students with tongue coating or tongue deposits and 55.6% of students with bleeding gums reported halitosis [Table 4].

## DISCUSSION

Bad breath can be a social handicap for an individual. Self-perception is important for diagnosing and controlling bad breath. A recent study of United States dentists reported that chronic bad breath was diagnosed by 41% of practicing dentists in one week.<sup>[20]</sup> Studies conducted in Japan,<sup>[21]</sup> Sweden<sup>[22]</sup> and France<sup>[23]</sup> have also reported the prevalence of oral malodor in the population. From such studies it can be concluded that halitosis is a problem that is perceived in different cultures and societies of the world.

**Table 2: Timing of self-perceived bad breath during the day**

Oral practices followed by students	Females (79 students)		Males (45 students)		Total (124 students)		Significance (P<0.05 significant)	
	n	%	n	%	n	%	X <sup>2</sup>	P value
After waking up	70	88.6	38	84.4	108	87.1	0.442	0.506
When hungry	12	15.2	5	11.1	17	13.7	0.403	0.525
When thirsty	6	7.6	9	20.0	15	12.1	4.149	0.042*
While talking with other people	0	0.0	4	8.9	4	3.2	7.256	0.007*
When tired	2	2.5	2	4.4	4	3.2	0.336	0.562
During work	1	1.3	0	.0	1	.8	0.574	0.449
Morning	8	10.1	4	8.9	12	9.7	0.050	0.823
Afternoon	2	2.5	1	2.2	3	2.4	0.012	0.914
All day	1	1.3	1	2.2	2	1.6	0.165	0.596

\*P&lt;0.05 was taken as significant

**Table 3: Correlation of halitosis to oral hygiene practices being followed by dental students**

Timing of bad breath during the day	Halitosis present		Statistical significance	
	n	%	X <sup>2</sup>	P value
Daily brushing habit (277 students)	126/277	45.5		
Brushing once daily (113 students)	54/113	47.8	1.246	0.742
Brushing twice daily (159 students)	70/159	44.0		
Brushing thrice daily (4 students)	2/4	50.0		
Brushing more than three times daily (1 student)	0/1	0.0		
Changing brush in 3 months (192 students)	83/192	43.2	1.081	0.582
Changing of brush in 6 months (70 students)	35/70	50.0		
Change of brush after 6 months (14 students)	7/14	50.0		
Use of dental floss (41 students)	22/41	53.7	1.296	0.255
Habit of tongue cleaning (259 students)	116/259	44.8	0.787	0.375
Use of tongue cleaner (115 students)	49/115	42.6	0.385	0.535
Use of toothbrush to clean tongue (142 students)	66/142	46.5		
Use of mouthwash (89 students)	45/89	50.6	1.362	0.243

**Table 4: Correlation of halitosis to smoking, dry mouth, caries, bleeding gums and coating over tongue**

Oral hygiene practices	Halitosis present		Statistical significance	
	n	%	X <sup>2</sup>	P value
Smoking habit (10 students)	8/10	80.0	4.984	0.026*
Presence of dryness of mouth (44 students)	30/44	68.2	10.865	0.001*
Presence of dental caries (120 students)	62/120	51.7	3.260	0.071
Presence of filled carious lesion (57 students)	28/57	49.1	0.193	0.660
Presence of decayed carious lesions (64 students)	34/64	53.1		
Presence bleeding gums (27 students)	15/27	55.6	1.223	0.269
Presence of coating over tongue (17 students)	9/17	52.9	0.406	0.524

\*P&lt;0.05 was taken as significant

In spite of the wealth of information on the condition, identification of the actual cause remains sometimes difficult. In many studies, including ours, the assessment of malodour relies on the subject's self-perception. Many professionals do not consider this method to be reliable because it is subjective, and obviously, the method is not standardized among participants. Nevertheless, despite its shortcomings, this method has been the most commonly used organoleptic technique of evaluating malodour.<sup>[24]</sup>

In our study the health care professionals such as dental students were studied for the prevalence of halitosis by correlating it to oral hygiene practices being followed by the students, the oral conditions such as dental caries, dryness

of mouth, smoking, bleeding gums and tongue coating. It suggested that students who brush their teeth with a frequency of at least twice daily, changed their brush within 3 months, used a tongue cleaner to clean their tongue on a regular basis and used a mouthwash had lesser prevalence of halitosis as compared to the ones who did not follow such oral hygiene practices.

The oral hygiene practices were better among the female students [Table 1] and also the prevalence of self reported oral malodor was less in the female dental students [Figure 2]. These results coincide with the results of other studies.<sup>[25,26]</sup>

Dry mouth is also major con related with oral malodor. In our study, almost 21% males and 14% females reported of dry mouth. It has been suggested that a reduced saliva flow during sleep favors anaerobic bacterial putrefaction, giving rise to so-called “morning breath,” a transient condition which disappears after a meal.<sup>[1,27]</sup> The presence of halitosis in individuals with dry mouth was supported with statistically significant result in our study ( $P = 0.001$ ) [Table 4]. In an estimated 10 to 30% of the population in the United States the problem of dry mouth remains more persistent and halitosis persists throughout the entire day.<sup>[28]</sup>

Halitosis was most prominent soon after waking up in most of the individuals (87%) who complaint of self perceived oral malodor. This can be attributed to the reduced salivary flow at night or to the lack of brushing habit at night. More males as compared to females experience halitosis while talking to other people and while they are thirsty. This difference in result was statistically significant ( $P = 0.007$ ,  $P = 0.042$ ) and can be due to better oral hygiene habits and less prevalence of bleeding gums, tongue coating and dry mouth in the female dental students.

Smoking has been defined as an extrinsic cause of oral halitosis.<sup>[26]</sup> In our sample, 2.5% females and 6.5% males were smokers. Many people try to overcome halitosis, this halitosis may be present in the strong smokers’ breath, and a history of smoking has been implicated in decreasing olfactory sensitivity.<sup>[25]</sup>

The prevalence of bleeding gums was almost equal among males and females in this study. Dental caries and periodontal diseases are potential factors contributing to the bad breath.<sup>[2,22]</sup> In the present study dental caries and periodontal disease such as bleeding gums showed correlation with the oral malodour but the result was not statistical significance. It has been seen in Table 4 that prevalence of halitosis was more in presence of decayed carious lesions as compared to filled carious lesions.

The presence of tongue coating was recognized in almost 105 males and 4% of female students. Miyazaki *et al.*<sup>[15]</sup> suggested oral malodor in younger generations could be ascribable mainly to tongue coat deposition. Furthermore, a positive correlation between levels of VSC on the tongue’s dorsum surface and whole oral malodor has been demonstrated.<sup>[29]</sup> Kishi *et al.*<sup>[30]</sup> indicated several VSC producing bacteria have the ability to colonize on the coat of the tongue in periodontally healthy subjects. It was also suggested oral malodor could be related to not only the amount of tongue coating but also the colonization of *P. gingivalis* in the coating. 52.9% of the students who

experienced tongue coating reflected the perception of bad breath.

Eli *et al.*<sup>[31]</sup> concluded in a recent study that the self-perception of breath odor is a multifactorial, psycho-physiological issue related closely to one’s body image and psychopathological profile. Therefore, in the present study, the subjective self-reported information should be carefully evaluated, due to the limitation of the reliability of the questionnaire surveys.

## CONCLUSION

From our study we conclude that female dental students maintained better oral hygiene practices than male dental students and had less prevalence of halitosis as compared to the male student population. There is room for considerable improvement in the oral health behavior of both the male and female dental student groups with a particular emphasis on the former as they are role models for their patients and the public at large. The oral health care providers are responsible for sound oral health of the nation. They cannot be role models for their patients until they maintain good habits themselves. This can be done by greater emphasis during their undergraduate dental training could improve their oral self-care behaviors. Halitosis is a reflection of poor oral health. In can be concluded from our study that poor oral hygiene habits and presence of conditions such a dryness of mouth, bleeding gums, dental caries and coating or deposits over tongue tend to influence the prevalence of halitosis.

## REFERENCES

1. Tangerman A. Halitosis in medicine: A review. *Int Dent J* 2002;52 (Suppl 3):201-6.
2. Scully C, el-Maaytah M, Porter SR, Greenman J. Breath odor: Etiopathogenesis, assessment and management. *Eur J Oral Sci* 1997;105:287-93.
3. Durham TM, Malloy T, Hodges ED. Halitosis: Knowing when ‘bad breath’ signals systemic disease. *Geriatrics* 1993;48:55-9.
4. Messadi DV. Oral and nonoral sources of halitosis. *J Calif Dent Assoc* 1997;25:127-31.
5. Tonzetich J. Oral malodour: An indicator of health status and oral cleanliness. *Int Dent J* 1978;28:309-19.
6. De Boever EH, De Uzeda M, Loesche WJ. Relationship between volatile sulfur compounds, BANA hydrolyzing bacteria and gingival health in patients with and without complaints of oral malodor. *J Clin Dent* 1994;4:114-9.
7. Kozlovsky A, Gordon D, Gelernter I, Loesche WJ, Rosenberg M. Correlation between the BANA test and oral malodor parameters. *J Dent Res* 1994;73:1036-42.
8. Tonzetich J, Carpenter PA. Production of volatile sulphur compounds from cysteine, cystine and methionine by human dental plaque. *Arch Oral Biol* 1971;16:599-607.
9. Kleinberg I, Westbay G. Oral malodor. *Crit Rev Oral Biol Med* 1990;1:247-59.

10. Yaegaki K, Suetaka T. Periodontal disease and precursors of oral malodorous components. *J Dent Health* 1989;39:733-41.
11. Tonzetich J. Production and origin of oral malodor: A review of mechanisms and methods of analysis. *J Periodontol* 1977;48:13-20.
12. Kleinberg I, Codipilly M. The biological basis of oral malodor formation. In: Rosenberg M, editor. *Bad Breath Research Perspectives*. Israel: Ramont Publishing, Tel Aviv University; 1995. p. 13-39.
13. Tonzetich J. Direct gas chromatographic analysis of sulphur compounds in mouth air in man. *Arch Oral Biol* 1971;16:587-97.
14. Tonzetich J, Richter J. Evaluation of volatile odoriferous components of saliva. *Arch Oral Biol* 1964;9:39-45.
15. Miyazaki H, Sakao S, Katoh Y, Takehara T. Correlation between volatile sulphur compounds and certain oral health measurements in the general population. *J Periodontol* 1995;66:679-84.
16. De Boever EH, Loesche WJ. Assessing the contribution of anaerobic microflora of the tongue to oral malodor. *J Am Dent Assoc* 1995;126:1384-93.
17. Kostelc JG, Preti G, Zelson PR, Brauner L, Baehni P. Oral odors in early experimental gingivitis. *J Periodontol Res* 1984;19:303-12.
18. McDowell JD, Kassebaum DK. Diagnosing and treating halitosis. *J Am Dent Assoc* 1993;124:55-64.
19. Yaegaki K, Sanada K. Biochemical and clinical factors influencing oral malodor in periodontal patients. *J Periodontol* 1992;63:783-9.
20. Löesche WJ. The effects of antimicrobial mouth rinses on oral malodor and their status relative to US Food and Drug Administration regulations. *Quintessence Int* 1999;30:311-8.
21. Miyazaki H, Sakao S, Katoh Y, Takehara T. Correlation between volatile sulphur compounds and certain oral health measurements in the general population. *J Periodontol* 1995;66:679-84.
22. Söder B, Johansson B, Söder PO. The relation between foetor ex ore, oral hygiene and periodontal disease. *Swed Dent J* 2000;24:73-82.
23. Frexinos J, Denis P, Allemand H, Allouche S, Los F, Bonnelye G. Descriptive study of digestive functional symptoms in the French general population. *Gastroenterol Clin Biol* 1998;22:785-91.
24. ADA Council on Scientific Affairs. Oral malodour. *J Am Dent Assoc* 2003;134:209-14.
25. Almas K, Al-Hawish K, Al-Khamis W. Oral Hygiene Practices, Smoking Habits, and Self- Perceived Oral Malodor Among Dental Students. *J Contemp Dent Pract* 2003;4:77-90.
26. Al-Atrooshi BA, Al-Rawi AS. Oral halitosis and oral hygiene practices among dental students. *J Bagh Coll Dent* 2007;19:72-6.
27. Suarez F, Furne J, Springfield J, Levitt MD. Morning breath odor: Influence of treatments on sulfur gases. *J Dent Res* 2000;79:1773-7.
28. Meskin LH. A breath of fresh air. *J Am Dent Assoc* 1996;127:1282,1284,1286.
29. Morita M, Wang HL. Relationship between sulcular sulfide level and oral malodor in subjects with periodontal disease. *J Periodontol* 2001;72:79-84.
30. Kishi M, Kimura S, Dhare-Nemoto Y, Kishi K, Aizawa F, Moriya T, *et al.* Oral malodour and periodontopathic microorganisms in tongue coat of periodontally healthy subjects. *Dent Jpn* 2002;38:24-8.
31. Eli I, Baht R, Koriat H, Rosenberg M. Self-perception of breath odor. *J Am Dent Assoc* 2001;132:621-6.

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