Oral Hygiene Practices, Smoking Habits, and Self-Perceived Oral Malodor Among Dental Students

Khalid Almas, BDS, MSc, FRACDS, FDSRCS, DDPH, FICD; Abdullah Al-Hawish, BDS; Waheed Al-Khamis, BDS

Abstract

The aims of this study were to determine the prevalence of oral hygiene practices and halitosis among undergraduate students from King Saud University, College of Dentistry. A self-administered questionnaire was distributed among all 481 students; 263 male and 218 female students. A questionnaire was developed to assess the self-reported perception of oral breath, awareness of bad breath, timing of bad breath, treatment received for bad breath, oral hygiene practices, caries and bleeding gums, dryness of the mouth, smoking and tea drinking habits, and tongue coating. The response rate was 77%. Forty four percent of male and 32% of female students reported the self-perception of breath odor. Self-treatment was sought by 12% male and 22% female. Six percent of males and 4% of females experienced bad breath interference at their work. Seventy-eight percent of male and 62% of female students experienced bad breath after waking up. Brushing was prevalent among 81% of male and 99% of female students. Both miswak (chewing sticks) and tooth brushing were used by 53% male and 83% female students. Fifty seven percent of male students and 44% of female students reported caries. Bleeding gingiva was experienced by 26% of males and 14% of females. Dry mouth was common among 14% of males and 17% of females, while smoking was prevalent among 13% of males and 2% of females. Tea drinking was common among 44% of males and 37% of females, while tongue coating was equally common among both males and females (21% and 20%), respectively. The results indicate female students had better oral hygiene practices, significantly less self-reported oral bad breath, and smoked less compared to male students. There was no difference in tongue coating among male and female students. Further research is needed to examine oral malodor clinically and objectively by the standard procedures available. Students should be motivated to be a health symbol and keeping their mouths free from oral malodor.

Keywords: Oral hygiene, miswak (chewing sticks), smoking, oral malodor, halitosis, dental students, Saudi Arabia

Introduction

Halitosis is the general term used to describe any disagreeable odor 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 malodor, and oral malodor. The latter term is reserved for halitosis from the mouth.¹

Halitosis affects a large proportion of the population and may cause a significant social or psychological handicap to those suffering from it.²

Reviews in research reports now agree, in the vast majority of cases, halitosis (80 to 90%) originates within the oral cavity, where anaerobic bacteria degrade sulphur-containing amino acids to the foul smelling volatile sulphur compounds (VSC), namely hydrogen sulphide and methylmercaptan. An estimated 10 to 20 % of halitosis has non-oral causes.³⁴

Halitosis of oral origin is associated with poor oral hygiene, dental plaque, dental caries, gingivitis, stomatitis, periodontitis, tongue coating, and oral carcinoma.³ Dry mouth (xerostomia) might also promote oral malodor,⁵,⁶ although a correlation is not always observed.⁷

In healthy subjects, tongue coating is by far the most important source of malodor, most of the odor coming from the dorso-posterior surface of the tongue where the crypts are the favored sites for growth of the anaerobic bacteria responsible for halitosis.⁷⁸

Some investigators believe that besides VSC, other volatiles produced by oral putrefaction processes such as organic acids, ammonia, and amines may also cause oral malodor.⁵,¹⁰

Oral malodor is a social stigma, and there are no reports available in the literature about the oral malodor among dental students in Saudi Arabia.

The Objectives of the Study

- To learn about self-perceived oral halitosis by undergraduate female and male dental students from the College of Dentistry, Riyadh.
- To learn about their oral hygiene practices.
- To determine the differences of self-perception of halitosis and oral hygiene practices among the female and male students.

Materials and Methods

Subjects and Method

The study was carried out on female and male dental students from King Saud University, College of Dentistry, (Daraiyah and Malaz Campuses) Riyadh.

A self-administered questionnaire was developed to assess the self-perception of oral health, awareness of bad breath, timing of bad breath, treatment received for bad breath, prevalence of oral hygiene habits, caries and bleeding gums, dryness of mouth, smoking and tea drinking habits, and tongue coating. The questionnaire was developed by reviewing the literature and making modifications according to local culture and was administered in the Arabic language. The questionnaire was tested in a pilot study and adjusted in the light of pilot responses. The questionnaire was anonymous (no identification of individual was possible). The questionnaire was explained to the class leaders before the start of the study. (Figure 1)

The data was entered into the FoxPro software program – Statistical Package for Social Sciences (SPSS) version 10.0 and was utilized for data analysis. The data was analyzed for frequency distributions. The Chi-square test was used for comparisons among male and female students. The significance level (p-value) was set at 0.05.

Results

Out of a total of 481 (263 male and 218 female) students, 372 responded. The response rate was 77%. The number of valid cases for data analysis was 352 (73%). Valid cases were those who answered the questionnaire completely. Incomplete questionnaires were dropped from the study. The respondents were in the age range of 19-24 years.
Questionnaire about oral hygiene, smoking habit and self-perceived oral malodor among dental students.

Serial No. ____________________________ Dated __________________
Age _______________________________ Male _______ Female _______

Q1. Can you smell your own breath?
   Yes (Y) ______ No (N) ______ Don’t Know ___

Q2. Have you ever had an examination for bad breath by your
   Dentist (Y) ___ (N) ___
   Physician (Y) ___ (N) ___

Q3. Have you ever received any treatment from your practitioner for bad breath?
   Dentist (Y) ___ (N) ___
   Physician (Y) ___ (N) ___

Q4. Have you ever treated yourself for bad breath by
   (a) Self medication (Y) ___ (N) ___
   (b) Traditional medicine (Y) ___ (N) ___

Q5. In the last month, did your breath interfere with your social life at place of work?
   (Y) ____ (N) ____

Q6. What time during the day you find your breath the worst (bad breath)?
   (a) After waking up.
   (b) When hungry
   (c) When thirsty.
   (d) While talking with other people.
   (e) When tired
   (f) During work.
   (g) Morning
   (h) Afternoon.
   (i) All day.

Q7. Put your right palm in front of your mouth and exhale (breath out). Do you have bad breath?
   Yes (present) ____ No (absent) _________
Q8.  (a) Do you brush your teeth every day?  (Y) ____  (N) ____
     (b) Do you use miswak every day?  (Y) ____  (N) ____
     (c) Do you use toothbrush and miswak regularly?  (Y) ____  (N) ____
     (d) Do you use mouthwash regularly?  (Y) ____  (N) ____
     (e) Do you use toothpick regularly?  (Y) ____  (N) ____

Q9.  (a) Do you have tooth decay (dental caries)?  (Y) ____  (N) ____
     (b) Do you have bleeding gums?  (Y) ____  (N) ____

Q10. (a) Do you have dryness of mouth, (dry mouth)?  (Y) ____  (N) ____
      (b) Do you smoke?  (Y) ____  (N) ____

Q11. (a) Do you drink tea with mint regularly?  (Y) ____  (N) ____
     (b) Is your tongue coated with white or yellowish deposits?  (Y) ____  (N) ____

THANK YOU VERY MUCH FOR YOUR COOPERATION.
Forty four percent of male and 32% of female students reported the self-perception of oral health (Table 1). Almost 8% of males and 3% of females were diagnosed by a dentist smelling their breath odor and 1.5% of the male and 1.3% of the female students were diagnosed by physicians smelling their breath odor (Table 2). Almost 7% of male and 2% of female students received treatment from their medical practitioners (Table 3). Self-treatment was sought by 12% of the males and 26% of the females, while traditional medication was almost equally utilized by both (15%-16%) (Table 4).

### Table 1. Frequency of self-perception of oral breath.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>87</td>
<td>79</td>
<td>32</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>(43.9)</td>
<td>(39.9)</td>
<td>(16.2)</td>
<td>(100.0)</td>
</tr>
<tr>
<td>Female</td>
<td>47</td>
<td>78</td>
<td>23</td>
<td>148</td>
</tr>
<tr>
<td></td>
<td>(31.8)</td>
<td>(52.7)</td>
<td>(15.5)</td>
<td>(100.0)</td>
</tr>
</tbody>
</table>

\[X^2 = 6.326 p = 0.042\]

### Table 2. Frequency of diagnosis for bad breath by practitioners.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Dentist</th>
<th>Physician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
<tr>
<td>Female</td>
<td><img src="image3.png" alt="Graph" /></td>
<td><img src="image4.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

\[X^2 = 2.857 p = 0.91\]

\[X^2 = 0.885 p = 0.0021\]

### Table 3. Treatment received from practitioners for bad breath.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12</td>
<td>154</td>
<td>166</td>
</tr>
<tr>
<td></td>
<td>(7.2)</td>
<td>(92.8)</td>
<td>(100.0)</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>103</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>(1.9)</td>
<td>(98.1)</td>
<td>(100.0)</td>
</tr>
</tbody>
</table>

\[X^2 = 5.240 p = 0.73\]
Table 4. Self-treatment (self-medication) and traditional medicine.

| Gender | Self-Medication | | | | Traditional Medicine | | | |
|--------|-----------------|-----------|-----------------|-----------------|------------------|-----------|-----------------|-----------------|-----------|
|        | Yes | No | Total | Yes | No | Total | | | |
| Male   | 18  | 135| 153  | 23  | 127| 150  | | | |
|        | (11.8) | (88.2) | (100.0) | (15.3) | (84.7) | (100.0) | | | |
| Female | 22  | 62 | 84   | 12  | 65 | 77   | | | |
|        | (26.2) | (73.8) | (100.0) | (15.6) | (84.4) | (100.0) | | | |

$X^2 = 8.044$  $p = .005$  

Table 5. Experience of bad breath interference at work during the last month.

| Male | Female | | | | | | |
|------|--------|-----------|-----------------|-----------------|------------------|-----------|-----------------|-----------------|-----------|
| No | Yes | 94.2% | 5.8% | | No | Yes | 95.6% | 4.4% | | | | | |

$X^2 = 0.293$  $p = 0.588$

Table 6. Timing of self-perceived bad breath during the day.

| | | | | | | | |
|---|---|---|---|---|---|---|
| | Male | | | | Female | | | | | | | | |
| | Yes | No | | Yes | No | | | | | | | | |
|_after waking up | 156 | 44 | (78.0) | (22.0) | | 95 | 57 | (62.5) | (37.5) | | 10.141 | 0.001 | |
| When hungry | 77 | 123 | (38.5) | (61.5) | | 43 | 109 | (28.3) | (71.7) | | 12 | 65 | |
| Thirsty | 14 | 186 | (7.0) | (93.0) | | 11 | 141 | (7.2) | (92.8) | | 0.007 | 0.932 | |
| Talking | 10 | 190 | (5.0) | (95.0) | | 2 | 150 | (1.3) | (98.7) | | 3.560 | 0.059 | |
| During work | 19 | 181 | (9.5) | (90.5) | | 4 | 148 | (2.6) | (97.4) | | 6.671 | 0.010 | |
| Morning | 19 | 181 | (9.5) | (90.5) | | 8 | 144 | (5.3) | (94.7) | | 2.189 | 0.139 | |
| Afternoon | 2 | 198 | (1.0) | (99.0) | | 0 | 152 | (0.0) | (100.0) | | 1.529 | 0.216 | |
| All day | 1 | 199 | (0.5) | (99.5) | | 1 | 151 | (0.7) | (99.3) | | 0.038 | 0.845 | |
Almost 6% of male and 4% of female students experienced bad breath interference at their work during the last month (Table 5). The majority of students, 78% male and 62% female, experienced bad breath after waking up (Table 6). Almost 9% of male and 5% of female students had self-perceived (hand-on-mouth technique) bad breath (Table 7).

Brushing habits were prevalent among 81% of male and almost 99% of female students. Both miswaks and toothbrushes were used by 53% of the male and 83% of the female students, 22% of the males and 44% of the females used mouthwash, and 47% of the males and 70% of the females used toothpicks (Table 8). More female students reported regular toothbrushing and less breath odor as compared to the male students.

Caries was self-reported at 57% prevalence among males and 44% among females, while bleeding gums was experienced by 26% of the males and 14% of the females (Table 9). Almost 14% of males and 17% of females experienced dry mouth, while smoking was prevalent among 13% of males and 2% of females (Table 10). Forty four percent of the males and 37% of the females reported drinking tea with mint flavoring. A tongue coating was identified in 21% of males and in 20% of females (Table 11).

**Discussion**

There is no data available from Saudi Arabia on the prevalence of oral malodor among the general population or dental students, so the discussion will emphasize comparisons of male and female self-perceived responses due to the lack of previous studies in Saudi Arabia. As far as self-perception of the oral breath is concerned, more males (44%) could smell breath as compared to 32% of females. This may reflect males have more prevalence or perception of bad breath.

![Table 7. Frequency of self-perceived oral malodor among male and female dental students.](image)

![Table 8. Prevalence of oral hygiene habits among students.](image)

<table>
<thead>
<tr>
<th></th>
<th>Caries</th>
<th>Bleeding Gums</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 57.1%</td>
<td>Yes 26.0%</td>
</tr>
<tr>
<td></td>
<td>74.0%</td>
<td>74.0%</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 49.0%</td>
<td>Yes 14.1%</td>
</tr>
<tr>
<td></td>
<td>85.9%</td>
<td>85.9%</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 3.920 \ p = 0.141 \]  \[ \chi^2 = 7.286 \ p = 0.007 \]

Table 10. Prevalence of dry mouth and smoking habits among students.

<table>
<thead>
<tr>
<th></th>
<th>Dry Mouth</th>
<th>Smoking Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 13.6%</td>
<td>Yes 13.4%</td>
</tr>
<tr>
<td></td>
<td>86.4%</td>
<td>86.6%</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes 16.9%</td>
<td>Yes 2.0%</td>
</tr>
<tr>
<td></td>
<td>83.1%</td>
<td>98.0%</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 0.702 \ p = 0.402 \]  \[ \chi^2 = 13.998 \ p = 0.000 \]
Dentists and physicians are the first line of practitioners having diagnosed the condition, but in the present study very few (3-7.5%) females and males were diagnosed by dentists. If we look into the treatment received for bad breath, only 2% of females and 7% of males received it.

Supermarkets are flooded with over-the-counter (OTC) products with cosmetic effects to relieve oral bad breath temporarily, so 26% of females and 12% of males use those products as self-treatment (self-medication). Different cultures enjoy traditional remedies for common illnesses, so the traditional medicines were almost equally used by both male and female students.

It has been reported bad breath can be a social handicap. Self-perception is very important for diagnosing and controlling bad breath. Very few (4-6%) females and males had experienced bad breath at work during the previous month. Only 5-9% of the students experienced bad breath while using the hand-on-mouth technique. More males (78%) had morning bad breath as compared to females (62%).

It has been reported an estimated 10 to 30% of the USA population suffer from bad breath on a regular basis. An epidemiological survey of the general population of Japan showed 24% of the individuals examined complained about bad breath. A Swedish study reported only 2.4% of the subjects had oral malodour. In a questionnaire given to 4,815 individuals aged 15 years or older as a representation of the French general population, 22% reported having bad breath. A recent study of United States dentists reported 41% of the dentists saw six or more patients a week “with chronic bad breath.” The above mentioned studies show oral malodor is a universal problem and is perceived in different cultures and societies. In the Saudi society oral malodor is also an important area of social life. The present study is a pilot study using health professionals such as dental students.
The prevalence of oral hygiene habits of dental students was very encouraging as reported by dental students. A larger percentage of females had a daily tooth brushing regimen as compared to males. Compared to males, females used mouthwash almost twice as often. In a recent intern research report16 conducted on male students only, the brushing habits were reported to be 49-79.5% which is similar to the present study. A recent study on secondary school male students reported that almost 72% of the students had a daily brushing habit.17

The prevalence of dental caries, compared to the previous report16, was above 90%, while in the present study only 57% of males have reported the presence of dental caries. The prevalence of bleeding gums was almost twice as high among males as compared to females in this study. It has been reported oral hygiene and periodontal disease are significantly correlated with fetor ex ore.13 In another report17, 24% of male students reported bleeding from gums, while in the present study 26% of the male students experienced bleeding gums. This study shows the trend that with an increase in age from high school to dental college the prevalence of bleeding gums may increase.

Dry mouth is also related with oral malodor. In our study, almost 14–17% of males and females had reported dry mouth. 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.18 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.11

In the present studied population smoking habits ranged from 2–13% among females and males, respectively. In a previous study the smoking habits of the male student was 10%. This may be an indication of an increase in smoking among dental students.

In another study among secondary school male students in Riyadh City, 23% of the students were smokers.17 The size of the smoking problem in different sectors of the Saudi community has been reported in some studies. The proportion of regular smokers among male medical college students19 and students in other colleges20 at King Saud University were 33% and 37%, respectively. Also in Riyadh, 38% of male and 16% of female physicians were current smokers.21 Health workers should serve as a role model of good health for others. The 13% smokers found among male students is high for this point in their professional careers. The habit should be discouraged as much as possible. The chances of smoking decreases as age increases22, so there should be organized efforts and support for students to quit smoking as soon as possible.

Many people try to overcome their halitosis by smoking.1 This may result in a strong smoker’s breath. A history of smoking has been implicated in deterioration of Olfactory Sensitivity.7 Halitosis patients are advised to stop smoking.7

Tea with mint is a culture based drink in the Saudi society. It was almost equally practiced by female and male dental students ranging from 37-44%. Finally, the presence of tongue coating was recognized. Almost equal numbers of male and female students (21-20%) had tongue coating. Miyazaki et al.23,24 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.25 Kishi et al.26 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. There is a need to emphasize tongue cleaning when oral hygiene instructions are given. As almost one-fifth of the male and female students experience tongue coating, it reflects the possibility of having bad breath.
The self-perception and self-reported data needs to be evaluated carefully as there are concerns about the reliability of the information.

In a recent study on self perception of breath odor, Eli et al. concluded the self-perception of breath odor is a multifactorial, psycho-physiological issue related closely to one's body image and psychopathological profile.

The concept of health has been the subject of intensified interest in recent years where the dominating professional aspects have been questioned. In dentistry, Locker has emphasized if oral health is to be actively influenced, subjective perspectives need to be added to objective clinical assessment. So, subjective, self-reported information is needed to be evaluated by objective clinical diagnostic methods.

In the present study, the subjective, self-reported information should be evaluated carefully due to the limitations of the reliability of the questionnaire surveys. Research on the validity of self-reported dental and oral health information is much more limited, but extant cross-sectional findings do suggest certain self-reported dental information is valid.

There is a need to enhance the knowledge of self-perception of oral and general health among dental students, developing healthy dietary and oral hygiene habits and professionalism as they are daily exposed to their patients.

Conclusion
Within the limitations of the present study, the following conclusions can be drawn regarding oral malodor:

- Forty four percent of male and 32% of female students could perceive oral breath, while only 6% of males and 4% of females experienced interference of bad breath at their work.
- Morning breath (wake-up bad breath) was common among 62–78% of both female and male students, respectively.
- Almost twice (22%) the percentage of females sought self-treatment of bad breath as compared to male students (12%).
- Female students have better oral hygiene practices, 99% as compared to 81% male students with a daily tooth brushing habit. Thirty eight percent of males and 11% of females used miswaks regularly.
- Dental caries and bleeding gums were less prevalent among female students.
- Smoking was prevalent among 13% of male students, while only 2% of female students were smokers.
- Tongue coating was almost equal 21% and 20% among male and female students.

It is highly recommended both male and female students put more emphasis on oral hygiene including tongue cleaning and self-perception of healthy conditions and behaviors as they have to be healthy role models for their patients.

Further research is needed to objectively assess the oral bad breath by standard procedures available for clinical research.
“The study was registered with College of Dentistry Research Center, project No, NF. 1940.”

References

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