

Original Research Article

## Prevalence of self reported halitosis in a sample of undergraduate dental students in Sulaimani University

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**Abstract:** The purposes of this study were to investigate the prevalence of self reported halitosis and its association with habit of smoking, systemic diseases, medications, oral hygiene habits and oral health status among undergraduate dental student. A questionnaire based study was carried out at school of dentistry, university of sulaimani among undergraduate dental students; the subjects consist of 103 dental students, 38(36.89%) of participant were male and 65(63.10%) were female. The questionnaire was distributed all the dental students, each dental student had to fill up questionnaire such as patient age, sex, systemic diseases, medications, smoking habit, oral health behaviours, oral health status, and presence or absence of halitosis. Chi square test was used to analyse the data. Prevalence of self reported halitosis was 28.15%. It was more prevalent among females (63.10%) than males (36.89%) but not significantly ( $P>0.05$ ). Prevalence of halitosis was higher among patients with systemic diseases (34.28%) than patients without systemic diseases (25%) however it was not statistically significant ( $P=0.32$ ). Prevalence of halitosis was significantly high among patients who were using medication and among smoker patients ( $P<0.05$ ). With some exceptions, prevalence of halitosis was lower among patients practicing oral hygiene habits than patients who were not practicing oral hygiene habits however it was not statistically significant ( $P>0.05$ ). Prevalence of halitosis was higher among patients who had xerostomia, bleeding gum when brushing, coated tongue, bleeding gum spontaneously than patients who were not having these conditions but not significantly ( $P>0.05$ ). Majority of patients reported halitosis when wake up (65.51%). there is a relatively high prevalence of halitosis among dental student ;prevalence of self reported halitosis was higher among females than males, prevalence of halitosis was higher among patients with systemic diseases than patients without systemic diseases; medications and smoking were significantly correlated with halitosis; with some exceptions patients who performed oral hygiene habits have shown lower prevalence of halitosis than patients who did not perform oral hygiene habits although without statistical significant as well as poor oral health status tend to increase prevalence of halitosis.

**Keywords:** Dental student, self reported halitosis, prevalence, oral hygiene, medication, smoker patients

### 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 [1]. Some studies have estimated the prevalence of halitosis to be between 22% and 50%, others between 6% and 23% [2]. Halitosis has been classified into three main categories: genuine, pseudo-halitosis, and halitophobia halitosis [3]. There is a general agreement that malodour originates in the mouth in 80-90% of cases [4]. There is evidence that on waking up in the morning most healthy adults have socially unacceptable bad breath [5]. This problem is attributed to reduced saliva flow during sleep, and it is usually resolved after washing and eating breakfast. Oral malodor has a multifactorial etiology involving

extrinsic and intrinsic causes [6]. The extrinsic causes consist of tobacco, alcohol and some volatile odoriferous foods and sociodemographic factors, which lead to transient oral malodor [7]. The intrinsic causes consist of intra-oral causes and extra-oral or systemic causes [8]. Intra-oral causes result from tongue coating, periodontal disease, extensive dental caries with exposed tooth pulps, pericoronitis, impacted food, unclean denture, mucosal ulcers and diseases, xerostomia and habitual mouth breathing, the latter involving children particularly [9]. Extra-oral causes include disturbances of the respiratory tract, gastrointestinal disorders, diabetic ketoacidosis, renal disease, hepatic cirrhosis and certain medications which reduce the salivary flow [9]. The main compounds that lead to bad breath emanating from the oral cavity are the volatile sulfide compounds (VSC), especially hydrogen sulfide (H<sub>2</sub>S), methyl mercaptan (CH<sub>3</sub>SH),

and dimethylsulfide [(CH<sub>3</sub>)<sub>2</sub>S] [10]]. These compounds are produced by the anaerobic gram-negative microorganisms such as *Treponema denticola*, *Porphyromonas gingivalis*, *Porphyromonas endodontalis*, *Prevotella intermedia*, *Bacteroides loescheii*, *Enterobacteriaceae*, *Tannerella forsythensis*, *Centipeda periodontii*, *Eikenella corrodens*, and *Fusobacterium nucleatum* that inhabit the oral cavity [11]. The microorganisms interact with the sulfur-containing substances that are present in saliva, gingival crevicular fluid, blood, and cells leading to the production of odiferous products [12]. Despite multidisciplinary approaches in the treatment of oral malodor, significant attention has been given to emphasizing the importance of eliminating the microbial load by professional and personal oral care instructions [13]. The purposes of this study were to investigate the prevalence of self reported halitosis and its association with habit of smoking, systemic diseases, medications, oral hygiene habits and oral health status among undergraduate dental student.

#### PATIENTS AND METHODS

A questionnaire based study was carried out at school of dentistry, university of sulaimani among undergraduate dental students using an anonymously constructed questionnaire. This research was approved by the Committee of Ethics at Research of the University of Sulaimani. According to Declaration of Helsinki, signed consent forms were obtained from all participants before conducting the study [14]. The subjects consist of 103 dental students, 38(36.89%) of participant were male and 65(63.10%) were female. The patients were categorized into seven age groups: eighteen, nineteen, twenty, twenty one, twenty two, twenty three, and twenty four. The questionnaire was distributed all the dental students, each dental student had to fill up questionnaire within 10 minutes which consist of four parts. The first part include patient information such as age and sex, the second part questioned about medical history as it may have a relation with halitosis, such as skeletal disorders, gastrointestinal disorders, cardiovascular disorders, endocrine diseases, urinary system, hematologic disorders, allergy to medication, respiratory disorders, neurological disorders, allergy, skin diseases as well as medication use, smoking status and questions about relative malodour, The third part include the oral hygiene practices and oral health status evaluated by questions of the presence or absence of oral hygiene

practices including professional tooth cleaning, tooth brushing, dental floss use, tooth pick use, use of chewing stick (miswak), use of mouth wash, use of tongue cleaner after brushing, as well as questions of the presence or absence of oral health conditions such as xerostomia, bleeding gum when brushing, coated tongue, tooth decay, sensitive teeth, bleeding gum spontaneously, in the fourth part, the presence or absence of halitosis was evaluated by asking the patient to put right palm in front of his mouth and exhale breath out and the patient asked a question "Do you have bad breath?", [15]. The response option were "yes", "No", and "don't know", only those who responded yes were designated as having halitosis. The patients also asked about the timing of bad breath (after waking up, when hungry or when thirsty, in the morning, in the afternoon, while talking with others, or throughout the day), also patients were asked whether halitosis interfere with social life and whether they had diagnosed by dentist or by physician or whether they had received treatment from dentist or physician.

Statistical analysis was performed using SPSS program version 16. Associations between categorical variables were tested using chi-square test. Statistical significance was set at  $P < 0.05$ .

#### RESULT:

This cross sectional study comprised 103 undergraduate dental students, 38(36.89%) of participant were male and 65(63.10%) were female, aged from 18-24 years. The female to male ratio was 1.7:1 (65/38). Prevalence of self reported halitosis was 28.15%. With exception of age group 20, 22, and 24, prevalence of self reported halitosis was higher among females than males however it was not statistically significant ( $P > 0.05$ ). Overall prevalence of self reported halitosis was higher among females (63.10%) than males (36.89%) however it was not statistically significant ( $P > 0.05$ ) (Table 1).

The most common disease with highest prevalence of halitosis was gastrointestinal disorders (75%), followed by skeletal disorders (66.66%), endocrine diseases (50%), and urinary system (50%). Prevalence of halitosis was higher among patients with systemic diseases (34.28%) than patients without systemic diseases (25%) however it was not statistically significant ( $P = 0.32$ ) (Table 2).

**Table 1. Prevalence of self reported halitosis according to age and sex**

Age group	sex	All patients N (%)	Patients reported halitosis	P-value
18	Male	7 (50)	2(28.57)	0.10
	Female	7(50)	5(71.42)	
	Total	14(13.58)	7(50)	
19	Male	11(61.11)	1(9.09)	0.28
	Female	7(38.88)	2(28.57)	
	Total	18(17.47)	3(16.66)	
20	Male	5(80)	3(60)	0.21
	Female	11(68.75)	3(27.27)	
	Total	16(15.53)	6(37.5)	
21	Male	1(7.14)	0(00.00)	0.58
	Female	13(92.85)	3(23.07)	
	Total	14(13.59)	3(21.42)	
22	Male	5(22.72)	1(20)	0.90
	Female	17(77.27)	3(17.64)	
	Total	22(21.35)	4(18.18)	
23	Male	7(41.17)	2(28.57)	0.94
	Female	10(58.82)	3(30)	
	Total	17(16.50)	5(29.41)	
24	Male	2(100)	1(50)	-----
	Female	0(00.00)	0(00.00)	
	Total	2(1.94)	1(50)	
Total	Male	38(36.89)	10(26.31)	0.75
	Female	65(63.10)	19(29.23)	
	Total	103(100)	29(28.15)	

**Table 2. Comparison of prevalence of halitosis among patients with systemic diseases and patients without systemic diseases**

Systemic diseases		Halitosis		Total	P-Value
		No	yes		
Skeletal disorders	No	73 (73)	27(27)	100(97.08)	0.13
	Yes	1(33.33)	2(66.66)		
Cardiovascular Disorders	No	73(71.56)	29(28.43)	102(99.02)	0.52
	Yes	1(100)	0(00.00)		
Gastrointestinal disorders	No	73(73.73)	26(26.26)	99(96.11)	0.03
	Yes	1(25)	3(75)		
Endocrine diseases	No	73(72.27)	28(27.72)	101(98.05)	0.48
	Yes	1(50)	1(50)		
Urinary system	No	72(72.72)	27(27.27)	99(96.11)	0.32
	Yes	2(50)	2(50)		
Hematologic disorders	No	71(71.71)	28(28.28)	99(96.11)	0.88
	Yes	3(75)	1(25)		
Allergy to medication	No	71(71.71)	28(28.28)	99(96.11)	0.88
	Yes	3(75)	1(25)		
Respiratory disorders	No	73(71.56)	29(28.43)	102(99.02)	0.52
	Yes	1(100)	0(00.00)		
Neurological disorders	No	73(71.56)	29(28.43))	102(99.02)	0.52
	Yes	1(100)	0(00.00)		
Allergy	No	69(71.13)	28(28.86)	97(94.17)	0.51
	Yes	5(83.33)	1(16.66)		
Skin diseases	No	70(71.42)	28(28.57)	98(95.14)	0.67
	Yes	4(80)	1(20)		
Total	No	51(75)	17(25)	68(66.01)	0.32
	Yes	23(65.71)	12(34.28)		

Prevalence of halitosis was significantly higher among patients who were using medication (57.14) than patients who were not using medication (23.59) (P=0.009) (Table 3).

Prevalence of halitosis was significantly higher among smoker patients (80%) than non smoker patients (25.51%) (P=0.008) (Table 4).

Prevalence of halitosis was higher among patients reported relative malodour (36.84%) than patients who had no relative malodour (26.19%) however it was not statistically significant (P=0.35) (Table-5).

With exception of professional tooth cleaning, dental floss use, and tooth pick use, prevalence of halitosis was lower among patients practicing oral hygiene habits such as tooth brushing, mouth wash use, chewing stick (miswak) and use of tongue cleaner after brushing than patients who were not practicing oral hygiene habits however it was not statistically significant (P>0.05) (Table 6).

With exception of tooth decay and sensitive teeth, prevalence of halitosis was higher among patients who had xerostomia, bleeding gum when brushing, coated tongue, bleeding gum spontaneously than patients who were not having these conditions however it was not statistically significant (P>0.05) (Table 7)

Regarding timing of bad breath, majority of patients reported halitosis when wake up (65.51%), followed by in the morning (41.37%) and when hungry (41.37%), when thirsty (20.68%), While talking with others (17.24%), and throughout the day (3.44%) (Table 8).

Among patients with halitosis; (17.24%) reported that halitosis interfere with social life, (34.48%) were diagnosed by dentist, (6.89%) were diagnosed by physician, (24.13%) were received treatment by dentist, (3.44%) were received treatment by physician.

**Table 3. Comparison of prevalence of halitosis among patients who were using medications and patients who were not using medications**

Medication	Halitosis		Total	P-value
	No	Yes		
No	68(76.40)	21(23.59)	89(86.40)	0.009
Yes	6(42.85)	8(57.14)	14(13.59)	
Total	74(71.84)	29(28.15)	103(100)	

**Table 4. Comparison of prevalence of halitosis among smoker and non smoker patients**

Smoking	Halitosis		Total	P-value
	No	Yes		
No	73(74.48)	25(25.51)	98(95.14)	0.008
Yes	1(20)	4(80)	5(4.85)	
Total	74(71.84)	29(28.15)	103(100)	

**Table 5. Comparison of prevalence of halitosis among patients reported relative malodour and patients who did not report relative malodour**

Relative Malodour	Halitosis		Total	P-value
	No	Yes		
No	62(73.80)	22(26.19)	84(81.55)	0.35
Yes	12(63.15)	7(36.84)	19(18.44)	
Total	74(71.84)	29(28.15)	103(100)	

**Table 6. Comparison of oral hygiene habits among patients reported halitosis and patients who did not report halitosis**

Oral hygiene		Halitosis		Total	P-value
		No	Yes		
Professional tooth cleaning	No	39 (78)	11(22)	50(48.54)	0.17
	Yes	35(66.03)	18(33.96)	53(51.45)	
Tooth brushing	No	13(56.52)	10(43.47)	23(22.33)	0.06
	Yes	61(76.25)	19(23.75)	80(77.66)	
Dental floss use	No	28(73.68)	10(26.31)	38(36.89)	0.75
	Yes	46(70.76)	19(29.23)	65(63.10)	
Mouth wash use	No	48(68.57)	22(31.42)	70(67.96)	0.28
	Yes	26(78.78)	7(21.21)	33(32.03)	
Tooth pick use	No	62(72.94)	23(27.05)	85(82.52)	0.59
	Yes	12(66.66)	6(33.33)	18(17.47)	
Chewing stick (miswak)	No	58(69.04)	26(30.95)	84(81.55)	0.18
	Yes	16(84.21)	3(15.78)	19(18.44)	
Use of tongue cleaner after brushing	No	60(71.42)	24(28.57)	84(81.55)	0.84
	Yes	14(73.68)	5(26.31)	19(18.44)	

**Table 7. Comparison of oral health status among patients reported halitosis and patients who did not report halitosis**

Oral health status		Halitosis		Total	P-value
		No	Yes		
Xerostomia	No	72 (73.46)	26(26.53)	98(95.14)	0.10
	Yes	2(40)	3(60)	5(4.85)	
Bleeding gum when brushing	No	65(76.47)	20(23.52)	85(82.52)	0.02
	Yes	9(50)	9(50)	18(17.47)	
Coated tongue	No	65(73.86)	23(26.13)	88(85.43)	0.27
	Yes	9(60)	6(40)	15(14.56)	
Tooth decay	No	35(68.62)	16(31.37)	51(49.51)	0.47
	Yes	39(75)	13(25)	52(50.48)	
Sensitive teeth	No	53(70.66)	22(29.33)	75(72.81)	0.66
	Yes	21(75)	7(25)	28(27.18)	
Bleeding gum spontaneously	No	69(72.63)	26(27.36)	95(92.23)	0.54
	Yes	5(62.5)	3(37.5)	8(7.76)	
	Yes	11(64.70)	6(35.29)	17(16.50)	

**Table 8. Timing of bad breath**

Timing of bad breath	N (%)
When you wake up	19(65.51)
When you hungry	12(41.37)
When you thirsty	6(20.68)
While talking with others	5(17.24)
In the morning	12(41.37)
In the afternoon	0(00.00)
Throughout the day	1(3.44)

**DISCUSSION:**

This study is the first study on the prevalence of halitosis among dental students in Sulaimani city. Since halitosis is a relatively common problem the data on its prevalence is important. In many studies, including this study, 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 [16]. The diagnosis is usually subjective as there are no standard criteria that define a patient with halitosis [17]. In this study, prevalence of self reported halitosis was 28.15%. this result is comparable to a study by Liu et al [18], in China (27.5%), and Frexinos et al [19] in France (22%) but it was lower

than study done by Youngnak-Piboonratanakit and Vachirarojipisan [20] (65%), and it was higher than study done by Settineri et al [21] (19.39%), the variation in the prevalence of halitosis among different studies may result from the difference of measurement methods ranging from self reported oral malodor to objective measurements such as VSC monitoring or organoleptic scores and the sampling design [20]. As well as age, sex, sample size can affect the differences in the result.

Prevalence of self reported halitosis was higher among females than males however it was not statistically significant although these results were similar to other studies [22] and the differences were insignificant, it appears that females were more capable of detecting malodour than males. However, these findings cannot be ascertained, as the self-estimation procedure is subjective and correlates poorly with objective assessment of patient's perception of bad breath [23]. Furthermore, females are invariably more concerned about their oral hygiene and appearance and this may explain the over-exaggerated self perception percentage [24].

The most common disease with highest prevalence of halitosis was gastrointestinal disorders, followed by skeletal disorders, endocrine diseases, and urinary system. Prevalence of halitosis was higher among patients with systemic diseases than patients without systemic diseases however it was not statistically significant. The findings in line with other studies, that the etiopathogenesis of halitosis is linked to medical problems such as urinary system disorders, anemia, gastrointestinal tract disorders, skin problems, allergies, and thyroid problems [21]. Prevalence of halitosis was significantly higher among patients who were using medication than patients who were not using medication; reviewing the literature, 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 [25].

Smoking has been defined as an extrinsic cause of oral halitosis [26]. 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 [27]; similarly in this study; prevalence of halitosis was significantly higher among smoker patients than non smoker patients

Prevalence of halitosis was higher among patients reported relative malodour than patients who had no relative malodour however it was not statistically significant but this result cannot be explained.

With exception of professional tooth cleaning, dental floss use, and tooth pick use, prevalence of halitosis was lower among patients practicing oral hygiene habits such as tooth brushing, mouth wash use, use of chewing stick (miswak) and use of tongue cleaner after brushing than patients who were not practicing oral hygiene habits however it was not statistically significant. It is known that adequate oral hygiene measures may reduce, treat or protect people from oral malodor [28,29].

We found that greater frequency of professional tooth cleaning, dental floss use and tooth pick use increased the frequency of halitosis. It is possible that using professional tooth cleaning, dental floss use, and tooth pick use may be a consequence of a person's self-perception of halitosis in this study.

With exception of tooth decay and sensitive teeth, prevalence of halitosis was higher among patients who had xerostomia, bleeding gum when brushing, coated tongue, bleeding gum spontaneously than patients who were not having these conditions however it was not statistically significant. Reviewing the literature; some oral health problems including periodontal disease, tongue coating and xerostomia influence the degree of oral malodor [30,31]. In this study it was found that tongue coating, xerostomia and bleeding when brushing teeth had an effect on self-perceived oral malodor. Many studies have shown that periodontal disease and tongue coating are the major source of VSCs and oral malodor [30,31]. It was found that self-perceived oral malodor was most closely associated with the tongue coating. This is attributed to the large surface area of the tongue which allows the accumulation of food debris, the presence of dead leukocytes and desquamated epithelial cells and the presence of many organisms, which provide an ideal environment for the production of offensive odor [29]. The level of VSC has been reported to increase with tongue coating and to reduce after the removal of the coating [32]. Xerostomia or dry mouth is generally regarded as another contributing factor of oral malodor. A reduction of salivary flow rate influenced the generation of VSC, which may result from depletion of the normal cleaning mechanism of the mouth and predisposition of the oral flora toward the gram-negative bacteria responsible for the oral malodor.

Regarding timing of bad breath, majority of patients reported halitosis when wake up, Similar to previous study done by Setia et al, [33] where halitosis was most prominent soon after waking up in most of their individuals, this can be attributed to the reduced salivary flow at night or to the lack of brushing habit at night [33].

Bad breath can have a distressing effect that may become a social handicap and the affected person may avoid socializing [15]. In this study; among

patients with halitosis; (17.24%) reported that halitosis interfere with social life.

In this study; about 34.48% of the participant were diagnosed by dentists, who provided treatment for about 24.13% of them. On the other hand, a few participant 6.89% were diagnosed by physicians and a few percentage 3.44% were treated by physicians. Diagnosis of halitosis is primarily the responsibility of the dentist, the relatively small percentage 34.48% diagnosed by dentists indicate their nearly negative role in the management of halitosis.

In conclusion, there is relatively high prevalence of halitosis among dental student and it is within the rang found in other studies, this study can be used as data base for future studies on prevalence of halitosis among general population; prevalence of self reported halitosis was higher among females than males, prevalence of halitosis was higher among patients with systemic diseases than patients without systemic diseases medications and smoking were significantly correlated with halitosis; with some exceptions patients who performed oral hygiene habits such as tooth brushing, mouth wash use, use of chewing stick (miswak) and use of tongue cleaner after brushing have shown lower prevalence of halitosis than patients who did not perform oral hygiene habits although without statistical significant as well as poor oral health status such as dryness of mouth, bleeding gum, spontaneous gingival bleeding, presence of coating or deposit over tongue tend to increase prevalence of halitosis. Oral hygiene instruction and improvement of oral health status should be emphasized in the community. Further studies on prevalence of halitosis among dental student is recommended using objective examination to ascertain the prevalence.

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