Self-reported Halitosis and Associated Factors Among Medical and Dental Students of a Tertiary Institution in Rivers State, Nigeria.

Correspondence: *Alade GO*
E-mail: *grace.alade@uniport.edu.ng*

Ezebunwa CF, Alade GO**
**Department of Preventive and Social Dentistry, Faculty of Dentistry, College of Health Sciences, University of Port Harcourt, Rivers State. Nigeria.*

Key words: Dental students, medical students, self-reported halitosis.

ABSTRACT

Objectives: To determine the prevalence of self-reported halitosis and associated factors among medical and dental students at the University of Port Harcourt.

Materials and Methods: This was a cross-sectional study, conducted among medical and dental undergraduate students at the University of Port-Harcourt (UPH), Rivers State. Each participant gave consent before enrolment into the study. Data was collected using a self-administered structured questionnaire. The questionnaire was grouped into four (4) sections; section A collected demographical information (sex, age, course and level), section B collected information on self-reported halitosis and self-care, section C collected information on oral hygiene practices, and section D collected information on associated factors.

Data collected were analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 27 software for Windows. Categorical variables were expressed as frequencies with accompanying percentages. The groups were compared using Chi-square tests for categorical variables. All statistical significances were assumed at p values <0.05.

Results: A total of 248 medical and dental students were recruited as study participants. Age range was 15-30 years, while the mean age was 22.9 ± 3.75 years. Male: female ratio was 1.13:1. The prevalence of self-reported halitosis among the study participants was 26%, with the worse experience been in the morning, 82(31.1%). The younger age group reported more halitosis compared to the older age group (p=0.016). More females, 40(34.5%), significantly reported halitosis compared to the males 24(18.2%) [p=0.003]. The occurrence of self-reported halitosis also decreases with increase in the level of study (p=0.003).

Participants who brush thrice a day claimed to have halitosis. Majority of the participants who claimed to have dry mouth, 26(76.5%), coated tongue, 50(80.6%), and have history of smoking, 14(58.3%), reported the presence of halitosis. Majority of participants who take alcohol, claimed not to have halitosis, however, this finding is not statistically significant.

Seventy-three (29.4%) of the respondents instituted self-care for halitosis in the form of chewing gums, 34(13.71%), mint candy, 20(8.06%), and mouthwash, 16(6.45%), while 3(1.21%) used other options such as compulsive tooth brushing.

Conclusion: Self-reported halitosis was found among 26% of participants. Halitosis occurred more in females and was significantly associated with dry mouth, coated tongue, and smoking. 73(29.4%) of the participants instituted self-care to mask their halitosis.

Running Title: Self-reported halitosis and associated factors.

INTRODUCTION

Halitosis is an oral health condition that is reported to rank next to dental caries and periodontal disease as the cause of patients' visits to the dentist.[1] It is a term used to describe an altered breath, which is unpleasant to both the affected individual and those with whom he/she interacts.[2] It is also known as bad breath,[3] foetor ex ore,4 breath odour,[4] offensive breath,[5] and oral malodour.[6] It is characterized by emanating odorous breath that may be due to intra- and extra-oral causes. It has been documented that halitosis originates from mouth in about 80–90% of patients.[1] This odorous breath is caused by degradation of volatile sulphur compounds (VSCs) such as hydrogen sulfide (H2S), methyl mercaptan (CH3SH), dimethyl sulfide ([CH3]2S), and other minor component sulfide, from organic substances (e.g. saliva, food debris, desquamated epithelial cells) by anaerobic bacteria, especially the Gram-negative bacteria.[1]These bacteria are usually found at the base of the micro-furrows and crypts at the back of the tongue.[7] Aetiology of intra-oral halitosis include poor oral hygiene, gingivitis, periodontitis, dental caries, faulty dental restorations, candidiasis, pericoronitis and periimplantitis.[7] Extra-oral halitosis are from the ear, nose, throat and sometimes the gastrointestinal tract.[7]

Halitosis is classified into genuine (true) halitosis, pseudo halitosis, and halitophobia.[8] Halitosis ranges from as low as 2% to as high as 75%19 Self-reported halitosis among Nigerians was reported to range between 13% to 15%.[10-12] This disparity is justified by the subjectivity of the diagnostic criteria, assessment methods, and sampling techniques.[13] Halitosis affects both sexes; a male predilection has been reported by Mento et al,[14] while a female predilection was reported by Nazir et al[15] However, a study by Lopez et al reported no sex predilection.[16]

Halitosis affects the individuals' psychosocial state and greatly impacts communication and interpersonal relationships, which in turn affects individuals' self-esteem and quality of life. Those individuals who suffer from halitosis generally make desperate attempts to hide or mask their problem using chewing gums, mints, repeated brushing, and rinsing with mouthwashes.[17] The psychosocial impacts of halitosis can be very grievous, especially among undergraduates, as this age group often socialize more and so have higher chances of perceiving the negative impact of halitosis when socializing. Also, this period in one's life is part of the major formative periods and the negativities, especially psychological, could last longer than is known. Hence, though several studies on halitosis have been reported in the literature, there is paucity of data on its occurrence among medical and dental students, especially at the University of Port Harcourt. As such, this study aims to determine the prevalence of self-reported halitosis and associated factors among medical and dental students at the university of Port Harcourt.

MATERIALS AND METHODS

This was a cross-sectional study, conducted among medical and dental undergraduate students at the University of Port-Harcourt (UPH), Rivers State. Ethical approval for the study was obtained from the Institution's Health Research and Ethics Committee. Two hundred and forty-eight participants were enrolled into the study. The study was conducted between September 2021 and January 2022. Each participant gave informed consent before being enrolled into the study. In addition, data were collected using a self-administered structured questionnaire.

The questionnaire was grouped into four (4) sections; section A collected demographical information (sex, age, course and level), section B collected information on self-reported halitosis and self-care, section C collected information on oral hygiene practices, and section D collected

information on associated factors.

All data collected were entered into an Excel spreadsheet. Accuracy of data entry was ensured using data validation, and then exported to IBM Statistical Package for Social Sciences (SPSS) version 27 (IBM SPSS Armonk, New York) software for Windows. The results were presented in the form of tables and figures. Chi-square was used to test differences between categorical variables and groups. All statistical significances were assumed at p values <0.05.

RESULTS

Study participants

A total of 248 medical and dental students were recruited as study participants. Their age range was 15–30 years and mean age was 22.9 ± 3.75 years. Most of the students 153(61.7%) are within the age group 20–24 age. The male to female ratio is 1.13:1. The proportion of medical students recruited for the study was about four times the number of dental students recruited for the study. Most of the students (69[27.8%]) were in year 4, 70(28.2%) were in year 5, while the least (21[8.5%]) were in year 3, as shown in Table 1.

Table 1. Sociodemographic Distribution of Study Participants

Sociodemographic variables	N	%
Age group		
15-19	31	12.5
20-24	153	61.7
25-29	63	25.4
≥30	1	0.4
Sex		
Male	132	53.2
Female	116	46.8
Course of study		
Medical	194	78.2
Dental	54	21.8
Level of study		
Year 1	30	12.1
Year 2	27	10.9
Year 3	21	8.5
Year 4	69	27.8
Year 5	70	28.2
Year 6	31	12.5
Total	**248**	**100.0**

PREVALENCE OF SELF-REPORTED HALITOSIS

The prevalence of self-reported halitosis among the study participants was 64(26%) (Figure 1) and this was experienced at different times of the day, with the greatest or worst being in the morning (82[31.1%]) (Figure 2).

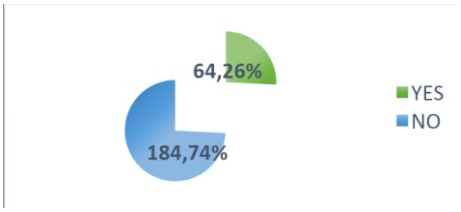

Figure 1: Prevalence of self-reported halitosis among study participants.

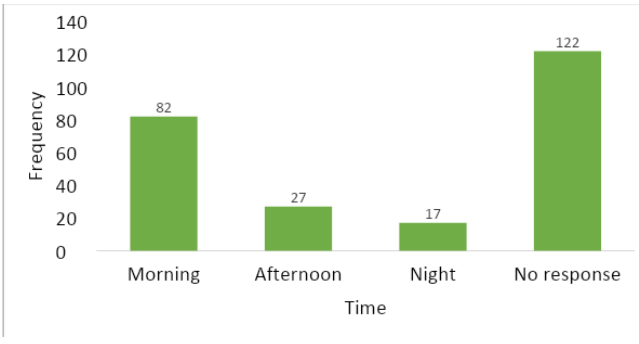

Figure 2: Frequency of time of worst perceived halitosis.

SELF-REPORTED HALITOSIS IN RELATION TO SOCIO-DEMOGRAPHIC VARIABLES

The younger age group reported more halitosis compared to the older age group. The relationship between self-reported halitosis and age group was statistically significant (p=0.016). Likewise, more females (40[34.5%]) reported halitosis compared to the males (24[18.2%]), and this was statistically significant (p=0.003). The occurrence of self-reported halitosis also decreases with increase in the level of study; and this was also statistically significant (p=0.003). However, there was no statistically significant difference (p=0.982) in the prevalence of self-reported halitosis between medical and dental participants. (Table 2)

Table 2: Socio-demographic variables and self-reported halitosis

Socio-demographic variables	Self-reported halitosis						P-value
	Yes		No		Total		
	N	(%)	N	(%)	N	(%)	
Age group							
15-19	15	(48.4)	16	(51.6)	31	(12.5)	
20-24	37	(24.2)	116	(75.8)	153	(61.7)	0.016*
25-29	12	(19.0)	51	(81.0)	63	(25.4)	
≥30	0	(0.0)	1	(100.0)	1	(0.4)	
Sex							
Male	24	(18.2)	108	(81.8)	132	(53.2)	0.003*
Female	40	(34.5)	76	(65.5)	116	(46.8)	
Course of study							
Medical	50	(25.8)	144	(74.2)	194	(78.2)	0.982
Dental	14	(25.9)	40	(74.1)	54	(21.8)	
Level of study							
Year 1	15	(50.0)	15	(50.0)	30	(12.1)	
Year 2	11	(40.7)	16	(59.3)	27	(10.9)	
Year 3	6	(28.6)	15	(71.4)	21	(8.5)	0.003*
Year 4	16	(23.2)	53	(76.8)	69	(27.8)	
Year 5	12	(17.1)	58	(82.9)	70	(28.2)	
Year 6	4	(12.9)	27	(87.1)	31	(12.5)	

**Statistically significant*

SELF-REPORTED HALITOSIS IN RELATION TO ORAL HYGIENE PRACTICES

Majority of the participants, who brushed once or twice daily, claimed not to have halitosis, while the participants who brushed thrice a day, reported having halitosis. However, this finding was not statistically significant. Participants who use toothbrushes and toothpastes claimed not to have halitosis, while most of the participants who do not use toothbrushes and toothpastes, reported having halitosis. This finding is statistically significant (p=0.016).

Fifty percent of those who use dental powder reported to have halitosis, and this finding is statistically significant (p= 0.033). There was an equal distribution of self-reported halitosis among those who practice interdental cleaning and those who do not practice interdental cleaning. However, most of the participants who used interdental cleaning aids once a day, twice daily, and after every meal, claimed not to have halitosis. This finding is statistically significant (p=0.008). Majority of the respondents used toothpicks as interdental cleaning aids, compared to other interdental aids. Most of the participants who used toothpicks claimed not to have halitosis. This finding is statistically significant (p=0.02). These findings are as shown in Table 3.

Table 3: Oral hygiene practices and self-reported halitosis

	Self-reported halitosis						**p-value**
	Yes		**No**		**Total**		
	N	**(%)**	**N**	**(%)**	**N**	**(%)**	
Frequency of toothbrushing							
Once	30	(23.1)	100	(76.9)	130	(52.4)	
Twice	33	(28.2)	84	(71.8)	117	(47.2)	0.155
Thrice	1	(100.0)	0	(0.0)	1	(0.4)	
Use of toothbrush and toothpaste							
No	5	(62.5)	3	(37.5)	8	(3.2)	0.016*
Yes	59	(24.6)	181	(75.4)	240	(96.8)	
Use of toothbrush and toothpowder							
No	57	(24.4)	177	(75.6)	234	(94.4)	0.033*
Yes	7	(50.0)	7	(50.0)	14	(5.6)	
Practice of interdental cleaning							
Yes	48	(27.6)	126	(72.4)	174	(70.2)	0.326
No	16	(21.6)	58	(78.4)	74	(29.8)	
Frequency of interdental cleaning							
Once a day	8	(14.0)	49	(86.0)	57	(32.6)	
Twice	11	(32.4)	23	(67.6)	34	(19.4)	0.008*
After every meal	27	(39.1)	42	(60.9)	69	(39.4)	
Others	2	(13.3)	13	(86.7)	15	(8.6)	
Interdental materials							
Dental floss	13	(21.7)	47	(78.3)	60	(24.2)	0.400
Toothpick	35	(33.3)	70	(66.7)	105	(42.3)	0.020*
Broomstick	0	(0.0)	1	(100.0)	1	(0.4)	0.555
Finger	1	(12.5)	7	(87.5)	8	(3.2)	0.382
Others	1	(33.3)	2	(66.7)	3	(1.2)	0.764

**Statistically significant*

SELF-REPORTED HALITOSIS IN RELATION TO ASSOCIATED FACTORS.

Majority of the participants who claimed to have dry mouth (26[76.5%]), coated tongue (50[80.6%]), and have history of smoking (14[58.3%]), reported the presence of halitosis. These findings were statistically significant (p<0.001). About half of the participants who reported to have tooth decay claimed not to have halitosis; this finding is statistically significant (p<0.001). Also, majority of those who claimed to have bleeding gums, reported absence of halitosis (p=0.004). Interestingly, majority of participants who take alcohol claimed not to have halitosis. However, this finding is not statistically significant. (Table 4)

Table 4 Self-reported halitosis and associated factors

	Self-reported halitosis						
	Yes		**No**		**Total**		P-value
	N	**(%)**	**N**	**(%)**	**N**	**(%)**	
Self-reported decayed tooth							
Yes	35	(44.3)	44	(55.7)	79	(31.9)	0.00*
No	29	(17.2)	140	(82.8)	169	(68.1)	
Self-reported bleeding gums							
Yes	38	(34.9)	71	(65.1)	109	(44.0)	0.00*
No	26	(18.7)	113	(81.3)	139	(56.0)	
Self-reported mobile tooth							
Yes	0	(0.0)	7	(100.0)	7	(2.8)	0.113
No	64	(26.6)	177	(73.4)	241	(97.2)	
Self-reported dry mouth							
Yes	26	(76.5)	8	(23.5)	34	(13.7)	0.00*
No	38	(17.8)	176	(82.2)	214	(86.3)	
Self-reported coated tongue							
Yes	50	(80.6)	12	(19.4)	62	(25.0)	0.00*
No	14	(7.5)	172	(92.5)	186	(75.0)	
History of smoking							
Yes	14	(58.3)	10	(41.7)	24	(9.7)	0.00*
No	50	(22.3)	174	(77.7)	224	(90.3)	
History of alcohol intake							
Yes	40	(29.0)	98	(71.0)	138	(55.6)	0.200
No	24	(21.8)	86	(78.2)	110	(44.4)	

**Statistically significant*

Seventy-three (29.4%) of the respondents instituted self-care for self-reported halitosis; 34(13.71%) used chewing gums, 20(8.06%) used minty candy, 16(6.45%) used mouthwashes, and 3(1.21%) exploited other options (Figure 3).

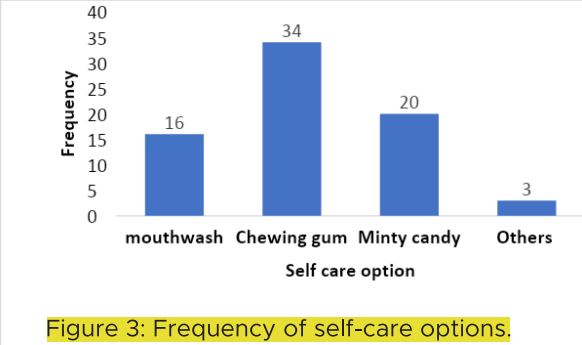

Figure 3: Frequency of self-care options.

DISCUSSION

In this study, we investigated the prevalence of self-reported halitosis and their associated factors among medical and dental students at the University of Port Harcourt, Rivers State. The prevalence of self-reported halitosis in this study was 26%. This follows the trends from previous studies by Paradowska et al[18] and Kim et al,[19] who reported a prevalence of 24% and 23.6%, respectively. However, the prevalence of self-reported halitosis from this study is lower than that reported in some previous studies. [15,16] The study by Lopes et al[16] reported a prevalence of 39.67%. However, this discrepancy may be due to age difference, as the study by Lopes et al16 was conducted among adolescents from 20 schools, while this study was conducted among undergraduates (young adults) from a particular institution. Nazir et al[15] reported a high prevalence of 75.1%, which could be due to the population that consists of dental students and interns from seven institutions, while the present study was conducted in one institution. The prevalence of self-reported halitosis in our study, however, is higher than that reported from other groups of studies.[10, 20] The difference could be as a result of the population used in these other studies; the participants in the study by Umeizudike et al[10] were dental patients who presented in the dental clinic, while the study by Mubayrik et al[20] focused on just female university students.

There are varying reports on the sex distribution of persons with halitosis in the literature. This present study showed a female predilection, which is in tandem with some other studies, [15,21] but in contrast to the reports by Umeizudike et al,[10] Paradowska et al [18] and Kim et al[19] where there was male predilection. However, the study by Lopes et al[16] reported no predominant sex. The prevalence of halitosis to age has been found to vary depending on the study population. Umeizudike et al[10] and Kim et al[19] reported an increase in self-reported halitosis with increasing age. In this study, however, we noticed a difference as the younger ages reported to have perceived halitosis more, which is probably due to the increased self-consciousness/awareness at such age. Though participants perceived halitosis at different times of the day, that of the morning was dominant in our study and agrees with several other studies.[15,18,21.]

As far as oral hygiene practices are concerned, all participants practiced tooth brushing, and this could suggest that people have good knowledge of oral hygiene practices. However, the fact that they might not be practicing it right cannot be taken with levity, a subject matter that was not taken into cognizance in this study. In this study, the prevalence of halitosis increased with the increased frequency of tooth brushing by the participants, and frequency of use of interdental cleaning aids. This increase could be associated with the increased consciousness and desire to care for the condition outside the clinic/hospital setting. It has been reported that halitosis can be reduced in people suffering from it, or protect other individuals from having it,

by adequate oral hygiene practice.[22]

Periodontal diseases and dental caries are one of the major aetiological factors of halitosis.[21] They could cause halitosis as a result of breakdown of blood in the gingival sulcus or periodontal pocket.[23] This study observed a positive and statistically significant relationship between bleeding gums, dry mouth, smoking, and self-reported halitosis. This finding is collaborated by previous studies; Tin et al[24] and Kayombo et al,[25] reported a positive association between bleeding gums and self-reported halitosis. Eldarrat et al[21] reported an increased in halitosis with decayed teeth, while Milanesi et al[26] reported a positive association between self-reported halitosis and dry mouth.

The tongue is said to be the most common source of halitosis within the oral cavity.[13] In this study, self-reported halitosis was significantly higher among those with coated tongues, which also concurs with previous reports.[15, 24] This could be because the uncleaned tongue usually harbours periodontal bacteria such as Prevotella intermedia, Porphyromonas gingivalis, and Fusobacterium species that are responsible for producing volatile sulphur compounds (VSCs) that account for halitosis.[27]

Smoking has also been grouped as a non-oral cause of halitosis.[28] In this study, smoking showed a statistically significant association with halitosis, like previous reports.[19, 21] It may be because smoking has been reported to cause significant disruption in the oral microbiota, creating an imbalance in the oral environment. Furthermore, it also causes hyposalivation, hence, contributing to halitosis.[29,30] Smoking has been implicated to cause a decrease in olfactory sensitivity[31] and this might have a negative impact, limiting the identification of self-reported halitosis in some individuals.

Alcoholic beverages are known to produce volatile compounds, acetaldehyde, and other odorous by-products by oxidation of alcohol in the mouth and liver.[32] Ethanol found in alcohol is converted into acetaldehyde which harms the salivary gland, causing xerostomia. Alcohol ingestion may result in transient halitosis.[33] This is collaborated in this study, as alcohol consumption showed no significant association with self-reported halitosis and is in line with a previous study by Kim et al,19 which also showed no significant association between alcohol intake and halitosis.

People with halitosis often make extra efforts to mask their oral malodour with mints, chewing gum, compulsive brushing, and repeatedly rinsing with mouthwashes.[17] This finding was collaborated in this study, as self-care for halitosis in form of chewing gum, mint candy, and mouthwashes were utilized by some participants in our study. Chewing gum has been reported to improve halitosis by increasing salivary flow rate and raising plaque-pH levels.[3,4] Oral mouthwashes containing essential oils, herbal extracts, and peppermint also possess some effective antimicrobial properties.[20] Thus, few of the participants with halitosis in this study, as in other studies, used chewing gums,[20,21] mints,[15] and mouthwashes to mask their halitosis.[20,21,24.]

LIMITATIONS

The findings from this study were based on the subjects' self-perception, which is not completely reliable because of its subjective nature, and obviously, it is not standardized or reproducible across participants.

CONCLUSION

Self-reported halitosis was found among 26% of medical and dental students. Halitosis occurred more in females. It was significantly associated with dry mouth, coated tongue and smoking. In addition, 29.4% of those who reported the presented of halitosis, instituted self-care to mask their halitosis.

REFERENCES

1. Rayman S, Almas K. Halitosis among racially diverse populations: An update. Int J Dent Hyg 2008;6:2-7.
2. Madhushankari GS, Yamunadevi A, Selvamani M, Mohan KP, Basandi PS. Halitosis - An overview: Part-I - Classification, etiology, and pathophysiology of halitosis. J Pharm Bioallied Sci. 2015;7(2):339-343.
3. Goldberg S, Kozlovsky A, Gordon D, Gelernter I, Sintov A, Rosenberg M. Cadaverine as a putative component of oral malodor. J Dent Res. 1994;73:1168–72.
4. Scully C, El-Maaytah M, Porter SR, Greenman J. Breath odor: etiopathogenesis, assessment and management. Eur J Oral Sci. 1997;105:287–93
5. McDowell JD, Kassebaum DK. Diagnosing and treating halitosis. J Am Dent Assoc. 1993;124:55–64
6. Tessier JF, Kulkarni GV. Bad breath: etiology, diagnosis and treatment. Oral Health. 1991;81:19–22. 24.
7. Zürcher A, Laine ML, Filippi A. Diagnosis, prevalence, and treatment of halitosis. Curr Oral Health Rep. 2014;1(4):279-385.
8. Yilmaz AE, Bilici M, Tonbul A, Karabel M, Dogan G, Tas T. Paediatric halitosis and *Helicobacter pylori* infection. J Coll Physicians Surg Pak. 2012;22:27–30
9. Oyetola OE, Owotade FJ, Fatusi OA, Olatunji S. Pattern of presentation and outcome of routine dental interventions in patients with halitosis. Niger Postgrad Med J. 2016;23(4):215-220.
10. Umeizudike KA, Oyetola OE, Ayanbadejo PO, Alade GO, Ameh PO. Prevalence of self-reported halitosis and associated factors among dental patients attending a tertiary hospital in Nigeria. Sahel Med J. 2016;19(3):150-154.
11. Arowojulo MO, Dosumu EB. Halitosis (Fetor oris) in patients seen at the periodontology clinic of the University College Hospital, Ibadan – A subjective evaluation. Niger Postgrad Med J. 2004;11(3):221-224.
12. Arinola JE, Olukoju OO. Halitosis amongst students in tertiary institutions in Lagos state. Afr Health Sci. 2012;12(4):473-478.
13. ADA Council on Scientific Affairs. Oral malodor. J Am Dent Assoc. 2003;134(2):209-214.
14. Mento C, Lombardo C, Milazzo M, et al. Adolescence, Adulthood and Self-Perceived Halitosis: A Role of Psychological Factors. Medicina. 2021; 57(6):614.
15. Nazir M, Almas K, Majeed M. The prevalence of halitosis (oral malodor) and associated factors among dental students and interns, Lahore, Pakistan. Eur J Dent. 2017;11(4):480-485.
16. Lopes MH, Rösing CK, Colussi PR, Muniz FW, Linden MS. Prevalence of self-reported halitosis and associated factors in adolescents from Southern Brazil. Acta Odontol Latinoam. 2016;29(2):93-103.
17. Bosy A. Oral malodor: Philosophical and practical aspects. J Can Dent Assoc 1997;63:196-201.
18. Paradowska-Stolarz A. Self-perception of halitosis among students of Wroclaw Medical University. Adv Clin Exp Med. 2007;16(4):543-548.
19. Kim SY, Sim S, Kim S-G, Park B, Choi HG. Prevalence and associated factors of subjective halitosis in Korean adolescents. PLoS ONE. 2015;10(10):e0140214.
20. Mubayrik AB, Al Hamdan R, Al Hadlaq EM, et al. Self-perception, knowledge, and awareness of halitosis among female university students. Clin Cosmet Investig Dent. 2017;9:45-52.

21. Eldarrat A, Alkhabuli J, Malik A. The prevalence of self-reported halitosis and oral hygiene practices among Libyan students and office workers. Libyan J Med. 2008;3(4):170-176.
22. Van Den Broek AM, Feenstra L, De Baat C. A review of the current literature on management of halitosis. Oral Diseases. 2008;14(1):30-39.
23. Newman MG, Takei H, Klokkevold PR, Carranza FA. Newman and Carranza's Clinical Periodontology. 13th ed. Philadelphia: Elsevier; 2019.
24. Tin-Oo M, Ying T, Saddki N, Mani S. Self-reported halitosis among medical, dental and health science undergraduate students at the University Sains Malaysia. Acta Stomatologica Croatica. 2013;47(2):137-146.
25. Kayombo CM, Mumghamba EG. Self-reported halitosis in relation to oral hygiene practices, oral health status, general health problems, and multifactorial characteristics among workers in Ilala and Temeke municipals, Tanzania. Int J Dent. 2017;2017(3):1-10.
26. Milanesi FC, Kauer B, Wagner TP, Daudt LD, Haas AN. Self-reported halitosis and associated demographic and behavioral factors. Braz Oral Res. 2016;30(1):e71.
27. De Boever EH, Loesche WJ. Assessing the contribution of anaerobic microflora of the tongue to oral malodor. J Am Dent Assoc. 1995;126(10):1384-1393.
28. Aylikci BU, Çolak H. Halitosis: From diagnosis to management. J Nat Sc Biol Med. 2013;4(1):14-23.
29. Al-Rawi AS, Al-Atrooshi BA. Oral halitosis and oral hygiene practices among dental students. J Bagh Coll Dent 2007;19:72-76
30. Scully C, Greenman J. Halitology (breath odour: aetiopathogenesis and management) Oral Dis. 2012;18(4):333-345
31. Almas K, Al-Hawish A, Al-Khamis W. Oral hygiene practices, smoking habit, and self-perceived oral malodor among dental students. J Contemp Dent Pract. 2003;4(4):77-90.
32. Dal Rio AC, Nicola EM, Teixeira AR. Halitosis - an assessment protocol proposal. Brazilian J Otorhinolaryngol. 2007;73(6):835-842.
33. Bicak DA. A Current Approach to Halitosis and Oral Malodor- A Mini Review. Open Dent J. 2018 Apr 30;12:322-330. doi: 10.2174/1874210601812010322.
34. Panagakos FS, Volpe AR, Petrone ME, DeVizio W, Davies RM, Proskin HM. Advanced oral antibacterial/anti-inflammatory technology: a comprehensive review of the clinical benefits of a triclosan/copolymer/fluoride dentifrice. J Clin Dent. 2005;16:S1-S19.