

Prevalence of self-reported halitosis and associated factors in 15 years old male students in Karbala City-Iraq

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ABSTRACT

Background: Halitosis is a common condition and is most often caused by a buildup of bacteria in the mouth because of gum disease, food, or plaque. It can result in anxiety among those affected, it is also associated with depression and symptoms of obsessive-compulsive disorder. This study aims to assess the prevalence of self-reported halitosis and associated factors (dental plaque, gingival condition and dental caries) in 15 years old male students in Karbala city in Iraq. Additionally, we studied adolescents' concern with their own breath and whether anyone had ever told them that they had halitosis.

Methods: A cross-sectional observational survey was conducted to 15 years old high school students from public and private schools in the city of Karbala, Iraq. The random sample consisted of 400 adolescents from 44 schools. An interview with a structured questionnaire was administered along with measurement of oral parameters (PI, GI, DMF).

Results: The prevalence of self-reported halitosis was 48.50% according to question one. The prevalence of halitosis according to the total score of the questionnaire was 86.5%. 13.5% reported that they didn't have halitosis. It is concluded that there is a high prevalence of self-reported halitosis, which is associated with a socio-economic pattern. Most adolescents report a concern with their own breath. Dental plaque and gingival status are associated significantly with self-reported halitosis. The high prevalence of self-reported halitosis according to the questionnaire among the students may be due to the consumption of garlic or spicy food, besides, dental plaque, gingivitis and dental caries cause an increase in volatile sulfur compound level which cause an increase in halitosis.

Conclusion: Self-reported halitosis is a prevalent situation in about 50% of adolescents in Karbala city. Patients' self-reported halitosis is found to be associated with dental plaque, gingivitis and dental caries.

Keywords: Halitosis; adolescent; prevalence. (Received: 15/1/2021, Accepted: 24/2/2021)

INTRODUCTION

Halitosis is a state in which respired air is offensively changed both for patients and for people with whom they communicate ⁽¹⁾. It distresses millions of people around the world, although its prevalence fluctuates, seemingly elicited by the shortage of oral hygiene and a disorganized lifestyle. It can cause social restrictions, interfere in the quality of life, and maybe a gauge of important systemic diseases. In most societies where halitosis is prevalent, people look for solutions, usually due to the discomfort or embarrassment to which they are subjected ⁽²⁾.

One of the aims for studying halitosis is its social impact as a result of patients feeling unconfident in social, professional and family contacts. It may also affect the quality of life and cause embarrassment to people relating to the individual with bad breath.

The measurement of volatile sulfur compound (VSC) concentrations in the exhaled air to assess halitosis is the only method used in some studies.

The results of these surveys have a different meaning from studies that determine the percentage of people who report having halitosis by a questionnaire ⁽¹⁾. Both conclusions are meaningful to understanding the issue, but observation through VSC monitors is considered a surrogate conclusion (measure the disease route, and in general it is therapy centred) ⁽³⁾, whereas self-reported awareness of halitosis is documented as a true outcome. Epidemiological observation taking into consideration both types of outcomes provides important information and allows broader acceptance of the issue ⁽¹⁾.

Adolescence is the evolution period between childhood and adulthood and is categorized by several changes in biological, psychological and social development ⁽⁴⁾. Adolescents are subject to several health linked signs, including halitosis, which exceeds the biological scope, affecting the social scope and possibly hurting the physical and psychological health of affected individuals ⁽⁵⁾. Furthermore, the presence of halitosis may indicate incidence of important systemic diseases requiring crucial diagnosis and treatment. Nevertheless, in Iraq there are limited papers on adolescents, and still fewer on adolescent halitosis.

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MATERIALS AND METHODS

Study design/study setting

This study was a cross-sectional study that was carried out during the period between December 2019 and February 2020. The survey was conducted among secondary schools in Karbala City-Iraq. The age was taken according to the criteria of the World Health Organization (1997) and according to the last birthday. The size of the sample composed of 400 students who were randomly selected from 5477.

❖ (The students with the systemic disease were excluded, besides, students in the study were free of:

- a) Medical history of infectious diseases.
- b) Malocclusion and draining fistulas associated with chronic alveolar abscesses.
- c) Usage of any chemical form of plaque control.
- d) Presence of crowding/overlapping of teeth.

❖ The children were examined by the single calibrated examiner for the following clinical parameters:

1. Self-reported halitosis by questionnaire.
2. plaque by using the plaque index (PI) developed by Silness and Loe (1964) ⁽⁶⁾.
3. Dental Gingival health—to check the gingival health of the subject, the gingival index (GI) developed by Loe and Silness (1963) ⁽⁷⁾ was used.
4. Dental caries—decayed, missing, filled teeth index (DMF-T, DMF-S INDEX) (WHO 1987) for permanent teeth.

Questionnaire

A well-made format (questionnaire) was designed from previous studies ^(2,8,9,10) and administered to the students who meet the criteria. The questionnaire was tested in a pilot study on 100 male students and validity and reliability was adopted, the questionnaire was adjusted in the light of pilot responses. The questionnaire was anonymous (no identification of an individual was possible). The questionnaire originally formulated in English, subsequently translated into Arabic and then retranslated into English, and ethical approval was achieved from the ethical committee in the college of dentistry and from the psychological department of the Faculty of Arts in Baghdad University.

Statistical analysis

Data were translated into a computerized database structure. An expert statistical counsel was sought. Data description, analysis and presentation were performed using Statistical Package for Social Science (SPSS version 21; Chicago, In Press, USA),

sample size calculator for prevalence studies (version 1.0.01) done by Daniel WW, 1999. Statistical analyses can be classified into two categories:

1-Descriptive Analysis: Frequencies and percentage for nominal variables, minimum, maximum, mean, standard deviation (SD) and Standard error (SE) for quantitative variable

2- Inferential analysis:

A. Independent sample T-test: test the difference between two independent groups.

B. Paired sample t-test: test the difference between two related means for one sample or two raters.

❖ Level of significance as Not Significant $P > 0.05$, Significant $P < 0.05$, highly significant $P < 0.01$.

RESULTS

The prevalence of halitosis among 400 students aged 15 years of male's secondary schools in Karbala city/Iraq was 48.50% according to question one, as seen in the table (1).

Regarding question one of the self-reported questionnaire of halitosis, as illustrated in Table 2, the mean value of plaque index and gingival index among students with halitosis is higher than those with no halitosis, which was statistically significant, ($P < 0.001$).

The findings of plaque index regarding the self-reported questionnaire of halitosis were illustrated in Table (3), the mean values of plaque index among students with halitosis were higher than those without halitosis, the higher mean value was recorded in question (4), which was asking the students if their breath interfered with social life. These findings were statistically significant, ($P < 0.001$).

Similarly, the mean value of the gingival index among students regarding the self-reported questionnaire of halitosis, was seemed to be higher in students with halitosis than without halitosis, (Table 4). The higher mean value was recorded in question (3), which was asking the students about receiving any professional treatment for halitosis. This finding were statistically significant, ($P < 0.001$). However, the last question (Q7), which asked the students If they take any measures against halitosis, the difference observed failed to reach the level of statistical significance ($P > 0.05$).

Table (1): Distribution of students by questionnaire.

Question	No.	Percent %	
Q1	Yes	194	48.50
	NO	206	51.50
Q2	Yes	188	47.00
	NO	212	53.00
Q3	Yes	87	21.75
	NO	313	78.25
Q4	Yes	162	40.50
	NO	238	59.50
Q5	Yes	190	47.50
	NO	210	52.50
Q6	Yes	217	54.25
	NO	183	45.75
Q7	Yes	179	44.75
	NO	221	55.25

Table (4) clarifies the mean values and standard errors (SE) of the caries-experience (DS, MS, FS, DMFS and DMFT) regarding the self-reported questionnaire of halitosis. the mean differences of DMFT were statistically significant concerning questions (2,4,5,6,7), similarly the mean differences of DS were statistically significant concerning questions (4,5,6), likewise the FS mean differences were statistically significant concerning question (5), and the mean differences of DMFS were statistically significant concerning question (5,6,7) ($P < 0.001$). On the other hand, other findings were statistically not significant ($P > 0.05$).

DISCUSSION

In the present study, 400 students of 5477 aged 15 years old were selected randomly from 44 males' secondary schools in Karbala city/Iraq, to measure the prevalence of self-perceived halitosis in secondary schools' students aged 15 years, as no previous Iraqi study on halitosis was done in this area for this age. The selected student was interviewed in an isolated room in each school to ensure privacy and

to avoid embarrassment while answering the questionnaire, and all the oral parameters including dental plaque, gingival condition and dental caries. Plaque Index of Silness and Loe (1964) ⁽⁶⁾ and Gingival Index of Loe and Silness (1963) ⁽⁷⁾ were used to assess dental plaque and gingival health condition, respectively. These indices were used due to their flexibility, which provides the possibility of selection of index teeth for examination rather than the whole dentition and keeps the duration of examination to a minimum; in addition to their ease of application ⁽¹¹⁾.

The age and gender were stationary, as age was not a risk factor for the increase in the level of VSCs ⁽¹²⁾. Multiple regression analysis revealed that male gender was the only variable showing a significant relationship with higher questionnaire scores. These findings corroborate previous studies showing the predominance of halitosis in male children aged 6-9 years, 6 -16 years ⁽¹³⁾, and 7 - 15 years ⁽¹⁴⁾. However, a study carried out in Israel ⁽¹⁵⁾, showed no difference between the sexes in the 5 -14 age group, nor was there a difference in the adult population ⁽⁹⁾. However, some studies have found a higher prevalence of halitosis in women ⁽¹⁶⁾. It is difficult to determine the actual influence of factors such as age and gender on halitosis, since breath odor may be influenced by many factors such as periodontal and dental status, dental hygiene, tongue coating, smoking, nutrition, level of education, and medication ⁽¹⁷⁾.

Self-assessment or self-perception of halitosis is a highly relevant outcome since it involves the individual in the process and makes him/her understand the importance of the condition ⁽¹⁸⁾. it is safe to assume self-perception as a true patient-centered outcome, which is highly recommended in present research in the health field⁶. In the present study the overall prevalence of halitosis according to the questionnaire (depending on the answer of question one which inquired the students if they have had bad breath to assess the awareness of the students about halitosis), the result was approaching fifty percent, this was almost similar to the results reported in Qassim, Saudi Arabia ⁽¹⁹⁾, which is also lower in comparison to a study done in Kinondoni (2013), but at the same time is higher

Table (2): Descriptive and statistical test of Plaque index and gingival index among the presence of halitosis.

variables	Q1				T	df	P-value
	Yes		NO				
	Mean	SE	Mean	SE			
PLI	0.952*	0.035	0.747	0.032	4.311	398	0.000 S
GI	0.852*	0.032	0.723	0.031	2.871	398	0.004 S

**=highly significant at p <0.01

Table (3): Descriptive and statistical test of Plaque index among questionnaire Categories

SRQ	Categories						T	df	P-value*
	No.	Yes Mean	SE	No.	NO Mean	SE			
Q2	188	0.918*	0.034	212	0.784*	0.034	2.765	398	0.006*
Q3	87	1.048*	0.056	313	0.791*	0.026	4.455	398	0.000*
Q4	162	0.988*	0.039	238	0.751*	0.030	4.906	398	0.000*
Q5	190	0.986*	0.036	210	0.721*	0.031	5.626	398	0.000*
Q6	217	0.928*	0.032	183	0.750*	0.036	3.702	398	0.000*
Q7	179	0.948*	0.039	221	0.765	0.029	3.795	398	0.000*

SRQ= self-reported questionnaire of halitosis No.= number *S= Highly significant p <0.01

Table (4): Descriptive and statistical test of gingival index among questionnaire Categories

SRQ	Yes		NO		T	df	P-value
	Mean	±SE	Mean	±SE			
Q2	0.847	0.035	0.731	0.029	2.569	398	0.011
Q3	0.932*	0.053	0.745*	0.025	3.447	398	0.001*
Q4	0.872*	0.037	0.727*	0.028	3.174	398	0.002*
Q5	0.872*	0.032	0.708*	0.031	3.656	398	0.000*
Q6	0.837*	0.030	0.725*	0.034	2.471	398	0.014*
Q7	0.820	0.031	0.758	0.032	1.349	398	0.178

*= highly significant at p<0.01

than the findings reported in other populations especially Brazil⁽⁸⁾, USA (1996)⁽²⁰⁾. In these studies, the gender had no statistically significant association to the outcome with similar methodology⁽⁸⁾, so the result of the current study could be compared with these studies. The prevalence of halitosis according to total score of the questionnaire was 86.5% higher than the prevalence of halitosis in Jordanian population which was 78%⁽¹⁰⁾, this may be due to the overall poorer oral hygiene, or the assumption by other authors that halitosis might be an underestimated oral health problem in the general population may be true⁽²¹⁾, or living in low-middle income countries⁽²²⁾. The high prevalence of periodontal diseases in low-middle income countries

might cause the greater prevalence of halitosis, in addition the intake of volatile foods such as spices and garlic may lead to change in breath odor, and consequently halitosis, another cause for the great prevalence of halitosis is the dryness of the mouth which plays an important role in the formation and perpetuation of halitosis⁽²³⁾.

Plaque, composed of bacteria and salivary proteins, is one sulfur source in the oral cavity. In an epidemiological study conducted among the 2000 Chinese population, plaque index is significantly correlated with VSC values⁽¹²⁾. This finding was agreed with the data presented in this study, in which the plaque index was associated

Table (5): Descriptive and statistical test of caries experience among questionnaire.

SRQ	Dental caries	Categories				T	df	P-value
		Yes		NO				
		Mean	SE	Mean	SE			
Q2	DS	2.441	0.161	2.264	0.174	0.741	398	0.459NS
	MS	0.186	0.069	0.189	0.066	0.026	398	0.979NS
	FS	1.250	0.139	1.118	0.126	0.705	398	0.481NS
	DMFS	3.877	0.267	3.571	0.257	0.828	398	0.408NS
	DMFT	2.234*	0.107	1.915	0.104	2.141	398	0.033*
Q3	DS	2.575	0.233	2.284	0.138	1.003	398	0.316NS
	MS	0.230	0.113	0.176	0.052	0.469	398	0.639NS
	FS	1.437	0.240	1.109	0.099	1.451	398	0.148NS
	DMFS	4.242	0.397	3.569	0.209	1.503	398	0.134NS
	DMFT	2.322	0.166	1.994	0.083	1.818	398	0.070NS
Q4	DS	2.648*	0.195	2.143	0.150	2.086	398	0.038*
	MS	0.154	0.068	0.210	0.065	0.575	398	0.566NS
	FS	1.327	0.175	1.080	0.102	1.301	398	0.194NS
	DMFS	4.129	0.310	3.433	0.227	1.855	398	0.064NS
	DMFT	2.321*	0.122	1.891	0.093	2.853	398	0.005*
Q5	DS	2.616*	0.174	2.105	0.163	2.147	398	0.032*
	MS	0.158	0.064	0.214	0.070	0.592	398	0.554NS
	FS	1.453*	0.161	0.933	0.100	2.799	398	0.005*
	DMFS	4.227*	0.284	3.252	0.237	2.649	398	0.008*
	DMFT	2.337*	0.114	1.819	0.095	3.511	398	0.000*
Q6	DS	2.687*	0.182	1.945	0.142	3.127	398	0.002*
	MS	0.253	0.075	0.109	0.054	1.513	398	0.131NS
	FS	1.221	0.117	1.131	0.150	0.480	398	0.632NS
	DMFS	4.161*	0.261	3.185	0.255	2.647	398	0.008*
	DMFT	2.323*	0.101	1.760	0.106	3.819	398	0.000*
Q7	DS	2.508	0.167	2.217	0.168	1.214	398	0.226NS
	MS	0.168	0.067	0.204	0.067	0.376	398	0.707NS
	FS	1.346	0.165	1.045	0.103	1.606	398	0.109NS
	DMFS	4.022	0.281	3.466	0.245	1.498	398	0.135NS
	DMFT	2.229*	0.120	1.932	0.093	1.984	398	0.048*

with halitosis. However, another study showed no significant association between plaque accumulation and halitosis in 2000 Belgian patients⁽²⁴⁾, this was inconsistent with the findings of Liu et al. (2006) and Kanehira et al. (2004) (plaque index).

Gingivitis is reversible and infrequently developed to periodontitis in children and adolescent except in special circumstances like aggressive periodontitis and periodontitis associated with systemic diseases⁽²⁵⁾. In the current study the finding is consistent with Liu et al. (2006)⁽¹²⁾, Kara et al. (2006)⁽²⁶⁾, P. S. Patil et al. (2014)⁽²⁷⁾, Al- Saidy (2013)⁽²⁸⁾, Ziaei N (2019)⁽²⁹⁾ and Alzoman H. (2020)⁽³⁰⁾. Although halitosis is possibly not caused by periodontal disease, there is ample proof to suggest that periodontal disease increases the severity of halitosis with higher production of volatile sulphur compounds⁽²⁷⁾. This can be explained as periodontal conditions favour

bacterial growth and retention of debris, besides, the blood decomposition products can themselves produce Sulphur containing peptides and amino acids that are the source of volatile Sulphur compounds. However, Kanehira et al. (2004)⁽³¹⁾ reported no association between halitosis and periodontal condition.

In the present study, there was a highly significant association between dental caries experience represented via DMF index and self-reported halitosis, which was in agreement with CM Kayombo (2017)⁽²⁰⁾. The findings were opposing with those of Miyazaki et al. (1995)⁽³²⁾, Kanehira et al. (2004)⁽³¹⁾ and Liu et al. (2006)⁽¹²⁾. Glucose and sucrose can constrain the enzyme activity of salivary peptides by making an acidic environment⁽³³⁾. Therefore, an acidic condition created by dental plaque may destroy VSC production. However,

Nalcaci et al. (2008)⁽³⁴⁾ found that the prevalence and severity of dental caries had a significant role in halitosis, as an increase in DMFT indicates an increase in caries and a low oral hygiene level, and it seems rational that this may increase the chance of halitosis. Previous studies have shown that this is true⁽²⁹⁾, this was a result to increase the incidence of unidentifiable Gram-negative rods, Gram-positive rods and Gram-negative coccobacilli, the increase in species diversity found in halitosis samples proposes that halitosis may be the result of complex collaborations between several bacterial species⁽³⁵⁾.

CONCLUSION

Patients' self-reported halitosis was found to be associated with dental plaque, gingivitis and dental caries. The existing findings suggest that a self-reported questionnaire of halitosis can be used to judge one's halitosis.

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المستخلص

الخلفية: رائحة الفم الكريهة هي حالة شائعة وغالبًا ما تحدث بسبب تراكم البكتيريا في الفم بسبب أمراض اللثة أو الطعام أو البلاك. يمكن أن يؤدي إلى القلق بين المتضررين، كما أنه يرتبط بالانكتئاب وأعراض اضطراب الوسواس القهري. كان الهدف من هذه الدراسة هو تقييم انتشار رائحة الفم الكريهة المبلغ عنها ذاتيًا والعوامل المرتبطة بها (لوحة الأسنان، حالة اللثة وتسوس الأسنان) لدى الطلاب الذكور في سن 15 سنة في مدينة كربلاء في العراق. بالإضافة إلى ذلك، درسنا قلق المراهقين بأنفسهم وما إذا كان أي شخص قد أخبرهم من قبل أن لديهم رائحة فم كريهة.

المواد والطرق: تم إجراء مسح رصد مقطعي على طلاب المدارس الثانوية في سن 15 سنة من المدارس الحكومية والخاصة في مدينة كربلاء، العراق. تكونت العينة العشوائية من 400 مراهق من 44 مدرسة. مقابلة مع استبيان منظم وأجريت جنبًا إلى جنب مع قياس المعلمات الشفوية (PI، DMF، GI).

النتائج: كان انتشار رائحة الفم الكريهة المبلغ عنها ذاتيًا 48.50٪ وفقًا للسؤال الأول. كانت نسبة انتشار رائحة الفم الكريهة حسب الدرجة الكلية للاستبيان 86.5٪. بينما أفاد 13.5٪ بعدم إصابتهم برائحة الفم الكريهة. أي أن هناك انتشارًا كبيرًا لرائحة الفم الكريهة المبلغ عنها ذاتيًا، والتي ترتبط بالنمط الاجتماعي والاقتصادي. أبلغ معظم المراهقين عن قلقهم من أنفاسهم. ارتبطت لوحة الأسنان وحالة اللثة بشكل كبير مع رائحة الفم الكريهة المبلغ عنها ذاتيًا. قد يكون الانتشار الكبير لرائحة الفم الكريهة المبلغ عنها ذاتيًا وفقًا للاستبيان بين الطلاب بسبب تناول الثوم أو الطعام الحار، بالإضافة إلى أن طبقة البلاك والتهاب اللثة وتسوس الأسنان تسبب زيادة في مستوى مركب الفضة المتطاير مما يؤدي إلى زيادة رائحة الفم الكريهة.

الاستنتاجات: رائحة الفم الكريهة المبلغ عنها ذاتيًا هي حالة سائدة في حوالي 50٪ من المراهقين في مدينة كربلاء. تم العثور على رائحة الفم الكريهة للمرضى المبلغ عنها ذاتيًا مرتبطة بلويحة الأسنان والتهاب اللثة وتسوس الأسنان.

