

Influence of oral health and lifestyle on oral malodour

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Objective: To assess the influence of oral health and lifestyle on the prevalence of oral malodour among university students. **Materials and methods:** Self-administered questionnaires. Chi-square test was used to detect any significant association between malodour and various variables. **Results:** 9% of males and 6% of females complained of malodour, while 36% of males and 31% of females did not complain of malodour. Nevertheless, 12% of the males and 6% of females were unable to decide. The highest percentage of respondents not complaining of malodour were non-smokers (55%). A significant number of respondents were free from caries (48%), gingival disease (55%) and also were not complaining of malodour. Statistically, a significant association was found between malodour and gingival disease ($p < 0.05$) and between malodour and the use of a toothbrush on a daily basis ($p < 0.001$). **Conclusions:** The results highlight the influence of oral self-care and lifestyle on malodour. Public awareness, diagnosis and treatment of malodour are primarily the responsibility of dentists. Malodour can have a distressing effect and the affected person may avoid socialising.

Key words: Oral malodour, bad breath, dental caries, gingivitis, oral self-care, lifestyle, halitosis

Halitosis is a medical term used to describe the emanation of an unpleasant odour from the mouth. The occurrence of this malodour is so common and so wide-spread that it is considered both a medical and a social problem.

The condition arises as a result of several factors, which can be of both oral and non-oral genesis. Regardless of whether the origin of the malodour is oral or non-oral most professionals use the term halitosis to describe the condition¹. The term oral malodour is consistently indicative of intra-oral causes. For the medical professional, halitosis has been classified into three categories: genuine halitosis, pseudo-halitosis, and halitophobia halitosis². As the name indicates, genuine halitosis is when the malodour emanating from the mouth is easily recognisable and is at a socially unacceptable level. Pseudo-halitosis is when the patient complains of having the condition but others do not perceive it. Halitophobia halitosis refers to an unreasonably persistent belief by the patient that he or she is suffering from halitosis, even after successful treatment of the first two manifestations described above.

Most professional agree that in the vast majority of cases (80–90%) the patient's mouth is the primary source of an existing condition of halitosis, and bacteria are the primary cause of the offensive odours³. When certain conditions are present in the mouth a series of

events produces pungent gases that mix with normal exhalation and are perceived as bad breath. A form of halitosis is commonly evidenced in the early morning upon waking from sleep. This manifestation of halitosis is not considered a medical condition needing treatment as it is a naturally occurring result of reduced saliva flow during sleep. Once saliva flow is re-stimulated upon waking, or once a person eats, drinks or washes the oral cavity, this manifestation of halitosis is generally resolved⁴. More chronic manifestations of halitosis may be attributed to several factors that are of immediate concern to the medical profession. These include conditions such as periodontal disease, exposed necrotic tooth pulp, imperfect dental restorations, carious lesions, unclean dentures, tongue coating and ulcerations, among others^{5–15}.

Chemically, the main causes of halitosis are volatile sulphur compounds such as hydrogen sulphide and methylmercaptan¹⁶. These compounds are produced as a result of the action of bacteria on proteins. A recent study demonstrated that mercaptan is the primary source of intra-oral halitosis, while dimethyl sulphide was found to be the main contributor to extra-oral or blood borne halitosis¹⁷.

However, these are not the only substances that are known to be contributors to the condition. Substances such as ammonia, amines and organic acids have also been shown to be contributors to halitosis^{18,19}. The

non-oral sources of oral malodour include upper respiratory problems such as sinusitis and polyps²⁰, some metabolic disorders such as diabetes mellitus and certain gastro-intestinal tract disturbances^{21–23}. Certain drugs that reduce salivary flow, such as antidepressants, decongestants and antihistamines, among others, are also contributors to the onset of halitosis^{24–27}. Finally, some common foods such as garlic and onion, as well as smoking also contribute to a malodorous oral cavity. However, these are not rightly the concern of the medical professional in terms of medical treatment.

Halitosis is a worldwide problem of the human community but its prevalence varies in different parts of the world, a fact that would seem to indicate that oral self-care and lifestyle are the main contributors to the onset of this condition. In most societies where halitosis is prevalent, people seek relief from the condition mostly because of social discomfort and/or embarrassment. In spite of the wealth of information on halitosis, identification of the specific causes remains difficult in most cases. With this in mind, the aim of this study was to assess the influence of oral-self care and lifestyle on the prevalence of oral malodour among young people.

MATERIALS AND METHODS

A self-administered questionnaire was the instrument used to assess the main aim of the study. To assess the influence of lifestyle on the prevalence of malodour, two groups were selected in the present study, undergraduate and newly graduated students. Participants' ages were between 19–24 years old. Three hundred questionnaires and consent forms were distributed to the participants in different Colleges of Garyounis University, Benghazi, Libya. An information sheet explaining the need for the study and the procedure for responding to the questionnaire was enclosed as a cover sheet. Data were entered on an Excel spreadsheet and imported into Statistical Package for Social Sciences (SPSS) version 13 (SPSS Inc., Chicago, IL, USA) for data analysis. In addition to the presentation of descriptive data, the Chi-square test was used to find out any significant association between malodour and various variables. The significance level (p-value) was set at 0.05.

RESULTS

Two hundred and thirty-three completed questionnaires were analysed in the current study, the response rate being 78%. Of the participants, 133 were males and 100 were females (Table 1). Response of males and females to the question 'Do you complain of bad breath?' is shown in Table 1. About 9% of the males and 6% of the females complained of malodour, 36% of males and 31% of females did not complain of

Table 1 Prevalence of oral malodour according to participants' gender

Do you complain of bad breath?	Gender		Total
	Male	Female	
Yes			
Count	22	14	36
% of total	9	6	15
No			
Count	83	72	155
% of total	36	31	67
Don't know			
Count	28	14	42
% of total	12	6	18
Total			
Count	133	100	233
% of total	57	43	100

malodour. Nevertheless, 12% of the males and 6% of the females were unable to decide.

Table 2 illustrates the self-perceived malodour among different students' groups; among the students, undergraduates complained of malodour more than graduates (14% and 1%, respectively) and a significant difference of malodour prevalence was found between the two groups ($p < 0.05$ at 95% confidence level). The results of assessing the association between malodour and habits such as cigarette smoking, caries and gingivitis are shown in Tables 3–5. Among the participants, the highest percentage of respondents who were not complaining of malodour were non-smokers (55%), as shown in Table 3, those free of caries (48%) as shown in Table 4 and those free of gingival disease (55%) as shown in Table 5. Statistically, a significant association ($p < 0.05$ at 95% confidence level) was found between malodour and gingival disease, while the values for smoking and caries were found statistically similar ($p > 0.05$ at 95% confidence interval).

With reference to participants' oral hygiene, a broad variety of oral self-care practices were utilised by the participants; 68% of the participants brushed their

Table 2 Prevalence of oral malodour among participants' groups

Do you complain of bad breath?	Groups		Total
	Undergraduates	Graduates	
Yes			
Count	34	2	36
% of total	14	1	15
No			
Count	124	28	152
% of total	54	12	66
Don't know			
Count	34	9	43
% of total	15	4	19
Total			
Count	192	41	233
% of total	83	17	100

Table 3 Self-perception of oral malodour and participants' cigarette smoking habit

Do you complain of bad breath?	Cigarette smoking		Total
	Yes	No	
Yes			
Count	7	27	34
% of total	3	12	15
No			
Count	27	129	156
% of total	12	55	67
Don't know			
Count	9	34	43
% of total	4	14	18
Total			
Count	43	190	233
% of total	19	81	100

Table 4 Self-perception of oral malodour and caries

Do you complain of bad breath?	Caries		Total
	Yes	No	
Yes			
Count	11	23	34
% of total	5	10	15
No			
Count	43	113	156
% of total	18	48	66
Don't know			
Count	11	32	43
% of total	5	14	19
Total			
Count	65	168	233
% of total	28	72	100

Table 5 Self-perception of oral malodour and gingival disease

Do you complain of bad breath?	Gingival disease		Total
	Yes	No	
Yes			
Count	12	22	34
% of total	5	10	15
No			
Count	29	129	158
% of total	13	55	68
Don't know			
Count	12	29	41
% of total	5	12	17
Total			
Count	53	180	233
% of total	23	77	100

teeth on a daily basis. Mouthwash was used by 33% as part of their daily oral self-care. About 20% of the respondents used dental floss to clean proximal surfaces of their teeth, while interdental brushes and tooth picks were used by 41% and 32%, respectively and 11% of

the subjects used miswak (a traditional chewing stick) to clean their teeth. The Chi square test showed that values for various oral self-care practices other than tooth brushing were statistically similar ($p > 0.05$ at 95% confidence interval). A significant association ($p < 0.001$ at 95% confidence level) was found between malodour and the use of a toothbrush on a daily basis.

Of the participants who were not suffering from malodour, many were also not drinking tea (39%) or coffee (37%). However, statistically an insignificant association was found between malodour and tea and coffee intake ($p > 0.05$ at 95% confidence interval).

Questionnaire responses showed that 34% of participants were diagnosed and received recommended treatment for halitosis from a dentist, while 5% were diagnosed by a physician. Dentists provided treatment for 24% of the subjects and only 3% sought treatment from physicians. Fifty-five percent of the participants used self-medication (commercial products such as mint chewing gum) to cure malodour and 10% used traditional medicine (such as clove oil). The percentage of subjects who experienced interference with normal social life or at work as a result of bad breath during the previous month was 10%. The worst malodour was reported during wake-up time in the morning (73%) and a significant number reported it during hunger (21%).

DISCUSSION

Oral halitosis is a worldwide problem of the human community but its prevalence varies in different parts of the world. Reported evidence revealed that oral sources are responsible for about 85% of bad breath complaints²⁰. This fact that would seem to indicate that oral self-care and lifestyle are the main contributors to the onset of this condition. In most societies where halitosis is prevalent, people seek relief from the condition mostly because of social discomfort and/or embarrassment.

In the current study, malodour was not very common among the participants. More than half (67%) of the respondents indicated they did not suffer from malodour as shown in *Table 1*. Self-perception of malodour was reported by 9% of the males and 6% of the females. In the current study, the differences of self-perception of malodour among males and females were statistically insignificant ($p > 0.05$ at 95% confidence interval) and the self-perceptions of malodour were similar among males and females. To assess the influence of lifestyle on the prevalence of malodour, two groups were selected in the present survey, undergraduate and newly graduated students. The undergraduates were stressed and very busy with their studying, while the graduates were relaxed and pleased with their new jobs. As shown earlier, the prevalence of malodour among undergraduates was higher than for

graduates and a significant difference of malodour prevalence was found between the two groups ($p < 0.05$ at 95% confidence level). This reflects the influence of busy lifestyle on malodour in particular and oral health in general due the ignorance of oral self-care and regular dental check-ups.

Dental caries, periodontal diseases and cigarette smoking are potential contributing factors for malodour^{10,28–32}. Among all the participants, 28% had dental caries and 23% had gingival disease. However, the highest percentage of respondents who were not complaining from malodour were free from caries (48%), gingival disease (55%) and were non-smokers (55%). In the present study a significant association ($p < 0.05$ at 95% confidence level) was found between malodour and gingival disease, while the values for smoking and caries were found to be statistically similar ($p > 0.05$ at 95% confidence interval). Neither caries nor smoking showed any correlation with the oral malodour.

As the present survey shows, the attitude of the participants towards maintaining good oral hygiene through self-care is very positive, as shown in *Table 6*; 86% of the participants brushed their teeth on a daily basis. A significant association ($p < 0.001$ at 95% confidence level) was found between malodour and the use of a toothbrush on a daily basis. Mouthwash was used by 33% as part of their daily oral self-care. About 20% of the respondents used dental floss to clean proximal surfaces of their teeth, while interdental brushes and tooth picks were used by 41% and 32%, respectively; 11% of the subjects used miswak to clean their teeth. These findings add more evidence to and highlight the importance of maintaining good oral hygiene for overall oral health and to prevent malodour. Similar results were reported by several investigators to highlight the strong association between oral malodour and oral hygiene, including brushing, use of anti-plaque mouthwashes and flossing^{16,33–37}.

Table 6 Self-perception of oral malodour and regular use of a toothbrush

Do you complain of bad breath?	Brushing teeth on a daily basis		Total
	Yes	No	
Yes			
Count	22	13	35
% of total	9	6	15
No			
Count	142	13	155
% of total	60	6	66
Don't know			
Count	38	5	43
% of total	17	2	19
Total			
Count	202	31	233
% of total	86	14	100

Miswak is a traditional chewing stick used as a natural toothbrush and made from twigs of the *Salvadora Persica* tree. It is widely used in the Middle East, particularly in Saudi Arabia. It has an antibacterial effect and has been shown to be as good as a toothbrush in removing dental plaque and reducing gingivitis³⁸. Miswak use among Libyans is infrequent and the majority of the population are unaware of its effectiveness in prevention and treatment of periodontal diseases. Therefore, the population should be made aware of its oral health care merits and encouraged to use it.

A considerable percentage of respondents (73%) reported malodour on awakening in the morning. It is well known that during sleeping saliva flow is reduced and this leads to morning oral malodour. However, in this circumstance the malodour is temporary and disappears once food or drinks are taken, and should not be regarded as true malodour. It is similar for respondents who reported malodour due to hunger and thirst. Reduction of salivary flow due to systemic causes such as diabetes, or oral causes such as salivary gland diseases, leads to mouth dryness (xerostomia) and enhances the malodour³⁹. In this survey, none of the participants was suffering from mouth dryness.

In the current survey, the percentage of participants who drank tea (41%) was similar to those who drank coffee (42%). Information available on the role of these two drinks in oral malodour is inadequate, though some studies reported an association between drinking tea or coffee and reduction in certain oral microorganisms⁴⁰. However, of the participants who were not suffering from malodour some were also not drinking tea (39%), or coffee (37%). Statistically it was found that there was an insignificant association between malodour and tea and coffee intake ($p > 0.05$ at 95% confidence interval).

Thirty-four percent of the respondents were diagnosed with malodour by dentists, who provided treatment for approximately 24% of these subjects. On the other hand, a few respondents (5%) approached physicians for diagnosis, and an even smaller number (3%) were given treatment or advice by physicians. Diagnosis of oral malodour is primarily the responsibility of the dentist. In view of the widespread awareness of malodour, the small percentage diagnosed by dentists reflects their non-active role in detection and treatment of the condition. Malodour can have a distressing effect that may become a social handicap to the point where the affected person may avoid socialising altogether. In this study, 10% of participants admitted that oral malodour interfered with their social life.

CONCLUSION

Results of the current study indicated a strong association between malodour, gingival disease, oral self-care

and lifestyle. The role of dental professionals in maintaining good oral health should be emphasised in the community and within the profession. There is a great need to control and reduce the incidences of dental caries and periodontal diseases, because of their influence on halitosis and to raise public awareness of the causes of oral malodour and its treatment. Finally, dental and medical professionals need to continue emphasising to patients the paramount importance of oral self-care.

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