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Relationship of oral health knowledge, behavior and status with self-perceived and clinical oral malodor among dental patients

Abstract

Objectives: The aims of this study were to examine self-perceived and clinical oral malodor, and to assess the relationship of these with oral health knowledge, oral health behaviors and oral health status among Myanmar dental patients.

Method: Data were collected from 55 dental patients who visited the periodontal clinic of University of Dental Medicine, Yangon. A self-administered questionnaire was used to obtain the information regarding oral health knowledge, self-perceived oral malodor and health behaviors. The oral health knowledge score was computed by adding correct answers of 11 oral health knowledge items. Oral malodor was measured by using Breathron®. Dentition status, periodontal status, oral hygiene, tongue coating and saliva characteristics were also examined. The independent sample t-test and chi-squared test were used for statistical analysis.

Results: For self-perceived oral malodor, 40% (n=22) of the subjects answered they had oral malodor, while 60% (n=33) reported they did not. Regarding clinical oral malodor, 25.5% (n=14) had oral malodor and 74.5% (n=41) had no oral malodor. Mean total knowledge scores were 5.86±1.81 in subjects with self-perceived oral malodor, and 6.09±1.63 in those without. The mean knowledge scores were 5.86±1.88 in subjects with clinical oral malodor and 6.05±1.64 in those without. No significant differences were found in dentition, periodontal status, tongue coating and saliva by self-perceived oral malodor. The proportion of subjects using mouthwash was significantly lower in subjects with self-perceived oral malodor than those without ($p<0.05$). However, chewing betel quid or smoking was higher in those with self-perceived oral malodor. Tongue coating characteristics and use of toothpaste were significantly different between subjects with clinical oral malodor and those without.

Conclusion: Self-perceived oral malodor was not consistent with clinical oral malodor. Different factors were associated with self-perceived or clinical oral malodor. The current findings provide useful information for further oral malodor research in general population

Keywords: oral health knowledge, behavior, self-perceived, oral malodor, dental patients, Myanmar

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Background

Oral malodor, also known as halitosis or bad breath, is a common problem worldwide and is associated with social embarrassment, anxiety and psychological depression.[1] Therefore, oral malodor has a negative impact on quality of life. Oral malodor is reported to be the third most frequent reason for people to seek dental care, behind dental caries and periodontal diseases.[2] The prevalence of oral malodor varies by country. Previous research has reported that about 30% to 50% of the population present with the oral malodor.[3–5] Oral malodor can be detected by the organoleptic test, that is regarded as a gold standard.[1] Alternatively, it can be examined by using sulfide monitoring equipment such as the Halimeter®, Breathtron®, Oral Chroma® and Gas chromatography.[6]

Many factors influence oral malodor including poor oral hygiene, tongue coating, periodontal diseases, low salivary flow, advanced caries, oral mucosal ulceration, ill-fitting restorations and systemic diseases like upper respiratory tract diseases, stomach problems, liver diseases and kidney diseases.[7] Among the causative conditions, more than 90% of the oral malodor originates from the oral cavity and the remainder is due to systemic diseases.

The main chemical compounds of oral malodor are volatile sulfur compounds (VSCs).[8–10] Any area in the oral cavity where microorganisms, plaque and oral debris accumulate can produce VSCs. VSCs are mainly generated through putrefactive activities of anaerobic bacteria in the oral cavity. These bacteria are commonly found in the dorsum surface of the tongue and most of them are the same bacteria as those associated with gingivitis and periodontitis.[1,9,11] The tongue forms a distinct environment for the accumulation of microorganisms, desquamated epithelium cells, and food debris due to its specific anatomical structure.[12]

People try to relieve oral malodor by reducing the number of their meals, brushing teeth frequently and for an extended time, eating mints, gums or candies and masking their breath with products such as tobacco and betel quid. Many studies have demonstrated that tongue cleaning and mouth washing are basic treatments for oral malodor reduction.[13]

Epidemiological research has reported that the prevalence of self-perceived oral malodor reaches upto 32% in the general population,[14] and 47% in dental patients.[15] However, self-perception of oral malodor is often inaccurate and tends to have low sensitivity. Therefore, self-perceived oral malodor has not been used as a surrogate for clinical oral malodor diagnosis.

There are studies that have investigated the relationship between self-perceived and clinical oral malodor among dental patients.[16,17] However, no research on this issue has been conducted in Myanmar. Therefore, the purposes of this study are to examine self-perceived and clinical oral malodor among Myanmar dental patients, and to assess the relationship of these two variables with oral health knowledge, oral health behaviors and oral health status.

Materials and methods

The subjects of this study were 55 dental patients who visited the periodontal clinic of University of Dental Medicine, Yangon from August through September in 2012. All the subjects were volunteering participated in this study and signed a consent form after an explanation about the study protocol.

Questionnaires

A self-completed questionnaire collected socio-demographic information (age, gender and education level), oral health knowledge (11 questions), and oral health behaviors (tooth brushing, tongue cleaning, use of toothpaste, mouth washing and chewing betel quid or smoking). An oral health knowledge score was calculated by adding the correct answers of the 11 questions. Self-perceived oral malodor was recorded as "yes or no" regarding on the response to the question "Do you suffer bad breath at the moment?"

Clinical oral malodor measurement

Oral malodor was measured by using the Breathron® (Yoshida, Tokyo, Japan) in participants attending the clinic from 9 am to 12 am. Measurements were performed after subjects tightly closed their mouths for 3 minutes. A disposable mouthpiece was directly inserted into subjects' oral cavity while they breathed through their nose during the measurement. The Breathron® requires 45seconds for measurement, and the values of VSCs are presented in units of parts per billion (ppb) on a digital screen. Subjects whose VSCs level was greater than 250ppb were diagnosed as having clinical oral malodor.

Oral examination

Oral examination assessed the dentition (teeth present, decayed, filled and missing teeth) and periodontal status. Periodontal examination included the number of teeth with bleeding on probing (BOP), the number of teeth with calculus, and the number of teeth with periodontal pocket depth more than 3mm. Salivary flow rate was determined by subjects being requested to spit all accumulated saliva into a collecting paper cup for 5 minutes. The saliva flow rate was then calculated (mL/minute) and the saliva pH were determined by using a bromothymol blue test strip.

Oral hygiene status was assessed by the number of teeth with plaque accumulation. Area and thickness of tongue coating were evaluated by tongue coating index as described by Oho et al.[18]. The area of tongue coating was scored: 0=no tongue coating, 1=<1/3 tongue dorsum surface covered, 2=1⁄3–2⁄3 tongue dorsum surface covered, and 3=>2/3 tongue dorsum surface covered. The thickness of tongue coating was scored: 0=no tongue coating, 1=thin tongue coating (papillae visible), and 2= thick tongue coating (papillae invisible). The color of tongue coating was categorized using the Winkel tongue discoloration method score: 0=no discoloration, 1=light discoloration, and 2= severe discoloration.[19]

Data analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS 16.0). The independent sample t-test was used to determine the differences of means between two groups. Chi square testing was employed to analyze the distributional differences between groups. A significance level was set at $P < 0.05$.

Ethical approval

This study protocol was approved by the ethical committee of Tokyo Medical and Dental University (No. 850) and authorized by the University of Dental Medicine (Yangon) (1759/AhKhaYa.3(Hta)2012) and Department of Medical Science, Ministry of Health (2(Ka)2/2012(9308) SaThaPa), Myanmar.

Results

The mean age of all subjects was 42.0±14.0 years, and 34.5% (n=19) of those were male and 65.5% (n=36) were female. For self-perceived oral malodor, 40% (n=22) of the subjects answered they had oral malodor, while 60% (n=33) reported they did not. Regarding clinical oral malodor, 25.5% (n=14) had oral malodor (ppb>250) and 74.5% (n=41) had no oral malodor. Proportions of highest education levels were categorized into three: low (primary school), moderate (secondary or high school) and high (university or higher) and were 32.7% (n=18), 49.1% (n=27) and18.2% (n=10), respectively.

Table 1 shows responses to the 11 oral health knowledge questions by self-perceived and by clinical oral malodor status. Mean total knowledge scores of the summited questions were: 5.86±1.81 in subjects with self-perceived oral malodor, and 6.09±1.63 in those who did not think they had malodor. In contrast the mean knowledge scores were 5.86±1.88 in subjects with clinical oral malodor, and 6.05±1.64 in those without. No significant differences in mean scores were found between any of the oral malodor conditions. Similarly, there were no significant distributional differences in oral health knowledge by oral malodor status except the question; "Oral malodor is related with tongue coating". Subjects without clinical oral malodor were more likely to choose the correct answer than those with clinical oral malodor ($p<0.05$).

Regarding oral health behaviors, 94.5% of the subjects claimed that they brushed their teeth regularly (Table 2). On the other hand, only 25.5% brushed their tongue every day. About 10% did not use toothpaste when brushed their teeth, and more than 80% did not use a mouth rinse. The proportion of subjects who had the habit of betel quid chewing or smoking tobacco was 20%. With respect to self-perceived oral malodor, the proportion of use of mouth rinse was significantly lower in subjects who believed they had oral malodor than those without ($p<0.05$). In contrast, the proportion of perceived

malodor was higher in the chewing betel quid or smoking. The percentages of tongue cleaning habit (every day and sometimes), and the use of toothpaste were significantly lower in subjects with clinical oral malodor than those without ($p<0.05$).

There was no significant difference in the mean VSCs between subjects with self-perceived oral malodor (205.3±65.6 ppb) and those without (196.7±74.0 ppb) (Table 3). The mean VSCs in subjects with clinical oral malodor (286.4±40.1 ppb) was significantly higher than in those without (172.9±49.6 ppb) ($p<0.001$). No significant differences were found in dentition, periodontal status, saliva and tongue coating by self-perceived oral malodor status. For clinical oral malodor, significant differences were observed in tongue coating index ($p<0.01$). Subjects with clinical oral malodor had a significantly larger areas of tongue coating (1.14±0.63) than those without (0.63±0.79) ($p<0.05$). Similarly, thickness of tongue coating was significantly greater in subjects with clinical oral malodor (1.14±0.54) than those without (0.59±0.74) ($p<0.05$). In color of tongue coating, a significant difference between two groups was also detected ($p<0.05$).

Table 1 Oral health knowledge by oral malodor status

Knowledge Questions	Proportion of Correct Answers					
	Self-Perceived Oral Malodor		P-Value	Clinical Oral Malodor		P-Value
	(+) N (%)	(-) N (%)		(+) N (%)	(-) N (%)	
Tooth decay is preventable	15 (68.2)	26 (78.8)	0.58	9 (64.3)	32 (78.0)	0.31
Gum bleeding is a sign of gingivitis	12 (54.5)	10 (30.3)	0.31	8 (57.1)	14 (34.1)	0.21
Gingivitis is preventable	7 (31.8)	11 (33.3)	0.18	2 (14.3)	16 (39.0)	0.11
Plaque is the soft deposit of food on the teeth	9 (40.9)	13 (39.4)	0.2	6 (42.9)	16 (39.0)	1
Caries is the main reason for tooth loss in children	16 (72.7)	26 (78.8)	0.77	11 (78.6)	31 (75.6)	1
Deciduous teeth are important	18 (81.8)	29 (87.9)	0.62	13 (92.9)	34 (82.9)	0.66
Fluoride is effective against caries	8 (36.4)	20 (60.6)	0.08	9 (64.3)	19 (46.3)	0.36
Oral health is related with general health	17 (77.3)	18 (54.5)	0.09	9 (64.3)	26 (63.4)	1
Oral malodor is related with dental caries	10 (45.5)	12 (36.4)	0.5	5 (35.7)	17 (41.5)	0.76
Oral malodor is related with periodontal diseases	10 (45.5)	14 (42.4)	0.82	6 (42.9)	18 (43.9)	1
Oral malodor is related with tongue coating	8 (36.4)	14 (42.4)	0.65	2 (14.3)	20 (48.8)	0.03

Table 2 Oral health behaviors by oral malodor status

Variables	Categories	Self-Perceived Oral Malodor		p-Value	Clinical Oral Malodor		p-Value
		(+) N (%)	(-) N (%)		(+) N (%)	(-) N (%)	
Tooth brushing	Everyday	20 (90.9)	32 (97.0)	0.34	13 (92.9)	39 (95.1)	0.75
	Sometimes	2 (9.1)	1 (3.0)		1 (7.1)	2 (4.9)	
Tongue cleaning	Everyday	7 (31.8)	7 (21.2)	0.14	4 (28.6)	10 (24.4)	0.02
	Sometimes	8 (36.4)	8 (24.2)		0 (-)	16 (39.0)	
	Do not brush	7 (31.8)	18 (54.5)		10 (71.4)	15 (36.6)	
Use of toothbrush and toothpaste	Present	20 (90.9)	29 (87.9)	0.73	10 (71.4)	39 (95.1)	0.01
	Absent	2 (9.1)	4 (12.1)		4 (28.6)	2 (4.9)	
Mouth rinsing	Everyday	0 (-)	1 (3.0)	0.04	0 (-)	1 (2.4)	0.72
	Sometimes	1 (4.5)	8 (24.2)		3 (21.4)	6 (14.6)	
	Never	21 (95.5)	24 (72.7)		11 (78.6)	34 (82.9)	

Table Continued...

Variables	Categories	Self-Perceived Oral Malodor (+) N (%)	Self-Perceived Oral Malodor (-) N (%)	p-Value	Clinical Oral Malodor (+) N (%)	Clinical Oral Malodor (-) N (%)	p-Value
Chewing betel quid or smoking	Chewing betel quid	2 (9.1)	3 (9.1)	0.03	1 (7.1)	4 (9.8)	0.9
	Smoking tobacco	3 (13.6)	2 (6.1)		1 (7.1)	4 (9.8)	
	Use of both betel quid and tobacco	1 (4.5)	0 (-)		0 (-)	1 (2.4)	
	None of them	16 (72.7)	28 (84.8)		12 (85.7)	32 (78.0)	

Table 3 Oral health status by oral malodor status

Variables	Self-Perceived Oral Malodor (+) (n= 22) Mean	±SD	(-) (n= 22) Mean	±SD	P-Value	Clinical Oral Malodor (+) (n= 14) Mean	±SD	(-) (n = 41) Mean	±SD	P-Value
VSCs (ppb)	205.3	±65.6	196.7	±74.0	0.67	286.4	±40.1	172.9	±49.6	<0.001
Present teeth	24.73	±6.70	24.91	±5.34	0.91	23.64	±8.05	25.24	±5.18	0.39
Decay teeth	3.23	±3.74	1.91	±2.04	0.1	3.14	±3.08	2.2	±2.81	0.29
Filled teeth	0.5	±0.96	1.15	±2.09	0.18	1.07	±2.53	0.83	±1.43	0.66
Total FTUs	8.68	±3.62	8.42	±3.08	0.78	8.86	±3.42	8.41	±3.26	0.67
Number of teeth with bleeding	2.18	±2.74	2.88	±4.08	0.49	3.93	±4.37	2.15	±3.22	0.11
Number of teeth with calculus	16.95	±8.88	15.67	±6.90	0.55	19.21	±8.73	15.15	±7.14	0.09
Number of teeth with periodontal pocket	1.05	±1.73	0.64	±1.25	0.31	1	±1.47	0.73	±1.47	0.56
Saliva flow (mL/min)	0.2	±0.10	0.22	±0.12	0.34	0.19	±0.08	0.22	±0.12	0.5
Saliva pH	6.68	±0.36	6.7	±0.39	0.88	6.6	±0.36	6.72	±0.38	0.38
Number of teeth with plaque	21.77	±7.78	20.36	±7.57	0.51	21.07	±7.31	20.88	±7.80	0.94
Area of tongue coating	0.82	±0.85	0.82	±0.81	1	1.36	±0.63	0.63	±0.79	<0.01
Thickness of tongue coating	0.64	±0.66	0.79	±0.78	0.46	1.14	±0.54	0.59	±0.74	<0.05
Color of tongue coating	0.59	±0.67	0.7	±0.68	0.57	1	±0.55	0.54	±0.67	<0.05

Discussion

No data regarding the prevalence of oral malodor among dental patients has been reported previously in Myanmar. This is the first study to evaluate the prevalence of clinical, and perceived oral malodor in Myanmar dental patients. The research was conducted in a government teaching hospital and patients who came to this hospital were not of high socio-economic status. Most patients had finished their education at secondary or high school level and only 20% had a higher education background. In this study, 40% of the subjects thought they had oral malodor, however, only one fourth of the subjects had clinically measured oral malodor. This finding is the same as a previous study that self-perceived oral malodor status was not consistent with clinical oral malodor status.[16]

The response to the oral health knowledge question "oral malodor is related with tongue coating" showed a significant difference between patients with clinical oral malodor and those without. The patients having clinical oral malodor had a lower proportion of correct answers (14%) and is in line with the clinical finding of tongue coating in those with clinical oral malodor. Tongue coating condition was poorer in patients with clinical oral malodor than those without.

Most participants (94.5%) claimed to have brushed their teeth every day, and only 3 patients did not brush their teeth regularly. This percentage of brushing is nearly the same as that in the general Myanmar population.[20] However, oral hygiene status in the study sample was poor, with a lot of calculus and plaque deposits. A previous study conducted in University of Dental Medicine, Yangon, found that about 80% of the patients had various degrees of gingivitis.[21] In this study population, most patients had gingivitis but not periodontitis. Very limited numbers of teeth had periodontal pockets more than 3mm. These findings suggest that provide information to patients on how to take care of periodontal health by systematic tooth brushing

including length, frequency and choice of products to patients for preventing the progress of periodontal diseases.

About 11% of patients did not use toothpaste when tooth brushing. Use of toothbrush with toothpaste for tooth brushing decreases the risk of clinical oral malodor. Therefore, the use of toothpaste, especially fluoridated toothpaste, should be recommended for not only dental caries prevention but also oral malodor improvement. Only a quarter of the subjects practiced regular tongue cleaning and this number is lower as compared with that of a previous study conducted in general Myanmar population.[20] Clinical oral malodor was closely associated with the tongue coating condition. Many studies showed wider and thicker tongue coating increased the risk of oral malodor.[3,13,18,22–24] Therefore, the absence of tongue cleaning would deteriorate oral malodor in dental patients. The use of mouthwash is proved to be one of the measures to decrease the clinical oral malodor. Since subjects without self-perceived oral malodor used more mouthwash than those with, use of mouthwash might give them more confidence in their oral breath. However, mouthwash is not popular in Myanmar and people usually do not use it. Thus, oral health information should include not only dental caries and periodontal disease prevention, but also proper self-care methods of oral malodor. It is a dental professionals' role to propose appropriate materials for oral malodor management and to encourage cleaning the tongue as part of the daily oral hygiene practice.

About 20% of the subjects had betel quid chewing or smoking tobacco habit. This percentage agrees to the finding of the previous study in general Myanmar population.[21] In this study, subjects with self-perceived oral malodor were more likely to chew betel quid or smoke. Betel quid chewing or smoking habits might be the reason for self-perceived oral malodor. In Myanmar, chewing betel quid with tobacco is popular among adult population. The number of people diagnosed as precancerous lesion has been increasing. The health education to oral cancer prevention besides oral malodor is also important in Myanmar.

There are some limitations in this study. Clinical oral malodor examination was conducted at a convenient time to patients, therefore the time of last eating or oral hygiene varied depending on the patients. Further, the sample size was too small to represent dental patients in Myanmar. Nonetheless, this study could add new information to oral malodor investigation in Myanmar dental patients and be useful for oral malodor research in general Myanmar population.

Conclusion

Self-perceived oral malodor did not correspond to clinical oral malodor, and different factors were associated with self-perceived and clinical oral malodor. Oral health behaviors such as betel quid chewing, smoking and use of mouthwash were related with self-perceived oral malodor while oral malodor knowledge, oral hygiene practice and tongue coating status were linked with clinical oral malodor. This study would give useful information about the prevalence of oral malodor and related factors in dental patients, and it could be used as a reference for further oral malodor research in general population.

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Conflicts of interest

The author declares there is no conflicts of interest.

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