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Evaluation of halitosis using Halitosis Associated Life Quality Test questionnaire and the Etiquette checker device

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Original Article

Abstract

BACKGROUND AND AIM: Halitosis is an unpleasant disorder and a common phenomenon in people. The study aim was evaluation of halitosis using Halitosis Associated Life Quality Test questionnaires (HALT) and the Etiquette checker device.

METHODS: The questionnaires were given to 345 individuals who referred to the Kerman Dental School and dental clinics, Kerman, Iran. At the same time, their halitosis was evaluated by Etiquette checker device. T-test analysis, chi-squared, one way analysis of variance, Fisher's exact test and SPSS were used.

RESULTS: The prevalence of halitosis was 54%. The analysis of the collected data showed that halitosis in women was more than men (P = 0.86), this disorder was more in individuals older than 35 in comparison with younger people (P = 0.01). This study showed that a significant relationship existed between the HALT score and the Etiquette score.

CONCLUSION: There was a significant relation between self-estimated halitosis and higher Etiquette score, therefore HALT questionnaire can be a valid device for evaluating the life quality especially for halitosis.

KEYWORDS: Halitosis; Questionnaire; Life; Quality

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Bad breath, also called halitosis in medical terminology, and oral malodor is an unpleasant disorder that most of the people try to avoid. Halitosis is an unpleasant smell that with expiration comes out through the mouth or nose.[1,2] The principles of biochemistry and the pathogenesis of halitosis were determined by Tonzetich.[2]

The epidemiological research about halitosis must be continued because it is still an important yet underrated taboo. The differences in racial and cultural recognized of smell for patients and researchers cause the lack of scientific data. Halitosis prevalence has a wide range in the world, about 50% in the USA and between 6% to 23% in China.[3-7] Halitosis is a multi-factorial disorder that is divided to genuine halitosis, halitophobia and, pseudo-halitosis.[4,5] Dentists estimate that only 25% have real halitosis and the other 75% have halitophobia.[8,9] The aim of this study was to evaluate halitosis using Halitosis Associated Life Quality Test (HALT) questionnaire and Etiquette checker device.

Methods

This study was descriptive-analytic and cross-sectional. First, based on defined standard procedures of methodology, the HALT questionnaire was translated. Accordingly, first two bilingual translators

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translated the texts separately and faithfully into Persian so that it met English grammatical and vocabulary standards and also the intentions of the source texts. For cases where preserving a literal translation of the source text disrupted the meaning of a questionnaire item, conceptual translation was used. Then, two bilingual individuals who were blind to the English questionnaire were asked to back translate the Persian questionnaire into English. Next, the final texts were compared with the source text and if there were any inconsistencies, we referred to the translators to discuss the matter and agree upon a more accurate translation. The Persian questionnaire were then finalized.[10]

The validity of this study was determined using the content validity index before data collection. In order to achieve validity, the questionnaire was submitted to 6 specialists in Kerman Dental School, Kerman, Iran, who were asked to give their opinion on the questions based on the options perfect, good, no idea, poor and very poor. After collecting and evaluating the comments, discussions were held about the questions and the comprehensibility of the questions. Based on dentists' views and review of the literature, the validity of the questionnaire was satisfactory. Validity of the questionnaire was 79% and validity of the questions ranged from 77% to 89%. Reliability coefficients were determined by submitting the questionnaire to 10 patients within an interval of 10 days. The patients were asked to respond to questions. Reliability coefficient was determined using Cronbach's alpha (α = 0.70), which proved satisfactory.

HALT questionnaire has several advantages including a simple scale making it easy and quick to use. The summation of this questionnaire can be in percentage so it could be easier to grade and quicker to understand the patients status for both the practitioner and the patient. This tool is easy to read as well as to fill out.[11] This questionnaire consists of 18 statements, to which the respondents indicate their level of agreement on a 5-point scale regarding how they feel at a given moment (1 = never, 2 = rarely, 3 = sometime, 4 = often, 5= always). The potential scores range from 18 to 90, with high scores representing high levels of halitosis associated life quality. Next, the questionnaire was distributed among 345 individuals who were patients and those who were with them, who had referred to the dentistry department or dentistry clinics throughout Kerman. Before conducting the examination, willing participants were asked to fill in questionnaire that held their agreement to the terms of the present study both written and orally (k: 214/92).

The inclusion criteria was age 18 years and above. The participants were not allowed to use deodorants or alcohol one week before performing the examination. Also, 24 hours before performing the exam the patients were not allowed to eat or drink anything that held essence, garlic, or onions in it, 2 hours before the examination the patients were asked to avoid eating and drinking anything but water, and also they were asked to not use scented cosmetics. Patients could be brush their teeth regularly.

The participants were examined during 8 AM until 12 PM and their halitosis was measured by the Etiquette system [Topland Etiquette Checker, Size:110 × 30 × 18 mm, weight: 52 g, material: ABS plastic, power: AAA battery × 2 (included), Sasli Boor Factory, Tokyo, Japan] (Figure 1) and the results were marked from 1 to 6 indicating: 1 = without halitosis, 2 = very mild halitosis, 3 = mild halitosis, 4 = moderate halitosis, 5 = intensive halitosis, 6 = severe halitosis.

Figure 1. Etiquette Topland Co., Japan

T-test analysis, chi-squared, one way analysis of variance, and Fisher's exact test were used. SPSS for Windows (version 21, IBM Corporation, Armonk, NY) was used to analyze the data. Values of $P < 0.05$ were considered significant.

Results

Among the 345 participants of the study, 210 (50.8%) were female, and 135 (39.2%) were male. The mean age of the patients was 35.23 ± 8.50 (Table 1).

Table 1. Demographic data of participants

Variables	n (%)
Gender	
Male	135 (39.2)
Female	210 (50.8)
Age (year)	
≤ 20	25 (7.2)
21-30	25 (7.2)
31-40	128 (37.1)
40-50	89 (25.8)
51-62	78 (22.7)
Smoking	
Yes	41 (12.0)
No	304 (88.0)
Brushing	
Yes	317 (92.0)
No	20 (6.0)
Dental floss	
Yes	113 (33.0)
No	225 (65.0)

According to their own statement, 186 participants (54.0%) suffered from halitosis (94 women and 92 men). Among 49 healthy individuals, nine (18.4%) reported having a problem with halitosis ($P < 0.001$) (Table 2).

Halitosis was observed to be more in women than in men ($P = 0.860$); and in the participants who were above 35 years of age ($P = 0.010$) in comparison to the younger participants (Figure 2); and in the smokers ($P = 0.001$). Participants who used dental floss and those who brushed their teeth at least once per day had less halitosis than those who did not brush or brushed on an irregular basis. ($P = 0.010$ and $P = 0.030$ respectively).

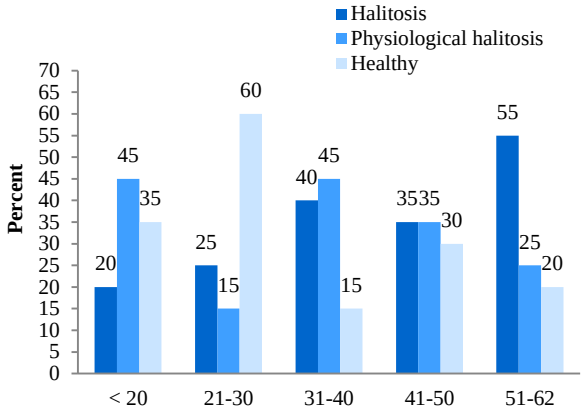

Figure 2. Distribution of respondents by clinical diagnosis and age groups

Halitosis = average level of Etiquette checker device was ≥ 4; Physiological halitosis = average level of Etiquette checker device was > 1 and < 4; Healthy = level of Etiquette checker device was ≤ 1.

Halitosis and its acuteness were measured by Etiquette checker device and the results are demonstrated in table 3. The results show that 24.0% of individuals, who according to their own statements did not have bad breath, gained a score higher or equal to 3 with the Etiquette checker.

Table 2. Self-evaluation of respondent's bad breath

Do you have problem with bad breath?					
Patients' answers*					
Clinical diagnosis	Yes, often n (%)	Yes, sometimes n (%)	No, rarely n (%)	No, never n (%)	Total n (%)
Halitosis	70 (37.6)	100 (56.2)	10 (5.6)	6 (0.6)	186 (100)
Physiological halitosis	5 (4.5)	30 (27.3)	50 (45.5)	25 (22.5)	110 (100)
Healthy	4 (8.2)	5 (10.2)	10 (20.4)	30 (61.2)	49 (100)
Total	79 (22.9)	135 (39.1)	70 (20.3)	61 (17.7)	345 (100)

*Chi-square test = 95.25, P = 0.001

Halitosis = average level of Etiquette checker device was ≥ 5; Non-physiological halitosis = average level of Etiquette checker device was ≥ 4; Physiological halitosis = average level of Etiquette checker device was > 1 and < 4; Healthy = level of Etiquette checker device was ≤ 1.

Table 3. Halitosis status in the participants using Etiquette device

Etiquette degree	Halitosis, according to the person opinion		
	Yes	No	Total
	n (%)	n (%)	n (%)
One	10 (5.38)	100 (62.90)	110 (31.88)
Two	12 (6.45)	21 (13.21)	33 (9.57)
Three	85 (45.70)	20 (12.58)	105 (30.44)
Four	47 (25.27)	8 (5.03)	55 (15.94)
Five	10 (5.38)	5 (3.14)	15 (4.35)
Six	22 (11.83)	5 (3.14)	27 (7.83)
Total	186 (100)	159 (100)	345 (100)

The average score gained by the participants was 58.5 ± 2.5 (men 52.3 ± 3.6 and women 58.7 ± 1.9). The highest average was for items 4 and 5 and the lowest was for items 2 and 3 (Table 4). This study showed a significant relationship between the HALT test score and the score given by the Etiquette checker. On each scale level, the mean HALT scores and standard deviations were calculated (Table 3). The mean HALT scores were significantly associated with the scales of Etiquette checker test (F = 125, P = 0.001; r = 0.96, P = 0.001) (Table 5). This study showed that the sensitivity and specificity of this questionnaire were 92.8% and 85.1% respectively.

Discussion

The Etiquette checker is a small portable device that its specify and sensitivity was approved by Kakoei et al.[12] These authors showed that Etiquette checker had acceptable sensitivity and specificity for detection of oral malodor and, this device could be used in future epidemiologic studies. In addition, Brunner et al.[6] estimated the correlation between organoleptic method and the devices used for measuring halitosis such as Halitox, Fresh Kiss, and Halimeter in 2010. The result showed that the measures from Halimeter and Halitox had a high correlation with organoleptic method.[6]

This study showed that 54% of the individuals suffered from self-reported halitosis. In a study by Talebi Ardakani et al.[13] halitosis prevalence was 27.8% that was compatible with other studies.[14,5]

Table 4. Relative and absolute frequency of the answers to the Halitosis Associated Life Quality Test (HALT) questions in participants

Question	Always n (%)	Often n (%)	Sometime n (%)	Rarely n (%)	Never n (%)
Mouth breathing	15 (4.35)	10 (2.90)	28 (8.12)	120 (34.78)	172 (15)
Recurrent infection of the tonsils	10 (2.90)	10 (2.90)	10 (2.90)	300 (86.96)	15 (10)
Frequent sinus infections	25 (7.25)	30 (8.70)	15 (4.35)	200 (57.97)	75 (25)
Worried about bad breath	45 (13.04)	55 (15.94)	10 (2.90)	205 (59.46)	30 (45)
Anxiety because of bad breath	55 (15.94)	40 (11.59)	25 (7.25)	100 (28.99)	125 (55)
Difficulty in chewing or limiting certain foods because of bad breath	35 (10.14)	25 (7.25)	20 (5.80)	120 (34.78)	145 (35)
Change in the taste of food and beverages due to bad breath	28 (8.12)	15 (4.35)	10 (2.90)	124 (35.94)	168 (28)
Difficulty speaking (or covering the mouth) because of bad breath	30 (8.70)	12 (3.48)	10 (2.90)	210 (60.87)	83 (30)
Affecting the appearance because of halitosis	22 (6.41)	12 (3.48)	15 (4.35)	280 (81.16)	16 (22)
Depression and isolation because of bad breath	10 (2.90)	10 (2.90)	17 (4.93)	300 (86.96)	8 (10)
Trouble concentrating because of bad breath	12 (3.48)	15 (4.35)	21 (6.09)	290 (84.06)	7 (12)
Embarrassment for halitosis	12 (3.48)	10 (2.90)	12 (3.48)	300 (86.96)	11 (12)
Loss of time (waste of time) to halitosis	25 (7.25)	10 (2.90)	15 (4.35)	280 (81.16)	15 (25)
Speaking from a distance because of bad breath	10 (2.90)	20 (5.80)	35 (10.14)	250 (72.46)	30 (10)
Not wanting to go out because of halitosis	10 (2.90)	10 (2.90)	25 (7.25)	300 (86.96)	0 (10)
Communication problems due to bad breath	5 (1.45)	5 (1.45)	20 (5.80)	250 (72.46)	65 (5)
The pain of losing money because of bad breath	10 (2.90)	10 (2.90)	25 (7.25)	200 (57.97)	100 (10)
Suffering due to loss of a social character/job because of bad breath	10 (2.90)	5 (1.45)	25 (7.25)	100 (28.99)	205 (10)

Table 5. The correlation between mean scores of Halitosis Associated Life Quality Test (HALT) questionnaire and evaluation of Etiquette device test (n = 345)

Etiquette degree	n (%)	Scores of HALT (mean ± SD)
1	110 (31.9)	11.35 ± 21.07
2	33 (9.6)	15.50 ± 28.28
3	105 (30.4)	14.45 ± 38.90
4	55 (15.9)	12.45 ± 54.25
5	15 (4.4)	11.45 ± 67.20
6	27 (7.8)	12.90 ± 65.12

F = 125, P = 0.001, Correlation coefficient (r) = 0.96, P = 0.001
HALT: Halitosis Associated Life Quality Test; SD: Standard deviation

Whereas Setia et al.[15] reported halitosis prevalence 45.0% in dentistry students. Studies done in Japan[16], America[17], France[18,19] showed similar percentages (42%, 45%, 41% and 41% respectively). The difference between the prevalence of self-perceived halitosis could be influenced by the age of the study group, difference in the expression of halitosis (in some of the cultures even a bit of smell could be known as halitosis), and the studied population.

Halitosis in women was more than men that is compatible with others studies.[13,16,12,20-24] Also, this disorder was more in individuals older than 35 years, and was also more in smokers than nonsmokers. Talebi Ardakani et al.[13] showed that there was no significant difference between halitosis and sex and increase in age. This was in contrast to results from Iwakura et al. study.[25]

In studies by Setia et al.[15], Almas et al.[4], Al-Atrooshi and Al-Rawi[3], incidence of halitosis in girls was reported lower than boys. These researchers showed that the prevalence of halitosis in smokers was more than nonsmokers that is in line with our study, and Tohidast Ekrad and Ghasemzadeh[14] showed aging increased halitosis. Nalcaci and Sonmez[26] reported that age was a considerable factor in the amount of volatile sulfur compounds (VSC). The increase in halitosis prevalence with aging could be due to less attention to oral hygiene, influence of systemic disease, taking multiple drugs that decreases saliva secretion and causes salivary gland atrophy, and increased xerostomia with aging.

In this study, it was shown that the individuals who used dental floss and those who brushed at least once a day, had more halitosis in comparison with the individuals who did not floss or brushed lesser, that is compatible with other studies.[2,7,13-15,27] In research done by Kakoei et al.[12], halitosis was higher in individuals who did not floss and brush their teeth compared to those who brushed and flossed, but this difference was not significant.

This study showed that the sensitivity of the present questionnaire was 92.8 and the qualification was 85.1% and it seems that the above mentioned questionnaire could be used as a screen for self-evaluation of halitosis in the individuals.

Iwanicka-Grzegorek et al.[28] conducted a study on halitosis. They distributed a questionnaire to ask the individuals' own personal opinion about halitosis and simultaneously each participant's halitosis was evaluated by a Halimeter and by using organoleptic procedure. The results showed that a significant relationship existed between the organoleptic procedure to recognize halitosis and the VSC level which was measured by a Halimeter.

The relation between the score achieved from HALT questionnaire and the procedure used by the Etiquette device has been evaluated for the first time in this study. The average score of the participants 58.5 ± 2.8. The highest average was for questions 4 (worried about bad breath) and 5 (anxiety because of bad breath), and the lowest average was for questions 2 (recurrent infection of the tonsils) and 3 (frequent sinus infections).

The results showed that there was a significant relation between HALT score and Etiquette score. The individuals with higher HALT score had a higher Etiquette score and stronger halitosis that is compatible with the Kizhner et al.[29] study.

Conclusion

This study showed that HALT questionnaire can be a valid device for evaluating the quality of life especially for halitosis.

Limitations

1. Small sample size
2. Checking of questionnaire with others tools such as organoleptic, gas chromatography.

Conflict of Interests

Authors have no conflict of interest.

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