Validation of organoleptics and instrumental measurement for halitosis among patient with malodour

Abstract

Objective: Assess the severity/levels of halitosis among the patient with malodor by using organoleptic technique and to compare the halitosis by organoleptics measurement and halitosis instrument/bad breath tester (Tanita©).

Materials and methods: A total 320 study population was considered for study and the age ranged from 20-60 years. Halitosis is measured by organoleptic method by two different examiner and also used halitosis instrument/bad breath tester (Tanita©) with scoring criteria. For data collection preformed, closed ended Questionnaire was used...Statistical analyses were used: chi square test.

Result: Out of 320, 29 (0.09%) subjets was recorded with no halitosis. While comparing of data of organoleptic method and instrument/bad breath tester (Tanita©) sensitivity and specificity are 41.1% and 53.3 % respectively.ROC curve is 0.473

Conclusion: The organoleptic method is more effective as compared halitosis instrument for detection of halitosis.

Keywords: halitosis, organoleptic method, halitosis instrument(Tanita)

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Ashwini Dayma,[1] Manish Jain,[2] Vrinda Saxena,[3] Nilesh Torwane,[4] Vineesh Vishnu,[5] Anshika Khare[6]

[1]Department of Community & Preventive Dentistry, UCMS college of Dental Surgery, Nepal
[2]Department of Community & Preventive Dentistry, SMBT Dental College, India
[3]Department of Community & Preventive Dentistry, Govt. Dental College, India
[4]Department of Community & Preventive Dentistry, Saraswati Dhanwantri Dental College, India
[5]Department of Community & Preventive Dentistry, Peoples Dental Acadmey, India
[6]Department of Community & Preventive Dentistry, Peoples College of Dental Science, India

Correspondence: Ashwini Dayma, Department of Community & Preventive Dentistry, UCMS College of Dental Surgery, Nepal, Email ashwinidayma@gmail.com

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Introduction

India, sixth biggest country by area is the second most populous country. Factors contributing to the steady rise in prevalence of oral disease due to poor oral health awareness. Annual health budget is 2% of Gross National Product but no specific budget is earmarked for oral health.[1]

Oral Diseases are a major public health concern owing to their higher prevalence and their effects on the individual's quality of life.[2] According to the World Health Organization (WHO), "Promotion of oral health is a cost-effective strategy to reduce the burden of oral disease and maintain oral health and quality of life."[3]

A large ratio of these diseases can be prevented at individual and community levels by providing oral health-related education; thus, improving the oral health attitude and practices among the general population.[4] For example; proper brushing is essential for cleaning teeth and gums effectively. Preventive dental care is almost nonexistent in the rural areas and very limited in the urban areas of India.[5]

Oral malodour (also known as bad breath, halitosis, fetor ex ore) usually originates when the halitosis emitted through the mouth combines with malodourous compounds originating in the oral cavity. So many reasons behind halitosis bad breath can be caused by following

1. Poor dental hygiene — Infrequent or improper brushing and flossing, allows bits of food that are stuck between the teeth to decay inside the mouth. Poor oral hygiene eventually will lead to periodontal (gum) disease, which also can cause bad breath.

2. Infections in the mouth — these can be caused by either a cavity in a tooth or by periodontal (gum) disease.

3. Respiratory tract infections — Throat, sinus or lung infections.

4. External source — Garlic, onions, coffee, cigarette smoking, and chewing tobacco. Smoking and drinking coffee, tea and/or red wine will contribute to your teeth becoming discoloured.

5. Dry mouth (xerostomia) — this can be caused by salivary gland problems, medicines or "mouth breathing." A large number of prescriptions and over the counter medicines cause dry mouth.

6. Illnesses — Diabetes, liver disease, kidney disease, lung disease, sinus disease, reflux disease and others.

7. Psychiatric illness— some people may believe they have bad breath, but others do not notice it. This is referred to as "pseudohalitosis."

Bad breath has a significant impact on our daily social life to those who suffer from it. Oral malodour may rank only behind dental caries and periodontal disease as the cause of patient's visit to the dentist.[6] This malodour causing volatile sulphur compounds result from microbial fermentation of proteins, peptides and mucins found in saliva, blood, postnasal drip, gingival crevicular fluid, lysed neutrophils and desquamated epithelial cells.[7] Many studies have demonstrated that hydrogen sulphide (HS), methyl mercaptan (CH_2SH) and to a lesser extent, dimethyl sulphide (CH_3SCH) accounts 90% of the total volatile sulphur compounds (VSCs) found in the mouth air, suggesting that these volatile sulphur compounds are the chemicals responsible for halitosis.[8] In this present period of

evidence-based dentistry and oral health, foremost priority should be given to researches dealing to validate organoleptics and instrumental measurement of halitosis among patient with malodor.

Materials & methods

This was a descriptive cross sectional study which included 320 halitosis patients reporting in the satellite center of dept. of public health dentistry, peoples dental academy, Bhopal Examination was done for period of three months & age-group between 20-60 with the chief complain of bad breath.. Ethical clearance was obtained from the Institutional Ethical Committee. A written informed consent was obtained from the patients prior to the inclusion in the study. All the patients are included who were reporting to the department with the chief complain of malodour in six month time & excluded are Individuals with self-reporting systemic diseases affecting breath odor such as uremia, hepatic cirrhosis, diabetes mellitus (Type 1), and Sinusitis. Treatment with antibiotics in the past three weeks, and the consumption of onions or garlic in the past two days. On the day of the examination, the participants were told not to consume alcohol, nicotine, or products containing mint. Prior to measurement, each participant had to subjectively assess the intensity of his/her own oral odor. Double investigator was trained and calibrated for carrying out the investigations for the entire study duration. Training and calibration was done in the Department of Public Health Dentistry, People's Dental Academy, Bhopal. A total 10 patients were examined for the questionnaire validity and assessed of the halitosis.

A checklist of questions will be used to collect the preliminary information from all the eligible participants who have consented. The check list will be filled by the examiner himself in a face to face interview to ensure uniformity in data collection and to avoid misinterpretation of the questions. Halitosis will be measured by following two techniques.

1. Organoleptics method.

2. Bad Breather Tester (TANITA©).

The organoleptic test was conducted using a screen which concealed the judge from the individuals and a sterile glass tube (10cm in length and 2 cm in diameter), which was fitted into a hole in the screen. Each volunteer was requested to close his/her mouth for one to two minutes prior to sampling and place about 4 cm of the glass tube into his/her mouth, then slowly exhale his/her mouth breath through the glass tube. This step was repeated three times during each test. One judge at a time smelled the mouth odour of the individuals until all three judges had evaluated the subjects. Organoleptic scores were then recorded independently by each judge on an ordinal scale as follows:

0 -No malodor **1-**Slight malodour **2-**moderate oral malodour

3: Strong malodor (strong intensity of mouth odor with entirely unacceptable)

3. very strong oral maodor

The recording of malodour (halitosis) was done using a small hand held breath checking device, which detected the volatile sulphur compounds and hydrocarbon gases in mouth air. As the monitor number appear was turned on, it emitted a beep, odour levels were measured by one of the grading on the graphic display of the instrument. if 'E' appeared then it was considered a reading error and the procedure was repeated . The organoleptics analysis was used to

select the patient and it will be compared with the small poratable Sulphide monitor (TANITA© Breath Checker)

0 -No malodor **1-**Slight malodour **2-**moderate oral malodour

3: Strong malodor (strong intensity of mouth odor with entirely unacceptable)

4. very strong oral maodor

5. extremely strong

The data was entered onto a personal computer and statistical analysis was done using SPSS version 20 [IBM Pvt Ltd, Chicago, IL, USA] using the relevant statistical tests in consultation with a statistician. Chi-square test is used to compare the groups.

Result

The demographic distribution of study subjects according to age & gender. There were 320 patient reported , out of which maximum patient reported in the age group between 20-30 year & minimum reported in the age group of above 50 year . Highly Statistically significant result were found between age & gender (Table 1). The distribution of organoleptics score with gender which include no malodor, slight malodor, moderate malodor, severe malodor, strong malodor it shown significant result (Table 2). The distribution of oral hygiene practice with organoleptics score & halitosis score which include cleaning aid, material used & brushing technique with both the score. When compare with organoleptic score with score it shown statistically highly significant result in all aspects (Table 3).The sensitivity & specificity of organoleptics score with TANITA for the detection of the halitosis. Sensitivity & specificity was only 41.4% & 53.3% respectively in the measurement of halitosis. ROC Curve area is 0.473. Halitosis measurement by TANITA is not significantly associated with organoleptics score (P=0.634) (Table 5). The validity & reliability of organoleptics score & tanita. chronbach alpha was 0.24 and it shown moderate agreement (Table 6).

Table 1 Demographic distribution of study subject according to age & gender

Age Groups (Year)	Male	Female	Chi-square	p-value
20-30	87(60%)	58(40%)	17.733	0.001(HS)
31-40	33(43.4%)	43(56.6%)		
41-50	31(57.4%)	23(43.6%)		
More than 50	37(82.2%)	8(17.8%)		

Table 2 Distribution of organoleptics score with gender

Organoleptics score	Male	Female	Chi-square test	p-value
No Malodor	18(62.1%)	11(37.9%)	9.91	0.04(S)
Slight Malodor	17(81%)	4(19%)		
Moderate malodor	88(62.4%)	53(37.6%)		
Severe Malodor	45(53.6%)	39(46.4%)		
Strong Malodor	20(44.4%)	25(55.6%)		
Total	188(58.5%)	132(41.25%)		

Table 3 Distribution of the oral hygine practice with organoleptics score & halitosis score

		Organoleptic score					Score	
		No malodor	Slight malodor	Moderate malodor	Severe malodor	Strong malodor	Absent	present
Cleaning by	Toothbrush	29(14.5%)	14(7%)	80(40%)	45(22.5%)	32(15%)	29(14.5%)	171(85.5%)
	Finger	0(0%)	7(8.3%)	33(39.3%)	39(46.4%)	5(6%)	0(0%)	84(100%)
	Neemsticks	0(0%)	0(0%)	28(77.8%)	0(0%)	8(22.2%)	0(0%)	36(100%)
Chi-square test		60.41					19.13	
p-value		0.001(H.S)					0.001(H.S)	
Material used	Toothpaste	29(10.5%)	21(7.6%)	113(40.9%)	80(29%)	0(0%)	29(10.5%)	247(89.5%)
	Charcoal	0(0%)	0(0%)	0(0%)	4(50%)	0(0%)	0(0%)	8(100%)
	Brick	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
	Other	0(0%)	0(0%)	28(77.8%)	0(0%)	0(0%)	0(0%)	36(100%)
Chi-square test		43.27					5.084	
p-value		0.001(H.S)					0.07(S)	
Brushing	Once	20(16.7%)	8(6.7%)	36(30%)	39(32.5%)	17(14.2%)	20(16.7%)	100(83.3%)
	Twice	9(4.5%)	13(6.5%)	105(52.5%)	45(22.5%)	28(14%)	9(4.5%)	191(95.5%)
	After every meal	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
	Don't know	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Chi-square test		23.729					13.47	
p-value		0.001(H.S)					0.001(H.S)	

Table 4 Association of tanita & organoleptics score for halitosis detection

		Organoleptic score		Chi square test	p-value
		Halitosis Absent	Halitosis present		
Tanita Score	Halitosis Absent	27(15.7%)	145(84.3%)	7.36	0.007(H.S)
	Halitosis Present	9(6.1%)	139(93.9%)		

Table 5 Sensitivity & Specificity of organoleptics & tanita score for diagnosis of halitosis

		Organoleptic score		Sensitivity
		Present	Absent	
Tanita Score	Present	139	9	41.4%
	Absent	145	27	
Specificity		53.3%		

Table 6 Validity & Reliability of organoleptics score & tanita score in the measurement of halitosis

Tanita	Organoleptics score		
	Test		Inference
	Chronbach's alpha	0.24	Moderate agreement

Table 7 Distribution of halitosis patient with gender

	Mean ±S.D	Median	Mann Whitney 'U' test	P-value
Male	2.17 ± 1.05	2	2.739	**0.006**
Female	2.48 ± 1.09	2		

Discussion

The current cross sectional study, was conducted among halitosis patient to validate organoleptics score and instrumental measurement (i.e. TANITA) in Department of public health Dentistry, Peoples Dental Academy, Bhopal.

The human nose remains the "Gold Standard" in detecting oral halitosis. The most widely used scoring system for ranking halitosis is the Organoleptic Score popularized by Rosenberg & McCulloch.[9] The organoleptic measurement depends on a trained examiner that has demonstrated reliability in smelling halitosis. The study by **Haas et al.**[10] has demonstrated good levels of reproducibility of breath odor measurements, under a blind evaluation. The reason by which the organoleptic score has been the gold standard for breath measurements rely on the fact that the human nose is capable of smelling and defining as pleasant/unpleasant not only the VSC, but also other organic compounds that come from exhalation and are identified as unpleasant. Oral malodor seems to affect a large percentage of population and has multifactorial etiology (biological, dental, psychopathological). Velasco[11] in his study found sex distribution of 61% and 47% were female & male participants. In prsesnt study, Organoleptic intensity scale found self reported halitosis was 29.70%. Settineri et al.[12] found rate of self-reported halitosis was 19.39% and this revealed personal awareness of one's own bad breath.

Study conducted by the Rosenberg et al.,[9] Rosenberg et al.,[9] Rosenberg & McCulloch,[9] Rosenberg,[9] Seemann[17] noticed that Organoleptic oral odor assessments are often not reproducible, as they depend on the subjective judgement of the examiner. Similar type of result was obtained in present study. To avoid interexaminer differences, all measurements in the present study were conducted by the same dentist.

Filippi et al.[13] conducted a study to assess the halitosis in this study they were concluded that oraganoleptics score among male patient is 46.5% & were severe malodor. Similar type of result obtained in present study was 53.6% were malodor. Miyazaki et al.[14] conducted a study to asses halitosis in this study it was reveals that prevalence of moderate halitosis was 28% by using halimeter similar as compared to present study by using TANITA.

Loesche et al.[15] conducted a study to asses halitosis in this study it was reveals that prevalence of self perception was 31% & prevalence of halitosis informed by other 24%. Similarly, Bornstein et al.[16] reveals

that prevalence of organoleptic score was 11.5% type of present study was done by using organoleptics score the prevalence of halitosis was 89.45%

In present study organoleptic score with severe halitosis is maximum in male i.e 44.4% & female 55.6%. Similarly study done by Lovely et al.[17] reported that 20.9% were male & 3.57% were female had halitosis. In present study sensitivity & specificity of organoleptics score & TANITA was 41.4% & 53.3 % respectively. In contrast to study conducted by Maryam et al.[18] to assess oral malodor. The Sensitivity and specificity was 61.1% and 87.8% respectively. Which is greater as compared a to present study.

Conclusion

Halitosis is a common unpleasant situation that affects individual's life. Halitosis is a crippling social problem. Surprisingly, a problem of this magnitude has been neglected by dental professionals, even though the most common cause is related to microbiota of oral cavity. Several methods are available in the market for the measurement of halitosis but more than an objective assessment, halitosis is a subjective perception of people. Halitosis emerging from intraoral causes can be easily and effectively treated with the use of daily oral hygiene maintenance aids, but halitosis of extraoral origin needs to be explored further and hence treated as of utmost importance. Hence, although halitosis may be a sign or symptom not seemingly needing any immediate care, the wider implications that halitosis has warrants its treatment at a priority basis.

Conflicts of interest

Authors declare that there is no conflict of interest.

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