

6-22-2015

## Assessment of the knowledge of dentists about halitosis at two dental teaching hospitals in Khartoum city

Islam KHALIL

Khadiga HASSAN

Follow this and additional works at: <https://digitalcommons.aaru.edu.jo/iajd>

---

### Recommended Citation

KHALIL, Islam and HASSAN, Khadiga (2015) "Assessment of the knowledge of dentists about halitosis at two dental teaching hospitals in Khartoum city," *International Arab Journal of Dentistry*. Vol. 6: Iss. 2, Article 5.

Available at: <https://digitalcommons.aaru.edu.jo/iajd/vol6/iss2/5>

This Original Article is brought to you for free and open access by Arab Journals Platform. It has been accepted for inclusion in International Arab Journal of Dentistry by an authorized editor. The journal is hosted on [Digital Commons](#), an Elsevier platform. For more information, please contact [rakan@aar.edu.jo](mailto:rakan@aar.edu.jo), [marah@aar.edu.jo](mailto:marah@aar.edu.jo), [u.murad@aar.edu.jo](mailto:u.murad@aar.edu.jo).

# ASSESSMENT OF THE KNOWLEDGE OF DENTAL SURGEON ABOUT HALITOSIS FROM TWO DENTAL TEACHING HOSPITALS IN KHARTOUM CITY

Islam Khalil\* | Khadiga Hassan \*\* | Eman Ahmed Kheir\*\*\*

## Abstract

The present study is a descriptive cross-sectional study that was conducted to assess the level of knowledge about halitosis among dental surgeons in Khartoum city.

One hundred and six dental surgeons were randomly selected from two dental teaching hospitals: Khartoum Dental Teaching Hospital and Ribat Teaching Hospital in Khartoum city. A fully structured, close ended questionnaire was used. Data collected was assembled and analyzed using the SPSS statistical software.

Most of the respondents were general practitioners. The knowledge about the causes and diagnosis of halitosis was generally poor (81%). The awareness about the treatment was generally moderate (37%) and good (38%). No association was found between gender and the level of knowledge about halitosis ( $p > 0.05$ ). A significant association was noted between the level of qualification or the years of clinical experience and the knowledge about the causes and diagnosis of halitosis ( $p < 0.05$ ).

The study revealed that dentists lack adequate knowledge regarding causes and diagnosis of halitosis especially for those with lesser years of clinical experience. An increase in knowledge levels could be achieved by emphasizing on this subject during professional training.

Keywords: Halitosis -organoleptic tests - Khartoum city - oral malodour.

IAJD 2015;6(2):77-86.

# ÉVALUATION DE LA CONNAISSANCE SUR L'HALITOSE DE CHIRURGIENS DENTISTES DE DEUX HÔPITAUX D'ENSEIGNEMENT DENTAIRE DANS LA VILLE DE KHARTOUM

## Résumé

Cette étude transversale descriptive a été menée pour évaluer le niveau de connaissances sur l'halitose chez les chirurgiens-dentistes dans la ville de Khartoum.

Cent-six chirurgiens-dentistes ont été choisis au hasard dans deux hôpitaux d'enseignement de soins dentaires. Un questionnaire structuré « close ended » a été utilisé. Les données recueillies ont été assemblées et analysées en utilisant le logiciel statistique SPSS.

La plupart des répondants étaient des médecins généralistes. Les connaissances sur les causes et le diagnostic de l'halitose étaient généralement médiocres (81%). La prise de conscience au sujet du traitement était généralement modérée (37%) et bonne (38%). Aucune association n'a été trouvée entre le sexe et le niveau de connaissance de l'halitose ( $p > 0.05$ ). Une association significative a été observée entre le niveau de qualification ou les années d'expérience clinique et les connaissances sur les causes et le diagnostic de l'halitose ( $p < 0.05$ ).

L'étude a révélé que les dentistes manquaient de connaissances suffisantes à propos des causes et du diagnostic de l'halitose surtout pour ceux ayant peu d'années d'expérience clinique. Une amélioration du niveau de connaissance pourrait être atteinte en mettant l'accent sur ce sujet au cours de la formation professionnelle.

Mots-clés: halitose – test organoleptique – mauvaise haleine.

IAJD 2015;6(2):77-86.

\* Faculty of Dentistry,  
University of Medical Sciences  
and Technology, Sudan  
islam1189@hotmail.com

\*\* BDS, FDSRC ED.

\*\*\* BDS,  
Faculty of Dentistry, University of Khartoum.  
MSc in Oral Medicine and Periodontology,  
University of the Western Cape,  
Cape Town, Republic of South Africa

## Introduction

The term halitosis is derived from the Latin word “halitus” meaning breath and the Greek suffix “osis” meaning condition. Halitosis is defined as a noticeable unpleasant odor that emanates from the mouth which is objectionable to others [1]. Halitosis is estimated to be the third most frequent reason for seeking dental aid, after dental caries and periodontal disease. Over 50% of the population experiences it [2 - 4], half of these individuals experience a severe problem that creates personal discomfort and social embarrassment [2]. Moreover, halitosis also has a vast economical importance since people spend over 2 billion dollars per year buying halitosis masking products such as breath mints and other mouth fresheners [5].

Since most of breath problems are of oral origin, the dental office is the most logical place for patients to seek help. Hence, dentists are primarily responsible for adequate management. However, this is not possible if the adequate knowledge and communication skills are lacking [6]. Ineffective management leads to multiple visits to the dentists (doctor shopping), and eventually, withdrawal from society. In spite of this general public concerns and the devastating implications of halitosis, health professionals including dental professionals generally lack adequate knowledge on this condition.

Some bad breath, such as morning breath [7] and menstrual breath [4, 7-9] are considered physiological. Other forms of physiological bad breath include smoking [7], alcohol and certain foods such as garlic and onions [4, 7-9].

90% of bad breath originate in the oral cavity [11-14], are due to poor oral hygiene, gingivitis, periodontitis, tongue coating, faulty restoration and other oral factors. Research showed that the primary cause of halitosis is the presence of volatile sulfur compounds (VSCs) in the mouth [1, 15] or in exhaled air. VSCs, a product of degradation of proteins by oral microorganisms [1], include hydrogen sulphide (H<sub>2</sub>S) and

methylmercaptan [3, 16-18], dimethyl sulfide ((CH<sub>3</sub>)<sub>2</sub>S), dimethyl disulfide [4, 8, 16] and sulfur dioxide (SO<sub>2</sub>) [4]. These gases have variable odour intensity, methyl mercaptan being the most offensive [4, 10, 19, 20].

Bad breath can be diagnosed by three primary measurement methods: organoleptic measurement, gas chromatography [21, 22] and sulphide monitoring [23]. Additional or alternative measurement methods are BANA test, chemical sensors, salivary incubation test, quantifying b-galactosidase activity, ammonia monitoring, ninhydrin method, and polymerase chain reaction [22]. Organoleptic measurement consists of sniffing the patient's breath and scoring the level of oral malodour [3]. However, seeming primitive [22], it remains the most reliable, sensitive, and practical procedure for halitosis evaluation [23].

Successful treatment of halitosis depends on the accurate diagnosis of the type of halitosis. Treatment is classified into five approaches called treatment needs (TN), thus enabling precise sequential treatment procedure [1].

TN-1 is the basic treatment allocated for all types of halitosis. It includes meticulous oral hygiene instructions such as brushing, flossing, tongue cleaning, and mouth rinsing. TN-2 is exclusively cause-related therapy directed to control all possible intraoral malodour causes. TN-1 is recommended to patients diagnosed with genuine physiological halitosis, while patients with genuine pathological intra-oral halitosis are given TN-1 and TN-2. Patients with pathological extra-oral halitosis are given TN-1 and referred to the physician for TN-3 for management of the systemic causes of halitosis. TN-4 and TN-5 are special management lines for psychological halitosis [1, 9].

Treatment modalities include mechanical reduction of microorganisms and their nutrients through professional and personal oral hygiene procedure [4], chemical reduction of micro organisms by mouth washes, rinses and lozenges [15]. Oral odour

masking products such as mouth sprays, lozenges and chewing gums are also used [1].

The outcomes of the present study were:

- 1- To assess the knowledge about causes and diagnosis of halitosis.
- 2- To assess the knowledge about the treatment of halitosis.

## Materials and methods

Out of the three governmental dental teaching hospitals present in Khartoum City, 2 hospitals were randomly selected: Khartoum Dental Teaching Hospital and Ribat Teaching Hospital. The sample size was determined after obtaining the total number of dentists in these two hospitals from the Ministry of Health records, which gave a total of 235 dentists, 175 in Khartoum Teaching Hospital and 60 in Ribat Teaching Hospital.

The following equation was used for sample size calculation:

$$n = n^0 / 1 + (n^0 / N) \quad \text{where:}$$

$n$  → Final sample size;  
 $n^0$  → Initial sample size;  
 $N$  → Total population = 235.

$n^0 = (1.96)^2 * p * q / e^2$  where:  
 1.96 → The critical value for normal distribution using 95% confidence interval.

$P$  → Proportion of the population expected to be knowledgeable about halitosis = 0.15.

$q$  → Proportion of the population expected to be knowledgeable about halitosis = 0.85.

$e$  → Random error = 0.05.

$$n^0 = (1.96)^2 * 0.85 * 0.15 / (0.05)^2 \approx 195.8$$

$$n = 196 / 1 + (196 / 235) \approx 107.$$

Using the records of the Ministry of Health which gave a total of 175 dentists in Khartoum Teaching Hospital and 60 in Ribat Teaching Hospital (with proportion of 4:1). Hence, 80 dentists were selected from Khartoum Teaching Hospital and 26 from Ribat Teaching Hospital.

### Sampling strategy

Each of the two hospitals had five departments, each department had from 1 up to 6 clinics. The distribution and the collection of questionnaires were done in two separate days, a day for each hospital during the working hours (from 8 am to 2 pm). Dentists were approached at their respective clinics; questionnaires were distributed to the first 5-8 dentists encountered at each clinic. The study was explained and a verbal consent was obtained.

### Data management and analysis

A well structured, closed ended questionnaire (annexe) was utilized to assess the level of dentists' knowledge regarding halitosis. This questionnaire was designed by the principle investigator under supervision and consultation of a periodontist. It consisted of a total of 27 questions under three main sections divided as follows:

- Section 1: included eight demographical questions;
- Section 2: composed of fifteen questions regarding causes and diagnosis.
- Section 3: consisted of four questions about treatment options.

Knowledge was assessed using a specially designed score systems.

#### Scale 1

This scale was designed for section 2 in the questionnaire used to assess the knowledge of cause and diagnosis. Questions were further divided into:

- Basic questions: 9 questions (questions 9, 10, 11, 12, 13, 14, 15, 17, 19).
- Advanced questions: 5 questions (questions 16, 18, 21, 22, 23).
- Very advanced questions: 1 question (question 17).

Then a score was given ranging from poor to very good as explained below:

- Poor: If  $\leq 6$  of questions about basic information are answered correctly.
- Moderate: If  $\geq 7$  of questions about basic information and  $\leq 2$  of the questions about the advanced information are answered correctly.

	Gender		Total
	Male n=36	Female n=70	
Knowledge about causes and diagnosis of Halitosis			
Poor	22	55	0.164
Moderate	5	3	
Good	7	10	
Excellent	2	2	
Knowledge of the treatment			
Very Poor	2	4	0.240
Poor	7	14	
Moderate	12	27	
Good	15	25	

Table 1: Association between the level of knowledge and gender.

- Good: If  $\geq 7$  of questions about basic information and  $\geq 3$  of the questions about the advanced information are answered correctly.
- Very good: If  $\geq 7$  of questions about basic information,  $\geq 3$  of the questions about the advanced information, and the question about the very advanced information are answered correctly.

#### Scale 2

This scale was designed for section 3 in the questionnaire used to assess the knowledge of treatment. This section contains 4 questions (from 24 up to 27).

A score was given ranging from poor to very good as explained below:

- Poor: If only one question is answered correctly.
- Moderate: If two questions correctly are answered.
- Good: If three questions correctly are answered.
- Very good: If four questions are answered correctly.

Results attained were presented in frequency tables. Statistical analysis was done using SPSS statisti-

cal package version 16. Chi-square test was used since it gives effective results with binary exposures and ordinal outcomes [25]. A p-value of less than or equal to 0.05 was considered significant.

## Results

Socio-demographic characteristics of the 106 participants showed that 66% were females and 90% were below the age of 35 years. About 81% of the participants were bachelor degree holders, 19% had acquired post-graduation degrees and the majority (75%) had a clinical experience of 5 years or less.

Knowledge about the causes and diagnosis of halitosis were generally poor since approximately 73% had a very poor knowledge score. However, the level of knowledge about the treatment ranged from moderate to good on the scale: approximately 37% showed moderate knowledge and 38% good knowledge (Graph 1).

The level of knowledge about causes and diagnosis of halitosis as well as the level of knowledge of the treatment

	Years of practice		Total
	<=5 n=81	>=6 n=25	
Knowledge about causes and diagnosis of halitosis			
Poor	65	12	0.005
Moderate	6	2	
Good	8	9	
Excellent	2	2	
Knowledge of the treatment			
Very Poor	5	1	0.890
Poor	20	1	
Moderate	27	12	
Good	29	11	

Table 2: Association between the level of knowledge and the years of practice.

	Years of practice		Total
	Bachelor n=86	Post-graduate n=20	
knowledge about causes and diagnosis of Halitosis			
Poor	67	10	0.040
Moderate	6	2	
Good	10	7	
Excellent	3	1	
knowledge of the treatment			
Very Poor	5	1	0.229
Poor	20	1	
Moderate	31	8	
Good	30	10	

Table 3: Association between the level of knowledge and the level of education.

were not significantly associated with the gender ( $p>0.05$ ) (table 1).

The number of years of clinical experience was significantly associated with the level of knowledge of the causes and diagnosis of halitosis ( $p=0.005$ ). However, no significant association was found with the level of knowledge of the treatment ( $p=0.890$ ) (table 2).

A significant association was found between the level of qualification and

the knowledge level of the causes and diagnosis ( $p=0.040$ ), whereas no significant association was found with the knowledge for treatment ( $p=0.229$ ) (table 3).

## Discussion

Halitosis is an embarrassing change and with significant social impact, affecting millions of people around the world. Many resources are

invested in products to improve the breath, with minor success. Halitosis causes social restriction, decreases life quality and may be indicative of the presence of more severe diseases [24].

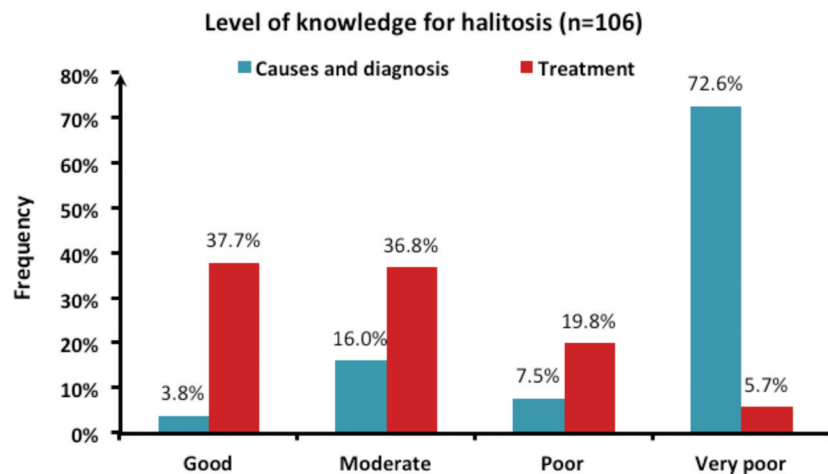
According to Greenman et al. [25], bad breath is one of the most common complaints reported by patients to dentists. In spite of the large magnitude of this problem, participants in the present study showed poor knowledge regarding the etiology

and diagnosis of halitosis, with 4% showing a very good knowledge, 16% showing good knowledge, almost 8% moderate knowledge and approximately 73% poor knowledge. This finding is consistent with the previous study done by Rayman and Almas [26] which concluded that in general, physicians and dentists are poorly informed about the causes and treatments of halitosis. It is also in agreement with a research done by Maleki et al. [27]. The high percentage of poor knowledge indicates that halitosis is poorly managed since diagnosis and proper treatment are highly dependent on the knowledge about the different etiologies.

Another interesting finding was the knowledge about the diagnostic tests of halitosis, precisely the organoleptic testing, 54% mentioned measuring volatile sulfur compounds, 29% correctly mentioned sniffing the patients breathe, 4% mentioned measuring the nitrous compound, and 13% mentioned measuring the phosphorus compounds. Furthermore when participants were asked about the most practical test to diagnose oral malodor nearly 9% chose chromatography, 46% correctly chose organoleptic, 10% chose sulfide monitoring and 34% chose breathe analyzer. These findings were quite similar to those obtained by Maleki et al. [27] in which 8.2% mentioned that gas chromatography is the best method to assess halitosis but 14.3% had chosen sulfide monitoring as one of the most practical methods. Knowledge about diagnosis is essential in determining the treatment procedure, and ultimately reduces the treatment costs.

The present study has shown a significant association regarding the relation between the knowledge of the causes and diagnosis of halitosis and the level of qualification. This could be explained by the fact that the further studies done by the post-graduated allowed them to acquire more knowledge about halitosis.

A significant association was also found between the knowledge of the



Graph 1: Frequency distribution of the respondents based on their knowledge of the causes and diagnosis and treatment of halitosis.

causes and diagnosis of halitosis and the years of clinical experience. This could be explained by the fact that individuals with more years in practice are likely to have managed more cases and thus attained more knowledge through experience. Moreover, they are likely to be more aware of the possible serious pathologies behind halitosis and its social and psychological consequences. Furthermore they are expected to have their own private clinics where they encounter patients with halitosis as their chief complain, taking into consideration that patients who attend private clinics are usually of a high socio-economic status. Thus they tend to be more concerned about halitosis which can adversely affect their social prestige.

The study also revealed no significant association between knowledge about the treatment of halitosis and level of qualification, and between the knowledge of treatment and years of clinical experience. This could be explained by the limited and straight forward treatment options which do not require much experience or high level of qualification, but quite the opposite is true regarding the causes and diagnosis of halitosis.

Interestingly, the present study showed no significant association between gender and the knowledge of causes and diagnosis and treatment of halitosis.

## Conclusion

Although halitosis can adversely affect the patient's life socially and economically, the present study revealed that dentists are poorly informed about its cause and diagnosis. This is especially true for those with lesser years of clinical experience. An increase in knowledge levels can be achieved by emphasizing on this subject during professional training. This will go a long way in effectively addressing this problem.

## Acknowledgments

Many thanks to the University of Medical Sciences and Technology for the funding of this project. Special appreciation to Professor Abdel Raouf Al-Otaibi for his help with the questionnaire design. I would also like to extend my gratitude to Mustafa Mohammad for his great assistance with the statistical work.

## References

- Joda AE, Olukoju OO. Halitosis amongst students in tertiary institutions in Lagos state. *African Health Sciences* 2012;12(4):473-478.
- Bosy A. Oral malodour: Philosophical and practical aspects. *Canadian Dental Association* 1997;63(3):[1p].
- Yaegaki K, Coil JM. Examination, classification, and treatment of halitosis: Clinical perspectives. *J Can Dent Assoc* 2000;66:257-61.
- Pratibha PK, Bahat KM, Bahat GS. Oral malodor: a review of the literature. *The Journal of Dental Hygiene* 2006;80(3):[1p].
- Azodo CC, Osazuwa-Peter N, Omili M. Psychological and social impacts of halitosis: A review. *J Soc Psychol Sci* 2010;3:74-91.
- Lento P, Majerus G, Bakdash B. Counseling and treating bad breath patients. *The Journal of Contemporary Dental Practice* 2001;2(2):473-478.
- Attia EL, Marshall KG. Halitosis. *CMA journal* 1982;126:281-5.
- Caranza NTK. Oral Malodor. In: Quirynen M, Van steenberghe D. *Clinical Periodontology*. 10th edition, Elsevier. 330- 42.
- Kawamoto A, Sugano N, Motohashi M, Matsumoto S, Ito k. Relationship between oral malodour and the menstrual cycle. *J Periodontal Res* 2010;45(5):681-687.
- Lee PPC, Mak WY, Newsome P. The aetiology and treatment of oral halitosis: an update. *Hong Kong Med J* 2004;10(6):414-8.
- Walsh, Laurence J. On the nose-new diagnostic and treatment approaches for oral malodour. *Australasian Dental Practice* 2006;17(4):60-2.
- Takehara S, Yanagishita M, Podyma-Inoue K, Ueno M, Shinada K, Kawaguch Y. relationship between oral malodor and glycosylated salivary proteins. *J Med Dent Sci* 2010;57:25-33.
- Roldán S, Winkel EG, Herrera D, Sanz M, Van Winkelhoff AJ. The effects of a new mouthrinse containing chlorhexidine cetylpyridinium chloride and zinc lactate on the microflora of oral halitosis patients: a dual-centre, double-blind placebo-controlled study. *J Clin Periodontol* 2003;30:427-34.
- ADA Council on Scientific Affairs Oral malodor. *J Am Dent Assoc* 2003;134(2):209-14.
- Van den Broek A, Feenstra L, De Baat C. A review of the current literature on management of halitosis. *Oral Diseases* 2008;14:30-39.
- Ratcliff PA, Johnson PW. The Relationship between oral malodor gingivitis and periodontitis. *J Perodontal* 1999;70(5):485-9.
- Lee S, Zhnag W, Li L. Halitosis update: a review of causes, diagnoses, and treatments. *J Calif Dent Assoc* 2007;35:259-260.
- Ratcliff R. Current concepts in the cause and treatment of halitosis. *Practical Hygiene* 1997:47-53.
- Scully C, El-Maaytah M, Porter SR, Greenman J. Breath odor: etiopathogenesis, assessment and management. *Eur J Oral Sci* 1997;105:287-293.
- Vandekerckhove B, Van den Velde S, De Smit M, Dadamio J, Teughels W, Van Tornout M & Quirynen M. Clinical reliability of non-organoleptic oral malodour measurements. *J Clin Periodontol* 2009;36:964-969.
- Annemiek MWT, Feenstra L, De Baat C. A review of the current literature on aetiology and measurement methods of halitosis. *J Dent* 2007;35:627-635.
- Iwakura M, Yasuno Y, Sakamoto S. Clinical characteristics of halitosis: Differences in two patient groups with primary and secondary complaints of halitosis. *J Dent Res* 1994;73(9):1568-74.
- Bahavand M, Maleki Z, Mohammadi S, Alavi K, Moghaddamet EJ. Assessment of oral malodor: A comparison of an organoleptic method with sulfide monitoring. *J Contemporary Dental Practice* 2008;9(5):76-83.
- Dadamio J, Van Tournout M, Teughels W, Dekeyser C, Coucke W, Quirynen M. Efficacy of different mouthrinse formulations in reducing oral malodour: a randomized clinical trial. *J ClinPeriodontol* 2013;40(5):505-13.
- Greenman J, Duffield J, Spencer P, Rosenberg M, Corry D, Saad S, Lenton P, Majerus G, Nachnani S, El-Maaytah M. Study on the organoleptic intensity scale for measuring oral malodor. *J Dent Res* 2004;83(1):81-85.
- Rayman S, Almas K. Halitosis among racially diverse populations:an update. *Int J Dent Hygiene* 2008;6(1):2-7.
- Maleki Z, Alavi K, Mohammadi S. Knowledge of dentists about halitosis in Tehran. *DJH* 2009;1(1):29-36.

## Annexe

### Questionnaire assessing the knowledge of dentists about Halitosis at dental teaching hospitals in Khartoum area

#### Section 1

Please answer the following questions by entering the appropriate LETTER in the corresponding box:

**1. Gender:**

- a) Male.  
b) Female.

**2. Age (years):**

- a)  $\leq 35$ .  
b) 36-55.  
c)  $\geq 56$ .

**3. Level of Education:**

- a) Bachelor BDS.  
b) Masters.  
c) PhD.

**4. Bachelor BDS obtained from:**

- a) Sudan.  
b) United States of America.  
c) United Kingdom.  
d) Others: Specify :.....

**5. Masters degree obtained from:**

- a) Sudan.  
b) United States of America.  
c) United Kingdom.  
d) Others: Specify: .....

**6. PhD obtained from:**

- a) Sudan.  
b) United States of America.  
c) United Kingdom.  
d) Others: Specify: .....

**7. Years of clinical practice:**

- a)  $\leq 5$ .  
b) 6-10.  
c) 11-15.  
d)  $\geq 16$ .



**8. Specialty training:**

a) Yes.

b) No.

If yes:

a) Orthodontics.

b) Prosthodontics.

c) Pedodontics.

d) Endodontics.

e) Periodontics.

f) Oral maxillofacial surgery.

g) Others: Specify .....

**Section 2****9. What do you do when you encounter a patient complaining of halitosis? (basic)**

a) Diagnose the cause

b) Prescribe halitosis masking products  
e.g. sprays, chewing gums... etc

c) Refer him/her to internal medicine.

d) Do nothing about it.

**10. If a patient came seeking other dental treatment and you realized that he is suffering from halitosis. Would you inform him /her (basic)**

a) Yes.

b) Sometimes.

c) No.

Which of the following is physiological or pathological?

**11. Bad breath after certain foods such as garlic, onions, and alcohol is : (basic)**

a) Physiological.

b) Pathological.

**12. Morning breath in an orally healthy individual is: (basic)**

a) Physiological.

b) Pathological.

**13. Tobacco smell after smoking is: (basic)**

a) Physiological.

b) Pathological.

**14. Menstrual breath is: (basic)**

a) Physiological.

b) Pathological.

**15. Pathological halitosis is mainly due to: (basic)**

a) Oral causes.

b) Extra-oral cause.

**16. Oral malodor is mostly due to: (advanced information)**

- a) Volatile sulfur compounds.
- b) Phosphorus compound.
- c) Nitrous containing compounds.
- d) Fluoride containing compounds.

**17. What is the main cause of halitosis of oral origin: (basic)**

- a) Caries.
- b) Periodontal disease.
- c) Tongue coating.
- d) all of the above.

**18. The bacteria responsible for oral malodor are mainly: (advanced information)**

- a) Periodontal.
- b) Cariogenic.
- c) Staph.aureus.
- d) Helicobacter pylori.

**19. Is decreased salivary flow associated with halitosis? (basic)**

- a) Yes.
- b) No.

**20. The most likely cause of halitosis in child with unilateral nasal discharge with foul odor: (very advanced information)**

- a) Adenoid.
- b) Sinusitis.
- c) Pharyngitis
- d) Foreign body obstructing the nostril.

**21. Other less common but serious causes of halitosis include: (advanced information)**

- a) Liver cirrhosis.
- b) Heart disease.
- c) Diabetes mellitus type I.
- d) Both a and c.

**22. Organoleptic testing is: (advanced information)**

- a) Measuring volatile sulphur compounds.
- b) Sniffing the patient's breathe.
- c) Measuring the nitrous compounds.
- d) Measuring the phosphorous compounds.

**23. The most practical test to diagnose oral malodor is? (advanced information)**

- a) Chromatography.
- b) Organoleptic testing.
- c) Sulfide monitoring.
- d) Breathe analyzer.

### Section 3

**24. Patients with halitosis of oral origin are:**

- a) Referred to physician or medical specialist.
- b) Given oral hygiene instructions and treatment of related oral causes.
- c) Given oral hygiene instructions and referred to a psychological specialist.
- d) Referred to a psychologist.

**25. Patients with extra-oral pathological halitosis are:**

- a) Referred to physician or medical specialist.
- b) Receive oral hygiene instructions and treatment of related oral causes.
- c) Given oral hygiene instructions and referred to a psychological specialist.
- d) Referred to a psychologist.

**26. Patients with halitophobia are:**

- a) Referred to physician or medical specialist.
- b) Receive oral hygiene instructions and treatment of related oral causes.
- c) Given oral hygiene instructions and referred to a psychological specialist.
- d) Referred to a psychologist.

**27. Oral hygiene instructions include:**

- a) Brushing and flossing.
- b) Brushing and mouthwash.
- c) Brushing flossing and tongue cleaning.
- d) Mouthwash.