

Article review

Bad Breath (Halitosis): Narrative Overview

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ABSTRACT

Halitosis is a health condition associated with an unpleasant odor from the oral cavity. The origin of bad breath may be related to systemic and oral conditions, but the large percentage of cases (about 85%) are related to oral factors. Because of its personal nature it can cause social embarrassment and psychological distress. Different society culture diverges acutely starts from those who believe that bad breath is genetically determined to those who turn to use crude scented items or over-the-counter products to camouflage the bad breath to others who consider the bad breath condition taboo subject finds it difficult to discuss or considered a private matter. The measurement of odors will not be as long as Corona is before Corona. Advanced dental clinics and also younger adults are newly equipped with many types of digital halite-testing devices and mobile phone applications making the diagnosis easy, safe and time-consuming. A Halitus patient initially visits the general dental practitioner for the betterment of the condition and here the responsibility lies on the dentists to diagnose and manage the condition. Treatment program must therefore address educative, preventive, curative and symptomatic line. In this review article we tried to highlight the bad breath condition and illustrate definitions, terminology, prevalence, etiology, classification, new measurement methods and management protocols.

Keywords: Bad breath, Halitosis, Causes, Sulphur, Treatment, Oral health.

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INTRODUCTION

Bad breath is a problem that traverses history, culture, and race and sex writings. These concerns can even be traced back to ancient times; references to bad breath and reminds for this condition can be found in the writing of ancient Greece and Roman including the works of Hippocrates the father of medicine (from 460-377 BC). Bad breath is a universal social stigma, with cross-cultural differences in perceptions of its etiology and cure.

Halitosis is highlighted to have a link to quality of life; it is considered as a social impediment has a strong emotional impact on the quality of life [1], it may cause embarrassment, depression and make relationships more difficult [2-4].

However, some of the affected are unaware of their condition possibly because this person may have developed tolerance or olfactory disturbance. Due to this cause, the patient generally cannot identify his/her halitosis and it is identified by his/her partner, family member, or friends. Another explanation could be the pathways between the inhaled and exhaled air diverge-because the exhaled air from the mouth travels horizontally, whereas the air breathed is travels primarily vertically, there is a lowered chance of detecting the smell from the exhaled air [5]. Our reluctance to notify even those close to us that they suffer from this condition serves to further exacerbate the situation. Thus, many people suffer unnecessarily from bad breath throughout their lives, without being remotely aware of it [6].

Socioeconomic status and inadequate knowledge about a health problem often leads to serious misconceptions and breed stigmatization-a well-known deterrent to seeking medical attention [7, 8]. However, misunderstandings prevail in the subject of halitosis in our community; the widespread ignorance encourages wrong information and misconceptions. These in turn breed stigmatization and the attendant psychological impact of social isolation. Those who should have sought help depend on self-perception. This is however, often unreliable because bad breath sufferers are often unaware of their condition [9-11]. Conversely, halitophobics are too conscious of a nonexistent bad breath. While the former do not seek treatment [8] the latter fail to respond to conventional treatment. They rather engage in a frenzy of oral hygiene practices [3, 4], and will usually need psychological support.

Since the oral cavity is the main source of halitosis in most cases, a general dental practitioner (GDP) should be the first person to contact. Many cases of bad breath can be treated by simple oral hygiene measures except for pseudohalitosis, delusional halitosis and halitophobia [12, 13].

Until now bad breath is not a matter of much interest in local dental clinics, even though it is of such high priority to the public. Much further, most physicians and dental practitioners are inadequately informed about the causes and treatments of halitosis. This paper attempts to offer an overview on aspects of bad breath mentioned in worldwide studies.

Self-betterment of bad breath

The concerns for self-betterment of bad breath condition can even be traced back to ancient times; in ancient Egypt, where detailed recipes for toothpaste are made before the pyramids are built. The 1550 BC Ebers Papyrus describes tablets to cure bad breath based on incense, cinnamon, myrrh, and honey [14]. Hippocratic medicine advocated mouthwash of spaces to cure bad breath. The Hippocratic Corpus describes a recipe based on marble powder for female bad breath sufferers [15]. The Ancient Roman physician

Pliny wrote about methods to sweeten the breath [16]. Ancient Chinese emperors required visitors to chew clove before an audience [14].

The Talmud describes bad breath as a disability, which could be grounds for legal breaking of a marriage license [17]. Early Islamic theology stressed that the teeth and tongue should be cleaned with a siwak, a chewing stick (Miswak is an essentially is like a natural toothbrush made from twigs) from the plant *Salvadora persica* tree [18].

The chewing of natural products for breath freshening has long been practiced around the world, such products include cloves (Iraq), parsley (Turkey, Italy), anise seeds (Far East), cinnamon (Brazil), and guava peels (Thailand) [5].

At present, there is a developmental basis for concern about the bad breath; the public attaches great importance to avoiding breathing mishandling. They spend on deodorant-type mouth (oral) rinses, mints, and other over counter products that do not need the help of a dentist/doctor without knowing if there is a real halitosis disease [19, 20]. Whatever, many of these practices are merely short-term attempts to conceal the smell.

Table 1: Characteristic smells of compounds that can be recovered from the mouth odor [5]

Compound	Smell
1. Hydrogen sulphide (H_2S)	1. Rotten eggs
2. Methyl mercaptan (CH_3SH)	2. Faeces
3. Skatole	3. Faeces
4. Cadaverine	4. Corpses (cadaver)
5. Dimethyl sulphide ($CH_3)_2S$	5. Rotten cabbage
6. Putrescine	6. Decaying meat
7. Indole	7. Small quantity in perfumes, smelly in large amounts
8. Isovaleric acid	8. Sweaty feet

Terminology and Classification

Halitosis (Latin halitus: breath, vapor) describes an offensive, unpleasant smell of the breath, independent of the cause. In the literature, the terms halitosis, foetor ex ore [21], bad breath [22], breath odor [21], offensive breath [23], and oral malodor [24] are used synonymously. The recommendation of the international consensus group is to use the term 'halitosis' and to distinguish between intra-oral halitosis and extra-oral halitosis. This includes all of the cases of real halitosis [14].

Table 2: Classification of different types of halitosis based on the recommendation of the international consensus group; modified from [25]

Type of halitosis	Definition
Real halitosis (<i>Genuine</i>)	Obvious malodor with intensity beyond socially acceptable level and/or affecting personal relationships.
Temporary halitosis (<i>Transient</i>)	Malodor caused by food and dietary factors such as garlic or morning bad breath.
Physiological	Bad breath (foul morning breath, morning bad breath) is caused by stagnation of saliva and putrefaction of entrapped food particles and desquamated epithelial cells by the accumulation of bacteria on the dorsum of the tongue, recognized clinically as coated tongue, and decrease in frequent liquid intake.
Transient bad breath	<p>Arise after someone has eaten volatile foods such as garlic, onions, condiments, pickles, radish, spices and consumption of tobacco, betel nut and alcohol.</p> <p>The resulting breath takes on a different odor that may last several hours.</p>
Intra-oral halitosis	<p>The source lies within the mouth</p> <p>The origin is often a coating on the dorso-posterior region of the tongue and/or a pathologic condition or malfunction of oral tissues (e.g., periodontal disease).</p> <p>The condition is influenced by co-factors (e.g., medication, smoking, stress).</p>
Extra-oral halitosis: non-blood-borne	<p>The source lies outside the mouth</p> <p>The malodor is emitted via the lungs and originates from disorders anywhere in the body (e.g., hepatic cirrhosis).</p>
Extra-oral halitosis: blood-borne	The malodor originates from nasal, paranasal, or laryngeal regions, or the pulmonary or upper digestive tract.
Psychogenic halitosis <i>Depression</i> <i>Hypochondriasis</i> <i>Obsessive compulsive disorder</i>	Obvious malodor is not perceived by others but the patient complains of its existence. No physical or social evidence exists for the presence of halitosis.

	After intensive information and education, halitophobic patients persist in believing that they have bad breath.
Pseudo-halitosis	The patient perceives a smell that is neither objectively verifiable nor measurable. The situation is improved by counseling and simple oral hygiene measures.
Halitophobia	The patient persists in believing they suffer from halitosis even after treatment of halitosis or pseudo-halitosis.

Prevalence

The prevalence of halitosis differs across the globe due to variations in the perception of odors among people of different races and cultures, absence of uniformity in evaluation as well as a disparity between self-perceived and clinically detected halitosis reports [26, 27, and 28]. However, the overall prevalence ranges from 2% to 87%, being higher when self-reported than clinically detected [29, 30].

Nevertheless, the exact prevalence cannot be determined without considering the factors contributing to halitosis involved [31, 32 and 33]. Gender and age ratio is dominant parameters in published studies nevertheless many other factors such as oral hygiene habits and dental health, smoking, food, and medicine and health condition can also have an impact.

Some studies proposed nearly three times higher in men than in women [34, 35], whereas others have found higher prevalence of halitosis in women [28, 36, 37]. In general, halitosis has been reported to be similarly prevalent in females and males [38, 39].

One study found statistically significant halitosis variations between women and men in the right-handed, among the left-handers (37), while another study reports that women showed two-fourfold increase in VSC levels during and shortly prior the menstruation [38, 39].

There are contradictory reports on the influence of age on halitosis; some studies have associated halitosis with increasing age [28, 33]. A study of 962 patients was seen in the ear, nose and throat department, out of which a total of 65 children had complaints of halitosis giving halitosis prevalence in children of 6.8%. The prevalence of halitosis was more common in the preschool age group (1-5years). Authors reported gradual decrease in prevalence of halitosis with age and final peak at 16-18 years. The orodental factors were the least while naso pharyngeal and psychogenic was the most [40].

The literature describes the prevalence of mouth breathing as ranging from 5 to 75% of children tested [41, 42 and 43].

Etiology

Halitosis is formed by volatile molecules which are caused because of pathological or non-pathological reasons, and it originates from an oral or a non-oral source (**Table 3**).

Table 3: Odoriferous components cause halitosis. Modified from [9, 44, 45]

Categories	Compounds
Volatile sulphur compounds	Methyl mercaptan: CH_3SH Hydrogen sulphide: H_2S Dimethyl sulphide: $(\text{CH}_3)_2\text{S}$
Diamines	Putrescine: $\text{NH}_2(\text{CH}_2)_4\text{NH}_2$ Cadaverine: $\text{NH}_2(\text{CH}_2)_5\text{NH}_2$ Butyric acid: $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ Propionic acid: $\text{CH}_3\text{CH}_2\text{COOH}$ Valeric acid: $\text{C}_5\text{H}_{10}\text{O}_2$
Phenyl compounds	Indole: $\text{C}_8\text{H}_7\text{N}$ Skatole: $\text{C}_9\text{H}_9\text{N}$ Pyridine: $\text{C}_5\text{H}_5\text{N}$
Alcohols	1-propoxy 2-propanol
Alkalines	2-methy-propane
Nitrogen-containing compounds	Urea: $(\text{NH}_2)_2\text{CO}$ Ammonia: NH_3
Ketones	

Volatile sulfur compounds (VSCs) are mainly responsible for intra-oral halitosis. These compounds are mainly hydrogen sulfide and methyl mercaptan. They produce bacteria by enzymatic reactions of sulfur-containing amino acids which are L-cysteine and L-methionine [46]. In addition, some of the bacteria produce hydrogen sulfide (H_2S), and methyl mercaptan (CH_3SCH_3) from serum. The bacteria which are the most active VSC producers are shown (**Table 4**) [9]. The other VSC is dimethyl sulfide (CH_3SH) which mainly responsible for extra-oral or blood-borne halitosis [46], but it can be a contributor to oral malodor. Ketones such as acetone, benzophenone, and acetophenone are present in both alveolar (lung) and mouth air; indole and dimethyl selenide are present in alveolar air [47, 48]. These compounds are also factoring for halitosis occurrence and it may be simply classified their origins into three categories; oral causes (Periodontitis), non-oral causes (Hepatic cirrhosis- Medications), and the other causes (foreign body).

Table 4: Bacteria which are active producers of volatile sulfur compounds in vitro (adapted from Persson et al. [9])

Hydrogen sulfide from cysteine	Methyl mercaptan from methionine	Hydrogen sulfide from serum	Methyl mercaptan from serum
Peptostreptococcus anaerobius	Fusobacterium nucleatum	Prevotella intermedia	Treponema denticola
Microsprevotii Eubacterium limosum	Fusobacterium periodonticum	Prevotella loescheii	Porphyromonas gingivalis
Bacteroides spp.	Eubacterium species	Porphyromonas gingivalis	Porphyromonas endodontalis
Centipedia periodontii Selenomonas artermidis	Bacteroides species	Treponema denticola	

Halitosis originates from oral cavity

According to the researches performed worldwide in several multidisciplinary breath clinics (involving professionals from various fields: dentistry, E.N.T. internal medicine, and psychology) in various centers, some 85-90% of breath odors originate from within the oral cavity itself.

In oral cavity, temperatures may be reached up to 37°C (and changed between 34 and 37°C). During exhaling also humidity may be reached up to 96% (and changed between 91% and 96%) in oral exhalations [49, 50]. These conditions may provide a suitable environment for bacterial growth. The number of bacterial species, which are found in oral cavity, are over 500 [29], and most of them are capable to produce odors compounds which can cause halitosis. In these conditions, poor oral hygiene plays a key factor for multiplication of halitosis causative bacteria and causes an increase in halitosis. These bacteria include especially Gr-negative species and proteolytic obligate anaerobes [51, 52] and they mainly retained in tongue coating and periodontal pockets [53]. These bacteria degrade organic substrates (such as glucose, mucins, peptides, and proteins present in saliva, crevicular fluid, oral soft tissues, and retained debris) and produce odors compounds [54].

By the poor oral hygiene, food debris and dental bacterial plaque accumulate on the teeth and tongue, and cause caries and periodontal diseases like gingivitis and periodontitis. The inflammation of gingivae, untreated deep carious lesions and some forms of periodontal disease, especially acute and aggressive forms such as acute necrotizing ulcerative gingivitis, pericoronitis, Vincent's disease or aggressive forms of periodontitis, can increase unpleasant breath odor [55].

The type of gingival enlargement which is dependent on inflammation or drugs (such as phenytoin, cyclosporine or calcium channel blockers) may increase the risk of bad breath [56]. Studies showed a relationship between oral halitosis and periodontal disease. However, periodontal diseases may be developed by the volatile sulfur-containing compound transition to periodontal tissues [52, 56].

Another important factor in halitosis is the flow of saliva. The intensity of sulfur compounds is increased because of salivary flow reduction or xerostomia [57]. Saliva functions as a buffering or a cleaning agent and keeps bacteria at a manageable level in the mouth [58]. Reduction of the salivary flow has negative effects on self-cleaning of the mouth and inadequate cleaning of the mouth causes halitosis [59].

Reduction of salivary flow may be affected from many reasons such as medications (e.g., antidepressants, antipsychotics, diuretic, and antihypertensive), salivary gland diseases (e.g., diabetes, Sjogren's syndrome), chemotherapy, or radiotherapy [60, 61, and 62].

Box 1: Oral causes of halitosis which is originated from oral cavity. Modified from [29]

1. Food impaction	10. Alveolitis
2. Tongue coating	11. Xerostomia
3. Periodontal pockets	12. Oral ulceration
4. Acute necrotizing gingivitis	13. Oral malignancy
5. Gingivitis	14. Exposed tooth pulps
6. Adult and aggressive periodontitis	15. Nonvital tooth with fistula
7. Pericoronitis	16. Imperfect dental restorations
8. Vincent's disease	17. Improper retention of dentures
9. Candida hypersensitivity syndrome	18. Bad prosthodontic constructions

Other factors that contribute to halitosis are endodontic, surgical, and pathologic factors such as exposed tooth pulps and non-vital tooth with fistula draining into the mouth, oral cavity pathologies, oral cancer and ulcerations, extractions/healing wounds or prosthetics or dentition factors such as orthodontic fixed appliances, keeping at night or not regularly cleaning dentures, restorative crowns which are not well adapted, non-cleaning the bridge body, and interdental food impaction. All these factors [Box 1], cause food or plaque retention area, raising bacterial amount, tissue breakdown, putrefaction of amino acids, and decreasing of saliva flow results in the release of volatile compounds that cause halitosis [29, 63, 64-65].

Halitosis originates from non-oral sources

Beside the oral cavity bad breath can originate from related sources (ear, nose, throat) (87%) or extra-oral in origin (13%) [66]. Respiratory system problems, gastrointestinal disease, hepatic disease, hematological or endocrine system disorders and metabolic conditions can all be the causes of halitosis [Table 6].

Respiratory system problems can be divided into upper and lower respiratory tract problems. They are sinusitis, antral malignancy, cleft palate, foreign bodies in the nose or lung, nasal malignancy, subphrenic abscess, nasal sepsis, tonsilloliths, tonsillitis, pharyngeal malignancy, lung infections, bronchitis, and bronchiectasis lung malignancy [67, 68]. Bacterial activity in this pathology causes halitosis which leads to putrefaction of the tissues or causes tissue necrosis and ulcerations and production of malodors gases, which are expired causing halitosis (Table 7).

Gastrointestinal diseases cause halitosis. Pyloric stenosis, duodenal obstruction, aortoenteric anastomosis, pharyngeal pouches, Zenker's diverticulum, hiatal hernia cause food retention. Reflux esophagitis, achalasia, steatorrhea, or other malabsorption syndromes may cause excessive flatulence or *Helicobacter pylori* infection causes gastric ulcers and VSC levels increase in oral breath. Levels of VCS's in oral breath may be higher in patients with erosive than non-erosive oesophagogastro-duodenal mucosal disease although VSC levels are not influenced by the degree of mucosal damage [69, 70].

Also, hepatic or hematological diseases which are hepatic failure (foetor hepaticus) and leukemia's, renal failure (usually end-stage renal failure), endocrine system disorders which are diabetic ketoacidosis or menstruation (menstrual breath), metabolic disorder which are trimethylaminuria and hypomethioninemia may cause halitosis (Table 7) [71-73].

Table 6: A list of systemic disease with characteristic halitosis (modified from [74]).

Disease	Characteristic odor
Diabetics	Acetone breath, fruity
Unbalanced insulin Dependent diabetes	Rotten apples
Hepatic insufficiency	Sweet odor that can be described as dead mice; fetor hepaticus (breath of death)
Trisonemy	Cabbage odor
Kidney insufficiency, trimethylaminuria	Fish odor
Uremia, kidney failure	Ammonia or urine like
Maple syrup urine disease	Burned sugar odor
Homocystinuria	Sweet musty odor
Isovaleriaan acidity	Sweating feet

Lung abscess or bronchiectasis	Odors rotten meat smell, putrefactive
Putrefaction of pancreatic juices	Hunger breath smell
Portocaval venous anastomosis	Feculent amine odor resembling a fresh cadaver known as "feto hepaticus" but characteristically intermittent in nature for long period of time
Blood dyscrasias	Resembling decomposed blood of a healing surgical wound
Hepatic cirrhosis	Resembling decayed wound
Weger's granulomatosis	Necrotic putrefactive
Syphilis, exanthematous disease, granuloma venerum	Fetid
Azotemia	Ammonia-like

Table 7: Odors in the case of metabolic or endocrinological problems, modified from van Steenberge [63]

Odors	Metabolic or endocrinological problems
Fruity odor	Type-1-diabetes in children Type-2-diabetes in adults Alcoholic ketoacidosis
Fecal odor	Intestinal obstruction Ammonia of fishy odor Kidney-insufficiency Trimethylaminuria
Mouse odor	Phenylketonuria Cooked cabbage odor Methionine adenosyl transferase deficiency
Sweating feet odor	Isovaleriaan acidity Deficiency on chromosome 15
Burned sugar odor	Maple syrup urine disease
Sweet musty odor	Homocystinuria
Rotten eggs odor	Disease of Lignac (syndrome)

Other causes of halitosis

Dietary products such as garlic, onions, spicy foods, also, alcohol, and tobacco cause transient unpleasant odor or halitosis. There withal drugs such as betel, solvent abuse, chloral hydrate, nitrites and nitrates, dimethyl sulfoxide, disulfiram, some cytotoxics, suplatast tosilate, and paraldehyde may create the same effect (**Box 2**).

Box 2: Various drugs have also been known to cause halitosis. Drugs associated with halitosis [75]

1. Lithium salts	10. Penicillamine
2. Griseofulvin	11. Thiocarbamide
3. Dimethylsulfoxide	12. Ethyl alcohol
4. Antihistamines	13. Diuretics
5. Phenothiazines derivatives	14. Tranquilizers
6. Chloral hydrate	15. Nitrites
7. Amphetamines	16. Paraldehyde
8. Suplatast tosilate	17. Bisphosphonates
9. Metronidazole	18. Arsenic salts

Assessment of Halitosis

General dental practitioner responsibility

Given that the oral cavity is the primary source of breath odor it is perfectly logical that general dental practitioners (GDPs) should be able to manage intra-oral halitosis under the conditions found in a normal dental practice. However, GDPs who are interested in diagnosing and treating halitosis are challenged to incorporate scientifically based strategies for use in their clinics such as: 1) general guidelines on how to assess and diagnose patients' breath odor concerns, and 2) general guidelines on regimens for the treatment of halitosis **(Figure 1)** [76].

GDPs should take into consideration that individuals suffering from bad breath usually have a long history and may have already visited one or more general practitioners or medical specialists; so, the resulting social and psychological stress can be very high [77]. It is important for GDPs to understand self-perception about halitosis because the condition is related to self-image and psychopathological characteristics of the patients as they are the primary health-care providers managing the condition. It has been suggested that GDPs should also be aware of cultural and social norms about halitosis so that they can provide optimal oral care to the patients to improve their quality of life [78].

Assessment methods of halitosis ensure discrimination of different types of halitosis and its source if it is really exist. Therefore, diagnosis of the halitosis, and assessment of its severity (conditions that patients have, is it real halitosis or pseudo-halitosis or halitophobia) are very important. The examination involves clinical, radiographical, and instrumental tests. The contributing medical conditions, once identified, are referred for treatment accordingly.

Patient of chief complaint of oral bad breath

<i>Rule out</i>	A thorough medical history including diet/medication intake Halitosis history Periodontal screening
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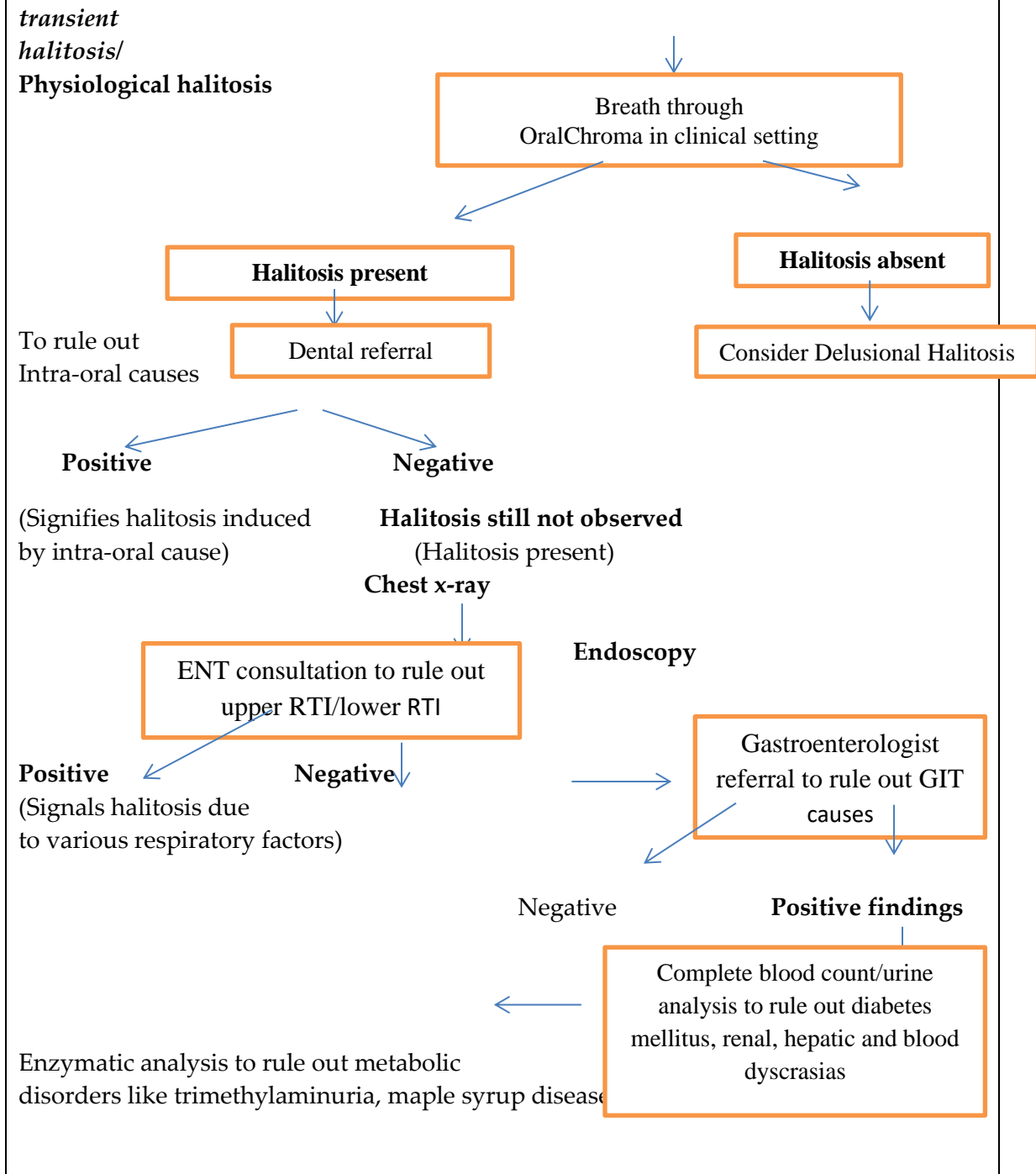


Figure 1: An investigative protocol workup in a clinical setting for a patient who presents to primary care practitioner (Modified from [31, 75, and 76].

Detection of halitosis

Since bad breath can be self-perceived; an instrumental detection is not mandatory but it can help to build a second opinion, to calibrate odor judges, or to build trust with the

patient, especially with patients suffering from psychogenic halitosis. However, the results can be used to confirm the diagnosis and to monitor the treatment progress.

There have been many diagnostic techniques for detection of halitosis in use until recently that becomes a myth because of advanced technology or cannot be performed because of the potential risk of the transmission of respiratory diseases - a particular concern following the severe acute respiratory syndrome, various respiratory viral infections, and recently SARS Corona virus (Coved 19) [79].

Nowadays, the new discovered digital personal and clinical devices provide a new space in the diagnosis of halitosis. Many of models available in the market such as: Breathometer (a compact wireless device that works with the smartphone to help the person understand more about his/her oral health), and Pocket bad breath tester. These devices enable the patient to measure themselves and decide whether he/she needs the doctor/dentist's visit, also help shorten the time of the visit and have made it easier for the doctor to identify the condition. Whatever, the objective way to measure VSCs, which are the principal components of oral malodor, is using of a chair side specific device.

OralChroma (CHM-2) device

The OralChroma™ (CHM-2, Abimedical, Kawasaki, Japan) is a chairside instrument bases on a gas chromatograph, which detects and discriminates the three most important VSCs. This information can be included in the diagnosis. For example, a high concentration of CH_3SH compared to H_2S may indicate periodontitis [80], and an increased H_2S level may indicate a problem with oral hygiene. Further, increased levels of $[\text{CH}_3]_2$ may indicate extra-oral halitosis [81, 82]. The measurements are reproducible and reliable, and even extremely low gas concentrations can be detected. A disadvantage of the OralChroma™ is that it can only detect sulphur gases and not any other volatile components (indoles, amines, and acids) contribute to halitosis [82].



Figure 2: OralChroma (CHM-2)

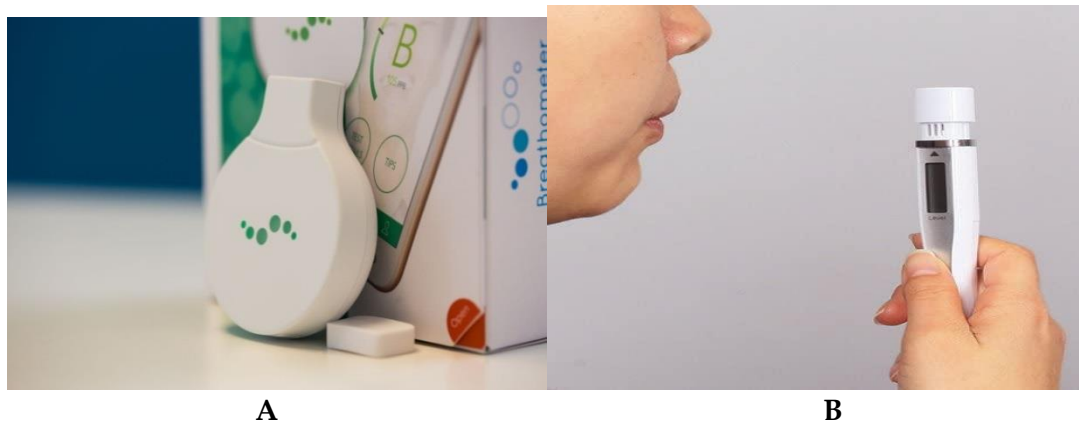
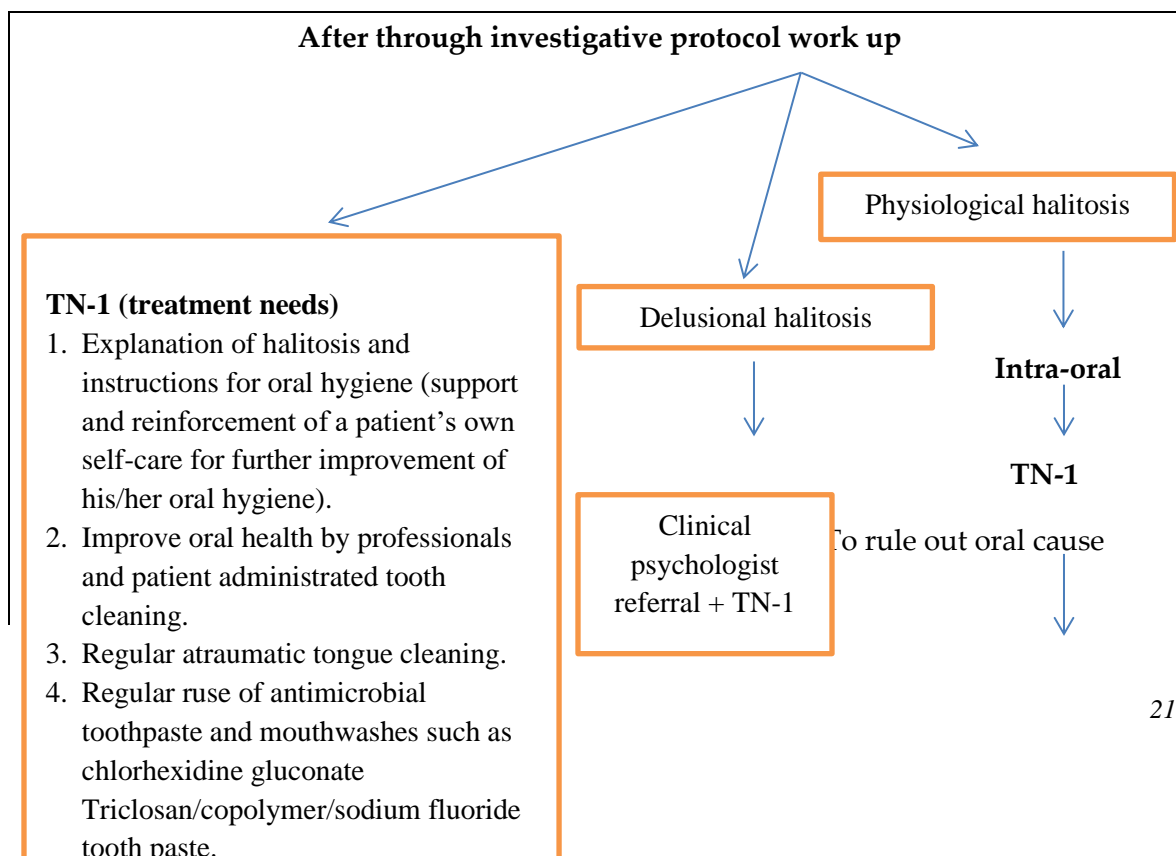


Figure 3: A) Wireless digital breathometer B) Pocket bad breath tester.

Professional Treatment

Halitosis can be treated if its etiology can be detected properly. Therefore, the most important issue for treatment of halitosis is detecting of etiology or determining of its source by detailed clinical history and examination [Figure 4]. Although most of the cases are caused from oral cavity, sometimes other etiologies can contribute oral halitosis. It is imperative to understand the origin of halitosis as multidisciplinary therapy typically is required in halitosis with emphasis on the causative factor. Therefore, treatment can only be successful when the investigation and adequate diagnosis are confirmed.



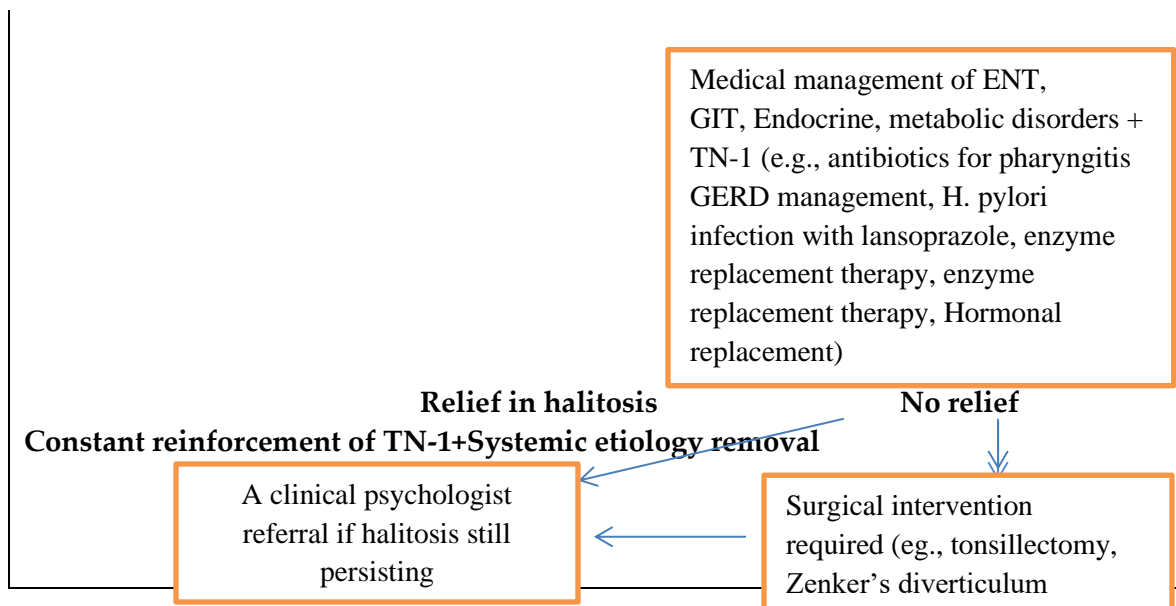


Figure 4: Management strategy for a patient with halitosis depending on the type and etiology (Modified from Porter and Scully [83]).

Management of intra-oral causes

In the bad breath caused by bad oral hygiene or oral lesions or conditions, reduction of the bacterial load is essential. Appropriate periodontal management is the first step. Initial periodontal treatment includes scaling and root planning which may alleviate the depth of the periodontal pockets and severity of gingival inflammation and it eliminates halitosis causing bacteria [84]. During periodontal therapy, usage of antiseptic mouth wash relieves reduction of the bacterial load.

Good oral hygiene education and instruction is another important issue for oral caused halitosis. Proper brush, dental floss, and inter-dental brush usage are very important. However, sometimes even if the periodontal health is perfect, tongue coating can be an important source of halitosis. The tongue dorsum can be a shelter for these bacteria. If a patient has geographic or fissure tongue, the coating will be more. Due to these reasons, cleaning of tongue dorsum by brushing, tongue scraper or tongue cleaner is important. Mechanical removal of the tongue coating can reduce VSCs concentration by 52% in the mouth air of a periodontally healthy individual [85]. Nevertheless, the presence of tongue coating does not necessarily precede oral halitosis.

Existing and necessary restorative conditions of a patient must be reviewed. Unsuitable prosthetics and conservative restorations, such as causing food impactions, uncleaning area or food retention, create a reservoir area for bacteria. Replacement or renewing of old restorations with proper restoration provides prevention of these reservoir areas. Also existing of the non-treated cavity of decayed teeth, nonvital tooth with fistula or exposed

tooth pulps may create a reservoir area for bacteria, so treatments of these teeth with proper restoration are important.

The other conditions cause halitosis such as xerostomia, oral ulceration, or malignancy which must be diagnosed and treated well, requires transfer the patient to specialized center and collaboration with the experts.

Management of extra-oral causes

Accordingly, duties of a dentist in extra-oral cause halitosis are aware of patient about source of halitosis and sending him/her to the specialist.

Mostly, xerostomia may be an oversight because of superficial clinical examination. This condition leads to patients deprived from protective and mechanical washing effects of saliva. The reasons of xerostomia must be examined in detail. If xerostomia caused by head and neck radio therapy or salivary glands pathology, the artificial saliva products must be suggest to the patients.

Sometimes people can think have halitosis in spite of them have no measurable halitosis. This condition is called a halitophobia; and can be can be may be mono symptomatic delusion ("delusional halitosis") or manifestation of olfactory reference syndrome. Halitophobia persons avoid socializing and even avoiding talking with people; therefore, treatment of halitophobia is very important. Prior to treating people who have halitophobia, it must be proven that he/she has no measurable halitosis by measuring devices. If persons are obsessed with the idea of having bad breath, consultation with a psychologist is required [86].

With regard to halitosis of psychogenic origin, the management includes discussion of the situation with the patient. The measurement of the mouth odor with the help of a sophisticated methods and devices is invaluable to demonstrate to the patient that halitosis may or may not be present.

Box 3: Patient general advises (Modified from [5]).

Things you should do:

- Visit your dentist regularly.
- Brush your teeth and gums properly.
- Floss or otherwise clean between your teeth, as recommended by your dentist.
- Ask your dentist to recommend a tongue cleaner. Clean your tongue all the way back gently, but thoroughly.
- Get control over the problem. Ask a family member to tell you whenever you have bad breath.

Things you shouldn't do:

- Let your concern about having bad breath ruin your life. Do not be passive.
- Be depressed. Get help. Do not ignore your gums-you can lose your teeth as well as have bad breath.
- Drink too much coffee-it may make the situation worse.

- Give mouthwash to very young children because they can swallow it.
- Clean your tongue so hard that it hurts.
- Rely on mouthwash alone-practise complete oral hygiene.

Key points

- Oral malodor presents a problem which has not as yet received enough attention from our dental clinics.
- The general dental practitioner is the first door to knock for the patient suffering from bad breath. So, the rule of the dentist is to provide primary oral health care and by that might treat about 90% of bad breath cases.
- Dentist must provide enough time and good mood while taking history for individuals suffering from bad breath.
- Dentist must be aware about the extra-oral halitosis causes and refer them for medical advice to the proper specialist.
- Halitosis can be treated if its etiology can be detected properly.
- Dentists must take responsibility for the widespread ignorance (inadequate oral health education) and to cope with misconceptions.
- Dentists and frontline health care workers should enforce a deliberate engagement of the emerging/millennial adults through social media and networking sites that they often access.

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No conflict of interest was declared.

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