■ ***Review Article***

Halitosis: a serious social problem

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Abstract

Halitosis means an unpleasant odor of the expired air, regardless of the source of this odor. The foul breath originating from the oral cavity itself is termed as oral malodor and it is usually the main contributor of unpleasant breath in an otherwise healthy individual. The most predominant causes of halitosis are gingivitis, periodontitis, and tongue coating. However, several non-oral pathologic conditions have also been related to halitosis, including infection of the upper and lower respiratory tracts, the gastrointestinal tract, and some metabolic diseases involving the kidneys and the liver, which should never be overlooked. Though this complaint of bad breath has existed from time immemorial, it has only recently come to scientific platforms of analysis and is being increasingly recognized as a social stigma in an ever-growing sensitive society. Breath malodor has important socio-economic consequences. Literature reveals almost $1 billion a year is spent in the United States on deodorant-type mouth rinses and mints which provide only short-term masking effects, instead of spending the money on a proper diagnosis and etiologic care to manage bad breath. Sulfur containing volatiles are the main constituent of oral malodor and that their levels correlate with the intensity as determined organoleptically. The treatment of intraoral halitosis consists of scaling/root planing and daily removal of tongue coating, and for extraoral halitosis, treatment of underlying systemic disease by a specialist.
Keywords: halitosis, bad breath, oral malodor

Introduction

Halitosis means an unpleasant odor emanating from the oral cavity. It is a technical term for bad breath and originates from the Latin "halitus" meaning "breath" and the Greek "osis" meaning "abnormal" or "diseased". This term is synonymous with breath malodor, bad breath, fetor ex ore or fetor oris, but is not always understood by the general population. Breath malodor should not be confused with the momentarily disturbing odor caused by food intake or smoking, or 'morning bad breath' as habitually experienced on awakening, which disappears after oral hygiene.[1] A persistent breath malodor, by definition, does reflect some pathology.

Breath malodor has important socioeconomic consequences and can reveal important diseases. A proper diagnosis and determination of the etiology allow initiation of the proper etiologic treatment. Although gingivitis, periodontitis, and tongue coating are by far the most common causes of malodor, a clinician cannot take the risk of overlooking the other, more challenging diseases. Several non-oral pathologic conditions have been related to oral malodor, including infection of the upper and lower respiratory tracts, the gastrointestinal tract, and some metabolic diseases involving the kidneys and the liver.[2]

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Socio-economic aspects

Breath malodor is a considerable social and/or relational problem. Everyone must have experienced breath odor that is unpleasant if not unbearable when a person is speaking at close proximity. Subjects who believe they produce malodor can adopt avoidance patterns like keeping a distance when speaking to others or holding their hand in front of the mouth while speaking. Even more disturbing is the fact that a number of subjects imagine they have bad breath when they may not have. This imaginary breath odor, also called halitophobia,[3] has been associated with

obsessive-compulsive disorders or hypochondria. It has even led to suicide.[4] The marriage license (the Ketuba) may be legally broken in the case of halitosis of one of the partners.[5]

Though this complaint has existed from times immemorial, it has only recently come to scientific platforms of analysis and is being increasingly recognized as a social stigma in an ever-growing sensitive society. There have been limited scientific investigations into this cause, mainly because of the difficulty in objectively identifying and quantifying the agents responsible for halitosis. Additionally, the recognition of oral malodor is reliant on normal olfactory receptor function and while the human nose is extremely sensitive in detecting even very low concentrations of odor causing volatiles, there is considerable difficulty in developing a matching 'halitosis detecting instrument'. Since objective assessment is consequently difficult, the true prevalence of fetor ex ore is unclear. However a study in Japan has found that upto 25% of the population had volatile sulfur compounds (VSCs) in the breath in amounts more than the acceptable social standards.[6] Another study in USA has found this figure to be 24%.

Etiology

It is now generally agreed that the main cause of oral malodor production is protein degradation by the bacteria covering oral hard and soft tissues, especially the tongue. The hydrolysis of proteins along with the catabolism of the resulting amino acids from this hydrolysis produces offensive smelling volatiles and this process is known as putrefaction.

Bacteria associated with gingivitis and periodontitis are almost all gram negative (P. gingivalis, P. intermedia, P. nigrescens, A. actinomycetemcomitans, C.rectus, F. nucleatum, P.micros, T. forsythia, Eubacterium species, spirochetes) and are known to produce VSCs.[7-12]

Studies have shown conclusively that sulfur containing volatiles are the main constituent of oral malodor and that their levels correlate with the intensity of oral malodor as determined organoleptically.[13] Other volatiles produced by putrefaction process such as organic acids, ammonia, and amines may also be included, but they functions as modifiers.

The reasons for the bad breath emanating from the mouth can either be because of the factors within the oral cavity (intraoral causes) or it can also be attributed, albeit to a smaller degree, to the causes elsewhere in the body (extraoral causes).

Intraoral causes

Oral malodor specifically refers to such odor originating from the oral cavity itself. Possible causes within the oral cavity include, coated tongue,[14-16] chronic periodontitis with pocket formation,[17] retention of odiferous food particles on and between the teeth, dehydration, dentures, healing surgical or extraction wounds, smoker's breath, acute necrotizing ulcerative gingivitis, increased rate of putrefaction of the saliva, unfilled cavities, and open gangrenous pulp.

Often one observes malodor upon waking up from sleep in the absence of any visible oral causes. It is probably due to the putrefaction of the epithelial cells and food debris that are not cleared by reduced salivation during sleep. Most of the time oral malodor is mainly a result of microbial metabolism of local debris.

This malodor production and salivary putrefaction are both increased in the presence of gingivitis/ periodontitis. It has been shown that the saliva from these individuals undergo putrefaction more rapidly and as a result produces more offensive odor than the similar saliva from a control group of healthy subjects.[6] The increased malodor in patients with gingivitis/ periodontitis can be due to higher number of desquamating epithelial cells and adherent bacteria, and increased bleeding and flow of fluid from gingival crevices and pockets. Blood, GCF, lysed leucocytes, and growth factors provide substrates that may stimulate the development of heavier bacterial loads on the oral soft tissue surfaces and these results in more odor production.

Extraoral causes

Upper and lower respiratory tract infections, gastro-intestinal infections, systemic diseases like leukemia, diabetes, and drugs like metronidazole are the primary extraoral causes. [18-22]

Some of the respiratory conditions such as sinusitis, tonsillitis, pharyngitis, rhinitis or lesions in the lower respiratory track such as bronchiectasis, lung abscess or bronchogenic carcinoma etc., may give rise to breath malodor. Malodor may also arise from the excretion

of volatile substances such as acetone, ketone, n-propanolol and o-toluidine in the breath.

Other causes can be Type 1 and Type 2 diabetes mellitus, which give rise to peculiar ketonic breath because of acetone. Type 2 diabetes often remains undiagnosed for years; perception of breath malodor may provide a clue to its diagnosis. Trimethylaminuria, a hereditary metabolic disorder also leads to a typical fishy odor of breath. Fetor hepaticus is the characteristic malodor in liver cirrhosis mainly because of excretion of H_2S, aliphatic acids, methyl mercaptan and dimethyl sulfide. Hunger and menstrual cycle is also associated with oral malodor although with little scientific evidence to support this and it is believed to be mainly due to the changes in the levels of volatile sulfur compounds.

In contrast to common public opinion, even among medical physicians, gastrointestinal pathologies are rarely responsible for bad breath.[23] The following pathologies might be responsible for less than 1% of malodor cases: a) Zenker's diverticulum, b) gastric hernia, c) regurgitation esophagitis, and d) intestinal gas production.

Diagnosis

There are no accepted clinical protocols for the diagnosis of patients with halitosis. The proper diagnostic approach to a malodor patient starts with a thorough questioning about the medical history. As often repeated, "listen to the patient, and the patient will tell you the diagnosis," usually holds true. Asking about all the relevant pathologies for breath malodor often leads to a diagnosis.

Organoleptic rating

Even though instruments are available, organoleptic assessment by a judge is still the "gold standard" in the examination of breath malodor. In this, a trained judge sniffs the expired air and assesses whether or not this is unpleasant using an intensity rating, normally from 0 to 5, as proposed by Rosenberg and McCulloch.[24] It is solely based on the olfactory organs of the clinician: 0= no odor present, 1= barely noticeable odor, 2= slight but clearly noticeable odor, 3= moderate odor, 4= strong offensive odor and 5= extremely foul odor. Before acting as a judge, persons should not be a smoker, and must ensure that they do not have anosmia (lost or impaired smelling capacity). The judge smells a series of different air samples, like, oral cavity odor, breath odor (expired air), tongue coating (tongue scraping), and nasal breath odor keeping the mouth closed.

Specific character of breath odor:

- A "rotten egg" smell is indicative of VSCs.
- A sweet odor, which some describe as that of 'dead mice" has been associated with liver insufficiency.
- The smell of "rotten apple" has been associated with insulin- dependent diabetes.
- A "fish odor" suggests kidney insufficiency.

Portable volatile sulfide monitor

This electronic device (Halimeter) analyzes the concentration of hydrogen sulfide and methylmercaptan of the mouth air, but without discriminating them. It can only reveal sulfur-containing gases, which explains the poor correlation with organoleptic measurements.

Gas chromatography

Gas chromatography can analyze air, saliva, or crevicular fluid for any volatile component.[25] This device is designed to digitally measure molecular levels of the three major VSCs (hydrogen sulfide, methyl mercaptan, and dimethyl sulfide) in a sample of breath air. It is extremely sensitive and produces visual results in graph form via computer interface.

Electronic nose

Latest developments lead to the so-called electronic or 'artificial noses', which are supposed to provide quantification and classification of exact smells. Originally these devices have been developed for quantitative assessments of smells in food or beverages. However, an application of this to diagnosis of halitosis appears reasonable. [26]

Classification of halitosis

In 1999, Miyazaki and co-workers[27] classified halitosis as "genuine" halitosis, pseudo-halitosis, and halitophobia. Genuine halitosis is subclassified as physiologic halitosis or pathologic halitosis. Pseudo-halitosis is a condition in which halitosis is non-existent but the patient is convinced that they have halitosis. Halitophobia can occur when there is no physical or social confirmation to suggest that halitosis is present, which can persist after therapy for either genuine or pseudo-halitosis.[28]

Temporary or transient halitosis is a condition caused

by oral dryness, hunger, morning breath, stress, eating certain foods such as garlic and onions,[29] smoking, or poor oral hygiene.

Treatment of halitosis

Dental clinicians have the responsibility to diagnose and treat oral malodor. At least 85% of breath malodors have an oral source.[30] Treatment should be centered on reducing the bacterial load by effective mechanical oral hygiene procedures. The gram negative anaerobic bacteria associated with gingivitis and periodontitis cause oral malodor by their proteolysis, which produces foul smelling VSCs. Bacterial coating of the tongue is one of the most important causes of oral malodor followed by gingival and periodontal diseases.[6,31,32] Although diagnostic instruments can detect VSCs, clinicians can be trained to be more accurate, using their olfactory sense to categorize halitosis.

Tongue cleaning

The most important cause of intraoral halitosis is the extensive accumulation of bacteria and its nutrients on the dorsum of the tongue in a periodontally healthy subject.[31,33] Cleaning of the tongue can be carried out with a normal tooth brush, but preferably with a tongue scraper if a coating is established. Cleaning should be gentle to prevent soft tissue damage. It is best to clean as far as possible; the posterior portion of the tongue has the most coating.[34] Tongue cleaning should be repeated until almost no coating material can be removed.[35] Gagging reflexes often are elicited, practice helps to prevent this.[36] Tongue cleaning has the additional benefit of improving taste sensation.[37,38]

Scaling and root planing

Because periodontitis causes chronic oral malodor, professional periodontal therapy is the treatment of choice.[6,39] A one-stage full-mouth disinfection, combining scaling and root planing with the application of chlorhexidine, reduces the organoleptic malodor levels up to 90%.[40] Interdental cleaning and toothbrushing are essential mechanical means of dental plaque control. Both remove residual food particles and microorganisms that cause putrefaction. A combination of tooth and tongue brushing has a remarkable beneficial effect in the reduction of bad breath.[13]

Oral rinses

Mouth rinsing is a common practice in patients with oral malodor.[41] Chlorhexidine is considered the most effective antiplaque and antigingivitis agent.[42,43] Because of its strong antibacterial effects and superior substantivity in the oral cavity, chlorhexidine rinsing provides significant reduction in VSC levels and organoleptic ratings.[44-48] Other agents like essential oils, cetylpyridinium chloride, hydrogen peroxide, and triclosan are also frequently used as a mouthwash. However, these agents have only a temporary reducing effect on the bacterial load of the oral cavity.

Chewing gum may control bad breath temporarily because it can stimulate salivary flow.[49] The salivary flow itself also has a mechanical cleansing capability.

Temporary halitosis: Gradually disappears on its own by eating or drinking.

Morning bad breath: It is a cosmetic problem analogous to body malodor. To minimize morning bad breath one should use a tongue scraper or antiseptic mouth rinses in the evening before sleeping.[50,51]

Extraoral halitosis: Patients with extraoral halitosis associated with respiratory problems (like sinusitis, tonsillitis, pharyngitis and rhinitis), pulmonary problems, and medications are referred to the appropriate specialist. However, chronic infection of the paranasal sinuses can occur due to violation of maxillary sinus during root canal treatments and dental extractions, which necessitates further dental intervention.

Conclusion

Offensive body odor is one of the greatest taboos in our society. In that respect, halitosis can be a crippling social problem and therefore needs to be considered a serious problem. Extraoral halitosis might be a manifestation of a serious disease. A proper diagnosis and determination of the etiology is of paramount importance. Although gingivitis, periodontitis, and tongue coating are by far the most common causes of malodor, health professionals in medicine and dentistry should be knowledgeable about diagnosis and therapy of this disorder. Almost all the cases of intraoral halitosis can be treated by scaling, and tongue scraping. The dental hygienist, dentist, and the periodontist are the most appropriate professionals to diagnose and to treat this condition.

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