REVIEW ARTICLE

HALITOSIS

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ABSTRACT

Halitosis is a broad term describing a range of unpleasant or offensive odours emitted in the breath, due to multiple causes.[2] Volatile sulphur compounds may be the main source of oral malodor. The source may be oral or non-oral. Non-oral causes of bad breath are mostly related to systemic conditions and/or drugs prescribed by the physicians to treat medical conditions such as diabetes, liver disorder, kidney malfunctioning, pulmonary disease etc. Medications which reduce salivary flow like antipsychotics, narcotics, antidepressants, decongestants, antihistamines and antihypertensives may also be responsible.[3] Oral causes of bad odor are mainly the gram-negative anaerobic bacteria, especially those localized at posterior surface of the tongue and within the surface of tongue and in throat.

Oral malodours were drastically reduced after treating chronic periodontitis. Diagnosis can be confirmed by one of the 3 techniques which are; Organoleptic measurement, Gas Chromatography and Sulphide Monitoring. The treatment plan comprises elimination of the causative agent and improvement of the oral health status.

Key words: *Halitosis, Periodontitis, Organoleptic score, Volatile sulphur compounds, Malodor*

INTRODUCTION

Bad breath usually originates in the oral cavity. It has different names; oral malodor, foetor ex ore, or halitosis. Bacterial products from deep periodontal pockets, food stagnating in dental cavities and tongue coating cause bad breath. Bacterial products from tonsils and pharynx may also be involved.[1] Role of anaerobic oral bacteria is important. They can flourish and survive in an atmosphere where oxygen is not present. They live in between the papillae (fibers) that make up the tongue. These bacteria assist in digestion by breakdown of proteins found in specific food, blood, diseased oral tissue and mucous. Proteins are amino acids; two basic types Cysteine and Methionine are rich in sulphur. In some circumstances these oral bacteria start breaking down proteins at a very rapid rate hence more sulphur deposits and worse aroma.[3,4]

Classification

Yaegaki and Coil (2000)[5] classified halitosis into three categories: Genuine halitosis, Pseudo-halitosis and Halitophobia.

Genuine Halitosis is an oral malodor beyond socially acceptable levels and can be subdivided into Physiological halitosis and Pathological halitosis and in some cases both may exist concurrently. *Physiological Halitosis* occurs through digestive process in the GI tract e.g intake of garlic or spicy foods, or through normal putrefactive processes in oral cavity[2,6,7] and is not associated to systemic disease or any pathology.[2] *Pathological Halitosis* may have intra-oral and extra-oral etiology. Intra-oral causes could be compromised periodontal status, or pathology of mucous membranes, whereas extra-oral causes include respiratory tract infections or systemic disorders, such as uncontrolled diabetes mellitus, liver cirrhosis and kidney diseases.[2,7]

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Pseudo-Halitosis is described as a condition in which patient believes significant malodour is present but on examination there is no evident pungent odour.[2]

Halitophobia is a psychic problem characterized by patients assumption that he or she is having halitosis in spite of reassurance, treatment and necessary counseling.[2,6,9] Halitophobia patients should be referred to psychiatrists.[6]

Etiology of Halitosis

Oral conditions like acute necrotizing ulcerative gingivitis (ANUG), severe periodontitis, dry socket, ulcers and other oral diseases are most likely to cause oral malodour.[10] Delanghe et al presented the scientific information regarding the origin of oral malodour.[11] They examined 260 patients and reported that 87% of the patients had halitosis which were of oral origin, 8% of them had malodour which originated from ears, nose and throat whereas in 5% of the patients etiology was unknown. Amongst the group of oral origin halitosis, 41% of them had tongue coating, 31% were having gingivitis and remaining 28% were periodontally compromised patients.[10, 11] Halitosis can be due to the result of serious systemic illness. Anaerobic infections of upper respiratory tract like tonsillitis and sinusitis, abscess in lungs or any neoplasm can be the cause of oral malodour. Systemic causes are unusual but are very important in dealing with a patient of bad breath. Such conditions include liver failures or infections, diabetic acidosis and trimethylaminuria.[10]

Aromatic gases expelled continuously from the oral cavity are also the cause of halitosis. Volatile sulphur compounds like hydrogen sulphide, methyl mercaptan, and dimethyl sulphide are the gases which are mostly involved in causing halitosis. Other non-sulphur gases are also known to be involved in causing bad breath as Volatile aromatic compounds like indole, skatole, organic acids like acetic and propionic and amines like cadaverin and putrescine.[10, 12]

Volatile sulphur compounds are formed mainly due to putrefactive activities of bacteria in oral cavity in saliva, gingival sulcus, tongue and other sites within oral cavity (Flow chart 1).[10, 13]

Role of Bacterial agents in producing Halitosis

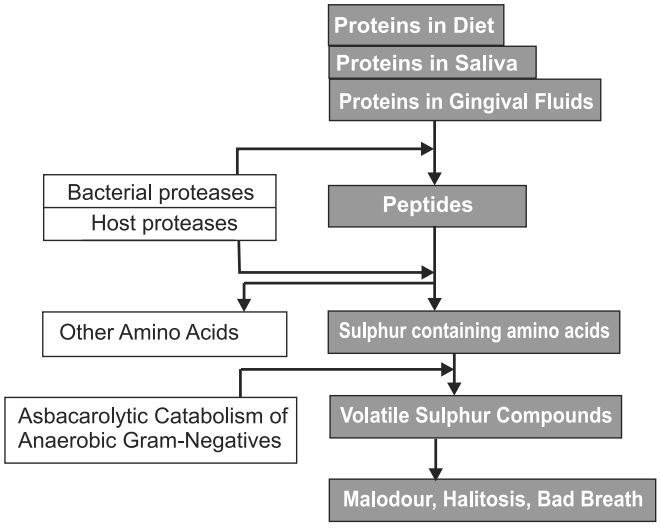
The odoriferous compounds responsible for Halitosis are formed only because of suitable microorganisms present in the oral cavity. Amongst these variety of bacterial organisms the most associated with periodontal and periapical inflam-mations and infections include Prophyromonas gingivalis, Treponema denticola and Prophyromonas endodontalis which are rarely found in healthy oral cavity.[10]

Physical and chemical conditions of the oral cavity in producing malodour

The pH, pO2 (oxygen level), and Eh (oxidation-reduction potential) varies depending on bacterial metabolism. If the sources of nutrient for bacterial metabolism are carbohydrates, their fermentation move the oral environment to an acidic side on pH scale, and it ultimately limits the volatile sulphur compound production. Whereas if the source is simply a protein whose metabolic end result like nitrogenous compounds e.g, urea shift the oral environment to a higher pH scale. Therefore the neutral or alkaline nature of the oral cavity favors the volatile sulphur compound production hence causing halitosis and typical bad breath.[10]

Role of Substrates

Saliva is a composite of discharge from salivary glands along with different species of bacteria, desquamated epithelium, leukocytes and food debris. Saliva is odorless under normal circumstances. When the pH of saliva fluctuates it develops a pungent smell. Saliva is rich in urea and proteins under normal conditions and glucose and carbohydrates components are in very little amounts. High protein proportion in saliva aids in



Flow Chart – 1: Production of Volatile Sulphur Compounds (VSCs) [10]

TABLE 1: MALODOR POSSIBLE CAUSES AND SOURCES[15]

Problem	Probable cause / sources of Halitosis
Odor after fasting, dieting, sleeping, taking medications, prolonged speaking, exercise	Dryness in the mouth, insufficient saliva flow
Gums bleed and / or smell	Gum problems, poor cleaning between teeth
Odor upon talking	Postnasal drip on back of tongue
Odor at onset of menstrual cycle	Swelling of gums
Small whitish stones with foul odour appear on tongue	Tonsilloliths from crypts in tonsils
Odor appears suddenly from mouth of young students	Onset of throat infection
Odor appears suddenly from nose of young children	Foreign body placed in nose
Taste or smell of rotten fish	Trimethylaminuria (rare)
Odor in denture wearers	Dentures kept in mouth at night or not cleaned properly
Odor from nose	Sinusitis, polyps, dryness, foreign body, hindered air or mucus flow
Bad taste all day long	Poor oral hygiene, gum disease , excessive bacterial activity on tongue

TABLE 2: ORGANOLEPTIC SCORES[10,26]

Organoleptic Scale (0-5)
0 = no appreciable odor
1 = barely noticeable odor
2 = slight but noticeable odor
3 = moderate odor
4 = strong odor
5 = extremely foul odor

TABLE 3: TREATMENT NEEDS (TN) FOR HALITOSIS[10]

Category	Description
TN - 1	Explanation of halitosis and instructions for oral hygiene (support and reinforcement)
TN - 2	Oral prophylaxis, professional cleaning and treatment for oral diseases especially periodontal disease
TN – 3	Referral to a physician or medical specialist
TN – 4	Explanation of examination data, further professional instructions, education and reassurance
TN - 5	Referral to a clinical psychologist, psychiatrist or other psychological specialist

production of volatile sulphur compound which is the major cause of halitosis.[10]

Approximately 30% of the population suffers from bad breath upon wakening (morning breath), and the reason is decreased salivary flow from major salivary glands, causing dry mouth (xerostomia). Dry mouth can be due to multiple causes such as by use of various medications, salivary glands problem or continuous breathing from mouth.[10,14] During the sleep, especially at night salivary glands slow down. In elders they stops secreting saliva, and ultimately when saliva is decreased mouth becomes dry and hence bad breath. For people who are mouth breathers and who snore at night, the continuous flow of air from palate creates a parched area on tongue and becomes breeding ground for anaerobic bacteria thus initiating the putrefaction process that cause bad breath.[10]

Role of Tongue surface

Tongue surface serves as the chief source for production of volatile sulphur compounds both in healthy and in periodontally compromised patients. Anaerobic bacteria can flourish and survive in an atmosphere where oxygen is not present, and for this particular reason they are present on the surface of the tongue as tongue coating. They also live in between the papillae that make up the tongue.[3,4,10] The morphology and anatomy of tongue in some patients is such that deep fissures and crypts are present and they protect the

microorganisms from flushing away and also favors them in creating an environment where they can survive in low oxygen levels.[10] Table 1. [15]

Relationship between Periodontal problems and Halitosis

Up to date evidence has confirmed an obvious relation between halitosis and compromised periodontal conditions. Microorganisms colonizing the tongue and periodontal sulcus aids in the formation of volatile sulphur compounds in both periodontally healthy individuals and periodontally compromised diseased individual.[22] Yaegaki *et al* in a study stated that periodontal pocket is the main source for volatile sulphur compounds in aggressive periodontitis.[10,23]

Oral malodors in periodontally compromised patients were also related with thick tongue coating, as tongue is a territory for oral microorganisms and therefore the potential need for tongue cleaning as part of daily oral hygiene.[17,18,22] Volatile sulphur compounds are a family of gases which are solely responsible for bad breath, a condition in which offensive odors are expelled from the oral cavity of an individual. Amongst VSC the hydrogen sulfide (H_2S) and methyl mercaptan (CH_3SH) are chiefly accountable for causing objectionable mouth odor. Production of these gases especially the production of methyl mercaptan (CH_3SH), at high levels is principally limited to periodontal pathogens. The methyl mercaptan (CH_3SH) not only increases the permeability of intact mucosa but also stimulates production of cytokines which have been associated with periodontal disease. In addition to it methyl mercaptan are also capable of inducing toxic changes in both the extracellular matrix and the local immune response of periodontium to plaque antigens.[19] Considerable associations have been found between oral malodour and the specific periodontal parameter. Levels of oral malodour were drastically reduced after treating chronic periodontitis via non-surgical periodontal treatment procedures and laser applications.[20]

The amounts of volatile sulfur compounds and methyl mercaptan/hydrogen sulfide ratio in expelled air from patients with periodontal involvement were 8 times greater than the individuals with healthy periodontium, and volatile sulphur compound concentration was 19% less in periodontally healthy individuals.[10,21]

Diagnosis of Halitosis

Diagnosing bad odor from an individual is mainly done by three techniques: organoleptic measurement/ Sniff test, gas chromatography and sulphide monitoring.[10,27]

Organoleptic Measurement can be done by sniffing the individual's breath to score oral bad breath. A translucent tube (2.5cm diameter and 10cm length) is given to the patient to exhale slowly into the tube to collect the exhaled breath undiluted by room air. The exhaled breath in the tube is later evaluated and given a suitable score from organoleptic measuring table (Table 2).[25] For organoleptic measuring method it is necessary for both the patient and the observer to follow certain sets of guidelines. The patients are pre informed to desist from strong foods at least 48 hours prior the test. The patients are also instructed to avoid using any scented cosmetics 24 hours prior appearing for the organoleptic measuring test. They are also warned to limit their usual oral hygiene practices like oral rinses, breath fresheners, tea or coffee, juices and smoking at least 12 hours prior the test. The examiner should have a normal sense of smell, and should avoid doing smoking, drinking tea, coffee, juices or drinks before or during the assessment.[10,26]

Gas Chromatography is considered to be the Gold standard to measure bad breath because it is specific for VSCs, which is the main etiology of halitosis.[10] Gas chromatography is the preferable technique.[27] The GC apparatus is huge and costly, therefore an expert operator is needed to operate this equipment and its use has been limited to research purpose only and not for clinical use.[10]

Sulphide monitoring is done by sulphide monitors to measure total sulphur content of the individual's expelled air. The equipment used for it is cheap, handy and simple to use.[10]

Treatment of Halitosis

The treatment modalities include the following: (Table 3)

1. Oral hygiene instructions to emphasize and encourage brushing, flossing and denture hygiene.
2. Mechanically scaling and root planning of the root pockets, and tongue cleaning can help in eradicating the cause of halitosis.

3. Using a mouthwash to control halitosis.
4. Dietary guidance to emphasize mouth cleaning after eating or drinking dairy products, fish, meat, garlic, onion, coffee, and smoking.
5. Regular follow up visits.[28]

CONCLUSION

From the above review it is concluded that volatile sulfur compounds and tongue coating score were drastically reduced after scraping of tongue was done along with periodontal therapy provided to the patients. Tongue coating could re-build up therefore oral hygiene instructions should be given to the patients to control it. Thus results indicated that tongue scraping can improve malodor extensively. The study shows that halitosis is highly associated with bad oral hygiene, periodontitis and tongue coating. It is not easy to assess to what extent periodontal treatment alone is helpful in controlling halitosis. Therefore periodontal therapy in combination with tongue scraping appears fruitful in controlling oral pathogenic halitosis.

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