

# Prevalence of Halitosis and its Correlation with Various Intraoral Etiological Factors: A Cross-Sectional Study.

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Received: July 2016

Accepted: July 2016

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## ABSTRACT

**Background:** Halitosis is one of the most frequent complaints while a patient visits to a dentist. It has negative impact on the psychology of the individuals because of the social stigma related to it. Halitosis can produce by the degrading action of gram-negative anaerobic bacteria on sulfur containing substance such as debris and plaque. In majority of cases the source of halitosis is oral cavity. **Methods:** A total of 300 patients were selected from the OPD of department of Periodontics. Out of all, 166 were male and 134 were female. Organoleptic scoring system was used to detect the grade of halitosis. Complete dental checkup of the patients were performed to find out the possible cause of malodor. **Results:** Prevalence of halitosis in the given population was 63% (n=188). Out of total subjects with halitosis, 62 subjects (32%) presented with grade-I, 46 subjects (24%) with grade-II, 38 subjects (20%) with grade-III, 24 subjects (13%) with grade-IV and 18 subjects (11%) with grade-V. Strongest correlation was found between tongue coating and prevalence of halitosis. Other causes reported was, dental caries, periodontal disease, smoking, tobacco chewing, and pericoronitis. **Conclusion:** Prevalence of halitosis in the given population was 63%. Men had significantly greater prevalence of halitosis compared to women. The major reported etiological factor for halitosis was tongue coating.

**Keywords:** Halitosis, etiological factors, oral causes, prevalence, population.

## INTRODUCTION

Halitosis is a medical term, first coined by the Listerine Company in 1921, used to describe unpleasant breath, regardless of its sources, oral or non-oral. It occurs worldwide and has a multifactorial origin.<sup>[1]</sup> It is one of the most frequent complaint while a patient visits to a dentist.<sup>[2]</sup> Halitosis also termed fetor-exore, fetor-oris and oral malodor is foul or offensive odor emanating from the oral cavity.<sup>[3]</sup> All over the world halitosis is a common problem in the general population, various studies and surveys have shown that nearly more than 50% of the world population is suffering from halitosis.<sup>[4]</sup>

Halitosis has negative impact on the psychology of the individuals because of the social stigma that it has in many cultures. It is a common observation in the people who have halitosis to have poor self-esteem and transient discomfort.

Halitosis can produce by the degrading action of gram-negative anaerobic bacteria on sulfur containing substance such as debris and plaque.<sup>[5]</sup> The primary molecules, which are responsible for halitosis, are volatile sulfur compounds (VSC) such as hydrogen sulfide, dimethylsulfide and methyl mercaptan.<sup>[5-7]</sup> The VSCs producing bacteria are commonly found on the dorso-posterior surface of the tongue. These bacteria have also been associated with periodontal disease.<sup>[8,9]</sup> In approximately 80–90 % of halitosis cases the source can be found in the oral cavity.<sup>[10]</sup> The tongue is a major site of oral malodor production, further possible cause can be periodontal disease, deep carious lesions, oral infections, periimplant disease, pericoronitis, mucosal ulcerations, impacted food or debris and candida infections.<sup>[11,12]</sup> Extra-oral halitosis is uncommon and common origin for extra oral halitosis can be ear, nose, and throat area or, in rare cases, in the gastrointestinal tract.<sup>[13,14]</sup>

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Various studies have evaluated prevalence of halitosis in the general population, with reported rates ranging from 22% to more than 50%. In addition, approximately 50% of adults and elderly individuals emit socially unacceptable breath, related to physiological causes, upon arising in the morning.<sup>[15]</sup> It has been reported that about 31% of American seniors suffer from chronic or recurrent halitosis, 32 % of Swiss adults reported to have halitosis sometimes or often (N= 419), and 45 % of Indian dental students reported halitosis, with >80 % of them experiencing morning bad breath.<sup>[16-18]</sup>

Various tools and parameters are available for the clinical detection of halitosis. Two primary methods are recommended by international consensus group; 1) organoleptic measurement and 2) instrumental measurements.<sup>[19]</sup> Instead of various advances in detection of halitosis human nose remains the “Gold Standard”. Organoleptic Score system given by Rosenberg and McCulloch is most widely used scoring system for halitosis ranking.<sup>[20]</sup> A trained examiner is required to grade the halitosis in organoleptic measurement scale. Organoleptic score has been the gold standard for breath measurements because the human nose is capable of smelling pleasant/unpleasant odor regardless of its origin. The aim of the present study is to find out the prevalence of halitosis and its correlation with various intraoral etiological factors.

## MATERIALS AND METHODS

The approval for this survey was taken from the Institutional Review Board. All the patients enrolled for study were asked to sign the informed consent form for the study designed. Nature of study was explained to the patients. A total of 300 patients were selected from the OPD of department of Periodontics. Out of all 300 patients, 166 were male and 134 were female. Patients above 18 years of age with minimum 20 teeth in the oral cavity have been included in the study. Patients who have undergone periodontal therapy, patients suffering from any systemic disease and female patients who are pregnant and lactating were excluded from the study. Organoleptic score were recorded for detection of the halitosis [Table 1].<sup>[20]</sup> Oral hygiene index taken for detection of debris and calculus (Green and Vermilion),<sup>[21]</sup> Periodontal status checked by Extent and Severity index (Carlos JP, Wolf MD),<sup>[22]</sup> Complete dental checkup of the patients were performed to find out the possible cause of malodor. Presence of gingivitis and periodontitis, tongue coating, Presence or absence of suppuration, deep caries, pericoronitis, brushing frequency and tobacco habit was noted. Data collected was transferred to excel 2000 edition and analyzed with Statistical Package for Social Sciences (SPSS).

**Table 1: Grading of halitosis according to severity**

| Sr. No | Rating                  | Intensity |
|--------|-------------------------|-----------|
| 1      | No halitosis            | Grade 0   |
| 2      | Barely noticeable odour | Grade 1   |
| 3      | Slight odour            | Grade 2   |
| 4      | Moderate odour          | Grade 3   |
| 5      | Strong offensive        | Grade 4   |
| 6      | Extremely offensive     | Grade 5   |

**Table 2: Demographic information and prevalence of halitosis in the selected population**

| Total subjects (n=300) | Male (n=166) (55%)                          | Individuals with halitosis (n=188) (63%) | Male (n=120) (40%)    |
|------------------------|---|--|-----------------------|
|                        |   |  | Female (n=68) (22.6%) |
| Female (n=134) (45%)   | Individuals without halitosis (n=112) (37%) | Male (n=46) (15.3%)                      |                       |
|                        |   | Female (n=66) (22%)                      |                       |

## RESULTS

A total of 300 subjects were enrolled in the study. Out of total, 166 were male and 134 were female [Table 2]. Prevalence of halitosis in the given population was 63% (n=188), 37% (n=112) of the subjects showed no evidence of halitosis. Gender distribution in prevalence of halitosis revealed 120 (40%) male subjects and 68 (22.6%) female subjects with halitosis out of total 166 (63%) subjects, 46 (15.3%) male subjects and 66 (22%) female subjects without halitosis out of total 112 (37%) subjects [Table 2].

Severity of halitosis was graded on a given severity scale with the minimum score of grade I and maximum score of grade V. Out of total subjects with halitosis, 62 subjects (32%) presented with grade-I, 46 subjects (24%) with grade-II, 38 subjects (20%) with grade-III, 24 subjects (13%) with grade-IV and 18 subjects (11%) with grade-V.

Correlation of various etiological factors with different grades of halitosis is presented in [Table 3]. Correlation of debris and calculus score with different grades of halitosis is presented in [Table 4].

## DISCUSSION

Halitosis is believed to affect one quarter of the population around the world and most people have this condition from time to time and associated with different etiological factor. The present study is a cross-sectional study to evaluate the prevalence of halitosis and its correlation with various intraoral etiological factors. The sampling technique employed in the study was random sampling method. The patients fulfilled the inclusion and exclusion criteria were included in the study.

The results of the study demonstrated that 188 subjects out of 300 subject positive for halitosis, suggesting the prevalence of halitosis is 63%. The prevalence of halitosis, according to the studies

published, is between 2% and 44%. According to the result of study about 30% of young world population suffers with this problem regularly.<sup>[23]</sup>

**Table 3: Correlation of different grades of halitosis with various etiological factors**

| Grade of halitosis | No. of subjects out of (n=188) | Etiological factors related to halitosis |    |                          |    |                                |    |                    |   |                           |    |                      |    |                        |    |
|--------------------|--------------------------------|--|----|--------------------------|----|--------------------------------|----|--------------------|---|---------------------------|----|----------------------|----|------------------------|----|
|                    |                                | Tongue cleaning n=124 (66%)              |    | Dental caries n=115(61%) |    | Periodontal disease n=84 (44%) |    | Smoking n=46 (24%) |   | Tobacco chewing n=44 (23) |    | Suppuration n=8 (4%) |    | Pericoronitis n=4 (2%) |    |
|                    |                                | M  | F  | M                        | F  | M                              | F  | M                  | F | M                         | F  | M                    | F  | M                      | F  |
| Grade I            | 62 (32%)                       | 17                                       | 14 | 18                       | 13 | 10                             | 09 | 12                 | 0 | 12                        | 0  | 0                    | 0  | 0                      | 0  |
| Grade II           | 46 (24%)                       | 16                                       | 12 | 16                       | 13 | 08                             | 06 | 14                 | 0 | 08                        | 01 | 0                    | 0  | 0                      | 0  |
| Grade III          | 38 (20%)                       | 15                                       | 14 | 13                       | 11 | 12                             | 09 | 6                  | 0 | 07                        | 02 | 01                   | 0  | 01                     | 01 |
| Grade IV           | 24 (13%)                       | 11                                       | 09 | 10                       | 09 | 09                             | 07 | 6                  | 0 | 06                        | 02 | 02                   | 02 | 01                     | 0  |
| Grade V            | 18 (11%)                       | 09                                       | 07 | 07                       | 05 | 09                             | 06 | 8                  | 0 | 06                        | 0  | 02                   | 01 | 01                     | 0  |

**Table 4: Correlation of different grades of halitosis with debris and calculus score**

| Grade of halitosis | No. of subjects out of (n=188) | Halitosis and debris score        |                                   |                                   | Halitosis and calculus score        |                                     |                                     |
|--------------------|--------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                    |                                | Debris score 0-1 (No. of subject) | Debris score 1-2 (No. of subject) | Debris score 2-3 (No. of subject) | Calculus score 0-1 (No. of subject) | Calculus score 1-2 (No. of subject) | Calculus score 2-3 (No. of subject) |
|                    |                                | Grade I                           | 38                                | 16                                | 08                                  | 36                                  | 17                                  |
| Grade II           | 26                             | 14                                | 06                                | 23                                | 17                                  | 06                                  |                                     |
| Grade III          | 12                             | 14                                | 12                                | 13                                | 12                                  | 14                                  |                                     |
| Grade IV           | 05                             | 08                                | 11                                | 03                                | 10                                  | 11                                  |                                     |
| Grade V            | 0                              | 05                                | 13                                | 0                                 | 06                                  | 12                                  |                                     |

According to another study nearly more than 50% of the general population has halitosis.<sup>[24]</sup> A study conducted in a group of 2672 Japanese workers showed halitosis prevalence of 57%.<sup>[25]</sup> An observational study conducted in a sample of 99 volunteers which showed a prevalence rate of about 49%.<sup>[26]</sup> According to the Brazilian Association of Halitosis, the incidence of halitosis in Brazilian population is about 40%. And, according to the American Dental Association, about 50% of the adult population had at least an occasional complaint of oral halitosis.<sup>[27,28]</sup>

In the present study prevalence of halitosis in male subjects (40%) are higher as compared to the female subjects (22.6%). The possible explanation for this finding could be prevalence of smoking and tobacco chewing habits in male subjects which is negligible in female subjects. Various published studies revealed that men had more halitosis than women; and also suggested that men and women seem to suffer in the same proportions; however, women seek for professional help faster than men for the treatment of any related dental problems.<sup>[29,30]</sup>

In present study the severity of halitosis was measured with the subjective halitosis detection test known as organoleptic scoring system. The highest

number of individuals were recorded with the Grade-I halitosis n=62 (32%) and the least number recorded with the Grade-V halitosis n=18 (11%). The finding suggests that maximum population affects with less severe grades of halitosis and little portion of population suffers from more severe grades of halitosis.

In our study the correlation of different etiological agents and halitosis revealed strongest correlation between in ability to clean tongue and severity of halitosis. Out of all the subjects with halitosis 124 (66%) subjects were unable to clean the tongue on regular basis. The severity of halitosis is in direct relation with the coating and inability to clean the tongue. Various other studies have the results in accordance with the present study suggesting tongue coating as the major reason for the halitosis.<sup>[31-33]</sup> According to a few authors, there was a reduction in halitosis, only with the removal of tongue coating. Tongue coating is excellence harbor of anaerobic bacteria that produce VSC and ultimately lead to halitosis.

The presence of active periodontal inflammation has also been suggested to be more important for the production of halitosis. In the present study, out of all the subjects suffering from halitosis, 84 (44%)

subject revealed periodontal disease. The severity of halitosis is in direct correlation with the periodontal disease. Studies have shown that patients with chronic periodontitis have more tongue coating when compared to healthy subjects.<sup>[34]</sup> Authors have also found that patients with periodontal disease have more VSC than healthy subjects.<sup>[35]</sup>

Other possible cause of malodor as shown in the result is, deep caries lesion particularly proximal, which will cause impaction of food and debris lead to putrefaction and ultimately cause halitosis. Among all the subjects with halitosis, 84 (44%) subjects revealed dental caries. Smoking not only raises the concentration of volatile compounds in the mouth but also further aggravates the situation because of its drying effect on the oral mucosa. Out of all subjects with halitosis 46 (24%) were smoker and 44 (23%) subjects were tobacco chewers. These findings suggest that smoking and tobacco chewing can play a vital role in production of halitosis. Partially erupted third molar creating the gingival pocket, which after the bacterial colonization causes pericoronitis or suppuration, may also lead to bad breath. In the result 8 (4%) and 4 (2%) subjects were reported with pericoronitis and suppuration respectively

## CONCLUSION

The present study described the etiological factors related to halitosis, including prevalence data, and its correlation. Tongue biofilm, debris and calculus deposition, periodontitis, seems to be directly involved in the production of oral halitosis. It is clear that a successful treatment of halitosis involves an appropriate diagnosis, professional therapy, mechanical plaque control, including tooth brushing and tongue cleaning, possibly combined with the use of an effective antimicrobial mouthrinse.

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**How to cite this article:** Salik A, Shaikh A, Gore A, Bhat MYS, Lokhande N, Gupta A. Prevalence of halitosis and its correlation with various intraoral etiological factors: A cross-sectional study. Ann. Int. Med. Den. Res. 2016; 2(5):DE20-DE24.

**Source of Support:** Nil, **Conflict of Interest:** None declared