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The Association between Periodontal Diseases and Halitosis among Saudi Patients

Abstract

Objectives: To assess the relationship between the presence of periodontal disease and halitosis.

Methods: A total of 120 patients were enrolled and divided into 2 groups, 60 patients with probing depth (PD) 3.0 mm (group 1) and 60 patients with PD ≤ 3.0 mm (group 2). Clinical parameters including, plaque index (PI), bleeding index (BI), and PD were obtained. Breath samples were collected and analyzed using a portable gas chromatograph to measure the concentration of volatile sulfur compounds (VSC).

Results: Halitosis was found to affect 59.2% of the total patients. The means of PI, BI, and VSC were significantly higher in group 1 (PD 3.0 mm) than in group 2 (PD ≤ 3 mm).

Conclusions: The percentage of patients suffering from halitosis in the Saudi population are comparatively high. In addition, there was a positive association between periodontal disease and halitosis.

Key words: Halitosis, Periodontitis, Volatile Sulfur Compounds, Oral chroma.

1. Introduction

Halitosis or oral malodor are common terms used to define a hostile or unpleasant odor emitted from the oral cavity. It can cause both health and social dilemmas that affect the life of subjects who suffer from this condition (Silva et al 2020, de Jongh et al., 2016, de Jongh et al., 2014, de Jongh et al., 2013, Zalewska et al., 2012).The cause of halitosis is connected to both systemic and oral disorders. Several studies demonstrate that the oral cavity is one of the important sources for halitosis (Scully and Greenman, 2012). Through an analysis of 491 subjects with oral malodor, Delanghe et al. (1999) demonstrated that approximately 87% originated primarily from the oral cavity, while 5-8% of halitosis were related to ear, nose, and throat (ENT) problems. Another report specified that 90% of halitosis cases were initiated by sources from the oral cavity (Tonzetich, 1977).

There are certain oral diseases and disorders which are connected with oral halitosis, such as gingivitis, periodontitis (De Geest et al., 2016, John and Vandana, 2006, Liu et al., 2004, Morita and Wang, 2001a), and acute herpetic gingivostomatitis (Kolokotronis and Doumas, 2006). In addition, other oral conditions could be connected with oral malodor, such as dental abscesses, aphthous ulcers, oral cancer, and xerostomia (Nachnani, 2011, Albuquerque et al., 2010, Nally, 1990).

Volatile sulfur compounds (VSC) have been deliberated as the primary gases responsible for causing halitosis. VSC are generated as a result of protein putrefaction by gram-negative bacteria (Nakano et al., 2002). There are several VSC associated with halitosis, such as hydrogen sulfide.(H2S), methyl mercaptan.(CH3SH), dimethyl sulfide.(CH3SCH3), phenol,

and pyridine.[18] Numerous studies have confirmed that oral halitosis is caused mainly due to the presence of H2S, CH3SH, and CH3SCH3 in the exhaled breath (De Boever et al., 1994, Volozhin et al., 2001, Huang et al., 2002).

Periodontitis is reported as one of the important etiological factors of halitosis. Previous studies demonstrated that the occurrence of oral malodor is considerably greater in periodontal patients when compared to healthy persons. They further stated that there was positive correlation between oral malodor and the presence of sites with pockets of 5 mm or more (Bolepalli et al .2015, Huang et al. 2002). Figueiredo et al. (2002) reported in their study that the relationship of periodontitis with oral malodor and VSC level was significantly higher in subjects with probing depth 3 mm; further, they also observed that gingival inflammation contributes the intensity of oral malodour (Aizawa et al., 2005).[3] In this present study, we aimed to evaluate the relationship between the presence of periodontal disease and halitosis.

2. Materials and Methods

2.1. Patients and Study Design

This study was conducted among a total of 120 patients at a single center in Riyadh, Saudi Arabia.[29] The protocol of the study was approved by the Ethical Review Committee of the College of Dentistry Research Center (CDRC), at King Saud University. Informed consent was obtained by all study participants.

A total of 120 systemically healthy patients with and without chronic periodontitis were selected from the outpatient clinic of the College of Dentistry, King Saud University, Riyadh, Saudi Arabia. The inclusion criteria were (i) no periodontal therapy in the previous 3 months, (ii) systemically healthy, and (iii) 18 years old and older. Patients were excluded if (i) they smoked, (ii) had lesser than 12 teeth, or (iii) had received antibiotics within 3 months preceding the study.

The patients that met the inclusion criteria were assigned into 2 groups based on their periodontal condition: group 1 patients with periodontal disease with probing depth (PD) 3 mm or group 2 (control) periodontally healthy patients with PD ≤ 3mm.

2.2.[18] Periodontal Examination

The clinical periodontal parameters including PD and bleeding on probing (BOP) were assessed in all subjects using a periodontal probe at 6 points around all teeth. Moreover, the plaque index (Pl) was used to calculate adherent dental plaque score.

2.3. Oral Malodour Assessment

Three hours before oral breath assessment,[16] all subjects were asked to avoid eating, drinking, chewing, brushing, and using mouthwash. The VSC concentrations in their oral cavity were examined using a portable gas chromatograph (OralChroma™, Kyoto, Japan) equipped with a flame photometric detector. A breath sample (1 ml) was taken using a gas-tight plastic syringe, then injected into the gas chromatography column at 70 °C. The concentrations of

Hydrogen sulphide, Methyl mercaptan, and Dimethyl sulfide were determined. Halitosis was defined when the VSC of the breath sample was greater than or equal to the cognitive threshold as follows: H2S ≥ 112 PPB, CH3SH ≥ 26 PPB and CH3SCH3 ≥ 8 PPB (Aizawa et al., 2005).

3. Results

A total of 120 patients (60 men and 60 women) participated in this study with a mean age of 27.19 years (± 6.3). Halitosis was found among 59.2% (n = 71) of the patients (Fig. 1).

Halitosis was significantly more prevalent among the group 1 (PD 3 mm) patients, 35.8% (n = 43), versus 23.3% (n = 23) in group 2 (PD ≤ 3 mm) patients Table 1. Clinical parameters showed a higher mean score for PI, BI, and PD in group 1 compared to group 2 (Table 1).

Figure 2 shows the VSC scores of the study population. The VSC mean scores were found to be significantly higher among patients with periodontitis (group 1) compared to healthy patients (group 2).

Table 2 shows the clinical measurements of the study population. Comparing group 1 to group 2 patients, significant results were obtained in the clinical parameters of PD (p = 0.0001), BOP (p = 0.001) and PD (p = 0.001).

4. Discussion

Earlier studies have reported that the important VSC that are related to halitosis are: H2S, CH3SH, and CH3SCH3 (Coli and Tonzetich, 1992, De Boever et al., 1994, Schmidt et al., 1978). Another study reported that VSC are the end result of bacterial putrefaction of proteins found in saliva, blood, and gingival crevicular fluid (Kleinberg and Westbay, 1992). Further, the amino acids comprising the sulfur compound leads to the formation of VSC (Waler, 1997, Yano et al., 2009).[2]

In the present study, breath samples were taken from 120 patients to estimate the relationship between the presence of periodontal disease and halitosis using gas chromatography to identify the level of VSC. Gas chromatography is regarded as a reliable method to detect oral gases; it is specific and sensitive for all three VSC i.e. H2S, CH3SH, and CH3SCH3 (Tonzetich et al., 1991, Tangerman and Winkel, 2008, Murata et al., 2006),[7] and is thus recognized as the gold standard for measuring VSC levels in the oral cavity (Tangerman and Winkel, 2008, Yaegaki et al., 2012).[1]

In the present study, 59.2% of the patients were diagnosed with halitosis. This finding is consistent with a previously reported self-assessment of halitosis among Saudi patients, wherein 52% of were aware of having halitosis (N., 2007).[3] In addition, Al-Zahrani et al. (2011) reported self-reported halitosis to be 42.1% among patients with type 2 diabetes. In contrast to the above findings, AlSadhan, (2016) stated the prevalence of self-perceived halitosis to be 22.8% among adults living in Riyadh. This difference in prevalence of this study could be attributed to halitosis being assessed using a survey questionnaire without clinical assessment or breath examination. This asserts the magnitude of the problem that

sensitivity of self-diagnosed halitosis is low, which therefore has a social impact (Bornstein et al., 2009a, Bornstein et al., 2009b). Pham et al. (2012) compared self-perceived halitosis with the actual clinical diagnosis of 565 patients using both the organoleptic test and Oral Chroma and revealed that patients were incapable of precisely perceiving their own oral malodour. In their study, they reported that 52.6% of patients failed to recognize that they had halitosis (Pham et al., 2012a). They further reported that there are several factors that might affect self-perception of oral halitosis, such as occupation, level of education, knowledge of the self-definition of halitosis, and sensitivity of the nose to their own halitosis.

In this present study, the percentage of patients identified with halitosis in group 1 (PD 3 mm) was 35.8%, whereas in group 2 (PD ≤ 3mm) it was 14.2%, indicating a statistically significant difference between the two groups (p 0.05). Further, this shows a high relationship between the presence of periodontal disease and halitosis. The result of this study coincides with an earlier report conducted by Morita et al. (2001) which revealed that VSC increased significantly with an increase in the amount of bone loss, and were highly associated with other clinical parameters such as PD, clinical attachment level, and BOP (Morita and Wang, 2001b). Other studies reported a strong relationship between periodontal inflammation and halitosis (Figueiredo et al., 2002). In addition, Figueiredo et al. (2002)reported direct correlation of the severity of halitosis with periodontal disease. In patients with periodontal disease, the mouth harbors anaerobic bacteria such as T. denticola, P. gingivalis, B. forsythus. These bacteria are adept at producing VSC, which may lead to halitosis (Loesche, 2003, Yasukawa et al., 2010, Kato et al., 2005). Further development of periodontal disease has been connected to the hastening in the fabrication of VSC (Pham et al., 2012b, Takeuchi et al., 2010). Non-surgical treatments have proven to be an effective method in improving the periodontal clinical status of a person, as well as reducing halitosis (Silveira et al., 2016, L et al., 2015, Pham et al., 2011).

5. Conclusion

Within the limitations of this study, it could be concluded that the percentage of patients suffering from halitosis among the Saudi population are relatively high and there is a strong association between the presence of periodontal disease and halitosis.