Original Article

A Study to find out the Dental and Associated Psychosocial Factors in Patients of Halitosis

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Abstract

***Background**: Halitosis is unpleasant breath, regardless of its sources. Oral malodor can actually be an indication of more serious health concerns. Some studies have estimated the prevalence of halitosis to be between 22% and 50%, others between 6% and 23%. Poor oral hygiene, periodontal diseases, nasal problems, and various systemic illnesses can be various reasons behind halitosis. Psychiatric problems and halitosis contributes to each other's pathology significantly. **Method**: 250 patients were enrolled for study. Sociodemographic profile was noted for all. Complete dental check up was performed to rule out dental factors for halitosis. Organoleptic scale was used to detect the intensity of halitosis. SCL-80 was used to find out psychological component of halitosis. Data was statistically analyzed. **Results**: Males significantly outnumbered females ($p<0.0001$) in being post graduates. Significantly more ($P=0.0024$) females were unemployed and household workers, 40 % were professional and 32% were students. Significantly higher number ($p<0.0001$) of subjects with halitosis had associated medical problems. Significantly higher ($p=0.0101$) difference was observed overall and among Males and females regarding dental problems. 34.47% had periodontitis, gingivitis (39.20%), missing tooth (22.80%), calculus (18.80%), tooth sensitivity (49.31%), caries tooth (53.29%), abscess (15.20%) and history of trauma (34.06%). Significantly higher results in somatization ($p=0.0003$; chi square=19.099), depression ($p=0.0019$; chi square=14.956), IP sensitivity ($p<0.0001$; chi square=27.506), phobia ($p=0.018$; chi square=10.063), OCD ($p=0.0312$; chi square=8.862) and anger hostility ($p=0.0016$; chi square=15.308) subscales of SCL 80. **Conclusion**: Present study concludes significant correlation between dental and psychological factors in halitosis. Halitosis itself produces psychiatric symptoms which could affect the social and personal interaction. Further research into these aspects of halitosis is strongly recommended in developing countries like india.*

***Key words**: Halitosis, dental factors, SCL-80, psychosocial factors.*

Introduction

Odors are essential clues in the creation and conservation of social bonds, as they are loaded with cultural values. The problem dates back to 1550 BC. Hippocrates mentioned that any girl should have a pleasant breath, making sure always to wash her mouth with wine, anise and dill seeds. The Romans used to hide halitosis with perfumed tablets, chewing leaves and stalks of plants. In Antiquity, having a fragrant breath meant exhaling the sweetness of life and asserting the purity of a person's soul. During Christianity, the devil's supreme malignant odor smelled of sulfur, and it was presumed that sins produced a more or less

bad smell. Archeological excavations in garbage deposits from the 19th century found earthenware pots with tooth powders. Announcements at that time disseminated the properties of "Chinese tooth powders", "tooth elixirs", "tooth opiates", confirming special interest in the elimination of bad breath and in cleanliness of the mouth. Another example comes from the Talmud, dating back more than 2000 years, which reports that, in view of some conditions, such as one of the partner's bad odor for example, the matrimonial license, called Ketuba, can be legally broken. A treaty in Islamic literature from the year 850 talked about the use of siwak when breath had changed or at any time when getting out of bed. This recommendation was probably aimed at minimizing the smell or morning or physiological halitosis. The Hindus and Buddhist monks in Japan also consider the mouth as the body's entry door and, therefore, insist that it be kept clean, mainly before prayers. Howe in 1874 affirmed that the importance of offensive breath derives from the fact that it becomes a constant source of unhappiness to the patient, and gets even worse when it destroys communication among friends and the pleasures of social contact[1].

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[2]. The scientific term, oral malodor is especially used to describe the odor from the oral cavity. Malcmacher[3] noted that oral malodor can actually be an indication of more serious health concerns such as infections. Treatment plans only help reduce – but not treat – bad breath[4]. Halitosis is a common complaint of both genders. It occurs worldwide and has a multifactorial etiology[5].

Delusional halitosis also referred to as psychosomatic halitosis occur in apparently healthy individuals who complain of chronic bad breath that no one else can smell, for which no local or systemic disease causing oral malodor could be found.[6]

Generally, halitosis is classified as either primary or secondary. Primary halitosis refers to respiration exhaled by the lungs, whereas secondary halitosis originates either in the mouth or upper airways[7, 8]. The intensity of bad breath is significantly associated with the level of volatile sulfur compounds (VSCs) in the oral cavity. While halitosis may have physiological and/or pathological causes, the main cause is related to conditions in the oral cavity[9]. Halitosis can further be: genuine, pseudo-halitosis, and halitophobia halitosis. In genuine halitosis, the malodor intensity is beyond the socially acceptable level. If malodor is not perceived by others but the patient persistently complains of its existence, it is diagnosed as pseudo-halitosis. If after successful treatment of genuine halitosis or pseudohalitosis the patient still complains of halitosis, the diagnosis is referred to halitophobia[10].

In halitosis, prime diagnostic importance in the identification of poor oral hygiene, periodontal diseases, nasal problems, and various systemic illnesses[11]. Bad breath, whether real or perceived, is a cause of concern, embarrassment, and frustration on the part of the general public and can lead to social isolation, divorce proceedings, and even contemplation of suicide[12].

Some studies have estimated the prevalence of halitosis to be between 22% and 50%, others between 6% and 23%).[2,3] According to the American Dental Association, 50% of the adult population has suffered from an occasional oral malodor disorder, while 25% appear to have a chronic problem. However, there are other extrinsic causes, e.g. smoking, alcohol, bad diet and sociodemographic factors.[13,14]

Interestingly, a study on the presence of VSCs did not observe any significant differences on the prevalence of halitosis linked to gender. It seems that women are more worried than men about their own oral malodor, which highlights the role of the mouth in relationships. Many studies on self-reported halitosis have stressed that the problem of halitosis is often not self-perceived. Few studies in the literature have highlighted the links between halitosis and emotions, e.g. anxiety[15]. Nevertheless, the relations between anxiety and halitosis have been analyzed with clinical observations suggesting that anxious situations may increase VSC concentration thus causing halitosis.[16]

Although the causes of oral malodor are not entirely understood, most unpleasant odors are known to arise from food debris trapped in the mouth which is processed by normal mouth flora. There are over 700 bacterial species or phylotypes, of which over 50% have not been detected in the oral cavity. Large quantities of these naturally

occurring anaerobic, mainly Gram-negative bacteria are often found on the dorsum of the tongue and periodontal pockets, where they are undisturbed by normal activity. The problem of oral malodor has been shown to originate in the oral cavity, where conditions favor the retention of anaerobic bacteria. Research has shown that the vast majority of patients with halitosis, approximately 80–90% originate within the oral cavity and not in the stomach, which many individuals believe. Increased production of VSC may represent a further mechanism of increased susceptibility to periodontitis in smokers and also help to explain the reported association between smoking and halitosis. The percentage of sites per subject with high levels of sulphides detected in moderate (4–6 mm) and deep (‡7 mm) periodontal pockets was found to be significantly higher in smokers, compared with non-smokers.[17] Darby and Walsh[18] describe health as a state of well-being with both objective and subjective aspects that exists on a continuum from maximal wellness to maximal illness.[2]

From a biological standpoint, saliva performs essential roles of enzymatic digestion, antimicrobial action, and regulation of pH, protection of oral tissues, lubrication and assistance in swallowing, potentiation of taste, elimination of the food bolus and facilitation of the removal of carbon. The normal salivary pH is generally 6.5. This slightly acidic pH suppresses the growth and proliferation of Gram-negative and anaerobic bacteria, hindering the activation of the enzymes necessary for the putrefaction of amino acids, the end products of which smell bad because the compounds contain reduced sulfur (SH2). Among the 50 to 65% of the population with halitosis, 8% of cases are associated with respiratory problems, and 90% are associated with oral problems. Saliva plays a central role in the development of bad breath, as it provides the protein substrate that is readily used by bacteria. Saliva is also an oxygen source for bacteria. A reduction in salivary flow has a negative effect on the self-cleaning of the mouth and can generate odoriferous volatile compounds.[5]

Mentally ill have been associated with an increased need for dental care. Various Population surveys have indicated that people with enduring mental health problems make less frequent planned visits to the dentist and report a greater number of missing teeth than the general population[19].

Material and Methods

The present study was conducted at Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar. Prior permission for the study was taken from the institutional authorities concerned. All the patients enrolled for study were asked to sign the consent form for the study designed. Nature of study was explained to the patients. Out of all, 250 patients were enrolled for the final study. 110 participants were male and 140 were females. General Sociodemographic profile Including age, sex, marital status, education and employment of the patients was noted. History of associated medical illness and history of taking any medicine for medical or psychiatric condition were noted. Complete dental check up of the patients was performed to find out the possible cause of malodor. To detect the intensity of malodor, the subjective halitosis detection test, also known as the organoleptic test was used. Climatic conditions and emotional states that affect the sensitivity of the examiner may mask the presence of halitosis. Nevertheless clinical assessment, breath measurement with organoleptic ntensity scale, routine scaling / polishing and counseling was performed to rule out the possibility of including individuals who had genuine halitosis or pseudo-halitosis with associated psychological component Patients were also subjected to symptom check list (SCL-80) questionnaire for screening of psychiatric symptoms. Confidentiality was maintained throughout the procedure. Data collected was transferred to excel 2000 edition and analyzed with Statistical Package for Social Sciences (SPSS). The confidence level was set at 99% and probability values (P-value) of $P<0.01$ was regarded as significant.

Results

110 males and 140 female patients were taken up for study. No statistical difference was observed in age distribution of the patients ($p=0.2807$). 109 patients enrolled were in age group of > 30 years. Males significantly outnumbered females ($p < 0.0001$) in being post graduates i.e. 70 male vs. 45 females out of 115. 110 patients (44%) were single,

Sociodemographic Profile of Subjects with Halitosis

Age	**Total**	**Male**	**Female**
< 20	50/(20%)	27/(54%)	23/(46%)
20-30	91/(36.4%)	38/(41.76%)	53/(58.24%)
>30	109/(43.6%)	45/(41.28%)	64/(58.72%)
Sex	**Total**		
male	110		
female	140		
Education	**Total**	**Male**	**Female**
Middle school	10/(4%)	3/(30%)	7/(70%)
high school	25/(10%)	7/(28%)	18/(72%)
graduate	100/(40%)	30/(30%)	70/(70%)
post graduate	115/(46%)	70/(60.87%)	45/(39.13%)
Marital status	**Total**	**Male**	**Female**
single	110/(44%)	56/(50.90%)	54/(49.10%)
married	119/(47.60%)	46/(38.66%)	73/(61.34%)
divorced	12/(4.8%)	6/(50%)	6/(50%)
widow/ widower	9/(3.6%)	2/(22.22%)	7/(77.78%)
Occcupation	**Total**	**Male**	**Female**
unemployed	2/(0.80%)	0	2/(100%)
student	80/(32%)	42/(52.50%)	38/(47.50%)
house wife	20/(8%)	0	20/(100%)
manual work	10/(4%)	5/(50%)	5/(50%)
clerical job	33/(13.20%)	15/(45.45%)	18/(54.55%)
professional	100/(40%)	45/(45%)	55/(55%)
Retired	5/(2%)	3/(60%)	2/(40%)

12 (4.8%) divorcee and 9 (3.6%) widow/ widower. Significantly more (P=0.0024) females were unemployed and household workers, 40 % were professional and 32% were students. 20% of the females were house wives. Significantly higher number (p<0.0001) of subjects with halitosis had associated medical problems. 40.90% males vs. 3.56% females were alcoholics, 50% males vs. 3.56% females were smokers, 34.54% male vs. 40% females were hypertensive, 39.09% male vs. 45% of females were diabetes, 1.82% males vs. 10.71% females were anemic, >50% of total patients in each group had some sort of allergies and skin problems, about 49% of both male and female had genitourinary infections, 57.27% male vs. 46.63% females had gastrointestinal problems. Significantly higher (p=0.0101) difference was observed overall and among Males and females regarding dental problems. Of all the patients, 34.47% had periodontitis, gingivitis (39.20%), missing tooth (22.80%), calculus (18.80%), tooth sensitivity (49.31%), caries tooth (53.29%), abscess (15.20%) and history of trauma (34.06%). Only history of trauma was more in males, rest all the dental problems were encountered more in females. Organoleptic intensity scale confirms significantly higher (p=0.0001) results were obtained overall and among the groups. Odor cannot be detected in 18% of the patients (25% female vs. 9.09% males). Odor was barely detectable in 14% of subjects (21.43% female vs. 4.55% males). Slight malodor was present in 22.73% of males vs. 16.43% females. Malodor was definite in 19.28% females vs.10.91% males. Strong malodor was present in 31.82% males vs. 14.28% females. 20.90% male vs. 3.57% females had very strong malodor.

On SCL-80, significantly higher (p=0.0003) 32.14% females vs. 11.82% males had mild symptoms and 10.91% male vs. 4.28% females had severe symptoms of somatization. Significantly higher (p=0.0019) depressive symptoms were seen in 8.57% females in moderate and 9.29% had sever category vs. 1.82% males in each group. No statistically significant difference (p=0.024) was observed in paranoid subscale in both the groups. Only 10.91% males vs. 18.57% females had mild symptoms of paranoia. Significantly higher (p<0.0001) IP sensitivity were observed in 22.86% females In mild and 12.85% in moderate range vs. 7.27% and 0.91% of males in respective group. Significantly higher (p=0.018) mild phobic symptoms were observed in females in 28.57% cases vs. 12.73% males. No significant differences

Organoleptic Intensity Scale

Rating	**Intensity**	**Male**	**Female**	**Total**
Odor can not be detected	0	10/(9.09%)	35/(25%)	45/(18%)
Questionable Odor, Barely Detectable	1	5/(4.55%)	30/(21.43%)	35/(14%)
Slight Malodor, Exceeds the Threshod of Malodor	2	25/(22.7%)	23/(16.4%)	48/(19.2%)
Malodor Definitely Detected	3	12/(10.9%)	27/(19.28%)	39/(15.6%)
Strong Malodor	4	35/(31.82%)	20/(14.28%)	55/(22%)
Very Strong Malodor	5	23/(20.90	5/(3.57%)	28/(11.2%)

(p=0.1718) were observed in anxiety symptoms in both the groups. Significantly higher (p=0.0312) females (35%) had mild OCD symptoms vs. 20% of males. Anger hostility was absent in 88.19% cases in males. Significantly higher (p=0.0016) females had mild symptoms of anger hostility than males (21.43% vs. 5.45%) respectively. No significant (p=0.219) difference was observed on additional symptoms subscale.

Discussion

Oral malodor seems to affect a large percentage of population and has multifactorial etiology (biological, dental, psychopathological). Nevertheless, like other studies it is possible that not all the subjects with halitosis expressly declared to be suffering from it.[20-22] (110; 44%) males and (140; 56%) female patients were taken up for study. No statistical difference was observed in age distribution of patients (p=0.2807; chi square= 2.541). Velasco in his study found sex distribution of 61% and 47% male participants.[23] In our study, Organoleptic intensity scale found self reported halitosis was 29.70%. Settineri et al found rate of self-reported halitosis was 19.39% and this revealed personal awareness of one's own bad breath[24]. Porter et al found malodor was perceived by 31.7% of the females and 23.4% of the males during the hand-on-mouth test (p=0.04)[25]. In a group of 626 young male adults in switzerland, the questionnaire revealed that 17% of all subjects had never experienced oral malodor[26].

109 patients enrolled were in age group of > 30 years. Males significantly outnumbered females (p<0.0001) in being post graduates. (110; 44%) were single, (12; 4.8%) divorcee and (9; 3.6%) were widow/ widower (p=0.1436). Significantly more (p=0.0024) females were unemployed and household workers. 47.6% of patients were married (p=0.1436). Significantly high patients (p=0.0024), 40% were professional, 32% students and 20% of the females were house wives. Porter et al found malodor is common among all ages. 25% of the respondents aged 12-16 years claimed to have noticed that their oral breath smelled bad[25]. Youngnak et al found oral malodor higher in the age range of older than 30 years compared with younger patients (p=0.000). Subjects with lower educational levels reported a significantly higher prevalence of self-perceived oral malodor than those with a university education (p=0.001)[27].The relationships between dental anxiety and other demographic variables such as income level and education have not been fully elucidated. While some studies have demonstrated that higher levels of dental anxiety are associated with low income and education,[28,29] other failed to find such relationship.[30,31] Doerr et al that being female, having a low income, and having a low perception of one's oral health status would be linked with higher levels of dental anxiety[30]. Porter et al in Bern found that majority of the subjects were single (59.7%), followed by married (32.4%) and separated (4.9%). The distribution of high school or lower and university education was almost equal (47.3% and 45.3%, respectively) [27].

In our study, significantly higher number (p < 0.0001; chi square = 101.47) of subjects with halitosis had associated medical problems. Youngnak et al concluded most subjects did not have any systemic diseases (54.8%), while 41.1% had systemic diseases. In contrast, there was no statistically significant difference in self-reported oral malodor with or without smoking or alcohol consumption (p = 0.106 and p = 0.307, respectively) [27]. In contrast, Smoking was significantly (p < 0.001) more prevalent among males (17%) than among females (1%). Brushing was practiced by 85% of non -smokers and 68% of smokers (p = 0.004)[29]. Chi square test showed that there is no significant relationship between halitosis, and smoking and gender (p > 0.05)[10]

Mohammad et al found only Hypertension to be medical disorder with a higher prevalence (91; 17.91%). Of the seventy-five patients reporting depression (42; 56%) were currently taking antidepressant medications. Only hypertension, postmenopausal females on estrogen replacement therapy (46; 9.06%), and patients with a penicillin allergy (44; 8.66%) exceeded the prevalence of patients on antidepressant medication (8.27%).[32] Craig woods found subjects reporting halitosis are preponderantly female and they present significant associations with thyroid problems correlated in the literature with anxiety problems.[33] The findings highlight, in line with other studies, that the etiopathogenesis of halitosis is linked to medical problems such as urinary system disorders, anemia,

gastrointestinal tract disorders, skin problems, allergies, and thyroid problems ($p < 0.001$), alcohol consumption, smoking and poor oral hygiene ($p < 0.001$) Smoking ($p < 0.001$).[24] DMFT index score was associated with duration of mental illness. This is probably because salivary inhibition caused by antidepressants has been identified as a cause of caries.[34]

In our study, significantly higher ($p = 0.0101$; chi square = 18.44) difference overall and among two groups i.e. Males and females in having associated dental problem. Diabetic patients have increased susceptibility to chronic infection and inflammation of the oral tissues especially when they are poorly controlled. Oral manifestations in diabetes include periodontal diseases, oral candidiasis and dry mouth.[35,36] A significant difference was found in the mean levels of HbA1c between subjects with and without halitosis, ($p = 0.03$).[35]In our study, psychiatric patients had a high prevalence of periodontal disease; in fact, all the patients had some form of periodontal disease. These findings are in accordance with other studies. Multiple regression analysis showed male sex to be associated with worse periodontal status. In contrast, Velasco reported female sex as a predictor of poor periodontal condition in psychiatric patients[23]. Youngnak et al[27] found patients with tongue coating, xerostomia and bleeding when brushing teeth reported a higher prevalence of oral malodor than patients without these problems ($p = 0.000$). Subjects receiving professional tooth cleaning and subjects brushing their teeth everyday had a lower prevalence of self-perceived oral malodor ($p = 0.025$ and $p = 0.008$, respectively).[27] Eli et al concluded 51% of the males and 49.6% of females had dental caries.[7]

Present study found significantly higher results in somatization ($p = 0.0003$; chi square = 19.099), depression ($p = 0.0019$; chi square = 14.956), IP sensitivity ($p < 0.0001$; chi square = 27.506), phobia ($p = 0.018$; chi square = 10.063), OCD ($p = 0.0312$; chi square = 8.862) and anger hostility ($p = 0.0016$; chi square = 15.308) subscales of SCL 80 and no statistically significant difference ($p = 0.024$; chi square = 4.59) was observed in paranoid, anxiety ($p = 0.1718$; chi square = 4.999) and additional subscales ($p = 0.219$; chi square = 3.029). Facco et al found dental fear to be a common phenomenon the world over; approximately 25% of patients avoid visits and treatments, and approximately 10% reach phobic levels of anxiety.[37] This problem is of great importance for several reasons: (a) avoidance causes poorer oral health and quality of life; (b) high levels of anxiety and phobias may affect the dentist-patient relationship. The link between a lack of adequate dental health education and high levels of dental anxiety is important, because it causes fear in patients and poor compliance.[24] Settineri et al[24] provides possible explanations, both biological and psychological, for the relations found between anxious situations and increased VSC. Psychological due to the declared presence of general anxiety problems (36.3%; $p < 0.001$) and stress (45.6%; $p < 0.001$). Moreover, the specific study on the presence of dental anxiety within the group of subjects with self-reported halitosis revealed significant average differences for both subscales of dental anxiety, phobic (das 1: mean = 11.00, s.d. = 4.189, $t = 3.99$, $p < 0.001$) and dentist patient relations (das 2: mean = 22.05, s.d. = 6.227, $t = 4.498$, $p < 0.001$). From the analysis it seems that subjects reporting halitosis were, on average, more phobic and less willing to interact with the dentist in comparison to subjects not reporting halitosis. Moreover, the regression analysis provided additional evidence as regards relational dental anxiety (das 2;).[24] Al – omari et al, in Holland, reported only 14% of the dutch population experienced no apprehension or anxiety when visiting a dentist, whilst almost 40% experienced "more than average" anxiety, and 22% were "highly anxious". In this study, the patients most likely to experience high levels of dental anxiety were women aged 26-35 years who were irregular attendees.[38] Craig[33] reported (75; 14.76%) of the patients reported depression, of which (42; 56%) were currently taking antidepressant medication. (42; 8.27%) of the patients reported a current or past history of substance abuse. Anxiety was reported as a significant problem by (29; 5.71%) patients. (23; 79.31%) of these patients were taking psychoactive medication for anxiety. 5 cases (1 %) of bipolar disorder were reported, and all 5 patients were taking medication for this condition. 5 patients reported insomnia. Patients reporting obsessive-compulsive disorder (3 cases), schizophrenia (3 cases), and unspecified psychotic disorder (2 cases)

were all taking psychoactive medication. Finally, there was one case each of agoraphobia, panic disorder, and dementia. Overall (72; 14.17%) of the 508 patients were taking at least one medication for a mental illness. This represents 53% of the patients who reported a mental illness. This study found all anxiety disorders to be underreported (38; 7.4%). Anorexia and bulimia rates (0.98%) were similar to lifetime rates nationally (anorexia, 0.5 to 3.7%.[33] Stouthard et al reported substance abuse (8.27%) compares closely to national statistics (7.3%).[39] Ulrik fredrik malt further found that the dental amalgam sample reported significantly more physical symptoms from all body regions. Self-reports suggested that 62% suffered from a chronic anxiety disorder (generalized anxiety disorder or panic). 47% suffered from a major depression compared with 14% in the two clinicalcomparison samples and none in the dental control sample. Symptoms suggesting somatization disorder were found in 29% of the dental amalgam sample compared with only one subject in the 272 comparison subjects[40].Rockville found that Women exhibited somatization-specific behaviour significantly more often (73%) than Men (27%). The dentists indicated that women (73%) exhibited one of the above characteristics more often than men (27%; $P < 0.05$).[41] Somatization-specific behaviour appeared to be independent of age.[42]

Present study thus concludes a positive correlation between dental and psychological factors in various dental conditions. Thus future research in this regard is highly recommended in different dental problems. A comprehensive team work in treating such patient can lead to better outcome of the treatment.

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